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October/November 2018

Volume 40, Number 5

UM coral study 12

University of Miami researchers recently concluded a study of how corals respond to simultaneous temperature and carbon dioxide increases in the ocean. Their conclusion: some coral species may survive the conditions brought about by climate change and some may not.

Lake O blooms 13

The National Aeronautics and Space Administration and Harbor Branch Oceanographic Institute installed a radiometer at the surface level of Lake Okeechobee to get a more accurate spectral picture of the lake's water quality and the extent of algae blooms.

PRP efficiencies 16

A DEP Petroleum Restoration Program survey and follow-up roundtable discussion produced several proposed action items intended to help increase program efficiencies. PRP officials have been working on the adjustments needed to implement the proposed action items.

Water supply, not lawsuits 17

The Polk Regional Water Cooperative filed a legal challenge to a permit for withdrawing water from the Peace River more than 50 miles downstream of Polk County. The challenge could divert dollars to attorney fees rather than the development of sustainable sources of water for residents—unless cooler heads prevail. SWFWMD Executive Director Brian Armstrong weighs in.

Departments

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Got a story lead?

Got an idea for a story? Like to submit a column for consideration? Fire when ready. And don't forget to fill us in on your organization's new people and programs, projects and technologies—anything of interest to environmental professionals in Florida. Send to P.O. Box 2175, Goldenrod, FL 32733. Call us at (407) 671-7777; fax us at (321) 972-8937, or email mreast@enviro-net.com.

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Dr. Greg Bossart and colleagues from the Georgia Aquarium handle a temporarily detained bottlenose dolphin in the Indian River Lagoon while conducting a study. Dolphin, alligators, turtles and fish from the IRL region have notably elevated perfluoroalkyl substances in their tissues, according to research studies. See story below.

Photo courtesy of Georgia Aquarium

PFAS bioaccumulating in IRL wildlife

By ROY LAUGHLIN

The recent interest in per- and polyfluoroalkyl substances detected on or near Brevard County's military bases has been primarily focused on contaminated groundwater at Patrick Air Force Base, Cocoa Beach and Cape Canaveral.

There, contaminated groundwater occurs at concentrations above—sometimes well above—the 70 parts per trillion U.S. Environmental Protection Agency's health advisory level for PFAS.

However, some of the focus is now shifting to bioaccumulation by wildlife in the Indian River Lagoon and its near-shore coastal waters.

Studies of bioaccumulation in sea turtles are some of the earliest to include PFAS among contaminants analyzed.

In a 2010 study, Steven O'Connell and his coauthors identified PFAS in juvenile loggerhead sea turtles collected from waters of the Chesapeake Bay, Charleston, SC, Cape Canaveral and Florida Bay.

The researchers found that perfluorooctane sulfonate, PFOS, was the predominant PFAS identified in 164 plasma and serum samples.

Concentrations ranged from 0.31 to 39.0 nanograms per gram. Chesapeake Bay and Florida Bay turtles topped the list for serum concentrations.

The authors correlated the habitats close to large human populations with the highest PFAS in sea turtles.

Samples from the study were collected between 2000 and 2008, and temporal trends indicated decreasing PFAS burdens over the eight years of the study.

In a second study, authored by Jennifer Keller, five species showed a clear trend in PFOS plasma concentrations with a trophic level that indicates PFAS

food chain biomagnification.

Green turtles, an herbivore species, had a median concentration of 2.41 ng/g. In Kemp's ridley sea turtles, which eat crabs predominantly, median serum levels were significantly greater, 15.7 ng/g, and in Hawksbill turtles, which eat sponges, it was about 11.9 ng/g of serum.

More recently, two teams of scientists measured serum samples of Indian River Lagoon wildlife.

Jacqueline Bagma led a team of investigators analyzing PFAS in alligators from several southeastern U.S. sites, including Florida's Merritt Island National Wildlife Refuge. As with sea turtles, investigators identified PFOS in

every serum sample collected.

Among all alligators collected from the 12 sites in the Southeast, median serum concentration was 11.2 ng/g with a range of 1.36 - 452 nanograms. The average PFOS concentration for male alligators was higher than the average for female alligators.

The PFOS serum concentrations in alligators taken from the Merritt Island National Wildlife Refuge topped the list.

The average serum concentration for 15 sampled MINWR alligators was 99.5 ng/g, with a range of 38.6 - 452

BIOACCUMULATION
Continued on Page 22

Recently released BMAPs for Florida springs now on hold

By BLANCHE HARDY, PG

The Florida Legislature created the Florida Springs and Aquifer Protection Act in 2016, setting a deadline of July 1, 2018, for the Florida Department of Environmental Protection to release basin management action plans with the necessary strategies to restore 24 impaired Outstanding Florida Springs within 20 years.

DEP adopted 13 of the BMAPs on June 29, 2018, several days before the July 1 deadline.

At least 13 organizations and individuals, including a state environmental agency employee, were sufficiently unhappy with the BMAPs and their rushed release to file petitions for administrative hearings or time extensions. Some of the petitions are spring-specific and some include all the BMAP sites.

A number of environmental organizations sent letters of concern with com-

ments on the BMAP drafts before DEP finalized its work. Many felt their concerns were not adequately addressed in the plans issued.

The depth of concern is well stated in a June 5, 2018, letter sent to the state by the Suwannee-St. Johns Group Sierra Club, Ichetucknee Alliance and Our Santa Fe River and provided to the *Specifier* by Lucinda Faulkner Merritt,

BMAPS
Continued on Page 13

DEP's Ullo resigns

Joe Ullo resigned his position as director of the Florida Department of Environmental Protection's Division of Waste Management, effective Oct. 1, to return to private practice. He served as director since October, 2015.

Deputy Director Tim Barr was named as interim division director.

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Replacement for CPP would shift power plant regulation from feds to states

Staff report

The Trump administration released details of its proposed replacement for the Clean Power Plan after months of promising to do so. The new rule, renamed to the "Affordable Clean Energy Rule," turns over the authority to regulate power plant emissions to states under more relaxed guidelines yet to be developed by the U.S. Environmental Protection Agency.

Under the proposed rule, the EPA will define "best system of emission reduction" for greenhouse gas emissions from exist-

ing plants as on-site, heat-rate efficiency improvements.

States will regulate industries using a list of "candidate technologies" to meet performance standards to be developed under the proposed rule.

The Clean Air Act Section 111(d) will be revised to give states "adequate time and flexibility to develop their state plans."

The new rule also proposes to update EPA's New Source Review permitting program, which requires existing plants to meet current air emission standards when they undergo substantial maintenance or

increase capacity.

EPA Administrator Andrew Wheeler claimed that the old regulations led to rising energy prices that have "hurt low and middle-income Americans the most."

However, following a decade of converting power plants to natural gas, electricity rates have fallen nationwide for several years.

In 2017, the U.S. Energy Administration reported that electricity rates fell nationwide an average of 1.4 percent—even more in states with less reliance on coal and nuclear generation.

The EPA said the new rule would cut electricity rates by 0.2 - 0.5 percent by 2026, a level hardly noticeable with all the noise of fuel adjustment charges.

As proposed, the rule does away with the review process. The EPA will lose substantially all of its authority to require power plants using any fuel to meet current emission rules when they upgrade their facilities for any reason.

Under the proposed rule, a dirty emissions plant will be able to expand its capacity in the future while continuing under emission permits from the past.

Haz waste tracking system. This summer, EPA launched its "eManifest" National Hazardous Waste Tracking System.

The system established an electronic reporting system for waste producers and transporters that is consistent nationwide and compatible with many state and local government reporting requirements.

The system has been under development since 2012. Both the federal government and states will benefit from electronic reporting.

As of June 3, 2018, all waste generators, haulers and disposal agents had to submit manifests to the e-Manifest system so that waste could be tracked electronically, and become part of a national reporting database for hazardous wastes and shipment data.

Manifests can be prepared and submitted either electronically or on paper, but the cost to submit favors the electronic version. By Sept. 30, the agency expects to have all waste receivers using electronic manifest submission.

The EPA will continue to fine tune its e-Manifest system through outreach to states and industry.

The agency noted in a press release that it will re-evaluate whether additional security measures are necessary for a small subset of manifest data regarding certain acute hazardous wastes.

FARM reporting requirements. Under the 2018 Federal Farm Agricultural Reporting Method Act, farms are exempt from CERCLA- and EPCRA-required reporting of certain hazardous chemicals, such as ammonia released from animal wastes.

The 2018 legislation should not be confused with the EPA's 2008 rule that exempted farmers from reporting such wastes. Farmers have never been required by either law or rule to report hazardous releases produced by animal wastes.

In April, 2017, the District of Columbia Circuit Court of Appeal vacated the final rule that gave farmers that reporting exemption. By the time Congress passed the FARM Act in 2018, the issue seemed to be settled.

Nevertheless, in late July, the EPA passed a final rule to make "regulatory revisions to reflect changes to CERCLA enacted in the FARM Act."

In so doing, the EPA removed the 2008 definitions of "farm" and "animal waste" from its regulations. It created alternative regulations for these terms to its CERCLA regulations that ensure consistency with the FARM Act.

Pesticide decision. The U.S. Court of Appeals for the Ninth Circuit ruled in early August that the EPA should ban the widely used agricultural pesticide chlorpyrifos.

The decision sided with EPA scientists and environmental activists who said that the risks of human neurological damage from the pesticide justified the ban.

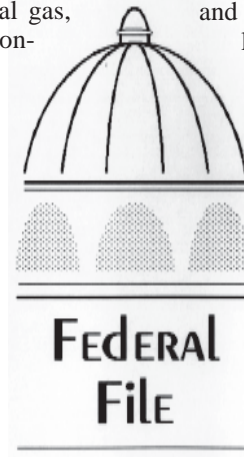
In 2016, EPA scientists concluded that its use on farms posed a significant risk of neurological problems to farm workers and their children under age two, and posed some risks to consumers eating treated fruits and nuts.

In the final months of the Obama Administration, the EPA began the process to ban chlorpyrifos. Almost immediately upon becoming EPA administrator, Scott Pruitt announced that he was reversing the effort to ban chlorpyrifos.

Pruitt said, among other things, that the rule reversal would give farmers who use the chemical "regulatory certainty."

In court, EPA lawyers argued that the chemical was, with reasonable certainty, "safe based on scientific evidence cited in 2017 to initiate the ban that Pruitt reversed."

The judges did not accept that argu-





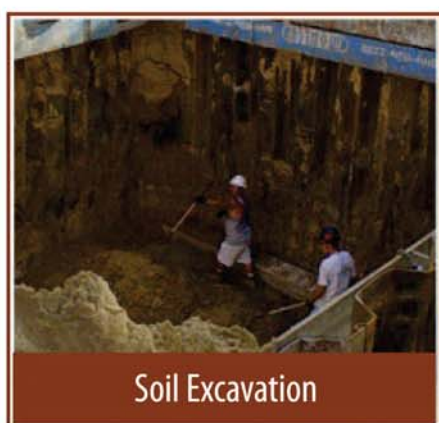
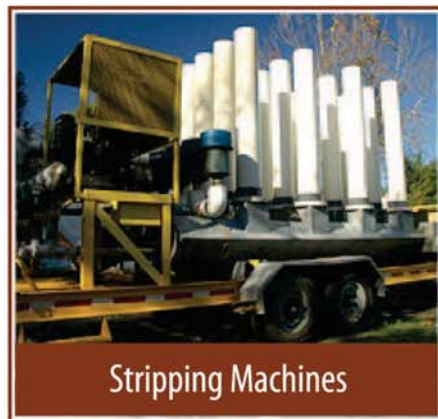
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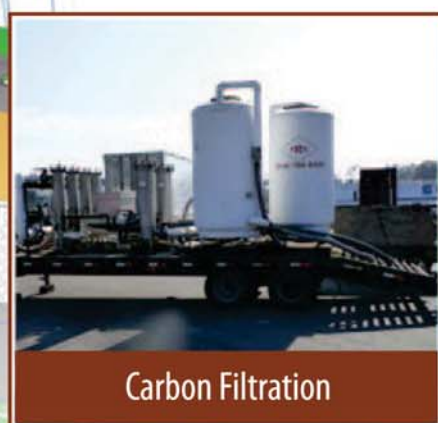
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The *Florida Specifier* (ISSN 0740-1973), founded in 1979, is published each month for \$24.95 per year (\$49.95 for three years) by National Technical Communications Co., Inc., P.O. Box 2175, Goldenrod, FL 32733. Subscription refunds are not provided.

Standard postage paid at Orlando, FL 32862. **POSTMASTER:** Send address changes to the FLORIDA SPECIFIER, P.O. Box 2175, Goldenrod, FL 32733.

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PEER report shows lowest levels of DEP enforcement in over 30 years

Staff report

An analysis performed by Public Employees for Environmental Responsibility found that Gov. Rick Scott's seven plus years in office have been the second worst for environmental enforcement levels in over thirty years.

The 2017 data showed a continuing downward trend in enforcement, with 2017 being the second least active year since 1987. Scott's DEP has made deep cuts in nearly every category of environmental enforcement statewide.

PEER reports that cases opened, penalties collected and other enforcement actions have been reduced by greater than 75 percent during Scott's tenure.

Officially, the state attributes the reduction to higher compliance rates. But PEER indicates hundreds of cases that should have been enforced were actually "forgiven" by the state.

"The records show Florida's environment subjected to death by a thousand cuts, as each pollution forgiveness without remedy or penalty inflicts another eco-laceration," said Jerry Phillips, current director of Florida PEER and a former Florida Department of Environmental Protection attorney.

WTE O&M agreements. Covanta Holding Corp. announced an agreement to purchase a subsidiary of Babcock & Wilcox Enterprises Inc.

The reported \$45-million-dollar deal includes operation and maintenance contracts for two waste-to-energy plants owned by the Solid Waste Authority of Palm Beach County.

"We are pleased to partner with the SWA on these two projects as they are a progressive special district that is committed to sustainable waste management," said Stephen Jones, Covanta's president and CEO.

The Palm Beach facilities have a combined capacity of over 1.7 million tons per year.

Palm Beach Renewable Energy Facility No. 1 has a waste processing capacity of 795,000 tons per year and generates up to 60 MW of electricity.

Palm Beach Renewable Energy Facility No. 2 has a waste processing capacity of a million tons per year and generates up to 95 MW of electricity. No. 2 is the newest waste-to-energy facility in the country.

Duke solar. Duke Energy Florida initiated the approval process to build a \$70-million solar plant in the Central Florida city of DeBary.

Duke is requesting approval of a major amendment to the Progress Industry Industrial Planned Unit Development that houses Duke's existing 561 MW fossil fuel combustion turbine plant.

The amendment will modify the PUD for a "utility-scale solar photovoltaic electrical generation facility," according to the development review committee agenda.

The solar array project's footprint will be located on roughly 350 acres of vacant developable land east of the existing railroad within the Progress Industry IPUD.

The DeBary facility is anticipated to generate 75 megawatts of electricity daily.

During an open house, Duke Energy Spokesperson Ana Gibbs said the plant will consist of 300,000 panels total on average at peak production that will power about 20,000 homes.

Duke plans to develop up to 700 megawatts of solar power by 2021. Construction of the DeBary plant is expected to be completed in 2019.

Miami-Dade highway extension. The South Florida Water Management District and the Florida Department of Environmental Protection questioned the proposed routes for the 836-expressway expansion in Miami-Dade County.

The roadway, also called the Kendall Parkway and Dolphin Expressway, is intended to relieve traffic in the West Kendall area.

The proposed corridor appears to cut across land set aside to protect the Everglades.

Environmental agencies and advocates are concerned that the roadway plans fail to fully determine the road's impact on natural resources, water supply and flood control.

The proposed roadway also raises questions among conservation activists about its potential to promote urban sprawl.

The town of Cutler Bay recently presented the Miami-Dade Board of County Commissioners with a resolution asking the board not to extend the roadway past the county's existing 2020 Urban Service Boundary.

U.S. Sen. Marco Rubio indicated that he intends to oppose the current plans at the federal level due to concern for the Everglades. Miami-Dade is considering shifting the corridor to the east in response to comments.

The currently proposed routes either enter, or are near, a sensitive canal and buffer and will cross wetlands intended for Everglades restoration. The roadway corridor also cuts across a large established wetland mitigation bank.

Largo clean energy. With the approval of its city commission, Largo has become the 75th city in the U.S. to commit to 100 percent clean energy.

The city is the fourth in Florida to make the clean energy commitment joining St. Petersburg, Orlando and Sarasota.

"Largo has shown great leadership to integrate 100 percent renewable energy goals in their new environmental action plan," said Bryan Beckman, leader of the Sierra Club's Largo Ready for 100 campaign.

"Implementing renewable energy and energy efficiencies saves money, reduces pollution and creates local jobs," he said.

The clean energy commitment is an addition to the Largo Environmental Action Plan that includes 35 sustainability indicators focused in three areas: infrastructure, workforce and natural resources.

Largo has already set a goal to update the LEAP by 2021, achieve 50 percent renewable energy by 2030 and 100 percent renewable energy by 2035.

Tallahassee development lawsuit. The mixed use Canopy at Welaunee devel-

NOTES
Continued on Page 24

Florida Notes



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Fort Myers, Cape Coral partner on water reuse system interconnect

Staff report

The city of Cape Coral wants more reuse water for landscape irrigation. The city of Fort Myers has more wastewater effluent than it needs.

Fort Myers currently releases several million gallons of treated wastewater a day to the Caloosahatchee River. That effluent contributes about 50,000 pounds of nutrients per year to the river.

The two cities agreed to construct a pipeline under the Caloosahatchee to transfer reuse water from Fort Myers' South Advanced Wastewater Treatment Facility to Cape Coral's Everest Water Reclamation Facility.

The two cities will share the cost of the project.

Fort Myers will spend \$24 million to upgrade its AWT facility to provide the reuse water to be piped to Cape Coral.

Cape Coral plans to spend about \$15 million, most of which will be used to construct the pipeline under the Caloosahatchee.

Cape Coral will also pay Fort Myers \$0.95 per 1,000 gallons of reuse water it receives under the agreement.

The need for additional irrigation wa-

ter typically occurs during the winter and spring months during sparse rainfall. Cape Coral expects to use a few million gallons of a day of reuse water during those months.

The agreement caps six years of negotiations between the cities. In 2014, Cape Coral obtained a \$780,000 grant from the state to underwrite pipeline design.

Both city councils must approve the agreement. Pipeline construction and wastewater treatment upgrades could be completed as early as 2023.

Port St. Joe wastewater lagoon. The city of Port St. Joe's wastewater treatment lagoon has experienced a number of performance failures in recent years that resulted in multiple DEP fines assessed for permit noncompliance.

In late August, DEP proposed a consent agreement that provides the city with a few more years to try a new biological process expected to improve the wastewater lagoon's function and to bring effluent

water quality criteria within permitted ranges.

Port St. Joe constructed its 75-acre wastewater lagoon in 1972. In recent years, the lagoon has experienced algae blooms and odor control problems.

Suspended solids in the effluent have been as high as 20 parts per million, well above the permitted five parts per million standard.

Another result of high levels of suspended solids is a rapid accumulation of muck on the lagoon bottom.

The consent agreement gives Port St. Joe utility officials three years to implement a proposed biological treatment method to reverse muck accumulation in the lagoon.

City officials considered dredging the muck from the lagoon but the million-dollar price estimate is more than the city can afford.

Temporarily, the permitted level of total suspended solids in the effluent will be increased to 20 parts per million so that it can be discharged to sprayfields that the city sometimes uses for effluent disposal.

DEP agreed to levy a fine of just \$500 for regulatory violations over several years, along with the three-year window to remove the lagoon's sludge.

Within that time, city officials hope to procure funding, perhaps from state or federal sources.

IRL subdivision septic-to-sewer. A recently-funded sewer expansion will allow up to 54 properties in western Wabasso's Whitfield subdivision to be converted from septic tanks to sewer system collection.

The conversion will reduce nutrient releases to the Indian River Lagoon near Sebastian Inlet.

The number of septic tanks to be retired is provisional because as of late July, only 46 of the 54 property owners within the subdivision had agreed to switch from septic tanks to the new sewer system upon its construction.

The project, budgeted for \$2.4 million, is supported by four government agencies. Indian River County will pay the largest share of the cost, up a million dollars.

In addition, the St. Johns River Water Management District will contribute \$825,000, the Florida Department of Environmental Protection will contribute \$450,000, and the Indian River Lagoon

National Estuary Program will contribute \$200,000.

The construction costs to the homeowners, if any, has yet to be determined. In addition, the project schedule has not been announced.

Silver Springs nutrient reduction. The St. Johns River Water Management District announced a solicitation for projects to promote agricultural water conservation and nutrient runoff reduction within the Silver Springs watershed.

The projects were solicited from farmers, growers and ranchers that wish to implement agricultural best management practices to improve water conservation and reduce nutrient runoff while maintaining the sustainability of regional agriculture.

Funding comes from the district's Agricultural Cost-Share Program. Eligible projects may receive up to 75 percent of cooperative funding up to \$500,000.

The funding may be applied to engineering, design, construction and implementation of projects to meet stated goals.

Eligible projects included irrigation system retrofits, conversion from overhead irrigation to micro-irrigation fertilization, soil moisture sensor technology, tail water recovery and reuse, or precision agriculture equipment purchase and use.

Mulberry water conservation. In August, the city of Mulberry in Polk County adopted a new building code ordinance that mandates water conservation compliance before the issuance of a certificate of occupancy for residential and commercial properties.

The city's new building code ordinance is based on Florida Water Star standards, a water conservation certification program that includes strict water efficiency standards for indoor fixtures and appliances, landscape design and irrigation systems.

To meet the new requirements, builders and construction contractors must achieve FWS certification, or submit documentation verifying that the construction meets FWS water efficiency requirements.

Homebuilders can receive a \$700 rebate for each FWS-certified home.

The Southwest Florida Water Management District collaborated with city officials to implement the new ordinance.

Polk County has maxed out its sustainable groundwater withdrawals from the Upper Floridan Aquifer. In the face of continued population growth, water conservation used in place of new source development will ensure sufficient supplies for the future.

Sullivan named HBOI director. James Sullivan, PhD, interim executive director of Harbor Branch Oceanographic Institute at Florida Atlantic University, was selected as the new executive director.

He served as interim director since March, and has worked at HBOI since 2015. As the executive director, he will develop, implement and lead environmental and ocean science research and programs at HBOI.


Wagner Creek/Seybold Canal project wins award. Two collaborating companies, consulting engineers AECOM and Stevenson Environmental Services, received the Western Dredging Association's Environmental Excellence Award for their Wagner Creek and Seybold Canal restoration project, conducted over the past year.

The two Miami River tributary sites were simultaneously designated as Outstanding Florida Waters, as well as listed among Florida's most polluted waterbodies.

River and canal sediments were notably contaminated by dioxin. Wagner Creek is now surrounded by high density residential development.

To complete the project, SES built custom dredging equipment to remove muck and contaminated sediment from the creek and the canal, and transported it by barge to a handling site.






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2018

FRC 2018: Day One, Wednesday, Dec. 5, 2018

9:00 Opening Session

A Word from the Chair

Jim Langenbach, PE, BCEE, Senior Principal, Geosyntec Consultants, Titusville

Brownfields Ascendant – Economic Trends, Practice Opportunities, and Litigation Avoidance for the Redevelopment Focused Environmental Consultant in Florida

Michael Goldstein, Esq., Managing Partner, The Goldstein Environmental Law Firm, Miami

A National and International Perspective on PFAS in the Environment

Rula Deeb, PhD, Senior Principal Civil and Environmental Engineer
Geosyntec Consultants Inc., Oakland, CA

Morning Break 10:00 - 10:30

Session 2: Per- and Polyfluoroalkyl Substances (PFAS)

10:30 Separation or Destruction - The Practice and Development of PFAS Treatment and Remediation

Dora Chiang, PE, Vice President, Technology Strategy Leader, CDM Smith, Atlanta, GA
Per- and polyfluoroalkyl substances comprise a diverse group of fluorinated chemicals used for over 50 years in various military and industrial applications and consumer products. PFAS are not biodegradable and relatively soluble in the environment. Their unique characteristics make this class of contaminants difficult to treat and to meet the cleanup criteria at parts per trillion levels. While need and policy of PFAS cleanup are still evolving, current practice of PFAS treatment has focused on 1) breaking drinking water exposure pathways, 2) emergency responses, and 3) on-site IDW treatment. The PFAS treatment technologies are also under development to address PFAS in the source areas and how dissolved groundwater plume can be managed and remediated. This presentation will be divided into two parts. The first part will discuss the "ready-to-go" technologies that are commercially available to mitigate the impacted waters. GAC has been considered the most economical and commercially available treatment technology for PFOA and PFOS, while ion exchange resin and reverse osmosis are also promising. The second part of presentation will discuss cross-agency funded PFAS treatment technologies that are currently under development. These technologies typically have research objectives of treating a wider range of compounds including co-contaminants and short-chain and precursors of PFAS. PFAS destruction technologies have also been looked into as stand-alone technology or as part of treatment train coupling with separation technologies. This discussion will bring attendees up to date on the uses, selections and development of PFAS treatment technologies.

10:50 Design/Build of an Emergency Granular-Activated Carbon System to Remove Perfluorocarbons from Drinking Water, Wright-Patterson Air Force Base, OH

Bill Scoville, PE, PMP, Business Development Director/Program Manager
APTIM, Cincinnati, OH
Treva Bashore, Remedial Project Manager, AFCEC/CZO, Wright-Patterson AFB, OH
Jessica Frehse, EI, Project Engineer
USACE Rapid Response and Cost Reimbursable TCX, Offutt AFB, NE
Under a U.S. Army Corps of Engineers, Omaha District, Rapid Response contract, APTIM provided immediate response to modify the existing groundwater treatment process to remove perfluorooctanesulfonic acid and perfluorooctanoic acid detected in two drinking water wells on Wright-Patterson Air Force Base, OH, to meet the U.S. EPA health advisory standard of 70 parts per trillion of PFOS, PFOA or their combined concentration. APTIM developed the detailed design, constructed the system modifications, and performed one year of operations and maintenance. APTIM was awarded the task order on July 1, 2016, and immediately obtained facility drawings and other utility drawings to evaluate designs for the temporary GAC system. Design-phase services performed by APTIM included evaluating alternatives to address the increased back pressure generated by adding GAC vessels; assessing treatment system location options based on ease of line access, available footprint, and access for large trucks to deliver GAC during change-outs; and conducting rapid column tests using the proposed GAC to demonstrate the removal effectiveness of the proposed system. The construction was performed from January, 2017, through May, 2017, and the system was started up in June, 2017, just 11 months after notice-to proceed. As of July 1, 2018, the system has treated more than 325 million gallons with no sign of breakthrough and no need for backflushing. APTIM's low maintenance design requires less than eight hours/week of operational support. Vessel pressures and flow rates are continuously monitored via a process logic control system that is tied into the drinking water plant's SCADA system for emergency shutdown. See us at Booth #5.

11:10 In-Situ Thermal Remediation of Emerging Contaminants

Lauren Soos, Project Mgr./Operations & Technical Sales, TRS Group, Longview, WA
Emerging contaminants, such as 1,4-dioxane and per- and polyfluoroalkyl substances, resist in-situ treatment by conventional advective flow-based technologies. Effective remediation is limited to expensive, ex-situ treatment by advanced chemical oxidation or filtration.

Concentrations of 1,4-dioxane in groundwater were recently observed at two ISTR projects where heating was used for treatment of chlorinated solvents in groundwater. Additionally, recent ISTR bench and field studies show significant PFAS concentration reductions in soil. Recent testing evaluated the effects of 1,4-dioxane treatment by steam stripping. The tests showed that the vapor-liquid equilibrium mass fraction ratios of 1,4-dioxane to water increase substantially as the system approaches the boiling point of water. The bulk of 1,4-dioxane remains in the vapor phase where it can be readily treated using vapor phase activated carbon. The PFAS tests drove temperatures of the PFAS to levels where they exhibited elevated vapor pressures, resulting in more than 99.99 percent removal. A vapor collection system collected the volatilized PFAS and subsequently condensed and filtered them for disposal. A similar approach (heating for volatilization, vapor collection and condensation) would be used in a full-scale field application, primarily focused on source zone remediation. The presentation will include the fundamentals of heating emerging contaminants, recent results from PFAS bench and field tests and lessons learned from full scale field applications using ISTR for 1,4-dioxane remediation.

11:30 Eliminating Risk of PFAS Contamination: Low Cost In-Situ Remediation with Colloidal Activated Carbon

Chad Northington, PE, Southeast District Technical Manager, Regenesys, Tallahassee
Colloidal activated carbon is emerging as a low-cost in-situ method to eliminate the risk associated with PFAS compounds in groundwater. By coating flux zones of an aquifer with colloidal activated carbon, a permeable sorption barrier is created in situ, purifying groundwater as it passively migrates. PFAS constituents from up-gradient source zones are rapidly sorbed to the carbon and removed from the mobile dissolved phase. By removing PFAS from the mobile phase, the route of exposure to down-gradient receptors is eliminated, thereby eliminating the down-gradient public health risk associated with PFAS. Colloidal carbon isotherm, retardation and sorption test data are presented for specific PFAS compounds indicating excellent sorption capability and increased performance with decreasing carbon particle size. The potential for competitive sorption/elution is discussed. Plume modeling is presented indicating longevity of in-situ colloidal carbon treatment for PFAS to be on the order of multiple decades before reapplication is required. Data are presented from field case sites where a single application of colloidal activated carbon resulted in orders of magnitude reduction in PFAS groundwater concentrations to below U.S. EPA health advisory levels. Design considerations for plume management are discussed including amending existing pump and treat systems to reduce project cost and to eliminate down-gradient risk to public health.

12:00 Day One Luncheon Sponsored by Advanced Environmental Laboratories

Concurrent Session 3A: Aggressive In-Situ Technologies

1:15 **Neutral Buoyancy Control for Surfactant-Enhanced Aquifer Remediation of DNAPL**
Sangho Bang, PhD, Technical Associate, Tersus Environmental, Wake Forest, NC
Various technologies for the remediation of subsurface contamination by dense nonaqueous phase liquids in groundwater are applied at numerous sites throughout the U.S. This study provides a method for removing subsurface contaminants by density modification of

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FRC 2018 Schedule of Activities

Tuesday, Dec. 4, 2018

9th Annual FRC Charity Golf Tournament at Rosen Shingle Creek Golf Club

10:30 pm: Registration opens for FRC 2018 Charity Golf Tournament
All proceeds to The Pink Butterfly Foundation
12:00 pm: Play begins
5:30 pm: Post-play ceremony and BBQ at the club

24th Annual Florida Remediation Conference at Rosen Centre Hotel

5:00 pm - 9:00 pm: FRC Exhibitor Move-in and Setup at the Rosen Centre
5:00 pm - 9:00 pm: Conference registration desk open at the Rosen Centre

Wednesday, Dec. 5, 2018

24th Annual Florida Remediation Conference at Rosen Centre, Day One

7:30 am - 5:00 pm: Conference registration desk open at Rosen Centre
7:30 am - 9:30 am: Coffee/munchies in exhibit area
7:30 am - 7:00 pm: Exhibit hall open
9:00 am: FRC Day One, conference convenes
5:00 pm: Conference adjourns for the day
5:00 - 6:30 pm: FRC Reception in Exhibit Hall

Thursday, Dec. 6, 2018

24th Annual Florida Remediation Conference at Rosen Centre, Day Two

7:30 am - 5:00 pm: Conference registration/help desk open
7:30 am - 9:30 am: Coffee/munchies in exhibit area
7:30 am - 12:00 pm: Exhibit hall open
8:30 am: FRC Day Two, conference continues
12:00 pm - 3:00 pm: FRC Exhibitor Breakdown
5:00 pm: FRC 2018 adjourns

DNAPL, using a co-solvent and interfacial tension reduction during DNAPL displacement with surfactant flushing. In laboratory testing, different injection sequences were applied for the efficient recovery of NAPL in extraction wells and neutral buoyancy control during DNAPL migration. This system exhibits significant differences from conventional technologies in at least three aspects: (1) The formulation is composed of green chemicals that minimize toxicity to both human and environmental receptors. Both surfactants and co-solvent in the formulation meet environmental regulations in most states; (2) Low interfacial tension is achieved with low surfactant concentrations. The remediation technology only requires less than 1 wt% of surfactant to form microemulsions within the DNAPL phase. Low cost makes this technology more economically feasible for most remediation sites; (3) The newly developed formulation is also a single-stage injection system that achieves lateral migration of DNAPL and low interfacial tension, and eliminates the need for multiple injection steps. This can minimize the number of injection steps and reduce the project cost in field applications. Recently, this remediation technology was demonstrated in the field as a pilot test. The test revealed that DNAPL was effectively removed with less logistical issues and complexity. Thus, we believe that this newly developed formulation provides significant improvements both technically and economically.

1:35 Proven Benefits of Combining Surfactants with Chemical Oxidation for Remediation
Dan Socci, CEO, EthicalChem, South Windsor, CT

Independent research by the University of Madrid documents the limit of traditional in-situ chemical oxidation and highlights the benefit of a combined surfactant-oxidant approach. Results also demonstrate the importance of selecting an optimal surfactant for use with the activated oxidant. This presentation will draw upon this research to show how traditional oxidation technologies are highly effective in aqueous phase destruction but require the addition of a surfactant to fully treat soil contamination, which is consistent with full scale field experience.



Dec. 5-6, 2018

Rosen Centre Hotel
International Drive, Orlando

Still a booth or two available ...

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Geoprobe Systems	Vapor Pin Enterprises
GeoSearch	Vertebrae Well Systems
Geotech Environmental Equipment	Walker-Hill Environmental
GFA International	Waste Connections - JED Landfill
Golder Associates	Waste Management

Contact Mike Eastman at (407) 671-7777 or
mreast@enviro-net.com for complete information.

Untreated soil contamination causes groundwater concentrations to re-establish over time after chemical oxidation treatments. This reoccurrence is known as rebound. Using a combined oxidant-surfactant solution, contaminant delivery to the oxidants can be optimized via contaminant desorption and emulsification by the surfactants. The combined oxidant-surfactant solution reduces interfacial tension between contaminant and groundwater. Organic contaminants which are immiscible with water are therefore brought into the aqueous phase by the surfactant, where they are available to the oxidant for efficient oxidation. Field case studies of successful surfactant-enhanced in-situ chemical oxidation implementations will also be discussed.

1:55 Combining Persulfate, In-Situ Ferrate Generation and Enhanced Bioremediation for Safer, More Effective Remedial Actions

Will Moody, Director of Bus. Development, Provectus Env. Products Inc., Freeport, IL

Ideally, in-situ chemical oxidation will rapidly oxidize organic contaminants of concern in a safe and effective manner (i.e., materials easy to handle on site; no extreme activation chemistries such as heat or grossly elevated pH; no generation of secondary contaminants). And, importantly, remedial actions are completed via a one-time application event. However, with essentially all conventional ISCO technologies, the oxidation reactions are partially incomplete and contaminant desorption / rebound is a very common problem. When ferric oxide is used to activate persulfate, the process quickly yields ferrate in addition to the sulfate radicals. Ferrate functions both as an oxidant and subsequent coagulant in the form of Fe(III) hydroxides that can immobilize heavy metals. Ferric iron activation of persulfate also enhances subsequent utilization of sulfate and iron as terminal electron acceptors for facultative redox reactions that sustain bioremediation of residual contaminants and partially oxidized compounds. This combination of chemical and biological treatment mechanisms allows for more cost-efficient treatment while supporting sustained, secondary bioremediation processes to manage residuals and prevent contaminant rebound. Provect-OX[®] is a pre-mixed, dry powder containing sodium persulfate, ferric oxide and buffer that can be easily applied into a subsurface environment via direct mixing, hydraulic fracturing, pneumatic fracturing and direct push injection of slurries. Ferrate and sulfate radicals will be continuously generated in situ to support extended oxidation of persistent compounds, provided that persulfate is maintained with iron as an activator. Thereafter, the residual iron and sulfate will support bioremediation processes to manage partially oxidized compounds and residual contaminants that continually desorb from the matrix over time (ca. 3 to 5 years). This presentation will outline parameters considered for calculating material requirements, discuss field application considerations and summarize performance data and costs from example projects.

2:15 Klozur CR Followed by Klozur One - Chemical Oxidation and Mass Flux

Patrick Hicks, Technical Sales Manager, PeroxyChem, Raleigh, NC

Activated Klozur[®] persulfate is one of the most prevalent remedial technologies having been implemented at thousands of sites to successfully remediate contaminated aquifers around the world. The Klozur[®] persulfate can be used simultaneously with PermeOx Ultra[®] to both activate the persulfate (alkaline) and supply dissolved oxygen for long-term support of microbial respiration (aerobic bioremediation). This product (50 percent sodium persulfate and 50 percent calcium peroxide) has been available for many years as Klozur CR[®]. The calcium peroxide acts as the activator and is stored in the same shipping container with the persulfate. The new blended activator-persulfate system, Klozur One[®], can be safely stored, transported, and batched together while still effectively treating the different contaminants of concern. The objective of this work was to test if in situ chemical oxidation could be implemented to control dissolved petroleum constituent contaminant mass flux. A suitable site was identified, and the first injection of Klozur CR[®] was performed through wells on March 23, 2017. A subsequent injection of Klozur One[®] was performed on November 28, 2017, through the same injection wells. The injection wells are located approximately eight meters up-gradient from a monitoring well. Periodic monitoring of geochemistry and petroleum constituents in the monitoring well and injection wells were performed. This presentation will illustrate site data showing the fluctuations of key parameters as the site transitioned from Klozur CR[®] to Klozur One[®]. Overall, greater than 90 percent reduction in contaminants was observed, which has allowed the site to be evaluated for potential risk-based closure.

2:35 The Use of LDA Rig for Steam-Enhanced, In-Situ Soil Mixing Treatment of Impacted Soils and Groundwater

Jim Brannigan, Technical Director/Vice President, FECC Inc., Orlando

Wilson Corners was a cleanup site at the National Aeronautics and Space Administration's Kennedy Space Center in Florida. The site was contaminated with tetrachloroethylene, its degradation products and Freon-113. Site contamination encompassed approximately 18 acres. TCE contaminant levels were as high as 300,000 ug/lit, well above the Florida Department of Environmental Protection's groundwater cleanup target level of 3 ug/lit. The vertical extent of contamination was as deep as approximately 50 feet below land surface. FECC was contracted to clean up soil and groundwater contamination using thermal treatment followed by in-situ treatment with zero valent iron. Thermal treatment was carried out by drilling an eight foot large diameter auger from land surface down to 52 to 55 feet. Steam and hot air were injected simultaneously and continuously from land surface down to the bottom via jet ports on the rotating auger. The steam and hot air volatilized the contaminants forcing them to rise to the surface through the drilled column. Air emissions at the surface were captured by a vapor shroud and then treated by an air emissions system. Volatile organic compound emissions were monitored continuously using flame ionization detectors. The VOC emissions were also speciated continuously into TCE, TCE daughter products and Freon-113 using gas chromatographs. Any contaminants left behind after steam and hot air injection were further treated in situ with zero valent iron. The ZVI was applied to the same column via the LDA immediately after steam/hot air injection to polish off any remaining contaminants. In 2015, for approximately seven months, a total of 308 columns underwent the above-described treatment at Wilson Corners. Sampling events are consistently attaining non-detect status per the analytical protocol. Sampling data indicated that TCE contaminant levels were reduced by at least 99+ percent.

Concurrent Session 3B: Conceptual Site Model Development

1:15 The Role of Data Gap Analysis/Filling in Developing Conceptual Site Models

Ziqi He, PE, PhD, Senior Engineer, HSW Engineering Inc., Orlando

The use of the conceptual site model is an important step in streamlining the representation of contaminant releases, their fate and transport in the environment, and exposure to human and ecological receptors to contamination. Performing data gap analyses are critical for developing/updating/refining a CSM throughout a life cycle of a project. Inadequate data, unknown conditions and data misinterpretations often lead to inaccuracy in the CSM, which causes uncertainties in decision making and cost allocations. Typical data gap analysis approaches include understanding historical site layout/operation and waste management, regional and local geology and

Continued on Page 7

hydrogeology, environmental sequence stratigraphy, fate and transport of contaminants, 3D modeling/presentation and statistical analyses. Data gap analyses were performed at several complex sites to evaluate the existing CSMs and path-forward strategies were recommended. Subsequently, the Triad approach and high-resolution site characterization strategies/techniques, as well as real-time technologies and advanced forensics analyses, were applied to fill the data gaps and refine the CSM. The refined CSM helped with better representation and communication between the responsible parties and regulatory agency.

1:35 Honing the CSM During Treatment Using Horizontal Investigative Tools

David Cochran, PE, Principal Engineer, Cameron-Cole LLC, Pensacola

Often assessment is a prolonged activity. Repetitive events and a feedback loop that requires iterations is necessary. Assessment often takes longer than expected and meanwhile the plume moves and changes. Obstacles on and off site typically present the biggest problems in obtaining a clear understanding of the magnitude and extent of contamination. Then, as treatment begins, site feedback often continues to change the site CSM and, as hindsight is 20/20, the approach to remediation that "would have been taken". One tool that is typically used in the wrong phase is the Vertebrae™ well system. These well systems are usually installed during the remediation phase of the project. But in every instance, once sampled, have provided a more thorough understanding of the magnitude and extent of contamination. The assessment capabilities are more important than the remedial qualities since all future action at the site depends on a detailed, accurate CSM. Two sites are covered that illustrate that an inadequate understanding of the contaminant mass under surface obstacles near the point of release can result in the under estimation of contaminant mass. Both sites to be discussed are fuel sites in the state of Florida program. One was largely impeded by a building where the other had a canopy and dispenser that impeded data collection at the point of release.

1:55 Application of Geostatistical Analysis for the Evaluation of the Dynamics of a Chlorinated Solvent Plume

Leif Layton, PhD, Associate Engineer III, Env. Consulting & Technology Inc., Tampa

The evaluation of the dynamics of contaminant plumes is an integral element of corrective actions for contaminated sites. When a sufficient number of monitoring wells are available, the temporal and spatial trends of plumes are often evaluated using hand-drawn isopleths of individual chemicals based on concentrations in groundwater and site-specific characteristics. This approach relies on the knowledge and experience of the site manager and may be subjective. Geostatistical analysis was performed to assess the dynamics of a chlorinated solvent plume within a semi-confined aquifer in Tampa. Plume stability and migration overtime were assessed using methods based on those developed by Joseph Ricker. Molar concentrations of trichloroethene and its daughter products were considered to account for degradation processes in the site's conceptual site model. Isopleths were generated using kriging, with significant attention given to modeling the experimental variogram to provide a reliable estimate of the variation of the plume concentration within the aquifer. Multiple isopleths were created for each data using different techniques to improve the kriging results (e.g., addition of control points to data sets, consideration of geometric anisotropy) and evaluated. Estimates of the plume's mass and centroid coordinates were calculated by spatially integrating the kriging-generated chlorinated solvent concentrations, and the results were used to assess the spatial and temporal trends of the plume and evaluate remedial action at the site.

2:15 Proven Method to Accurately Access Location and VI Potential to Better Define your CSM

Laurie Chilcote, Director, Marketing & Sales, Cox-Colvin & Assoc. Inc., Plain City, OH

The ability to accurately assess the location and vapor intrusion potential of VOC sources beneath buildings is vital in developing an effective conceptual site model. Recent advancements in the VI field have significantly streamlined and improved the assessment process. Through these new advances, the professional can complete a thorough and accurate assessment of sub-slab vapor conditions in less time and at a lower cost. Information generated by an accurate assessment can then be leveraged using GIS to increase the understanding of a VOC source's age and the potential release mechanism and better define your CSM. The discussion will include standard disposal practices prior to the adoption of environmental regulations, reasons why interviews with site personnel may cause the professional to focus on the wrong areas, and reasons why streamlined methods are effective means of improving data quality, data density and the understanding of VI potential. It will demonstrate how GIS methods can help the professional develop a more accurate understanding of the VOC sources and the CSM. The discussion presents three case studies of large manufacturing facilities that had been active as early as 1880. At least one had a long-documented history of chlorinated solvent use. In each case, the use of high quality, rapidly obtained, active sub-slab soil gas measurements obtained from narrowly spaced grid systems provided information necessary to locate VOC sources and better define the CSM.

2:35 More than Just Sand and Clay: Heavy Minerals and Implications for Groundwater Plume Management

James Studer, PE, Principal Technical Consultant, InfraSUR LLC, Albuquerque, NM

Florida is blessed with not only abundant carbonate-dominated bedrock but also an extensive mantle of unconsolidated sediments including vast amounts of sand with varying silt, clay, and shell-lime content. Throughout the state, surficial and intermediate aquifer systems comprised largely of sand inter-bedded with clay are utilized for water supply. They are vulnerable to contamination by human activities. Active management of contaminant plumes may be necessary to ensure protection of shallow potable water as well as the ubiquitous Floridan carbonate aquifer system that the surficial and intermediate aquifer systems overlie. For a specific area of the state, the existence, lithological structures, and mineralogical compositions of surficial and/or intermediate aquifer systems are determined in large part by geology. Pleistocene and Holocene sediments deposited by marine, alluvial-fluvial and/or aeolian processes may comprise the entire permeable horizon of a surficial aquifer. Here, essentially inert quartz grains or carbonate shells often dominate the mineralogy. But surficial and intermediate aquifers in many areas of the state include clastic deposits with noticeable departures in mineralogical composition. These coincide with older sediments of Miocene, Pliocene and, in some locations, Pleistocene age. Where present, the noticeably different character may be important to the scientist and engineer seeking to understand the potential for natural attenuation of, or efficacy/optimization of active management strategies for, groundwater contaminated by organic or inorganic chemicals. Florida depositional history was highly influenced in the Miocene to Pliocene by uplift rejuvenation of the southern Appalachianians, sea level changes and massive erosion and southward-directed fluvial-deltaic transport of igneous/metamorphic siliciclastic sediments. The world-class heavy mineral placer deposits and kaolin clay deposits of northern Florida are a result but clastic sediments containing, in some places, significantly high percentages of heavy minerals (and feldspars) also

found their way into parts of the Panhandle, Central and South Florida. Careful review of the geologic literature and customized on-site investigation at groundwater contamination sites can reveal where surficial and intermediate aquifer systems are (or are not) mineralized. University and U.S. EPA research can be applied, with caution, to assess the potential for natural reactivity to pollutants by heavy minerals (e.g., iron-bearing and sulfide-bearing minerals such as magnetite and iron sulfide). Biogeochemical manipulation experience within the remediation community can be leveraged to optimize in-situ groundwater treatment and performance assessment approaches. Important considerations pertinent to remedial planning, supplemented with site characterization data, will be presented.

Afternoon Break: 3:00 - 3:30

Concurrent Session 4A: Speed Talks

- 3:30
- 1) Rapid Field Screening of VOCs on Contaminated Sites Using a Portable GC
Brian Bendis, Technical Sales Representative, Pine Environmental, Tampa
 - 2) Vapor Pin: A Reliable Sampling Device
Laurie Chilcote, Director, Mktg. & Sales, Cox-Colvin & Assoc. Inc., Plain City, OH
 - 3) Electronic Field Data Collection - When Will it Make Cents?
John Gobins, Founder, GroundLogs, Flushing, NY
 - 4) The Role of Passive Samplers in Site Assessment and Remediation
Tim Fitzpatrick, Business Dev. Mgr, SGS AXYS, Sidney, British Columbia, Canada
 - 5) Enhanced Hydrocarbon Fingerprinting
Kesavalu Bagawandoss, PhD, JD, Laboratory Director, TestAmerica, Nashville, TN
 - 6) Drone-Enabled Technology for Assessment
Brent Klavon, Director, Commercial Drones, Aviation Systems Eng. Co. Inc., Jacksonville
 - 7) Changing the Perspective on 30 Years of Granularity with HRCD
Lance Robinson, PE, Vice President, EN Rx Inc., Parrish
 - 8) Horizontal Directional Drilling and Well Installation for Substrate Injection
David Bardsley, PG, Vice President, Directed Technologies Drilling, Bellefonte, PA
 - 9) Sustained ISCO of 1,4 Dioxane and Chlorinated VOCs Using Sustained Release Chemical Oxidant Cylinders
Tim Colgan, U.S. Sales Manager, Remediation, Carus Corp., Peru, IL
 - 10) Life Cycle Considerations for PFAS Water Treatment
AnnieLu DeWitt, Remediation Technologies Business Development Manager
Clean Harbors, South Portland, ME

Concurrent Session 4B: Liquid Carbon Injection

- 3:30
- First Use of PetroFix™ - A Radical Advance in Liquid Activated Carbon
Wm. Gordon Dean, PE, VP, Advanced Environmental Technologies LLC, Tallahassee
Advanced Environmental Technologies was selected by Regenesys to perform the first ever in-field test of their newest liquid carbon technology, PetroFix™. PetroFix™ is an evolution of their PlumeStop liquid activated carbon technology developed specifically for petroleum hydrocarbon impacted sites. PetroFix™ is designed to treat groundwater in higher concentration (i.e., approximately 10 to 100 parts per million total organics) target treatment zones where free product is not observed. The Reef Deli site in Panama City was selected for the test. Approximately 1,000 gallons of gasoline was discharged in March, 2007. A source removal was conducted and several remedial technologies were utilized to address the groundwater plume with limited success. Petroleum contamination migrated beneath the adjacent road and onto the downgradient property. Groundwater concentrations have been in the thousands of micrograms per liter in the off-site well since 2008 depending on rainfall, depth to water and mass flux from beneath the road. Since February, 2016, BTEX plus naphthalene concentrations have varied from 1,310 µg/L to 14,300 µg/L. TRPH concentrations varied from 4,300 µg/L to 11,000 µg/L during that time. AET and Regenesys injected a total of 1,700 pounds of PetroFix™ and electron acceptors into 13 DPT injection points around the off-site well in March, 2018. A 60-day post-injection sample was collected in May, 2018. All contaminants were below both laboratory detection limits and the Florida groundwater cleanup target levels. A subsequent 90-day post-injection sample was collected in June, 2018. All contaminants remained below laboratory detection limits and GCTLs. Full scale site remediation is being designed based on the test results.

- 4:00
- Distribution of a Carbon Slurry Injectate as Examined by Extensive Soil Cores, Documented by Photographs and Modeled
Bill Brab, CPG, PG, Senior Project Manager, AST Environmental Inc., Midway, KY
The key to in-situ remediation is the ability to ensure contact of injectate and contaminants. Limited excavation and sampling studies have been conducted to characterize injectate distribution, but to date no studies have comprehensively characterized the distribution of activated carbon-based materials using extensive soil core logging. Questions exist regarding the distributional characteristics of carbon slurry injectates in the subsurface when installed by high-pressure injection. One month after injections were completed, twelve continuous soil borings were advanced next to existing monitoring wells and 28 additional borings were advanced throughout the treated area. A pair of one-inch PVC wells were installed at each of the additional 28 locations, one shallow screen to test the upper portion of the aquifer and a deeper well screen for testing of the lower portion of the aquifer. All wells were sampled and analyzed for anions and VOCs to evaluate distribution of injectate. The continuous soil cores were carefully inspected macroscopically and microscopically for the presence of carbon and logged for lithology. Close to 1,000 pictures were taken to document the distribution of injected carbon slurry in various soil types and along bedding interfaces. Samples of suspected carbon in soil cores were analyzed to confirm carbon. Finally, a survey was performed to accurately define locations for all soil borings, monitoring wells and their respective elevations to support modeling.

- 4:30
- Multi-Site Performance Review of Colloidal Liquid Activated Carbon for In-Situ Groundwater Treatment
Chad Northington, PE, Southeast District Manager, Regenesys, Tallahassee
This presentation will discuss the use of colloidal carbon-based injectables to expedite groundwater cleanup through coupling contaminant destruction with sorption, specifically in the state of Florida. Data will be drawn from several sites using various remedial strategies to address petroleum hydrocarbon impacted sites and encompassing a variety of geological settings. Field data will be presented describing performance against remediation goals, performance validation, and lessons learned regarding material placement, site characterization and the importance of design verification testing prior to full-scale application.

- 5:00 FRC 2018 Day One adjourns

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9:50 **Go Big: A Cleanup Case Study of a Multi-Acre Chlorinated Solvent Plume at Launch Complex 39B**
Mike Burcham, PE, Environmental Engineer, Geosyntec Consultants Inc., Houston, TX
In the late 1990s, chlorinated volatile organic compound impacts were identified at Launch Complex 39B, Kennedy Space Center, FL. Following multiple, subsequent field investigations, which relied heavily on high-resolution site characterization techniques, an approximately 27-acre dissolved CVOC plume was delineated. The dissolved CVOC impacts generally extended to 55 feet below land surface, the depth at which a fine sand/silt unit is present that retards vertical migration. A focused feasibility study was completed, and the selected path forward was air sparging a nine-acre area where CVOCs exceeded their respective natural attenuation default concentrations. Air sparging was selected as the proposed remedy because the soil permeability was high enough to support the technology, the effective radii of influence development has been documented at other KSC sites, and a quick turnaround was needed due to future site use (launches are expected to resume in the near future). This necessitated an aggressive and ambitious approach to remediate a multi-acre area in a short time period. The resulting design and turnkey installation is the largest air sparge system at KSC—and potentially in the southeastern U.S.—and includes 279 air sparge wells, 32 manifold/air distribution boxes, over three miles of piping/trenching, and a mobile treatment system housing a 100-horsepower air compressor and associated appurtenances/telemetry. This large-scale system was installed in approximately six months and operation commenced in July, 2017. The system operates 24 hours a day and cycles between four operational zones, and the operational schedule and parameters are continuously optimized to maximize performance. While the system is anticipated to operate for up to five years, performance monitoring activities spanning the first year of operation, through July, 2018, indicate that CVOC concentrations have been significantly reduced throughout the treatment area during the first year and it's estimated that total CVOC concentrations have been reduced by more than 90 percent.

Morning Break: 10:10 - 10:40

Concurrent Session 5B: Zero Valent Iron

10:40 **Historical Perspective on the Use of Induced Fractures in Various Geologic Settings**
Drew Baird, PG, Senior Geologist, FRx Inc., Charlotte, NC
Tools and methods required to create fractures vary depending on the drilling method required to reach a target treatment zone and characteristics of the target formation. Shallow target zones are commonly reached with direct push technology drilling methods and utilize hydraulic fracturing methods that have been field-proven over a period of nearly 30 years. Deep target zones or target zones in dense, tough overburden or competent bedrock require more robust tools and methods that direct greater energy to the formation. Three projects highlight injection methods, fracture form and applied use of induced fractures. The first site, a trichloroethene source zone in glacial clay till, utilized DPT drilling and jet injection methods to create horizontal fractures filled with zero valent iron. Samples collected 18 months after injection indicated an 84 percent reduction in TCE mass in the source zone and 67 percent reduction in TCE mass flux in groundwater. The second site is a manufacturing facility in northeast Connecticut where sand-filled fractures were used to enhance recovery of TCE from fine-grained glacial till using dual-phase extraction. The dense till required injection through dedicated wells and more robust tools and methods than those created in DPT borings. Multiple lines of evidence (e.g., drawdown, vapor pressure, vapor discharge) highlight performance improvements in fracture-enhanced recovery wells compared to conventional wells. The third site illustrates creation and use of fractures in fresh granodiorite bedrock to treat TCE at a former manufacturing site. Open-hole bedrock wells were used to create 102 new fractures with a horizontal attitude that created an interconnected, lattice-like fracture network that was used to deliver 2,860 gallons of emulsified vegetable oil to the target zone. The phased approach to the work resulted in 28 percent cost savings during Phase 2 and 58 percent cost savings in Phase 3 compared to Phase 1.

11:00 **Successful Treatment of Carbon Tetrachloride and Carbon Disulfide in Groundwater Using and Improved Formulation of Emulsified Zero Valent Iron**
Les Porterfield, PE, Director of Florida Operations, TEA Inc., Santa Rosa Beach
Two distinct microscale iron materials were tested to compare reactivity by evaluating particle size distribution, hydrogen gas production and surface area. One of the microscale irons was clearly more reactive. Both iron materials were used to produce emulsified zero valent iron, and used in a groundwater treatability test for a U.S. site to treat carbon disulfide and carbon tetrachloride. The team tested and characterized properties on two sources of iron media that would illustrate the potential reducing power of the iron. The comparative analysis showed that one microscale iron product possessed three times the surface area (2.24 vs. 0.78 m²/g) and four times the reactivity/faster electron dosing rates [4.53 vs. 1.14 ml/(g-day)]. The particle size distribution was about two times greater for the more reactive iron (e.g. 7.53 vs. 3.93 mm D50 values). Test samples were exposed to EZVI produced using the two different iron types, and also received no EZVI exposure. All samples were sent to a commercial laboratory and analyzed for CS₂ and CCl₄ (and other compounds including breakdown/daughter products of these parent compounds). The EZVI prepared with the more reactive iron demonstrated significantly higher removal rates for CS₂ and CCl₄ in solution. Removal rates demonstrated during this seven-day test showed 73 percent and 91 percent for CS₂ and CCl₄, respectively. Based on these results, a pilot study is being performed in groundwater at the chemical facility and additional research is being performed to improve the manufacturing process for EZVI.

11:20 **In-Situ Halogenated DNAPL Destruction Utilizing EZVI Technology: Applications and Advancements**
Greg Booth, Senior Vice President, Provectus Env. Products Inc., Baton Rouge, LA
EZVI is a unique ISCR halogenated DNAPL destruction technology that utilizes the combined effects of biological remediation processes, abiotic chemical remediation processes and contaminant physical chemistry characteristics to provide rapid mass flux abatement and direct destruction of free phase and residual source materials. The EZVI technology was first implemented for full scale DNAPL remediation in 2005. Since then, it has been utilized at many sites across the U.S., Canada and the EU. EZVI was originally invented to address DNAPLs located in saturated soils and implemented as a "hot spot" type of approach. This continues to be the most common use of the technology, however, due to the unique properties of the product additional implementation approaches are enabled, including vadose application. Also, there have been recent advancements to the originally patented formulation that include both biologically mediated and abiotic processes. These characteristics should be considered by remedial practitioners when evaluating approaches that can be compatible with site specific remedial objectives. In-situ DNAPL destruction utilizing the EZVI technology is frequently utilized among seasoned professionals as the positive effects of rapid mass flux abatement and source mass

Continued on Page 9

FRC 2018: Day Two, Thursday, Dec. 6, 2018

Concurrent Session 5A: Young Professionals

8:30 **What Can High Resolution Site Characterization and 3D Visualization Bring to your Investigation?**
Fabio Fortes, Staff Engineer, HSW Engineering Inc., Tampa
This presentation will provide an overview of a site assessment project performed by HSW Engineering for a Superfund site in Florida where high-resolution site characterization and three-dimensional visualization were used to refine the conceptual site model for the contaminant fate and transport of sodium and refine remedial alternatives for ongoing cleanup activities. Using data collected from over 200 high-resolution sample locations, a 3D model was developed to visualize the present contaminant plume behavior and hydrogeology information. These data and the corresponding 3D model helped streamline and clearly define the targeted remedy strategy for the site that surpasses traditional methods. In this presentation, participants will leave knowing: (1) the advantages that high-resolution site characterization has in comparison to other traditional groundwater sampling methods, (2) lessons learned during the site assessment project, and (3) understanding the effectiveness of using 3D or 4D visualization.

8:50 **Using the R Programming Language to Enhance and Streamline Data Processing, Analysis and Visualization**
Justin Spengler, Environmental Engineer, Golder Associates Inc., Jacksonville
Integrating computer software into data processing is essential to working in a technical field today. However, many processes are still performed using dated methods of manual manipulation where computer programming is more efficient. The programming language R is a free software program designed for statistical computing and data visualization that can improve upon traditional data processing methods, particularly when the analysis required is intensive and/or repetitive. Two examples follow. A report completed semi-annually for the past 10 years including temperature, pressure and oxygen data for a series of gas wells was imported into R, where each well's measured values were checked against regulated limits. Exceedances were flagged in a corresponding Microsoft Excel file. The program reduced the possibility of human error and significantly reduced the time needed for the task. To evaluate the effectiveness of an in-situ thermal remediation project, R was used to calculate contaminant mass removal rates and evaluate contaminant trends versus depth at 17 large diameter auger boring locations using real-time system operational data. Over 100,000 data points were generated in two distinct data sets during operation, including treatment depth, volatile organic compound concentration using a flame ionization detector and gas chromatography, and off-gas extraction flow rate. R was used to interpolate the values of one data set into the other, identify and implement baseline FID values, and generate a series of graphs and tables for each boring location. Attaining the same analytical depth by traditional methods would not have been viable due to time constraints.

9:10 **Large Scale Coverage to Surgical Precision: Horizontal Injection Wells Provide Effective and Efficient Amendment Delivery**
Kyle Carlton, PG, Senior Geologist, Directional Technologies Inc., Miramar Beach
Delivery of chemical amendment to the target subsurface zone is crucial to the success of in-situ injection remediation. Installation of horizontal injection wells with horizontal directional drilling accesses contaminated areas beyond the reach of vertical drilling methods. This presentation will demonstrate the versatility of horizontal injection techniques through discussion of three case studies detailing sites varying from large scale injection beneath extensive areas to smaller scale, precise injection approaches. Case Study 1: A major redevelopment project faced significant environmental challenges due a chlorinated solvent plume which extended over 1,600 feet. An in-situ chemical oxidation system needed to be installed while construction activities were ongoing. Ten single-entry horizontal injection wells installed beneath the future building sites enabled delivery of 1.03 million gallons of KMNO₄ solution within a 26-day period. Case Study 2: Industrial process wastewater leaking from a drain line contributed to perchlorate concentrations in the groundwater ranging from 10 to 500 mg/L and an estimated mass on the order of 1,500 pounds of perchlorate. Two horizontal injection wells installed beneath a parking lot and building injected a soluble carbon source and bio-culture to facilitate anoxic biodegradation of the perchlorate. Case Study 3: Leaking USTs originally installed in the 1980s resulted in a petroleum plume beneath an active chemical manufacturing facility in New South Wales, Australia. Surface obstructions including warehouses, ASTs, loading racks and high traffic areas prevented vertical injection points. Three horizontal injection wells were installed beneath the infrastructure to provide hydrogen peroxide and ferrous sulphate delivery.

9:30 **Remediation System Performance Evaluation**
Ken McVeigh, Project Engineer, APTIM, Tampa
What do people want? Often, the answer is "to make my job easier." Environmental service clients would certainly offer this answer. Whether the client is the environmental, health and safety manager of a single manufacturing plant, or the environmental manager of a major retail petroleum supplier, job responsibilities are often stretched well beyond comfortable levels with our "leaner" management approach. The RSPE was developed by APTIM, and three other member consultants, for a national retailer to provide layered access to all project information, commensurate with the needs of the user first, and the complexity of the site last. Unlike database systems listing data in sets that can be cumbersome when plunging into the document abyss, the RSPE starts with a simple dashboard. This provides instant information as to the status of a site and whether it requires further attention. The dashboard gives the status of the technical, financial, and site sensitive parameters, but also has controls to allow the user to access additional information if needed. From the dashboard layer, the user can access sequential layers increasing in detail ranging from technical summaries to site maps and photos, to financials. This intuitive project management tool was develop within PowerPoint and is particularly useful in focusing on what is important, while still providing access to other available information on that particular topic instantly. Although this tool was originally developed for active remediation sites, it can be adapted for any site to make the user's job easier. Who doesn't want that? See us at Booth #5.

destruction are realized. The following topics will be discussed: 1) What is EZVI? Background information will be covered briefly to provide an understanding of what makes the technology is unique and how it works; 2) When is EZVI a remedial option? Guidelines for the effective use of EZVI will be presented including; product formulation, dosing and implementation options for vadose and saturated soils; 3) How does EZVI product composition vary and what are the consequences? Various key parameters for the technology will be discussed, including ZVI particle size, emulsion type and the associated remedial implications; and 5) What are the most recent advances to the EZVI technology? Important advancements will be discussed including antimethanogenic properties and enhanced abiotic reactivity.

11:40 Removal of Selenium using Novel ZVI Media

Madan Tandukar, PhD, Hoganas Env. Solutions Inc., Cary, NC

Typical zero valent iron media has several limitations for selenium-based contaminant removal, primarily due to low reactivity, limited capacity and surface passivation. In order to address these challenges, an array of innovative ZVI media (Cleanit® media series) were engineered with customizable reactivity, particles size and surface characteristics. A batch kinetic study, using Cleanit® media, was conducted with an initial selenium concentration of 10 mg/L (a mix of selenate, selenite, selenosulfate and selenocyanate) and a loading rate of 0.1 mg Se/g media. Within 24 hours, all four selenium species were removed to below the detection limit (1 µg Se/L). The pseudo first order reaction constants for each selenium species mentioned above were 25.0, 23.7, 11.1, and 1.0 h⁻¹, respectively. The maximum removal capacities for the four species were 2.70 ± 0.12, 4.90 ± 0.03, 4.74 ± 0.22, 5.00 ± 0.00 mg Se/g media, respectively. Since selenate is the most challenging selenium species to be removed by ZVI, column tests were conducted using three different grades of Cleanit® media: Cleanit®-SR.1S, Cleanit®-SR.2S and Cleanit®-SR.3S with site soil and the impacted site groundwater. The initial selenium concentration was 2,200 µg/L. With an average retention time of 4.4 hours at a flowrate of 0.5 mL/min, all three Cleanit® media demonstrated selenate removal efficiencies between 97 and 98 percent. Among the three Cleanit® media tested, Cleanit®-SR.1S showed the highest selenium removal capacity and low pressure build-up in the column. In summary, Cleanit® media demonstrated a significant potential for organic and inorganic selenium removal for groundwater remediation.

Concurrent Session 6A: In-Situ Bioremediation 1

10:40 History of Bioaugmentation and Assessment of Implementation Strategies for EISB - Is There a Right Way?

David Alden, PE, Technical Associate
Tersus Environmental Wake Forest, NC

Successful enhanced in-situ bioremediation relies on the effective delivery of amendments to create the appropriate conditions where microbial populations can thrive to degrade the contaminants of concern. When designing implementation plans for electron donor and bioaugmentation cultures, each site often has unique considerations affecting the design. Having a consistent approach from site to site following published guidelines is often difficult leading to multiple implementation strategies that have been used. This presentation provides an overview of the development of organohalide respiring bacteria, as well as lessons learned from chlorinated solvent EISB projects by comparing implementation approaches. Microbiologists in wastewater and groundwater remediation have optimized bench-scale tests with extensive genetic tests to easily detoxify chlorinated-solvent contaminated groundwater. Remediation practitioners implement these findings using standard design considerations for EISB systems include geology, porosity, concentrations of chlorinated solvents and other electron acceptors, groundwater velocity and treatment size. Also, other site-specific factors come into play like locations of buildings, roadways, railways and other items that can affect the location of injection and monitoring locations. Case studies from a variety of commercial and non-traditional products and approaches will be compared in this presentation, highlighting site-specific technical and non technical factors that influence the implementation method chosen. This presentation will compare EISB implementation methods and feedback from stakeholders. Questions to be answered include why injection quantities rarely rely on pore replacement volumes yet satisfactory results are reported. Varied donor estimation processes are analyzed, explaining why hydrogen demand requires many assumptions and the demand is often dwarfed by soil retention factors. Also, analysis on weather biostimulation and bioaugmentation during the same mobilization offer advantages.

11:05 Sustained Anaerobic Bioaugmentation via In-Situ Bioreactors
Eric Raes, PE, LSRP, Director Remedial Services
Bio-Enhance Inc., High Bridge, NJ
The study updates the use and

performance of an in-situ bioreactor in promoting reductive dechlorination of trichloroethylene in a bedrock monitoring well. The remediation has been ongoing for two years and has recently been expanded from one well to three, including an experimental ISBR design. The study also presents the testing of the longevity and potential for sustained biodegradation following ISBR removal and relocation to another well at the site. The site is a former chemical distribution facility where a deep, fractured aquifer had been impacted predominately by TCE. An ISBR unit was initially installed in an existing monitoring well to promote reductive dechlorination. The ISBR was deployed in an existing monitoring well at a depth of 60 feet below ground surface. Groundwater samples were routinely obtained at a depth of 140 feet to determine whether ISBR operation affected contaminant concentrations and geochemical conditions throughout the depth of the saturated zone. Bio-Trap® samplers were also deployed at depths of 60, 85, 105 and 140 feet BGS. After one year, the inoculated ISBR was moved to a new well, and two new ISBR remedial units were installed at the site. One of the new reactors was an experimental design to assess if nitrogen sparge gas (for circulation purposes only) could be removed. Prior to the initial ISBR deployment, all data confirmed reductive dechlorination processes were limited under existing conditions. For example, cis-1,2-dichloroethylene was detected but vinyl chloride and ethene concentrations were below detection limits. Consistent with historical groundwater monitoring, Dehalococcoides concentrations were low and vinyl chloride reductase genes were not detected. After approximately six months of operation, geochemical monitoring at 140 feet BGS demonstrated sulfate consumption and methanogenesis. After nine months of operation, the Dehalococcoides concentration at 140 feet BGS had increased by four orders of magnitude, surpassing 1 million cells/mL. After five quarters, all chlorinated solvents were non detect. The inoculated ISBR was relocated to a new well and similar mass reductions and elevated microbial populations were observed. Most interesting, biodegradation processes remained elevated in the initial well, even after the removal of the ISBR. Overall, the results conclusively demonstrated that the ISBR successfully enhanced anaerobic bioremediation throughout the saturated thickness of the monitoring well and indicated that ISBRs can be an effective remediation approach even in a deep, fractured bedrock aquifer.

11:30 Strong Endogenous Decay Contribution During the ERD of TCA DNAPL in Bedrock Groundwater

Kent Armstrong, President, TerraStryke Products LLC, Andover, NH

Incidental trichloroethene releases at a former electronics manufacturer impacted shallow bedrock groundwater. Site hydrogeology includes 15 to 20 feet of alluvial silty clay or gravelly sand overlying fractured sandstone, with an estimated ten foot thick interval of dense, nonaqueous

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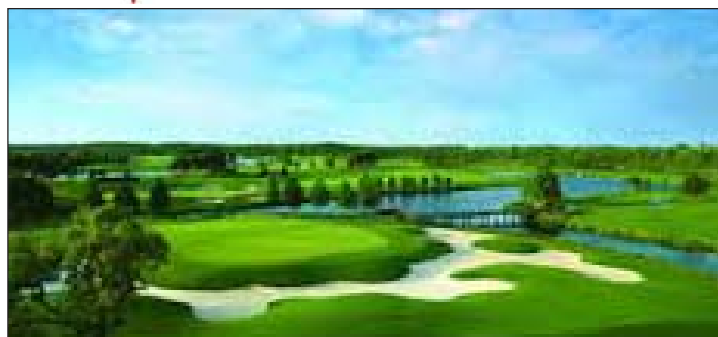


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Advocacy groups release report aimed at state, federal candidates detailing pressing environmental challenges

By **BLANCHE HARDY, PG**

A coalition of environmental advocacy groups recently released "Trouble in Paradise," a report characterizing the state of Florida's environment intended to inform candidates running for federal and state office in Florida.

The report identifies increasing threats to our ecosystems and natural resources.

The Trouble in Paradise project was initiated by Nathaniel Pryor Reed, co-founder of 1000 Friends of Florida, who passed away in July.

1000 Friends joined the Apalachicola Riverkeeper, Defenders of Wildlife, Florida Defenders of the Environment, Florida Springs Council, Florida Wildlife Corridor, Florida Wildlife Federation, Howard T. Odom Florida Springs Institute, the League of Women Voters of Florida and other advocates to complete Reed's important work.

"We share the hope of our late co-founder, Nathaniel Reed, who conceived of this report as a means to spur candidates for state and federal office in Florida to confront the pressing environmental challenges facing our state and respond with the decisive action those challenges de-

mand," said Paul Owens, president of 1000 Friends. "While 1000 Friends of Florida took the lead on editing and publishing this report, it represents the consensus view of us and eight other conservation organizations.

"We hope that amplifies its message and creates extra pressure on Florida's leaders to respond with meaningful measures to restore and protect our state's environment. If they do, all Floridians will experience the benefits of a healthier environment, a better quality of life and a more prosperous and sustainable economy."

"Candidates and constituents alike can review this report for a better understanding of the environmental challenges facing Florida," said Georgia Ackerman, executive director of Apalachicola Riverkeeper. "More importantly, the report can be a tool for seeking solutions to the problems and challenges needing to be addressed comprehensively."

The report highlights six critical statewide priorities requiring immediate consideration: land conservation, safeguarding water supply, water conservation, water quality, growth management and cli-

mate change.

In addition to suggesting action priorities, the report identifies several ecologically sensitive areas that need further protection including the Everglades, Lake Okeechobee, the Indian River Lagoon, Apalachicola River and Bay, and several natural springs.

"Trouble in Paradise is a high-level briefing document," said Jim Gross, PG, executive director of Florida Defenders of the Environment. "It is intended for candidates for elected office and for the general public during this very important election year."

He noted that the document covers an array of important environmental and growth management issues in Florida today and provides recommendations for what elected officials should be doing now and into the future to address those issues.

"It is especially important now because we have largely been ignoring these issues for the last eight years or more," he said.

Impacts go beyond the environment, Ackerman explained. "Florida's economy is built on tourism. Protecting water and land is critical to our survival. The report can serve as a tool for discussion with can-

didates for elected offices. We want candidates to fully understand what's at stake."

"The challenges we are facing will not resolve themselves," said Gross. "We cannot continue to ignore them and blindly hope they will simply go away. With more than 1,000 people moving to Florida each day, these problems will only become more severe."

Whole sectors of our economy are at risk of collapse if we do nothing, he said. "We need leaders who are not afraid to champion these issues. We need leaders who understand the issues and who will inspire confidence among all Floridians that we can do great things working together."

"All the issues in the report are critical," he continued, "People may prioritize them differently, but one thing is clear. If we do not address all of them in a substantive fashion, we place large sectors of our people at risk—economic risk, health risk, social risk."

"As the report also points out, Florida's environment is in deep trouble," said Owens. "The most obvious indication is the algae blooms that have fouled waterways across Florida this summer, killing aquatic life and devastating businesses that depend on tourism and healthy fisheries."

He said there are other danger signs for Florida's environmental health.

"The growing demand for drinking water from our state's rapidly rising population is depleting our underground supply and reducing the flows that nourish lakes, rivers and springs.

"Sprawling development is consuming open land, eliminating areas for animal habitat and groundwater recharge, and increasing pollution from runoff.

"South Florida coastal communities are routinely experiencing flooding during high tides from sea-level rise, threatening saltwater intrusion in their water supplies and forcing them to face the huge cost of retrofitting their infrastructure."

The report includes five recommendations on how to move forward.

First, we must re-establish the Florida Springs Initiative and include enforceable standards, requirements for routine monitoring and springs health assessments, strict enforcement of existing laws and adequate funding for full springs restoration.

Second, we must acquire critical conservation lands in the springsheds, for example, using Amendment 1 funding to acquire and protect the most vulnerable and significant conservation lands in springsheds.

Third, we must engage in aggressive water conservation and reduce the amount of groundwater extractions permitted throughout North and Central Florida to maintain healthy spring flows.

In addition, we should establish strategies to require new development and major remodeling to follow standards established under Florida Friendly Landscaping™ and Florida Water Star programs.

Fourth, we must dramatically reduce the amount of nutrients introduced into springsheds, and reduce or eliminate the use of nitrogen-based fertilizers.

In addition, we should prohibit the installation of any new septic tanks on parcels less than five acres and replace all existing septic tanks on smaller properties with nitrogen-removing central sewer systems.

Where septic tanks are too scattered to be replaced by gravity sewer systems, we should build smaller pressure sewer systems.

In addition, we should limit the densities of livestock as needed to meet the spring nitrate standard of 0.35 mg/L in the underlying groundwater and improve our practices for treating municipal, agricultural and commercial wastewater reuse and disposal in springsheds.

Finally, we must manage recreation's impacts on springs and develop science-based management plans that insure compatibility between appropriate recreational activities and sustainable ecological communities.



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Think tank takes new tack to exploit benefits of carbon taxes to help lower GHG emissions

By ROY LAUGHLIN

A recent white paper, “How Induced Innovation Lowers the Cost of a Carbon Tax,” makes a conceptual case for using modest carbon taxes on greenhouse gas emissions to underwrite a technological development scenario called “induced innovation” that would justify the taxes in both an economic and social context.

The idea is that carbon taxes impose economically significant costs on the use of carbon fuels, supplying equally economically significant justification for developing non-carbon and thus tax-free alternative energy technologies.

The 28-page report from the Information Technology and Innovation Foundation is a logically-structured argument discussing prior efforts and concepts, presenting the case for a carbon tax, and introducing the induced innovation economic model.

Under the scenarios proposed, induced innovation would foster adoption of technological innovation to reduce carbon emissions that would widely benefit society.

Parts of the discussion are old hat, particularly the scientific certainty of carbon emissions’ role in climate change, and the potential risk of doing nothing to reduce emissions.

With that familiar refrain in mind, the report makes an important point: “All parties of good will and open mind should be able to agree on the facts and then engage in a robust debate about the best steps to limit the negative impacts from climate change.”

The report provides a new conceptual assertion of how creating the proper financial incentives can make or break technological advances.

While acknowledging that induced innovation does not offer a failsafe outcome, the report’s author, Joe Kennedy, a senior

fellow at the ITIF think tank in Washington, DC, makes the point that charging a tax on carbon emissions to reduce them is more efficient than cap-and-trade, of more durable effectiveness than regulations, and satisfies conceptual requirements dearly held by advocates of market self-determination.

However, the report notes that the “social benefits of research and investment in carbon-efficient technologies are greater than the economic benefits a company receives. As the clean energy economy continues to evolve, society will be better off if companies conduct more R&D and invest in more machinery and equipment than is strictly profitable for them to do.”

Nevertheless, the report proposes a carbon tax because “a moderate carbon tax will deliver environmental benefits, induce innovation in new technologies of the future and, if accompanied by tax incentives to invest, could even lead to faster economic growth.”

In his recent book, *Tailspin*, author Steven Brill describes in great detail how companies that don’t maximize quarterly profits have been bought up by corporate raiders, chopped up and sold off after leveraged buyouts, or otherwise destroyed.

U.S. equity markets have become gambling casinos more than supporters of industrial production with innovation at its foundation.

CEOs and top management who buck this trend lose their companies and their jobs in the process. If they are the ones to make decisions to pay taxes to support induced innovation, it will not happen.

Because Brill’s book discusses in minute detail what has happened in the last 45 years in business and the U.S. economy, his work is a better indication of what will happen under a carbon tax than what could happen in the best-case scenario endorsed in this new report.

The goal of this brief review is not to steer readers and potential advocates away from the report and its conclusions. There are several reasons to include it on a summer reading list.

The first is summarized in its conclusion: “Current negotiations (internationally) seem more focused on the commercial opportunity presented by low emission technology, and therefore aimed at implementing policies to take advantage of it.”

The report suggests that the U.S. will be a major recipient of the economic benefits of developing those low emission technologies, the current political environment notwithstanding.

Brill notes that U.S. businesses are increasingly positioned to take advantage of innovation, whether induced or from any other source.

Other countries will rush in if the U.S. stands aside. The first to develop a technology picks the low-hanging fruit and often continues to harvest most of the crop, a point not lost on other nations and trading regions.

One might dismiss the prospects of this report because by the time the investment yields any benefit to corporate decision makers, the “I’ll be gone—you’ll be gone” rule would have already played out.

TBW: Grants available for protecting drinking water sources

Tampa Bay Water announced mini-grants ranging from \$2,000 to \$10,000 to community groups, non-profits, schools and universities that join the water utility in preventing pollution, cleaning local waterways and protecting drinking water sources.

To qualify for a grant, applicants should submit an event or project plan related to source water protection in Tampa Bay Water’s service area that includes Hillsborough, Pasco and Pinellas counties.

To apply, download an application at

In fact, the crises are occurring now and have a cost to be paid.

The report discusses a Congressional Budget Office study that considered a \$25 per metric ton carbon tax that increases by two percent per year.

The CBO estimated that it would yield \$437 billion in the first five years and \$997 billion in the first 10 years. (Note that the ITIF report endorsed a \$15 per metric ton carbon tax, not the higher levy considered in the CBO report.)

Compare the tax revenue enumerated in the CBO report to the estimated costs of the hurricane years 2005 and 2017. Estimated minimum financial losses of \$250 billion occurred in each.

This estimate does not account for other natural disasters associated with climate change such as agricultural losses due to drought, forest fires and coastal flooding.

A carbon tax used to help pay for recovery costs may become less of a conceptual musing. As the costs of climate change mount, it could become a populist rallying cry resulting in the adoption of a carbon tax to pay for past crises and underwrite future mitigation and avoidance.

In that case, this report could become the cradle of a concept born into a practice by expedience.

tampabaywater.org/grant and provide a plan for events or projects such as river cleanups, litter prevention projects, public education campaigns and conservation outreach events in Tampa Bay Water’s service area.

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New UM study explains heat, acidification resistance in hard corals

By ROY LAUGHLIN

A team of University of Miami researchers reported essential insights into how corals respond to simultaneous temperature and CO₂ increases in the ocean.

The simple message is that some coral species may survive climate change. And some may not.

Resistance is mediated by the heat tolerance of the coral's symbiotic algae, not the corals themselves. If elevated environ-

mental temperatures kill the symbionts, corals cannot survive.

The researchers exposed two coral species for 62 days to either 26 degrees C, a typical environmental temperature and the control, or to 32 degrees C temperature, an elevated ambient temperature expected to occur routinely under current consensus global warming scenarios.

Carbon dioxide exposure had two levels: 1) the current atmospheric average of 380 parts per million, or 2) an elevated 800 parts per million level expected by the end

of this century.

Corals were exposed to simultaneous low temperature/low CO₂, low temperature/high CO₂, high temperature/low CO₂ or high temperature/high CO₂.

Coral polyps are a symbiotic association of an animal, the coral, and of single-celled photosynthetic flagellates that live in coral tissue.

When corals are stressed by high temperatures, they expel their algal symbionts. Loss of zooxanthellae, called coral bleaching, frequently leads to coral death, the extent of which varies from one coral species to another.

Corals depend on photosynthetic products from the flagellates for a nutritional boost. When the flagellates die due to high temperature, the corals follow, perhaps because of nutritional stress.

Algal symbionts are genetically classified into at least four separate groups, termed "genetic clades." The researchers used DNA analysis to distinguish the algal symbionts' genetic clades in the two corals they studied.

Those two coral species were *Acropora cervicornis* and *Orbicella faveolata*. The researchers found that *A. cervicornis* hosted symbiont clades A and C, while *O. faveolata* hosted only clade D.

An unexpected surprise in the experimental results was how different the sensitivity of each coral species was to high temperatures. During four weeks of exposure to 32 degrees C, all *A. cervicornis* colonies died, preceded by the loss of algal symbionts a few days before death. *O. faveolata* colonies, on the other hand, experienced zero mortality during the 62-day experiment. They did not expel algal symbionts.

"I knew that *A. cervicornis* was heat stress sensitive but not that it would experience not just bleaching but 100 percent mortality after just 25 days at 32 C (a condition that could become frequent in just 12 years)," said Chris Langdon, PhD, professor of marine biology and ecology at the University of Miami's Rosenstiel School of Marine and Atmospheric Science and the lead researcher, in an email. "Conversely, I was very surprised at how heat stress resistant *O. faveolata* was."

The researchers measured two sublethal responses by the corals: phytochemical efficiency and skeletal growth. The research noted these two physiological processes reflect energy production and use in the corals.

Experimental results showed that while high levels of both CO₂ and/or temperature reduced phytochemical efficiency and coral calcification, high-temperature played a dominant role in curtailing metabo-

lism and growth in both coral species.

It was the master factor, with high acidity due to CO₂ responsible for a fraction of additional reduction.

The surprise discovery of this research was the correlation between coral mortality and algal symbiont clade. The more temperature-sensitive A/C clades in *A. cervicornis* were responsible for that coral species' bleaching that caused coral death. The more heat-tolerant D clade in *O. faveolata* was not expelled at 32 degrees C and that corals species survived.

Langdon noted that the existence of zooxanthellae genetic clades and a general knowledge of different heat resistance based on clade was established through prior research by several investigators. Sensitive clades are associated with bleaching.

"The new finding is specifically how sensitive or how resistant our Florida corals are," he said.

Langdon also noted that the clade associations with these two coral species are not absolute. The symbiont clade can be the opposite of that found in this experiment and, if so, would be high temperature resistant.

Even though *O. faveolata* colonies survived, their growth rate under high CO₂ conditions was significantly reduced during exposure to high CO₂ levels and to high temperatures. Notably, growth rates recovered during a two-week post experimental recovery interval in the laboratory when corals were exposed to 26 degrees and 380 ppm CO₂.

"I was very surprised at how heat stress resistant *O. faveolata* was," said Langdon. "Where it stood out was its ability to survive a very lengthy heat stress period and then very quickly recover when the temperature was lowered back to typical fall temperature."

"This study is unique for looking at the ability of corals to recover following a defined period of heat stress ... By only looking at how many corals are bleaching we are missing half of the story. We also need to be looking at how many corals are able to recover following bleaching."

Another valuable component of the discussion is a comparison of experimental conditions to temperature and CO₂ levels in the Florida Keys reefs. The field data were collected at a monitoring station there over a three-year interval from 2012 to 2015.

Monitoring data show the sea has seasons. CO₂ is both consumed by photosynthesis and produced by community respiration in different seasonal patterns.

CO₂ levels in seawater drop significantly in the spring. They are episodically much higher in late fall and early winter, even higher than the high experimental level used in this experiment.

Likewise, ocean temperature, especially during El Niño years, already approaches the lethal limit found in this experiment for *A. cervicornis*.


Results from this research predict that a combination of rising temperatures due to global warming with additional heating observed during hot El Niño summers will stress sensitive shallow water corals to death.

Another important finding is that coral heat resistance is intrinsically dependent on that of their algal symbionts. Coral colonies that lack heat resistant algal symbionts and cannot acquire them will be the first to die due to bleaching under high temperature/high CO₂ conditions.

The data also show that high CO₂ levels do not accelerate symbiont photosynthesis sufficiently to compensate for reduced coral calcification in acidified seawater.

"By the end of the century, the oceans are likely to be not only warmer but also 2-3 times more acidic," Langdon said. "To survive, corals will need to withstand both stressors."

"While this sounds bad, you can find some corals in Florida that have adaptations that allow them to survive such doubly stressful conditions in the lab. I am trying to find out what makes them so tough and then figure out how to increase their numbers on the reef."



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NASA improving algal bloom surveillance efforts in Lake Okeechobee

By ROY LAUGHLIN

The National Aeronautics and Space Administration's Aerosol Robotic Network program will be taking a closer look at Lake Okeechobee's algal blooms from space.

NASA partnered with Florida Atlantic University's Harbor Branch Oceanographic Institute to install a SeaPRISM radiometer at lake surface level to get a more accurate spectral signature of the lake's water and algal blooms' characteristics.

The radiometer was installed this summer.

Malcolm McFarland, PhD, a research associate at HBOL, said that the institute is primarily providing ground support to NASA's AERONET program to install a pole-mounted sensor in Lake Okeechobee.

The program, according to the NASA web site, supports a radiometer network "to provide measurements for aerosol research, satellite and atmospheric model validation and synergy with other data bases."

Several years ago, the program began using satellites to observe large lakes and the oceans for algal bloom occurrences.

The satellites' instruments measure absorbance and reflection of discrete wavelengths or narrow wavelength bands of light. This data can indicate the presence and extent of an algal bloom.

BMAPS

Continued on Page 13

communications coordinator for Ichetucknee Alliance.

The letter stated that "(a)fter careful review of the recently released BMAP draft, we have concluded that adoption of this draft BMAP will not lead to a satisfactory or timely restoration of water quality within 20 years, as required by law."

Whitey Markle, chair of the Suwannee-St. Johns Group Sierra Club, pointed out that the issued BMAPs are insufficient because "the statute(s) do not provide a definition of 'significant harm,' which leaves room for argumentation. A definition should be made by rule."

Further, Markle said that "there is no rule regarding best management practice monitoring. BMP monitoring is nearly nonexistent. In fact, staffing that would monitor BMPs was reduced. In our negotiations with DEP and DOACS, the agency representatives blamed legislative funding. When asked how that request should be made to the Legislature, they said such procedure was not in their realm of responsibility—that request should come from outside of the agencies."

In addition, "nitrate concentrations and sources appear to have been 'designed' by the agencies to include limited data. Apparently, total springsheds were not included in their modeling."

Markle also noted that "projects were insufficient to adequately affect the nutrient problem, and the projects were either underfunded or unfunded altogether. Some projects appeared to be irrelevant to water quality solutions. In several of the 'public' workshops, local government representatives reported that their project proposals in the recent past, after all the work of producing project proposals, were underfunded or unfunded."

Legislative funding and clarity are the most critical issues, according to Markle.

"Judging by the way policy has been sculptured historically; policy change is sporadic, political and partial," he said. "The protocol in Tallahassee is totally political. We had legislators introduce very effective water quality legislation in the form of bills and amendments to bills during the last several sessions only to have the committee chair(s) refuse to place them on their agendas.

"In effect, the Legislature, as a body, is not complying with the existing statutes regarding water quality and springs protection."

Among the petitions filed, the WWALS Watershed Coalition's is typical.

In some cases, it can also indicate the types of algae responsible for the bloom. For example, blue-green algae typically provide a very different spectral signature compared to the diatoms responsible for an algal bloom.

The satellite instruments provide the most accurate data when the ground-truthing measurements close to an observed lake are available to correct the sat-

ellites' data for atmospheric distortion and absorption.

The SeaPRISM radiometer placed in Lake Okeechobee makes its observations every 30 minutes and sends the data to NASA to be used for both satellite validation and direct assessment of lake water color, said McFarland.

He noted that NASA will be responsible for the data reduction and interpreta-

tion, which is publicly available on the NASA AERONET web page.

Placing the SeaPRISM radiometer in Lake O was planned well before this summer's algal bloom reached its recent epic dimensions.

With the instrumentation in place, NASA will have the chance to monitor a full-blown bloom and observe its decay after rains and runoff lessen later this year.

Destin officials taking advantage of RTK GPS technology

By BLANCHE HARDY, PG

The city of Destin is using a real-time kinematic global positioning system tool to map the erosion control line on its beaches. Officials hope to determine the split between public and private beach property.

RTK uses carrier-based ranging to provide positioning that is orders of magnitude more precise than those available through code-based positioning.

The range is calculated by determining the number of carrier cycles between the satellite and the rover station, then multiplying this number by the carrier wavelength.

RTK is used for projects requiring a high degree of accuracy, such as centimeter-leveling positioning. Advancements allow instruments to achieve one centime-

"WWALS filed comments and requests with Sec. Noah Valenstein and Suwannee River Basin Coordinator Terry Hansen, both of the Florida Department of Environmental Protection, on June 4, 2018, and Petitioner WWALS has received no response.

"Petitioners anticipated a department response to comments, questions and suggestions submitted by petitioners, other stakeholders and others during the comment period. Petitioners would avail an opportunity to discuss the department's plans. Without a department explanation, petitioners lack information regarding these matters and require additional time and information," noted their petition.

"If DEP is daunted, maybe it will welcome more time to try to do it right," said Suwannee Riverkeeper John Quarterman.

Objection to the new BMAPs isn't limited to environmental advocates.

The Florida Home Builders Association also filed a petition for time extension for all of the June 29 BMAPs on July 2, 2018.

The association is concerned about the BMAPs' requirements for on-site wastewater treatment systems, commonly referred to as septic tanks.

Each of the BMAPs contains an appendix covering OWTS remediation. According to the group, the BMAPs require nitrogen-reducing enhancements for new systems installed on lots less than one acre in primary focus areas.

These systems require a permit from the Florida Department of Health. However, FDOH hasn't completed the rule governing the permitting of these systems so the BMAPs depend on an unfinished and unadopted rule.

The association's petition states that FHBA filed the request for an extension seeking time to allow FDOH to complete its OWTS rulemaking, FHBA to evaluate the FDOH rules when finalized, the OWTS systems covered by the new rules to become commercially available, and FHBA members to design and construct new homes utilizing the OWTS permitted in accordance with the Springs BMAPs and the FDOH rule.

When asked for a recommendation for action, Markle suggested a legislative amendment that would clarify procedures and comply with existing law.

"The question remains, which legislative leader has the will and ability to change the law?" said Markle. "At this point, the only option we have is litigation, which tends to bankrupt our treasuries."

ter accuracy over applications on both Android and iOS devices.

For municipal purposes, the erosion control dividing line can determine what needs to be addressed with public funds and what is the responsibility of private property owners.

The tool can also be useful in determining code enforcement boundaries and for infrastructure mapping. In addition, the technology is used for hydrographic surveying and unmanned aerial vehicle navigation.

Destin officials used RTK technology to assist in the development of a map of

their stormwater systems. No drawings or files of the existing infrastructure were available and very little documentation of facilities occurred between 1984 and 1997.

Project workers there were still finding buried and unused utilities during activities such as road improvement projects.

The city used RTK GPS to obtain the coordinates for each stormwater structure and outfall in its drainage systems.

A variety of data was collected for each drainage facility and downloaded to the city's GIS database. The mapping was used for the city's Illicit Discharge Detection and Elimination Program manual.

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Largo officials making progress on wastewater system improvements

By PRAKASH GANDHI

The city of Largo is moving forward with the next stage of a massive overhaul of its wastewater treatment system.

The improvements, the most significant in the city's long history, are in response to orders from state environmental officials.

When completed, the ambitious \$60 million improvement plan will make its discharged wastewater effluent cleaner and reduce sanitary sewer overflows, said city

officials.

The net result is good news for both the environment and for residents," said Jerald Wolosynski, the city's engineering services director.

"Sanitary sewer overflows affect our environment and our residents," he said. "If we hadn't embarked on this program, we would be extremely poor stewards of our environment."

The projects that have been largely completed were undertaken in response to a consent order from the Florida Department of Environmental Protection.

The department required the city to reduce the amount of sewage it discharged into local waterways during plant overflows.

"Under the first project, we tried to produce a system in which we could move wastewater across the city with a series of force mains that were connected to a series of sanitary sewer lift stations or pump stations," Wolosynski said. "This would deal with major storm events defined as more than 7.5 inches of rain falling within a 24-hour time period."

He said the piping and pumping system is now operational.

Other improvements to the wastewater system include a headworks project and construction of a new five-million-gallon storage tank.

"Rather than all of the wastewater coming to the plant and overflowing it, we can hold the wastewater in the storage tank. Once the ten-year rain event is over, we can distribute the wastewater through the system," Wolosynski said.

Another improvement completed is a disinfection project.

"That project is intended to give a higher level of disinfection to prevent any disinfection byproducts from being discharged from the plant," he added.

The work also included improvements to the infrastructure of the effluent pumping system.

The final project involves upgrading the part of the plant's treatment train where bacteria and enzymes break down sewage.

Since 2012, the city has been under a DEP administrative order to find a way to reduce the level of nitrogen it discharges into Old Tampa Bay via Feather Sound.

The overall goal is to replace or improve aging components at the facility and revamp parts of the treatment system that are at risk of flood damage and storm surge, and improve safety training for staff.

Wolosynski said officials expect to complete that project within about two years.

DEP wants the city to reduce the amount of effluent it discharges into local waterways and cut down on the number of sanitary sewer overflows by the end of January, 2019.

City staff is working with DEP to merge several administrative and consent orders into one to better track results and possibly reset the deadline. Officials said this will ensure that the city has enough time to complete the new work and review the results of its performance.

The city wants to reduce nitrogen in the effluent from its current rate of 27 tons per year to the required 19 tons per year. These numbers are based on a five-year rolling average.

"We don't have a phosphorous problem, but we do have a problem with nitrogen," Wolosynski said. "And that's something we are taking seriously. Lower nitrogen levels lead to more seagrasses and an increase in the fish population."

A consortium of which Largo is a member has placed limits on nitrogen levels entering Tampa Bay and that has had a positive impact, he said. "Seagrasses have made a tremendous recovery from where they bottomed out years ago."

Wolosynski said every city in Pinellas County has experienced overflows. Two years ago, Largo and other areas were impacted by Hurricane Hermine.

Florida CAFOs may be contributing to recurring algae blooms

By ROY LAUGHLIN

A recent report by Florida Public Employees for Environmental Responsibility builds a strong case that the Florida Department of Environmental Protection under Gov. Rick Scott did not enforce permit reporting requirements for Florida's concentrated animal feeding operations after Hurricane Irma's flooding rains.

The vast majority of Florida's CAFOs are dairies, and 14 of them are upgradient of Lake Okeechobee.

The report presents records showing that DEP has not properly conducted facility inspections since at least early 2017.

Consequently, DEP officials had insufficient knowledge of the prospects that nutrient runoff from the CAFOs located from southern Orange County down to Lake Okeechobee could spark this summer's harmful algal bloom in Lake O.

The bloom has now spread to tidewater on both coasts of Florida in releases from the lake this summer.

The report, The Florida Department of Environmental Protection's Oversight of Dairy Farms after Hurricane Irma, begins by explaining that under DEP permits, if a CAFO experiences a 25-year/24-hour flood event, it must to file a report of its discharges.

The report presents data to show that Hurricane Irma dropped 10 - 15 inches of rain in peninsular counties where CAFOs are located.

"It is clear that each of these counties experienced rainfall rates that were more on the level of a 100-year storm, which is far worse than the 25-year/24-hour events for which the CAFO permits expected each CAFO facility to be able to withstand," the report states.

Yet, only two dairies, both Dakin Dairy Farms, reported any discharges following Hurricane Irma.

DEP's records show a lack of adequate DEP inspection. In the absence of emission reporting, DEP might have considered inspecting the facilities, the report asserts.

Hurricane Irma passed through Florida during the third week of September, 2017.

According to the report, DEP did not conduct any inspections for more than two months following the storm's passage, and just four between mid-November and the end of 2017.

In the time before and after the storm, 11 facilities inspected had permit violations and, of those, just two were inspected in the months following the hurricane.

"When Hurricane Irma struck Florida, the DEP simply turned its head and looked elsewhere when it came to being on the scene and determining the extent to which the flooding brought about by the hurricane had resulted in discharges of wastewater from CAFOs into surrounding surface waters," said the report.

The report noted that DEP's permits do not prohibit discharges during extreme rainfall events, as Hurricane Irma was, and thus there's no reason for DEP to conduct an enforcement action because of flood water releases. But releases do have to be reported, and had they been, water agencies might have been more vigilant about the prospects of a harmful algal bloom this summer.

The report follows two prior PEER reports. The first noted that under the Scott Administration, DEP has sharply reduced enforcement activity by 88 percent, from 1,600 cases in 2010 to 200 cases in 2017.

In a second, more recent report, PEER discussed CAFO numbers, size and distribution in peninsular Florida to show that they are potentially significant nutrient source for surface waters.

The second report highlighted the numbers. Florida's CAFOs are permitted for up to 89,000 dairy cattle, capable of producing 744 billion pounds of manure annually. That translates to 10 million gallons of liquid waste daily.

The report estimated 23 and 8 million pounds of nitrogen and phosphorus, respectively, are released each year with the greatest percentage produced in Okeechobee County.

"There is no indication that meaningful change in the permitting or enforcement aspect ... is forthcoming, at least with the DEP as it is currently constituted," the report concluded.



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National Academies releases report on interconnection of Gulf's natural, human systems

By BLANCHE HARDY, PG

The National Academies of Science, Engineering and Medicine released a report identifying three critical areas of research needed to bridge the gaps in scientific knowledge regarding the interconnection of the Gulf Coast's natural and human systems.

The study was sponsored by the group's Gulf Research Program established at the request of the U.S. government as part of legal settlements in the aftermath of the Deepwater Horizon oil spill.

"Understanding the Long-Term Evolution of the Coupled Natural-Human Coastal System: The Future of the U.S. Gulf Coast" examined "deeply connected natural and human interactions and feedbacks that have lead to a complex, interconnected coastal system."

The report considered significant changes to the physical character of the region in response to processes such as coastal subsidence and river sediment deposition as well as short term impacts such as hurricanes.

The report stated that an improved understanding of the coupled natural-human

coastal system will support informed decision-making and help promote resilience of coastal communities and ecosystems under rapidly changing environmental conditions.

Work was carried out by a committee that subsequently produced the report. They identified three critical areas of research with the potential to address gaps in "high-priority scientific knowledge."

The first area asked: "How will coastal land forms and coastal ecosystems along the Gulf Coast respond to rapidly changing conditions (both natural and human-induced), especially given the expectation for continued relative sea-level rise acceleration?"

The second area asked: "How will human settlement and economic activity along the Gulf Coast respond to evolving coastal land forms and ecosystems under rapidly changing conditions?"

The third area asked: "How can improved understanding of both near and long-term evolution of the Gulf Coast's coupled natural-human system be applied to inform stakeholder decisions made at

local, state and regional levels? How will the coupled system evolve when decision-making is updated as scientific understanding advances?"

The report recommended that the Gulf Research Program create an integrated research program focused on understanding the progression of the coupled coastal system.

The research program should support multi-disciplined research teams working collaboratively. The teams should promote inclusive Gulf-wide observations and modeling efforts that facilitate research opportunities to promote repeated observations over long periods of time with respect to one or more study variables.

The committee's synopsis indicated that "the physical and ecological systems, people, and economy in the Gulf Coast are inextricably linked. The natural system includes processes such as sea-level rise, subsidence, storm surges and flooding, sediment management, marsh and wetland

loss, and conservation and restoration activities.

"The human system encompasses land use and coastal development, adaptation, and migration or relocation. The interactions and feedbacks between the natural and human systems are what make up the coupled system."

The report recommended the resulting data and model results be publicly accessible to easily inform and subsequently transform living along the Gulf Coast and in coastal zones around the world by facilitating enlightened decision making by local to federal governing bodies.

Planning efforts should be undertaken on both a near-decadal scale (10-50 years) and a decadal-century scale (50-200 years).

These periods are inclusive of the time scales of the physical and ecological causes of anticipated changes and the motivating factors for human response.

Collaboration between scientists and stakeholders, such as city planners or emergency managers, is necessary for the results of the studies to be useful.

Surface water cleanup study underway

Staff report

Ecological Laboratories LLC, a Cape Coral bio-tech company, recently began a field pilot study to treat polluted surface waters based on its commercial formulations that are used successfully in aquaculture and lake management.

The products remove nitrogen nutrients by increasing microbial denitrification rates in lakes and ponds. The hypothesis is that converting nitrates and ammonia to nitrogen gas will reduce algal bloom frequency and severity.

The process will concomitantly reduce muck accumulation on lake bottoms.

Ecological Labs has had a permit pending

with the Florida Department of Environmental Protection to field test its "Microbe-Lift" treatment. The recent cyanobacteria bloom in Lake Okeechobee outflow provided conditions suitable for the pilot study to begin.

In late August, the pilot got underway at Cabot Canal in Ft. Myers.

In the pilot study, half the canal's length will be treated with Micro-Lift. The canal's other half, the control, will be untreated. A bubble curtain separates the treated and untreated halves of the canal. The experiment will last 180 days.

PILOT

Continued on Page 16

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DEP Petroleum Restoration Program to move forward with action items from recent survey

By STEVE HILFIKER

The results of the Florida Department of Environmental Protection Petroleum Restoration Program survey administered by the *Florida Specifier* this summer were discussed by survey respondents and representatives of the PRP at the DEP Central District office on Aug. 13, 2018.

The survey questions and procedures were approved by DEP as outlined in the

June edition of the *Specifier*. Industry associations, vendors and contractors were asked to participate in the survey, and respondents were invited to the public meeting in Orlando.

The industry roundtable discussion was effective and similar meetings are desired periodically to continue the dialogue as part of PRP's commitment to the ongoing development of program operations.

Three proposed action items were developed during the discussion that should support the goal of the survey, with emphasis on reducing the time between the assessment and remedial phases of work.

Scopes of work

The first proposed action item was to have the agency term contractor prepare the scopes of work. This would allow DEP site managers more time for their reviews.

The ATC professional geologist or professional engineer certifying the work product could oversee the design of the scope of work. Site-specific knowledge obtained from completing prior phases of work is particularly valuable.

One of the expressed primary concerns of the ATCs when the program shifted in 2014 to more of a contracting/bidding program was the reduction of consulting by ATCs.

These contractors have site knowledge, and the firm that performs and certifies the work could develop the next phase. Property owners rely on ATCs for consulting, and the change would provide ATCs with more involvement in decisions.

The benefit of this in terms of efficiency would be to save the site manager time. The extra time would allow the site manager to more effectively review deliverables and scopes of work.

Narrowing RAC POs

The second proposed action item was to remove scopes of work from remedial action construction purchase orders that are not directly related to the construction phase of work. The phases of work discussed for removal were operations and maintenance, and post active remediation monitoring.

One of the primary topics of the survey was how to best reduce the time frame between an approved assessment and the authorization of a purchase order for remedial action (construction or source removal).

The survey and meeting results indicated that there are some delays related to determining cost reductions necessary to allow the same ATC/engineer who designed the remedial action plan and the same ATC/geologist who certified the assessment to continue the project, rather than suspending all that work and sending the site out for an eQuote.

Typically, all parties are in favor of having the ATC continue the work, as a large amount of time is spent trying to make the scope fit within the limit of the purchase order.

The ATCs and their subcontractors have site-specific knowledge that bidders

cannot obtain from file reviews. Plus, ATCs have already established good working relationships with regulatory officials, site owners and tenants.

The benefits of keeping the certifying contractor on site are numerous. The cost for remedial implementation for many sites is in the \$325,000 range, and when one year of O&M or one year of PARM is required to be included in the same purchase order, a higher portion of those purchase orders approach or exceed the \$325,000 cap.

All parties at the meeting were in favor of removing the one-year O&M or one year of PARM requirement from O&M RAC and source removal purchase orders.

RAC specialist appointment

The third proposed action item is to appoint RAC specialists to focus exclusively on processing remedial projects. Such specialists would be appointed in local programs and in Tallahassee, with the goal to involve them at the beginning of the process.

These remedial reviewers need enough field experience to know what works and what does not work so they and the ATC engineers can promptly establish a workable remedial action plan that can efficiently progress to a RAC PO.

As of July 31, 2018, there were 3,420 sites in assessment phases, 794 in RAP, 104 active source removals, 106 RACs, 244 sites in O&M, 358 in PARM and 1,163 in NAM.

More focus is needed on site remediation to reduce contaminant impacts to our groundwater resource and achieve the intent of the PRP.

PRP officials have been working on the adjustments needed to implement these proposed action items. More information on the status of these process improvements will be available in the near future.

PRP officials expressed appreciation for the input of everyone who replied to the survey and attended the follow-up meeting. They welcome additional suggestions and similar meetings as part of their ongoing commitment to efficiently manage petroleum cleanup funds.

Steve Hilfiker is president of Environmental Risk Management Inc. in Fort Myers. He can be reached at 888-368-6468 or steve@ermi.net.

PILOT From Page 15

Field personnel from Ecological Labs will monitor the spectrum of nutrient nitrogen compounds in the water and sediments.

They will also monitor what they expect will be a significant reduction of muck on the canal's bottom in the treatment half of the canal.

Muck will be metabolized by denitrification microbes in the same way biosolids are degraded during denitrification processes in advanced wastewater treatment plants.

Doug Dent, senior vice president with the firm, described their product as a bacteria inoculum of 13 species. The species have unusual metabolic capabilities including sulfur oxidizers, nitrate reducers and even one soil bacteria, *Bacillus subtilis*, that sometimes occurs as a human enteric bacteria.

The concept behind the study is to add the microbes to modify the sediment microbial community so that nitrate reducers become more abundant, removing nitrogen nutrients from water and sediments by producing nitrogen gas, a form of nitrogen that is not a plant nutrient.

Dent noted that the treatment is expected to prevent blooms from any type of algae, but is not expected to be a treatment for existing cyanobacteria blooms. It is likely to be more effective in lakes and ponds than in the moving waters of streams and rivers.

Showing that microbial modification will be consistently effective in an open natural water system is another of the pilot test's purposes.

Experience suggests it will be.



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Resources should be focused on water supplies, not lawsuits

By BRIAN ARMSTRONG, PG

The “water wars” in the Tampa Bay region spanned three decades, cost taxpayers tens of millions of dollars and taught us valuable lessons about how to address regional water supply issues. Today, the Tampa Bay region has one of the most diverse, drought-resistant water supplies in the country.

The war was not won in the courtroom, despite all the money spent on attorneys. The issues were resolved by cooperating on our shared interests, fairly distributing the costs of new water supplies, and employing effective and fair regulations.

When the Southwest Florida Water Management District identified through our planning efforts that Polk County faced a long-term water supply challenge, we applied the lessons learned from the Tampa Bay region.

Regional problems require regional solutions. We spent years encouraging and assisting in the formation of the Polk Regional Water Cooperative, bringing together the county and its municipalities in a cooperative effort to develop water supplies in a safe and sustainable way.

Working with the PRWC, the district has already budgeted \$40 million toward exploring feasible water supplies, with an expectation that we would potentially end up investing about \$300 million to develop water supplies for Polk residents.

The PRWC has identified the three most likely water supply projects to further investigate and none of them involve withdrawing water from the upper Peace River.

There are good reasons for that. With Polk County being in the upper reaches of the watershed, there’s naturally less water there than is available downstream after thousands of more acres of land contribute drainage.

Also, and just as importantly, there are environmental limitations. The upper Peace River is not meeting its environmentally necessary minimum flows. When those flows are not being met, no water is available from the river.

Considering all these factors, the district was disappointed when the PRWC filed a legal challenge to a permit for a water supply authority withdrawing water from the Peace River more than 50 miles downstream of Polk County. This legal challenge over a permit of very little relevance to Polk’s water supply situation will divert tax

and utility dollars to courtroom maneuverings rather than developing actual sustainable sources of water for Polk residents.

The legal challenge has led to excited news coverage about the coming “water wars.”

Let’s not repeat the mistakes of the past. Let’s not waste millions of dollars of payments to attorneys without generating any new water supplies. In addition to the financial costs, water wars also tend to strain the relationships among the participants. It’s a shame that at a time when our focus should be on regional partnerships for positive outcomes, our attention is diverted to legal briefs and depositions.

Despite these distractions, the district’s priority remains to ensure a sustainable water supply, one that will meet the needs of Polk County residents, encourage economic growth and protect the water resources. Our potential investment of more than a quarter of a billion dollars provides evidence of our commitment to the people of Polk County.

Brian Armstrong, PG, is the executive director of the Southwest Florida Water Management District in Brooksville.

As water officials continue to approve consumptive use permits, aquifers continue to dry up

By ROBERT KNIGHT, PhD

Nature’s water cycle is amazing and free. Solar energy lifts fresh water from the ocean as vapor and transports it over the land with wind currents, depositing precipitation on Florida at an average rate of about 150 billion gallons each day.

About 15 billion gallons of this rainfall recharges the state’s natural underground water storage and conveyance system every day. The remaining 90 percent evaporates or runs off in rivers to the ocean. This is like a natural jacuzzi, bathing Florida’s environment in life-giving fresh-water at no cost.

Fast forward to 2018. Humans have corralled and redirected Florida’s natural water cycle to fulfill their own desires. Florida’s surface water in rivers and lakes is widely impaired due to poorly regulated pollutant discharges and excessive withdrawals.

Increasingly, Floridians have turned to underground waters for supply, first for drinking water and then for nearly every other use, including landscape and crop irrigation that was traditionally supported by rain.

The foreseeable consequence of this shift is the increasing depletion of Florida’s most precious and least plentiful fresh water supply—the groundwater in Florida’s aquifers. In North and Central Florida, the resulting destruction of our natural springs and rivers that rely on



groundwater inputs for dry-season baseflow is visible to all who care to look. Downstate, in the absence of springs, aquifer depletion is harder to see.

Rather than facing this cascading calamity head on by establishing a cap on groundwater pumping to reserve adequate water to protect natural environments, Florida’s leaders continue to kick the can down the road under the

cover of poor science and public apathy.

Some of us consume less than 30 gallons a day of groundwater for drinking, bathing and cleaning, and are content to rely on rain to water our grass. But the average Floridian consumes closer to 100 gallons a day of groundwater. Just by cutting out unnecessary water uses, we could reduce the public’s three billion gallon-per-day groundwater habit to less than one billion gallons a day.

Fortunately, a few areas of the state are concerned enough about depleted aquifers to have already cut historic water uses in half. Unfortunately, the benefits realized by this growing Florida water ethic are undone by a much smaller group of water users—namely for-profit business owners who shamelessly drink for free at the public water trough.

Water in Florida is a public trust resource, owned equally by all citizens. But, with no charge for using groundwater, the cunning few who control the water-permitting system easily gain permits to withdraw gigantic quantities of groundwater at no charge.

While water bottlers are a convenient target for public wrath about this type of corporate welfare, they are a literal drop-in-the-bucket compared to phosphate mines, paper mills, industrial farms and others.

More than 30,000 consumptive use permits allocate nearly half of all groundwater recharge in Florida’s Springs Region. Averaging more than 150,000 gallons per day each, these permits legalize groundwater extractions that are collectively killing our springs, arguably the most endangered natural landscape in Florida.

Despite compelling evidence that Florida’s springs are drying up, the state’s leaders continue to promote their costly charade justifying new water consumption permits based on obfuscation and flawed groundwater flow models.

While restoring Florida’s springs is as easy and free as reducing permitted groundwater allocations, the water management districts would rather bilk taxpayers for the cost of their own water.

For example, leaders at the St. Johns River Water Management District seriously considered putting a pipe in the Ocklawaha River downstream from Silver Springs and pumping the water to a treatment and recharge system next to the spring at an estimated capital cost of more than \$100 million and annual operating costs of nearly one million dollars. District employees privately dubbed this ridiculous idea the “Jacuzzi Project.”

Instead of cutting water use permits back in North Florida, the same water management district is implementing a \$40 million scheme to pump water from Black Creek to restore water levels in the Keystone area lakes.

Once again, the cost for this Ponzi scheme will be borne by taxpayers rather than by the businesses who continue to profit by depleting the aquifer.

A series of similar projects are in the planning stages at the Suwannee River Water Management District. Together these two water districts have projected a \$300 million price tag to provide “alternative” water supplies to meet future demands.

The plethora of pump-treat-recharge projects being promoted by Florida’s water managers is an embarrassment. How can these “public servants” continue to expend the public’s money to implement these unnecessary water supply projects?

The simple answer is that they are desperate enough to try anything to keep their jobs. If we don’t demand better of our leaders, you can bet we won’t get it.

Robert Knight, PhD, is director of the Howard T. Odum Florida Springs Institute in High Springs.

We must make the change to smarter recycling

By CHARLIE LATHAM and DARRELL SMITH, PhD

The U.S. has exported a third of its recyclables to China for many years without any issues. It worked well.

Americans like to recycle and China wanted the materials to feed their manufacturing base.

However, beginning in 2013, China began to make a series of policy shifts to reduce the amount and types of recyclable materials into their country.

In July, 2017, China announced a ban on the import of 24 materials including mixed paper and mixed plastics. This ban went into effect on Jan. 1, 2018, and was followed by the implementation of a policy limiting contamination to 0.5 percent.

With these new policies, China is no longer available as a recycling market for mixed paper or mixed plastics. Unfortunately, there is not sufficient demand from other alternative markets to replace the capacity lost by China’s import restrictions.

China’s new policies have significant impacts on global recycling, effectively creating more supply than the global marketplace can handle. As a result, many recyclers in the U.S. and in other countries are unable to find markets for paper, in particular.

And because of this supply and demand imbalance, commodity prices have plummeted, while processing costs have increased as recyclers work to produce the high quality product that markets demand.

The U.S. waste and recycling industry is committed to improving recycling quality. Many of our service and supplier member companies have already made major investments to develop and deploy equipment that will remove as much contamination from the recycling stream as possible.

They have invested in new screening and sorting technology, including robotics and machine vision, made improvements to existing equipment and hired more workers to remove contaminants from the process by hand. They do all this as prices for recyclables fall.

The waste and recycling industry has not stopped there. Many organizations have embarked on education campaigns to remind customers what items can and cannot

be recycled.

About three in four Americans recycle. We all want to be “green” and protect the planet but a lot of us do not recycle correctly. Instead, we toss things in the recycling bin even when we don’t know if it is recyclable. We hope that it will all just get sorted out at the plant.

That’s called “wishcycling” and is leading to more and more contamination in the recycling stream.

It is not uncommon to find pizza boxes stained with grease, old garden hoses, plastic bags and more plastic bags. These items cannot be recycled in the curbside bin. Food contaminates paper and cardboard making them less likely to be recycled. The hose and the plastic bags wrap around the machines that screen and sort items disrupting the operations and reducing the amount of material that can be recycled.

Contamination has been a problem for a long time. However, with increasingly stringent standards, it becomes more important to try to limit it. We need the public to help us by recycling smarter. We need them to be thoughtful, intentional and deliberate with their recycling. We need everyone’s support to make recycling successful again.

This effort requires a partnership between the recycling industry and the public. We need the public to help by changing behaviors and doing things differently. Start by keeping out the food and bags, and check in with local municipalities or service providers to see what can be recycled.

The waste and recycling industry is leading on this issue, continuing to meet with federal officials and responding to the multiple rules promulgated by the Chinese government. Most importantly, we are supporting our members’ efforts to educate the public on how to recycle smarter so we can all get this right. If we want to continue to recycle then we must do it well.

We all have a stake now in America’s recycling future.

Charlie Latham is with Waste Management and the Florida Chapter Chair of the National Waste and Recycling Association. Darrell Smith, PhD, is the president and CEO of the National Waste and Recycling Association.

Scott's "green governor" claim doesn't match his record on environment

In spite of his recent claims, Gov. Rick Scott has an abysmal record on environmental stewardship. Imagine our surprise when, in late July, Scott's campaign aired an alternative fact campaign ad blaming Florida Sen. Bill Nelson for harmful algal blooms in Lake Okeechobee's drainage basin.

The ad incorrectly stated that Nelson failed to deliver sufficient federal assistance to improve water quality and prevent the series of algae blooms that are a hallmark of Scott's water quality accomplishments.

So, since Senate candidate Scott brought up the topic, we thought we would briefly review his record as the state's "green governor."

One of Scott's most egregious failures of environmental stewardship was when he walked away from the purchase of 150,000 acres of U.S. Sugar Corp.'s Everglades Agricultural Area land that the company offered to sell in 2008.

The tract would have provided a path for water flow from Lake Okeechobee through Everglades National Park and into Florida Bay. It would have restored a significant portion of the Everglades' historical water flows from Central Florida to Florida Bay.

The estimated \$800,000 million cost represented a once-in-a-lifetime opportunity. The EAA reservoir, a partial fix approved by the Legislature two sessions ago, will take years to complete, will not be sufficient for all EAA runoff water and will cost \$2 billion or more.

Since Scott took office, the Caloosahatchee and St. Lucie estuaries have had three extensive and prolonged harmful algal blooms. Each one has been progressively more extensive and damaging than its predecessor.

This unfortunate situation will not surprise anyone familiar with the Scott administration's efforts to dismantle effective water quality programs and avoid rules that reduce the nutrient runoff that causes eutrophication in our surface waters.

Recent eutrophication crises are a result of a scenario that began in 2011, when Scott's Florida Department of Environmental Protection petitioned the U.S. Environmental Protection Agency to allow Florida to abort numeric nutrient criteria and continue relying on narrative water quality criteria.

The EPA refused the petition and the Scott administration lost a subsequent lawsuit challenge before grudgingly ending its overt opposition to the EPA mandate.

Legally bound to establish and enforce numeric nutrient concentrations, Scott's DEP developed an interesting avoidance strategy, according to David Conway, managing editor of the *Florida Sportsman* magazine.

Based on extensive insight from Gary Goforth, PhD, a well known and respected water quality scientist with years of water quality experience with the South Florida Water Management District, Conway described in detail how DEP used a mathematical model to estimate reported compliance values for total phosphorus loading to Lake O. The model outputs and the Scott administration reports hypothetical, not actual, values.

Thus, DEP used "artificial intelligence" (mostly artificial) to conjure up imaginary declining nutrient loading from watersheds into Lake O.

The Southwest Florida Water Management District collects monitoring data that DEP could use to accurately portray the state's progress in reducing nutrient levels in runoff. Those data characterize a Lake O phosphorus loading picture that is more consistent with the observed harmful algae blooms.

Phosphorus loading into Lake O remains over 381 metric tons per year, more than 3.5 times the target loading of 105 metric tons per year.

Two sub-basins contributing runoff, one with 20,000 acres of sugarcane fields and no runoff monitoring, are among the wild cards in the recent phosphorus estimates and measurements.

Why hasn't either the state or water management district done the necessary monitoring and enforcement to ensure compliance with runoff water quality? Wouldn't

that be less burdensome to the public?

By 2014, Conway wrote, the SFWMD hired consultants to study Lake O's Basin Management Action Plan. The goal was to more effectively reduce phosphorus in runoff to Lake O.

The report included a trove of technical data and recommendations to implement stricter phosphorus loading and runoff management on farms.

In 2017, according to an article in the *TC Palm*, U.S. Sugar lobbyist Irene Quincy intervened to modify and weaken the report's recommendations, thus rendering them less enforceable.

Under Rick Scott, the state continues using ineffective BMAPs that have not sufficiently reduced phosphorus levels in current runoff.

Harmful algae blooms are not limited to a Lake Okeechobee phenomenon. Gov. Scott's statewide BMAP implementation strategy to set numeric nutrient standards—and avoid enforcement when they fail—is responsible for harmful algae blooms across the state.

PRP reform

Scott's flawed attempt to "reform" Florida's Underground Storage Tank Program, now the Petroleum Restoration Program, is another example of his incompetence both as an administrator and a steward of the environment.

The *Florida Specifier* has covered the PRP reform for the past six years in depth. So here we will point out just a few of the low points of that effort.

In 2008, Florida's petroleum cleanup program was a high-tech national leader, with a budget on the ground of with over \$100 million annually that funded the work of more than 100 contractors and their subs. The industry was active. Sites were being addressed quickly.

But behind the scenes, rumors of fraud within the program by its private sector contractors circulated. Instead of investigating the alleged malpractice and punishing any wrong-doers first, Scott-appointed DEP officials turned the program upside down for a few years by imposing extensive new and initially unwieldy contracting rules.

After four years of chaos, an inspector general report found no systematic corruption by contractors. Meanwhile, Scott had diverted money from the Inland Protection Trust Fund for other, non-program purposes.

By 2017, the program's list of sites still eligible for cleanup funding was, for the first time, shorter than the list of closed sites. Credit for that goes to PRP leadership and staff who worked diligently through the chaos of reform.

The success came primarily through the adoption of risk-based cleanup standards, the Low-Scored Site Initiative, EPA's mandated the use of double wall tanks and pipes, and petroleum company employee training.

But how much more quickly would the cleanup of the remaining contaminated sites been completed if the PRP had not been bogged down by the interference and burden of Scott's ill-informed "improvement" strategies.

Budget cuts, staff cuts

When Rick Scott won Florida's governorship in 2009 on a promise of smaller government and lower taxes, the recession offered him the perfect cloak to divert public attention while orchestrating a perverse and mean-spirited campaign to gut several state agencies, particularly DEP and the water management districts.

Until Scott took office, DEP's annual budget had been about \$1.9 billion. Since then, DEP's annual budgets have been substantially less, averaging \$1.5 billion, even following the economic recovery.

Florida's water management districts experienced similar budget cuts. In Scott's first budget as governor, WMDs experienced a \$700 million cut across all districts.

Most of Florida's water management district funding comes from *ad valorem* property taxes, with additional targeted funding appropriated by the Legislature. That WMD budgets statewide remain \$400 million less than when Scott took office, however, is his responsibility and has contributed in no small way to the present poor water quality conditions across the state.

The inadequate budgets cost the jobs of many environmental professionals, even under a governor who claimed to be the "jobs governor." Under Scott, employee intimidation effectively compelled hundreds of state employees to flee their positions. Many were fired for minor infractions and others alleged firings for no reason.

DEP's pre-Scott employment roster totaled about 3,600 employees. Now, in 2018, in a thriving economy as Scott campaigns as a "green" Senate candidate and "jobs governor," DEP has 2,930 employees. The WMDs also lost employees. Staff cuts occurred at all levels, sacrificing institutional memory, decades of expertise at the top, and hundreds of professionals with scientific and technical talent at mid-levels.

At the South Florida Water Management District, where Florida's most visible water quality problems are presently on international display, staffing is still hundreds

below the level of when Scott first took office, according to Conway's analysis.

Lack of funding and loss of knowledgeable employees has had a predictable effect. Across the state and its WMDs, environmental monitoring to ensure regulatory compliance has declined significantly. In South Florida, the number of surface water sampling sites has declined from 350 to 115, according to the *Miami Herald*. By failing to measure for eutrophication, absence of evidence has not translated well into evidence of absence.

What enforcement?

So, how does the state enforce environmental regulations in the face of little data to characterize infractions, diminished staff and funds diversion? Under Scott, we don't.

Florida Public Employees for Environmental Responsibility reported that under the Scott administration, annual enforcement dropped from 1,600 cases in 2010 to approximately 220 in 2017.

Fines and penalties that could have been used to improve water quality—or just to more effectively convince polluters to stop polluting—have fallen precipitously due to less enforcement activity and "forgiveness" by DEP officials.

If there's no cost to be paid for polluting the environment, corporations and individuals can produce huge financial gains—gains funded at the expense of public health and the environment.

Diverting Amendment 1 funds

In 2014, Florida voters passed Amendment 1, the Florida Water and Land Conservation Initiative. This voter-initiated constitutional amendment was passed with a 75 percent majority of votes.

Scott's response to this clear message from voters was to divert the money, allocating Amendment 1 funds from conservation to underwrite DEP's operating budget and other non-conservation uses.

Science denial

Scott is a science denier, especially when it comes to climate change. Until the practice became public, he and his subordinates forbade state employees from mentioning "sea level rise" or "climate change" in public meetings and reports.

Climate change and sea level rise are an existential environmental problem for human society and will remain so on a historical time scale. It is not a partisan or religious issue any more than cancer or education of the young is. It is accepted by the broadest scientific consensus.

But for some reason, Scott's anti-science view has been, at least for a while, state policy. When questioned about this, he simply states that he's not a scientist—but has not explained why he can't accept the consensus conclusion of scientists.

He has become, along with the likes of disgraced former EPA Administrator Scott Pruitt, a role model of ideologically-impaired bad judgment. That's not a leadership quality that qualifies him for the U.S. Senate.

Lack of ethics, lack of integrity

Science and environmental stewardship aside, Scott's most significant flaw is his lack of integrity.

We do not bring this up just because he bilked \$1.4 billion from Medicare while making his fortune as head of the Hospital Corporation of America, or because his political candidate financial disclosure statements broadly fail to meet Office of Ethics disclosure standards.

That's old news for this candidate.

But can Rick Scott give Florida voters an honest answer regarding where he stands on offshore oil drilling along the Florida coast and its Offshore Continental Shelf areas?

The U.S. Department of Interior offered a Gulf of Mexico area-wide lease sale including Florida's eastern Gulf tracts that are off the table by law. Floridians, by a huge majority, do not want OCS oil drilling off the Florida coast.

When the leases were announced, Scott arranged a Tallahassee fly-in, made-for-media event with Interior Sec. Ryan Zinke. Scott announced after this meeting that the eastern Gulf was off limits for drilling. However, in the lease sale that occurred two months later, the tracts were, in fact, offered.

Voters should not be misled by Scott flaunting his pristine born-again "no oil drilling in Florida" virginity. He clearly lost it in a few private moments in Tallahassee with Ryan.

In the future, deep-water tracts near the Florida Keys and the Dry Tortugas will be offered to oil companies. Floridians should expect that if oil companies lease those tracts, they will be drilled.

Of all campaign issues, none gives a clearer choice to voters about Rick Scott's integrity than offshore drilling

SCOTT
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Florida Specifier

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The *Florida Specifier* welcomes columns, articles and letters to the editor on any subject or issue pertinent to the environmental, regulatory and technical areas the newspaper covers. We reserve the right to edit all submissions for newspaper style and publish submissions on a space-available basis only. The opinions expressed on this page are those of the authors.

Calendar

October

OCT. 2 – Course: DEP SOPs For Water Sampling & Meter Testing, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 3 – Course: Intro to DEP SOPs For Groundwater, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 3-5 – Course: Backflow Prevention Assembly Repair and Maintenance Training and Certification, Orlando, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 4-5 – Course: Asbestos: Management Planner, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 5-6 – Course: Backflow Prevention Recertification, Venice, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 12-20 – Course: Backflow Prevention Assembly Tester Training and Certification, Fort Myers, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 15-19 – Course: Landfill Design and Construction, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16 – Course: Refresher Training Course for Experienced Solid Waste Spotter - 4 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16-18 – Course: Initial Training Course for Landfill Operators and C&D Sites - 24 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16 – Course: Initial Training Course for Spotters at Landfills, C&D Sites and Transfer Stations - 8 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16-18 – Course: Initial Training Course for Operators of Landfills and Waste Processing Facilities, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16-17 – Course: Refresher Training Course for Experienced Solid Waste Operators - 16 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16-18 – Course: Process Control of Advanced Waste Treatment Plants, Kissimmee, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16-17 – Course: Initial Training Course for Transfer Station Operators and Materials Recovery Facilities - 16 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16 – Course: Refresher Training Course for Experienced Solid Waste Operators - 8 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 16 – Course: Refresher Training Course for Experienced Solid Waste Operators - 4 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 17 – Course: Refresher Training Course for Experienced Solid Waste Operators - 8 Hours, Jacksonville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 18 – Seminar: Innovative and New Wastewater Treatment Technologies: Stories of Implementation, Startup and Lessons Learned, Orlando. Presented by the Florida Water Environment Association. Call (407) 574-3318 or visit www.fwea.org.

OCT. 18-19 – Course: Backflow Prevention Recertification, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 22-26 – Course: Asbestos: Contractor/Supervisor, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 23-25 – Course: Backflow Prevention Assembly Repair and Maintenance Training and Certification, Beltsville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 23-26 – Conference: Florida Redevelopment Association 2018 Conference, Fort Myers, FL. Call 1-800-342-8112 or visit redevelopment.net.

OCT. 24-26 – Meeting: Florida Society of Environmental Analysts 2018 Fall Meeting and Technical Session, Jupiter, FL. Call (941) 748-5700 or visit www.fsea.net.

OCT. 24-26 – Summit: American Water Summit, Philadelphia, PA. A National Association of Clean Water Agencies Partner Event. Call (202) 833-2672 or visit www.nacwa.org.

OCT. 25-26 – Course: Backflow Prevention Recertification, Pensacola, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 26-27 – Course: Backflow Prevention Assembly Repair and Maintenance Training and Certification, Venice, FL (FRI-SAT). Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 27 - NOV. 4 – Course: Backflow Prevention Assembly Tester Training and Certification, Tampa, FL (Two Consecutive SAT & SUN 10/27-28 & 11/3-4). Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

OCT. 28-31 – Conference: Fall Conference of the American Council of Engineering Companies, Las Vegas, NV. Call (202) 347-7474 or visit www.acec.org.

OCT. 31- NOV. 1 – Course: Effective Utility Leadership Practices, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

November

NOV. 1-2 – Course: Backflow Prevention Recertification, Destin, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 3-4 – Course: Backflow Prevention Recertification, Bradenton, FL (SAT-SUN) Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 5-6 – Course: Backflow Prevention Recertification, Altamonte Springs, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 5-9 – Course: Backflow Prevention Assembly Tester Training and Certification, Pensacola, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 5-9 – Course: Backflow Prevention Assembly Tester Training and Certification, Orlando, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 7 – Course: Asbestos Refresher: Inspector, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570.

NOV. 7 – Course: Asbestos Refresher: Management Planner, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 8 – Course: Asbestos Refresher: Contractor/Supervisor, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 9-17 – Course: Backflow Prevention Assembly Tester Training and Certification, Venice, FL (Two Consecutive FRI & SAT 11/9-10 & 11/16-17). Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 10-11 – Course: Backflow Prevention Recertification, Tampa, FL (Sat-Sun). Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 13-16 – Course: Wastewater Class C Certification Review, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14-15 – Course: Initial Training Course for Transfer Station Operators and Materials Recovery Facilities - 16 Hours, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570 or visit www.treeo.ufl.edu.

NOV. 14 – Course: Refresher Training Course for Experienced Solid Waste Spotters - 4 Hours, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570.

NOV. 14 – Course: Refresher Training Course for Experienced Solid Waste Operators - 4 Hours, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570.

NOV. 14-15 – Course: Refresher Training Course for Experienced Solid Waste Operators -16 Hours, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570.

NOV. 14-16 – Course: Initial Training Course for Operators of Landfills and Waste Processing Facilities, Gainesville, FL. Presented by the University of Florida TREEO Center. Call (352) 392-9570.

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Nov. 5-9, 2018 | Pensacola, FL

Nov. 9-17, 2018 | Venice, FL**

*Two consecutive Sat. & Sun. **Two consecutive Fri. & Sat.

Backflow Prevention Assembly Repair and Maintenance Training & Certification

Dec. 5-7, 2018 | Orlando, FL

Backflow Prevention Recertification

Nov. 1-2, 2018 | Destin, FL

Nov. 3-4, 2018 | Bradenton, FL

Nov. 5-6, 2018 | Altamonte Springs, FL

Nov. 10-11, 2018 | Tampa, FL

Nov. 15-16, 2018 | Gainesville, FL

Nov. 29-30, 2018 | Pensacola, FL

Nov. 30-Dec. 1, 2018 | Ft. Myers, FL

Dec. 1-2, 2019 | Bradenton, FL

Dec. 3-4, 2018 | Altamonte Springs, FL

Dec. 3-4, 2018 | Orlando, FL

Dec. 6-7, 2018 | West Palm Beach, FL

Dec. 7-8, 2018 | Venice, FL

Dec. 10-11, 2018 | Destin, FL

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Initial & Refresher Courses

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Leachate & Landfill Gas Management System Design

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Exam Review Courses

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Water Class B Certification Review

Dec. 11-14, 2018 | Gainesville, FL

Water Class C Certification Review

Apr. 2-5, 2019 | Gainesville, FL

Wastewater Class A Certification Review

Feb. 18-22, 2019 | Gainesville, FL

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Oct. 22-26, 2018 | Gainesville, FL | CEUs: 3.5

Asbestos Refresher: Inspector

Nov. 7, 2018 | Gainesville, FL | CEUs: 0.4

Asbestos Refresher: Management Planner

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Asbestos Refresher: Contractor/Supervisor

Nov. 8, 2018 | Gainesville, FL | CEUs: 0.8

Respiratory Protection

Dec. 4-6 2018 | Gainesville, FL | CEUs: 2.4

Water/Wastewater Courses

Microbiology of Activated Sludge

Jan. 22-24, 2019 | Gainesville, FL | CEUs: 2.2


Effective Utility Leadership Practices

Feb. 5-6, 2019 | Destin, FL | CEUs: 1.35

phase liquid trapped in the shallow bedrock. Dissolved TCE was detected at concentrations between 55 and 550 milligrams per liter along with the dechlorination byproduct cis-1,2-dichloroethene at up to 15 mg/L; however, vinyl chloride was not detected above detection limits. A proof-of-concept biostimulation study was initiated utilizing ERDenhanced™, a carbohydrate-based biostimulant formulated with a proprietary blend of inactive yeast and inorganic nutrients to stimulate biotic reductive dechlorination and increase the residence time of its beneficial effect by leveraging endogenous decay. Bioaugmentation was not performed given the baseline detection of ethene. Results from the three-year study demonstrated: 1) an 80-99.9 percent reduction in TCE concentrations relative to baseline concentrations up to approximately 30 percent of TCE's aqueous solubility limit; 2) in two of three performance wells, up to 99 percent reduction in cis-1,2-DCE concentrations, with no change at a third well despite a 99.9 percent reduction in TCE; 3) consistent indicator parameters of a robust biotic dechlorination pathway; 4) increased ethene concentrations following biostimulation demonstrating reaction completion; and 5) the presence

of Dehalococcoides mccartyi and the dehalogenase genes tceA, bvcA, and vcrA at biostimulated performance wells indicating dechlorinators are present expressing these beneficial genes facilitating the TCE-to-ethene completion pathway. Following the period of active biostimulation, ongoing monitoring of passive biostimulation by endogenous decay demonstrated a positive effect residence time of at least three years. Importantly, no observed TCE rebound was noted in the well network during the period monitoring endogenous decay, including the well with the baseline concentration of 550 mg/L. In fact, TCE concentrations at that well during this period generally ranged from approximately 0.07 to 2.6 mg/L, with a geometric mean of 0.8 mg/L, which represents a 99.9 percent reduction from baseline concentrations. In addition to the extended effect residence time, while many ERD additives achieve a one order-of magnitude (90 percent) reduction in DNAPL constituents, reductions on the order of two orders of magnitude, as achieved using ERDenhanced™ during this proof-of-concept, are far less common. The authors hypothesize that the up to 99 percent reduction in TCE concentrations observed are the result of quorum sensing and signaling behavior induced by the additive. A pilot study is now underway at the site to collect predesign data for a full scale enhanced reductive dechlorination remedy.

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Concurrent Session 6B: Costing through CSM Enhancements

8:30 Challenges and Solutions for Estimating Intergenerational Cost Estimates

Paul Favara, Client Solution Leader, Jacobs, Gainesville

Site complexities, such as back-diffusion from a low permeability matrix and inability to identify residual sources at complex sites, typically drive cleanup time estimates. Cleanup times for complex sites typically range from several decades to centuries. Industry alternative evaluation processes, used to screen and select alternatives, were not designed with intergenerational remedies in mind. The objective of this paper is to explore the cost-estimating challenges for long-term cleanup projects and provide recommendations for framing these cost estimates. A survey of decision documents for complex sites was completed to assess how costs were framed for long-term cleanup projects. Industry guidance was surveyed to evaluate recommendations for preparing long-term cost estimates. The trend in discount rates, going back nearly 40 years, was evaluated to highlight variability over time. The parameters for estimating present-value cost were evaluated for their impacts on cost estimates. Long-term uncertainties, such as the societal value of cleanup over the life of the project and advances in technology are assessed for their potential impact in how the cost-estimate is qualified. Additionally, a project scenario that explored numerous scenarios based on different cleanup time estimates and discount factors was explored to highlight how different cost-estimating approaches could lead to different conclusions based on life-cycle cost estimate results. Most long-term cleanup decision documents surveyed used a 30-year cost estimate as a basis, even though most sites would require more time to complete; some cleanup time estimates exceeded 100 years. Several important cost-estimating guidance sources were identified, but they do not fully address the challenges of developing long-term cost estimates for cleanup sites. An approach to help decision makers understand the trade-off between costs today and consideration of future generations was developed. The project scenario shows a "tipping-point" in decision making depending on the assumptions used in the cost estimate. Based on these findings, recommendations on how intergenerational cost estimates should be prepared are provided. Additionally, recommendations on integrating adaptive site management attributes (e.g., future advances in technology, changing real costs of completing long-term cleanups) to address future cost uncertainties will also be presented.

8:55 How do 3D Models Reduce the Costs of Environmental Remediation?

Jim Depa, 3D Visual Group Manager, St. John-Mittelhauser & Assoc. Inc., Chicago, IL

The objective of the project was to create a 3D conceptual site model depicting subsurface trichloroethene contamination at a former auto parts manufacturer, and explain how the model reduced the costs of both the subsurface site investigations and the design of the remediation system. In order to create the 3D model, both soil analytical results and geologic boring log data were statistically modeled and visualized using C-Tech's Earth Volumetric Studio. Then, the model was used to communicate data about the subsurface contamination to the client, remediation contractors and governing agency. The 3D conceptual site model was responsible for reducing the costs of the remediation by more than \$1.1M. Specifically, the 3D model was able to quickly identify data gaps from previous soil investigations, limit the amount of additional investigative work, help to select electrical resistive heating as the most cost-effective remedial technology, optimize the design of the ERH remediation system and reduce the size of the treatment volume by over 30 percent, and effectively communicate the results of the soil investigations, design of the ERH system and confirmatory sampling plan to the governing agency. In addition, the 3D conceptual site model was produced into a several short animations and uploaded to YouTube. The animations provide a way for anyone with an Internet connection to better understand how and why environmental investigations are performed, how geology effects subsurface contaminant migration, and how ERH remediation operates. The animations also continue to be used as a convenient way to market company services.

9:20 Cost of Remedial System Ownership

Simo Koncalovic, Engineer, Remedial Systems Integrated LLC, Tampa

Recently, the private sector absorbed the responsibility of providing remediation systems, which created a dilemma for professional consultants of whether to purchase or rent systems for their projects. Generally, both options may be used comparably. Yet, practical considerations factor into who bears the risk. The risk/cost balances with the system ownership cost. Thus, a careful analysis begs the question of the actual cost to own and operate a remediation system. In other words, what does it really cost to secure the highest return on investment considering all costs associated with it? The "24/7 unattended" models expose the capital investment to much more potential risks, such as vacancy rate, inadvertent downtime, component failure or a project specific customization demand. All these factors greatly affect the rate of return, the single deciding factor when considering investment into such working capital. This presentation focuses on ownership cost evaluation of remedial systems and collateral costs associated with risks. This presentation covers every aspect from component choices and lead times on malfunctioning components to the shelf life of commonly used components. The review not only analyzes these factors, it presents real life costs to run monthly and quarterly operations. The survey highlights life-span expectations applied to the cash flow horizon before additional investment and offers realistic conclusions. The presentation will cover potential hidden pitfalls and obscure aspects of system ownership and operation often omitted from the rate of return calculation.

9:45 Lowering the Cost of LUST Management Through Scale-Appropriate Data on LNAPL and Soil Permeability

John Sohl, Chief Executive Officer, COLUMBIA Technologies, Rockville, MD

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UST and LUST sites with confidence is both the proper assessment of residual hydrocarbons and the impact of soil behavior on petroleum storage or transmissivity. Historically, addressing LNAPL problems at complex sites has been a challenging and expensive proposition. During this presentation, the speaker will present advanced technologies that address these challenges through high resolution mapping LNAPL and soil permeability to improve the confidence of decision makers. The presentation will provide case studies for interactive discussions with session participants on how the use of remediation focused direct sensing tools such as optical interface probe, membrane interface probe and the hydraulic profiling tool combined with high-resolution soil sampling to better inform remedial decisions. The new generations of direct sensing technologies combined with targeted soil, water, and vapor sampling enable the site decision makers to understand the evolving dynamics of LNAPL mobility and migration. Best practices for achieving site closure at LUST release sites include leveraging small-footprint direct sensing tools to define the horizontal and vertical extent of petroleum contamination, determine accurate depth intervals for remedial activities, measure hydraulic permeability and provide lithological data to target corrective action remedies. High resolution site characterization approaches are able to provide a 3-10x return on cleanup and closure—cost-effectively remediating these sites while reducing the mass distribution of mobile contaminants at the properties. This presentation will discuss project examples including LNAPL distribution assumptions and how proper data on LNAPL and permeability can be used to develop an effective conceptual site model with advanced real-time characterization tools.

12:00 *Day Two Luncheon* Sponsored by *The Goldstein Environmental Law Firm*

Concurrent Session 7A: In-Situ Bioremediation 2

1:40 Design Tool Advancement: Determining Injection Quantities for In-Situ Bioremediation and/or In-Situ Chemical Reduction

Brad Elkins, MS, PG, EOS Remediation LLC, Raleigh, NC

Publicly available Microsoft Excel-based aquifer remediation calculators such as the ESTCP Emulsion Tool Kit (2008), Substrate Estimating Tool (2010) or Soluble Substrate Design Tool (2012), run design calculations based on a single aquifer cubic volume and associated cross-sectional area for volume and mass flux in the evaluation for the proper electron donor dosage. However, the limitation is each design can only be determined for one location at one vertical interval. If multiple areas and/or two or more water bearing vertical units need treatment, the designer must run several variations in the design tool generating multiple reports that must be checked and tracked during planning and implementation. Conceivable consequences include deficiencies in the performance, over or under estimating substrates and unexpected additional costs. The solution was to develop a design tool that used the formulas and equations of the existing design tools and create a new model that could examine multiple areas at different depth intervals. The new design tool remains Microsoft Excel-based, thus easy to use. Additionally, this design tool can perform a simple cost analysis across eight different categories of substrates or additives. Pricing information would be needed from the vender(s) of choice, or an existing/past order could be used as a reference. This presentation will cover the formulas and equations from existing design tools. It will explore the commonalities in calculating substrates for enhanced bioremediation and/or abiotic reduction. Various substrate loading rates and differentiators will be disseminated. Finally, the new design tool will be presented along with example case studies for demonstration.

2:05 Evaluating the Dechlorination Longevity of a Mixed Lactate and Vegetable Oil Substrate

Michael Sieczkowski, CHMM, Tech. Sales Director, JRW Bioremediation LLC, Lenexa, KS

The practice of using organic substrates to enhance the biological reductive dechlorination of solvent plumes has been commercially demonstrated for over 25 years on hundreds, if not thousands, of sites. Over that time, a myriad of organics have been proposed and applied to reach a goal of finding a cost-effective material that would promote dechlorination for an extended period of time. To measure effective longevity, some practitioners promote tracking analytical parameters such as maintaining specific amounts of total organic carbon or ORP while others take a more empirical approach. A dry cleaner site in Central Colorado has been the subject of a number of remedial approaches since 2009 including chemical oxidation followed by enhanced reductive dechlorination. While success in the form of dramatically reducing the concentrations of chlorinated ethenes was achieved on almost the entire plume, one small up-gradient area continued to see contaminant flux, presumably from a source area that was never adequately treated. A review of over five years of data suggests that biological dechlorination has been occurring for well past the expected longevity of the organic substrates used to promote biological reductive dechlorination. The data also suggests that dechlorination is occurring at ORP conditions and TOC concentrations not normally associated with maintaining anaerobic conditions conducive to biological reductive dechlorination. This set of seemingly contrary information opens the discussion as to how long can one expect to be able to maintain robust reductive dechlorination and what should the practitioner look for to support the premise.

2:30 1,4-Dioxane Bioremediation: The Expanding Tool Box for this Challenging Groundwater Contaminant

Phil Dennis, MASc, Senior Manager, SiREM, Guelph, Ontario, CN

1,4-dioxane is a probable carcinogen commonly detected in groundwater due to its use as a solvent stabilizer. The high solubility of 1,4-D often leads to large dilute plumes with associated remediation challenges. Fortunately, available options for implementing bioremediation in 1,4-D contaminated groundwater are increasing. Aerobic cometabolic bioventing utilizes the addition of oxygen and alkane gases to groundwater and has been tested in the lab and successfully implemented in the field. For example, at a DoD site in Arizona, sequential methane and oxygen gas infusion was used to enhance cometabolic 1,4-D degradation. Delivery of sufficient oxygen identified as a major challenge for in-situ bioremediation of 1,4-D and in some cases may favor ex-situ approaches, such as bioreactors. Bioremediation of 1,4-D by aerobic energy yielding pathways shows growing promise. A major milestone was the discovery of *Pseudonocardia dioxanivorans* CB11902, a microorganism that uses 1,4-D as an energy source. Molecular tools to quantify CB1190 1,4-D functional genes in groundwater allow assessment of intrinsic bioremediation potential at 1,4-D sites. Where indigenous 1,4-D biodegraders are absent, bioaugmentation is also an option. Bench-scale studies are demonstrating successful bioaugmentation with 1,4-D cultures and help to verify and optimize remediation strategies prior to field testing. Phytoremediation can provide hydraulic control and delivery of oxygen to groundwater and has been deployed at 1,4-D sites in North America and in Europe. Interest in phytoremediation paired with bioaugmentation is growing and the potential for this combined approach for treatment of 1,4-D plumes will be discussed.

Concurrent Session 7B: Combined Remedies to Closure

1:40 Pilot to Closure: Combined Remedies for a High Concentration Chlorinated Solvents Mixture

Brendan Brown, PWS, Environmental Scientist, CDM Smith, Maitland

CDM Smith designed and constructed an enhanced anaerobic bioremediation system at a former industrial manufacturing facility in Orlando. The site was characterized by high a concentration (>100,000 µg/L) mixture of chlorinated solvents (1,1-DCE, vinyl chloride, 1,1,1-TCA, 1,1-DCA, and methylene chloride) in the surficial aquifer with concentrations of 2,000,000 µg/L in one well. Source zone contamination was remediated using EAB with potassium lactate and groundwater circulation to biostimulate indigenous *Dehalococcoides* spp. bacteria. The EAB system consisted of three 100-foot horizontal extraction wells, a vertical injection well network

Continued on Page 23

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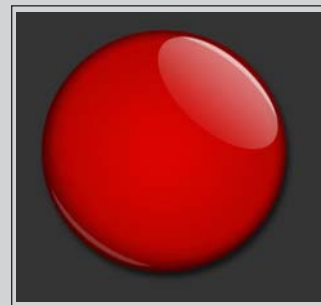
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BIOACCUMULATION

From Page 1

ng/g. The alligator with the lowest serum levels was three times greater than the median for all alligators sampled.

The research team studying alligators also found a positive correlation between snout length, an indication of age and PFOS concentration in the serum. Such a positive correlation is often evidence of contaminant biomagnification.

A lower PFOS concentration in males versus females of egg-laying species, such as birds and reptiles, often occurs when females transfer some of their tissue burdens to the yolks of their eggs. While that may stabilize an adult female's bioaccumulation, it gives young alligators an accumulation head start.

Researchers analyzed for 14 other perfluorinated substances in the alligator serum they collected. By far, perfluorooctyl compounds dominated tissue burdens for this chemical class.

A more recent study, published this

spring by John Bowden and colleagues, reported median PFOS concentrations in striped mullet at the MINWF.

For mullet muscle and gonads, median PFOS burdens were 9.01 and 80.2 ng/g, respectively.

The fourth study of Indian River Lagoon wildlife involved bottlenose dolphin. This study reported total perfluoroalkyl acids in the serum of 37 adult and 26 juvenile dolphins sampled.

Adult Indian River Lagoon dolphins had an average of 665 (range 112 - 4470) ng/g PFAA.

In contrast to alligators, juvenile dolphins had greater serum PFAA concentrations, averaging 943 (range 113 - 3530) ng/g. Dolphins are top trophic level consumers in the lagoon, and their high serum burdens are more evidence of PFAS biomagnification.

The bottlenose dolphin study included samples from the Charleston, SC, area. Indian River Lagoon dolphins, although they have the highest PFAS concentration

of any wildlife species from the lagoon examined, have approximately 2.3 times lower concentrations than found in dolphins in the Charleston area.

Among wildlife discussed here, both turtles and dolphins from the Charleston area have higher total PFAS serum burdens. This may result from a PFAS synthesis plant near Wilmington, NC, that has a history of PFAS releases.

Increased attention to PFAS in the environment focuses on groundwater contamination because PFAS concentrations in groundwater at local air force bases are above the current EPA voluntary health advisory concentration of 70 parts per trillion at many facilities.

The reported tissue concentrations in wildlife in Indian River Lagoon's wildlife are two to three orders of magnitude greater than those groundwater concentrations. It is possible that liver, nervous system and perhaps kidney concentrations

could be another order of magnitude higher if PFAS behave like similar persistent hydrophobic contaminants.

Bioaccumulation and food chain biomagnification are also indicated in this data.

So far, the analysis of human samples does not indicate that humans generally bioaccumulate PFAS to the extent that wildlife species have. It does indicate that humans who consume seafood from contaminated habitats such as the Indian River Lagoon are at significant risk of higher PFAS accumulation than the population average.

Studies of PFAS bioaccumulation by wildlife are still in the early stages.

The ones described here indicate that the dream of "better living through chemistry" has morphed into a nightmare involving another incidence of persistent environmental contamination that reaches up through the food chain to humans.

grant from the agency. The Broward volunteers will restore 21,512 square feet of coastal habitat to benefit water quality and improve habitat for sea turtles, migratory birds and other species.

The grants were awarded through the Five Star and Urban Waters Restoration Program.

Funds for this program come from the EPA, the U.S. Forest Service, the U.S. Fish and Wildlife Service, FedEx, Shell Oil Co., Southern Co. and BNSF Railway.

In 2018, \$2.2 million in total was available for funding nationwide.

Air quality funding for Pinellas, Hillsborough. The EPA awarded \$98,300 to Pinellas County's Board of County Commissioners and \$135,300 to the Hillsborough County Environmental Protection Commission.

The two agencies will use the money to conduct air quality monitoring of air toxics for the National Air Toxics Trends Station program.

The monitoring characterizes organic compounds, semi-volatiles, carbonyls and metals in the air in the two counties.

The monitoring represents a continuation of ongoing efforts to characterize air toxics and trends in ambient air quality in urban and rural areas nationwide.

The data will help measure progress towards meeting goals for reducing air toxic emissions and the health risks associated with them.

FEDFILE

From Page 2

ment in their 2-1 decision.

Lawyers for the Dow Chemical Co., chlorpyrifos' manufacturer, could appeal the ruling but, until then, the court decision apparently provides the regulatory certainty—but not the health risks—that Pruitt promised.

Plaintiffs in the case included the California Rural Legal Assistance Foundation, EarthJustice and other environmental and farm worker advocacy groups.

Florida offshore oil drilling. The Natural Resources Defense Council announced the availability of an online tool to help voters determine federal legislators' and governors' positions on offshore drilling.

In a campaign year when many candidates auction their official positions to the highest bidder, voters may wish to check a candidate's latest position on offshore drilling.

The tool is available at www.nrdc.org/stop-trumps-offshore-drilling-assault.

Choctawhatchee Bay habitat restoration grant. The EPA awarded the Northwest Florida State College Foundation and the college's Choctawhatchee Basin Alliance a \$40,000 grant to restore two acres of oyster habitat in the bay.

In addition, the Volunteer Action Center of Broward County was awarded a

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Lakewood Ranch authority embarks on stormwater quality, erosion control improvements

By PRAKASH GANDHI

Since late June, more than 7,500 plants have been added along the banks of five stormwater ponds in Phase 1 Lakewood Ranch, a master planned community in southeastern Manatee and northeastern Sarasota counties.

The plants will take up nutrients from fertilizers in stormwater runoff and help prevent soil erosion, said Basil Iannone III, PhD, assistant professor at the University of Florida.

He said officials will measure water quality, algae quantities and inorganic and organic levels of phosphorus and nitrogen in the ponds.

The project is a partnership between UF, the Lakewood Ranch Inter-District Authority, Altec Lakes & Natural Areas Inc. and Down to Earth Inc.

Iannone said plants for the project were donated by the LRIDA and the Florida Nursery Growers and Landscaping Association who awarded the project a grant to assess water quality.

He said the authority has experienced erosion as well as problems with water quality in some of its stormwater ponds.

Authority officials want to explore the potential benefits of using plants around the bank edges and in areas of shallow water to help stabilize the banks and help with water quality through plants uptaking nutrients.

They are also trying to prevent grass clippings from entering the ponds and add-

ing to the nutrient load.

"Usually, non-mowed buffer zones can achieve these goals," he said. "But residents of Lakewood Ranch don't like that because the resulting vegetation looks unruly and blocks their view of the water."

"So our project wanted to determine if planting aesthetically appealing ornamental plants along the banks and within shallow areas of the stormwater ponds would be beneficial for bank stabilization and help to improve water quality."

There are an estimated 115,000 retention ponds in Florida. Iannone said healthy ponds should have clearer water and lower nutrient levels. This will mean more wildlife and fewer algae blooms.

Currently, all plantings are done. Water sampling will begin in a few weeks and continue through next summer.

"We hope to quantify the potential benefits of ornamental planting on stormwater ponds and to use this information to guide stormwater pond management in other communities that want to balance the need of water quality with aesthetics," Iannone said.

Officials plan to host workshops to determine strategies for managing stormwater pond plantings.

He said that planted ponds were put in areas open to the public to show community members that plantings can enhance the beauty of ponds.

Iannone said he hopes residents become more accepting of this potentially cost-effective management strategy.

and a groundwater treatment plant. Groundwater was circulated between horizontal wells and injection well networks. As concentrations began to approach groundwater cleanup target levels, CDM Smith used both zero-valent iron and in-situ chemical oxidation via sodium persulfate injections to polish zones of contamination outside the EAB treatment area. Within the first 33 months of operation, total VOC mass was reduced from an estimated 2,800 pounds to less than 30 pounds with molar concentrations of all VOCs decreasing steadily. Concentrations in the source area decreased from >100,000 µg/L to <10 µg/L at multiple locations. ISCO injections further reduced concentrations outside the EAB treatment area. Post-active remediation monitoring has shown concentrations at or below applicable GCTLs. Currently, a no further action proposal has been approved in principal by the Florida Department of Environmental Protection to close the site with institutional controls with final closure pending recording of the restrictive covenant.

2:00 System Optimization and Utilization of Alternate Cleanup Criteria to Expedite Cleanup Objectives

Joseph Bartlett, PE, Environmental Engineer, Geosyntec Consultants, Titusville

Historic releases of petroleum product due to overfilling of above ground storage tanks resulted in both soil and groundwater impacts at an active marina facility located in Merritt Island. Soil impacts were immediately delineated and excavated from the site by others. Geosyntec completed groundwater site assessment activities, and preparation and implementation of an air sparge/soil vapor extraction remedial action plan. The remediation system was comprised of an AS/SVE system that provided air flow to 16 air sparge wells and vapor recovery from four vapor extraction wells. Monthly operation and maintenance events provided an opportunity to implement optimization strategies that included modifying operational configurations (i.e. changed air flow rates or operational wells) in order to avoid static conditions and to distribute air, as needed, based upon site-specific monitoring data. The system was further enhanced based on evaluation of performance monitoring sampling results, which included the installation of an additional air sparge well at a location where recalcitrant impacts remained. The AS/SVE system operated for approximately 1.5 years and was successful in reducing groundwater impacts to below target levels. In order to further expedite cleanup timeframes, 2017 changes to Chapter 62-780 FAC were leveraged. In particular, changes regarding alternate cleanup target limits pertaining to sites not eligible for state-funded site rehabilitation were utilized, which subjected the site to less stringent cleanup target limits for certain organoleptic constituents thereby, reducing the cleanup timeframe. Four quarters of post-active remediation monitoring has been completed at the site and a site rehabilitation completion order with no further action via risk management option is anticipated by the end of 2018.

2:20 Combined and Phased Remediation of a Petroleum and Chlorinated Solvent Plume Using Soil Vapor Extraction, Air Sparge, Multi-Phase Extraction, Groundwater Pump and Treat, and Bioremediation at a Florida Drycleaner Solvent Cleanup Program and Petroleum Restoration Program Site

Brian Moore, PE, Principal, GHD Services Inc., Tampa

The McNatts drycleaning facility operates in Tampa and has been the subject of ongoing assessment and remediation through the Florida Drycleaning Solvent Cleanup Program since the late 1990s. The initial assessment identified highly concentrated soil and groundwater tetrachloroethene impacts beneath and in close proximity to the drycleaning equipment. The site is underlain by shallow sands that transition to clay just above the water table, which is situated approximately 15 feet below land surface. This presentation provides an overview of the assessment results and details the positive outcomes realized as a result of the combined and phased remedial approach to site cleanup. The combined remedy portion of the cleanup involved soil vapor extraction for shallow soils, multiphase extraction for treatment of the deeper clayey soils and groundwater recovery for plume control. A phased portion involved the simultaneous use of air sparge/SVE to treat commingled petroleum impacts. The final phase of the remedy involved a transition to enhanced bioremediation to polish remaining chlorinated solvent groundwater impacts. The case study will emphasize the benefits and cost savings associated with the use of the combined and phased approach.

2:40 Case History: American Celcure, A Brownfields Redevelopment Story

Sean Rome, Florida Operations Manager, TRC Solutions, St. Augustine

Since the mid-1980s, the former American Celcure wood treatment site located in Jacksonville has undergone more than 17 site assessments and multiple interim remedial actions by six different federal and state agencies. This case history presents the positive outcome on what can happen when a determined owner teams with a group of engaged state regulators. This presentation will explain how to deal with multi-media contamination, discuss how separating contamination zones and media may benefit closure, review the helpful role that your local regulators, specifically DEP, may offer, and provide further understanding of the brownfields redevelopment process and financial tools, beyond grants, that may be available.

3:15 Session 8: Annual Regulatory Session

Moderator: • Joe Applegate, Senior Principal Hydrogeologist
Geosyntec Consultants Inc., Tallahassee

Speakers: • Teresa Boeshaghi, Program Administrator, Waste Cleanup
DEP, Tallahassee
• Austin Hofmeister, Program Administrator, Petroleum Restoration Program
DEP, Tallahassee
• Brian Dougherty, PhD, Environmental Administrator, DEP, Tallahassee
• Wilbur Mayorga, PE, Division Chief, Miami-Dade County RER DERM, Miami

5:00 FRC 2018 Conference adjourns



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Registration and Hotel Information

FRC Conference set for Dec. 5-6, 2018

For general questions about participating in the 24th Annual Florida Remediation Conference, call (407) 671-7777 or e-mail mreast@enviro-net.com. Visit our website at www.enviro-net.com for FRC updates, the technical session agenda, a current list of exhibitors and booth availability, speaker updates and more.

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National Technical Communications Co. Inc., publishers of the *Florida Specifier* and producer of the Florida Remediation Conference, is an approved Continuing Education Provider (CEP 0004002) for the Florida Board of Professional Engineers. As a provider, NTCC offers continuing education (CE) credit hours for attending FRC 2018 to professional engineers licensed in Florida (and other states) as follows: Attend both days, earn 12 CE's; attend Day One only and earn 6 CE's; Day Two, 6 CE's. **Sign-in is mandatory for PEs and your PE license number is required.** Continuing education credits are also now available for professional geologists in South Carolina, Alabama and other states where continuing education is required for PG licenses.

In addition, FRC has qualified for continuing education credits through the International Society of Technical and Environmental Professionals Inc., INSTEP. Credits apply to those currently registered by this association. Participants will receive one CE credit for every actual hour of instruction. LEPs may enter their credits on the LEP Center Section of the INSTEP website.

Hotel Information

The Rosen Centre Hotel is the host hotel and conference center for FRC 2018. The hotel is located on International Drive adjacent to the Orange County Convention Center in Orlando. For directions and additional information about the hotel, visit their website at <http://www.rosencentre.com>.

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Registration

Registration for the full Florida Remediation Conference is \$395. Day One Only is \$295 and Day Two Only is \$245. The fee includes registration for the conference, conference manual and flash drive containing PDF files of all the talks, continental breakfasts, beverage breaks, luncheons and the conference reception for Day One registrants only.

To register for the conference, complete and return the registration form on the next page with payment in full to: NTCC Inc., P.O. Box 2175, Goldenrod, FL 32733, or fax your completed registration form with credit card information to (321) 972-8937. This is a secure fax number. (Purchase order numbers are accepted for government employees.)

We encourage you to register early. Conference registration is limited to avoid overcrowding. Please note: Payment in full is required to confirm your registration. Cancellations received before Nov. 6, 2018, will be refunded, less a \$75 service charge. No refunds will be made for cancellations received after that date. However, paid no-shows will receive a copy of the presentation materials upon request. Substitute attendees will be accepted at any time, preferably with advance notice.

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SCOTT

Continued on Page 18 in Florida.

Financial conflicts of interest

Due to Scott's willful failure to disclose his financial holdings, the public has only a small inkling of how much of his wealth comes from natural resource exploitation or whether his decisions as governor pose significant financial conflicts of interest.

The *Florida Phoenix* reported that Scott has \$500,000 invested in NextEra, which owns state-regulated FPL and the Sable Trail natural gas pipeline that fuels FPL generators in South Florida.

They also reported that he has a financial interest in Fortress Investment Co. The firm owns All Aboard Florida, a private

NOTES

From Page 3

opment in Tallahassee is now facing lawsuits from the Florida Department of Environmental Protection and the North Florida Water Management District.

DEP's lawsuit claims Sandco Inc., the firm doing the site work, failed to install and maintain appropriate erosion and sediment controls, and failed to meet the conditions of its stormwater pollution prevention plan.

The department said that 11 violations have occurred. The state is seeking

rail company that intends to provide high-speed rail passenger service from Miami to Orlando, and perhaps to Tampa.

All Aboard Florida has been a generous Scott campaign supporter and for that, in 2011, Scott turned down \$2.4 billion in federal funds to build a publicly owned passenger rail company linking Tampa to Orlando and later to Port Canaveral.

Given Scott's lack of transparency in financial reporting, we can't be sure exactly how much he personally profits from decisions that don't pass the smell test for self-dealing, such as those above.

Bottom line, Scott's environmental record disqualifies him for holding any public office. U.S. Senator Bill Nelson is the only real choice in this race.

\$10,000 a day per violation.

NFWMD's lawsuit named a host of companies affiliated with the Canopy development and is "seeking temporary and permanent injunctive relief and monetary penalties" for former and on-going violations of the district's environmental resource permits.

The district's suit states that the violations are "sometimes purposeful." The district has called for a halt to further development until the project is in compliance.

The site's problems have been exacerbated by the failure of a large retention pond that resulted in flooding and the closure of a local road.

The district found that Canopy didn't have the environmental resource permit required to prevent off-site flooding.

People news. Kate Harris was elected chair of the board for Stanley Consultants. She has over 25 years of international experience in the construction, engineering and consulting industry. Stanley has offices in Miami, Sarasota and West Palm Beach.

Thomas Nogaj, PhD, PE, and John Kabouris, PhD, PE, joined Cardno Inc. as water & wastewater infrastructure practice group manager and wastewater technology specialist, respectively.

Nogaj has more than 30 years of experience in the civil and environmental engineering fields. Kabouris brings more than 30 years of experience in environmental engineering.

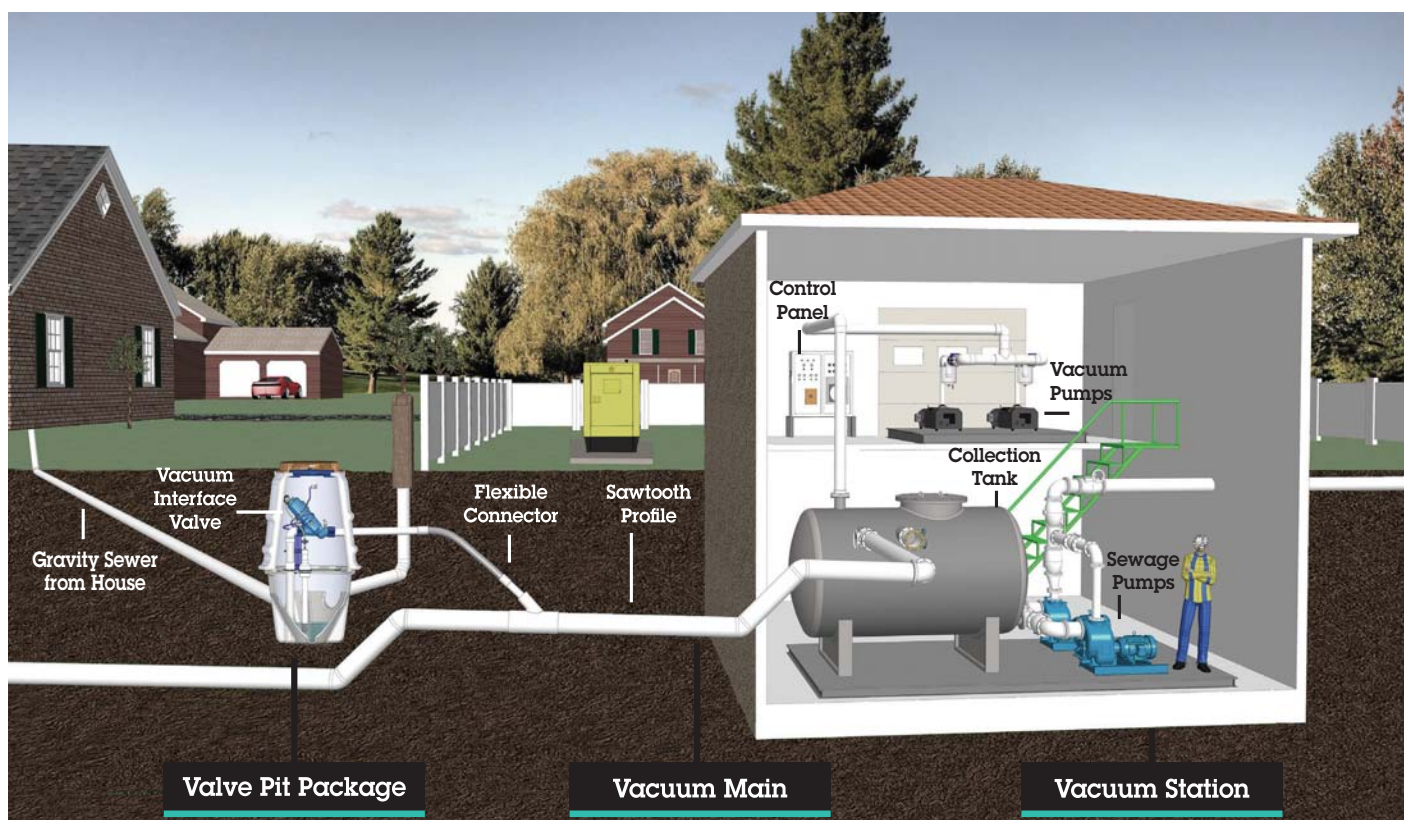


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