17th Annual

FLORIDA REMEDIATION CONFERENCE

An NTCC Conference

October 13-14, 2011

Doubletree by Hilton Orlando
at Sea World

The Soil and Groundwater Cleanup Conference of the Year

Produced by NTCC, Inc. and the

Florida Specifier

Post-Conference Workshops: Friday, Oct. 14, 2011:

- **Sustainable Remediation: Successful Implementation Strategies**

- **ADaPT: Regulatory Update and Electronic Deliverables**

2nd Annual Florida Specifier/FRC Fall Classic: Oct. 12, 2011

Charity Golf Tournament

Celebration Golf Club

PDHs for PEs

FRC Provides Continuing Education Credits for PEs and LEPs

Day 1 Thursday, October 13, 2011

8:00 **Keynote Address from our Conference Chair**
Nick Albergo, PE, DEE, Principal, HSA Engineers & Scientists, Tampa

Session 1: In-Situ Remedial Applications

8:30 **Performance of a Microemulsion as a Carrier for In-situ Chemical Reductive Minerals**
Donovan Smith, PE, JRW Bioremediation LLC, Lenexa KS

Recent research into the anaerobic degradation pathways of chlorinated ethenes, ethanes and other anaerobically degradable contaminants has turned to the evaluation of the biotic and abiotic contributions to overall contaminant degradation. One result of this paradigm is the use of emulsified vegetable oil as a slow release biotic substrate combined with in-situ chemical reductants such as iron to provide an abiotic degradation mechanism. Since suspending solids in liquids is usually problematic, the main challenges with the economical introduction of an ISCR are a general inability to transport the material away from the injection points to ensure adequate coverage and the difficulty in providing a reductant of sufficiently small particle size to optimize surface area and limit agglomeration. The use of microemulsion technology to biologically enhance reductive dechlorination combines two immiscible materials to form sub-micron-sized particles that are thermodynamically stable. Since microemulsions are stable systems, they exhibit superior subsurface transport. Producing iron-based ISCR in the form of materials such as magnetite inside a microemulsion has resulted in iron-based particles ranging from sub-micron up to 2 microns. In order to investigate whether a combined ISB/ISCR microemulsion system could be effective, a series of laboratory tests were performed. Several different ISCRs were successfully dispersed into a microemulsion carbon substrate forming a low viscosity, single phase liquid that retains the physical properties of a microemulsion. This system was compared in a microcosm study with various ISCRs alone and abiotic systems to demonstrate biotic, abiotic and possible synergistic remedial effects.

9:00 **Sustained-Release Permanganate: Reactive Barriers for Green and Sustainable Remediation**
Pamela Dugan, PhD, PE, Carus Corp., LaSalle, IL

The intention behind site cleanup is inherently green, however, remedial activities use energy, water and materials resources to achieve cleanup objectives. Traditional remediation technologies require electricity and fossil fuel to power equipment to remove contamination from soil and groundwater. Extracted fluids are then processed above ground, or disposed of in landfills when filters are used. The intractable nature of subsurface contamination suggests the need to explore the use of innovative technologies that reduce the environmental footprint of remedial treatments. Reactive materials in permeable reactive barriers have proven very useful for transforming or destroying organic waste in situ. Once emplaced they typically do not require a continued supply of electrical power and have the added benefit of creating a reactive zone for the destruction of contaminants in place. Controlled-release techniques have been utilized extensively in diverse fields such as pharmaceutical and agrochemical technologies. However, controlled- and sustained-release of an oxidant during ISCO is an emerging concept that is extremely relevant to the field of environmental remediation, yet to-date has received little attention. ISCO using the oxidants permanganate, persulfate and catalyzed hydrogen peroxide has shown great promise for remediation of many recalcitrant organic contaminants of concern. Because the oxidant also reacts with natural organic matter, inorganic soil constituents and other reduced compounds, the presence of a protective barrier that controls oxidant release may enhance the efficiency of ISCO and allow for long-term low-cost treatment of chlorinated solvents. To this end, sustained-release permanganate was developed. Paraffin wax was used as the environmentally benign and biodegradable matrix material for encapsulating the solid potassium permanganate particles. The paraffin matrix protects the solid KMnO4 particles from fast dissolution and potentially undesirable nonproductive reactions. The SRP material contains between 60-80 percent permanganate and can be formed as candles for direct push applications in reactive barriers, or chipped material for hydro-fracturing into low permeability media.

9:30 **Field Experience with Combined Anaerobic Bioremediation and Chemical Reduction with Zero Valent Iron**
John Haselow, PhD, PE, President, Redox Tech LLC, Cary, NC

Redox Tech has injected Anaerobic Biochem Plus, ABC+, a mixture of carbon substrate and zero valent iron, at nearly 100 sites throughout the U.S. and Europe. The carbon substrate ZVI mixture has proved to be a robust amendment for treating DNAPL contaminated sites and soluble halogenated alkenes and alkanes in different geologic environments. Often times, reaction times are comparable to those obtained with chemical oxidation approaches. ABC+ is documented to persist for over two years in low permeability environments. Post injection, hydrogen gas has been observed as high as sixty-three percent by volume. ABC+ is a proprietary carbon substrate mixture, ABC® and ZVI. ABC® is a mixture of lactates, soluble fatty acids, micronutrients and pH buffer. ZVI is the most widely applied chemical reductant in the groundwater remediation field. Carbon substrates are widely available and are often viewed as commodities for anaerobic bioremediation. ZVI has been proven and widely accepted as an effective in-situ remediation technology of chlorinated solvents such as TCA, PCE, TCE and daughter products. The combination of carbon substrate and ZVI is applied through an intellectual property license with Adventus Americas. Redox Tech has been applying ABC+ for over five years in

diverse geologic settings including saprolite, partially weathered rock, Coastal Plain sediments and glacial deposits. Combined anaerobic bioremediation and chemical reduction with ZVI produces a greater reducing environment than with substrate alone. The "penalty" for the low oxidation potential is loss of hydrogen to methane production. However, the slight penalty is balanced by a more robust and rapid remediation solution. Data obtained from sites in South Carolina, Florida and Denmark will be presented.

10:00 Morning break

Session 2: Accelerating Remediation

10:30 **Surfactant-Enhanced Remediation via Short-term Recirculation Process**
Brian Timmins, Director, ETEC LLC, Portland, OR

Two surfactant-enhanced remediation case studies were conducted in Florida and Georgia in 2010 and 2011. These projects involved the injection and extraction of surfactant solution within target remediation zones to mobilize and capture residual sorbed fuel constituents from soil and groundwater. The process utilizes a biodegradable surfactant solution which is injected into wells under pressure and subsequently extracted from surrounding wells using submersible pumps. By performing this process over a period of one to two weeks, subsurface contact between the surfactant solution and residual sorbed fuel is achieved, resulting in subsequent mobilization and capture. Surfactant-enhanced treatment can dramatically accelerate site remediation, and is applicable as a stand-alone remedial approach or for use with operating remediation systems as a "polishing" process. The data from two separate projects will be presented. One project utilized surfactant-enhanced remediation as a stand-alone remediation approach, while the other project involved use of surfactants to enhance the effectiveness of an existing dual-phase extraction system. Both sites demonstrated substantial capture of fuel mass as a result of application of the short-term recirculation process. Information on the remediation layouts and injection/extraction procedures will also be presented. A discussion of process costs will also be included as part of the presentation. The site remediation results will demonstrate that surfactant-enhanced remediation using a short-term recirculation process is a cost-effective remediation alternative both as a primary remediation approach, and also as a polishing step to reach stringent soil and groundwater cleanup standards.

11:00 **Managing Carbon Tetrachloride and Chloroform in Bioremediation of Chlorinated Solvents**
Jeff Roberts, Laboratory Manager, SiREM, Guelph, Ontario, Canada

Chloroform is a toxic and carcinogenic contaminant detected in groundwater as a primary contaminant, as a degradation product of carbon tetrachloride and/or as part of mixed contaminant plumes. Apart from its general toxicity, CF is a potent inhibitor of many anaerobic microbial processes essential for bioremediation including methanogenesis and dechlorination. CF is frequently found as a co-contaminant with tetrachloroethene and trichloroethene, and its presence—even at low concentrations—can prevent the complete dechlorination of PCE and TCE to ethene. Only recently has metabolic reduction of CF been reported. This reaction results in partial dechlorination of CF to dichloromethane, which is less inhibitory. A Dehalobacter species has been identified to be responsible for this reaction. Bioaugmentation with Dhb can be used to overcome CF inhibition by converting it to DCM. Cultures capable of this transformation are currently available commercially; increasing the number of CTC and CF sites for which bioremediation may be applicable. Field- and bench-scale case studies highlighting the use of this culture will be discussed. While removal of CF inhibition by conversion to DCM is desirable, complete dechlorination of CF to non-chlorinated end products is preferred. Recent research has demonstrated that complete dechlorination of CF is possible and is of microbial origin. Current research efforts focused on characterizing and scaling up a culture capable of complete CTC and CF dechlorination will be presented with a focus on future field application.

11:30 **Bases of the ART In-Well Technologies ... Green & Effective**
Mohamed Odah, Phd, PE, Principal Engineer, Accelerated Remediation Technologies Inc., Overland Park, KS

The ART technology combines in-situ air stripping, air sparging, soil vapor extraction, enhanced bioremediation/oxidation and subsurface circulation in an innovative wellhead system. The multiple remediation concepts combined within the ART technology are well suited for recalcitrant compounds because the synergistic systems are attacking contaminants on a number of fronts. The multiple, in-well stripping passes and high air-to-water ratio achieved in the well via stripping and sparging are integral to the physical removal of contamination. Concurrently, the subsurface circulation process actively flushes residual contamination from the soil matrix and mobilizes it back to the well for further treatment. The circulation and extraction processes also actively and continuously provide significant dissolved oxygen boost throughout the radius of influence, enhancing bioremediation/oxidation of the hydrocarbon compounds. The ART system is designed to operate within a four or six-inch well. Its green nature is exhibited in the subsurface stripping process which eliminates the need for water extraction and aboveground treatment. The typical short life of the project, and most importantly, success in site treatment and closure will manifest the green nature of the ART remedial technologies. Project summaries will be presented and typical design parameters will be discussed.

12:00 Day One Luncheon, Sponsored by Jamson Environmental

Speed talks: Eric Kramer, PE, Shaw Group
Liza Gruden, PE, Handex C&R
Jim Clark, Clark Environmental
Glenn Iosue, PE, GES

Session 3: Injection Approaches

1:00 **Remediation of a Petroleum Spill at Grand Teton National Park, WY, Using Oxygen Diffusion**

Don Ray, President, Performance Technologies, Tallahassee

A release of gasoline occurred in the UST system supplying fuel to boats at the Colter Bay Marina Village at Grand Teton National Park. Groundwater in the immediate area was contaminated with BTEX to levels exceeding 5,000 parts per billion. Challenges in the selection of an appropriate groundwater remediation system included the need to be successful in a low permeability, glacial till and secondly to find a low effort O&M technology that can operate over the very long, frigid winters common to Teton Park. Consultants for the project selected the in-situ Submerged Oxygen Curtain® technology because of it proven capabilities to meet these two challenges. Seven iSOC® injection wells operated at the Colter Bay Marina site from September 2004 to May 2006. Five injection wells were located in the source area and two wells were located along the shore of Jackson Lake to provide an oxygen barrier. During the 1.5 years of remediation, the iSOC® system created strongly oxidizing conditions through the entire contamination area; BTEX in the UST source area was eliminated; the oxygen barrier along the shore of Jackson Lake kept petroleum constituents from reaching the lake; and the remediation system operated year round in spite of the extreme winter weather conditions and limited access to the site for only three months per year.

1:30 **ISCO Remediation of Fungicide Spill on Remote Public Lands**

Sterling Turner, Project Manager, GES Inc., Richmond, VA and
Charles Blanchard, PE, Project Engineer, GES Inc., Concord, CA

A bulk shipment of wettable-powder fungicide was released to state-owned public lands due to a vehicle accident and subsequent fire-fighting efforts. The fungicide dissolved in the groundwater, resulting in a plume of ethylene thiourea, ETU. ETU is highly soluble and generally breaks down quickly to inert compounds in the presence of light and oxygen. However, ETU at the subject site proved recalcitrant to degradation in the slightly anoxic water table aquifer. Ten years after the initial response, levels persisted well above the Florida groundwater criteria. Due to the remote location, lack of nearby power supplies, and somewhat unique conditions such as roaming livestock and occasional controlled burns to limit vegetation, many potential remediation technologies were not feasible. In-situ chemical oxidation remediation via short-duration injection events was utilized to reduce the ETU plume mass and control migration of the plume leading edge. The GES Max-Ox® ISCO technology and HypeAir® mobile injection platform fulfilled the remedial objectives and caused little to no impact to site vegetation and wildlife. A suite of oxidants and amendments was used to facilitate advanced chemical oxidation reactions. Combined liquid and gaseous injection enhanced oxidant distribution and contact with ETU. Performance monitoring indicated sustained increases of oxidation potential and dissolved oxygen in the aquifer for up to two months following each injection. The pilot test was followed by six injection events performed over 2.5 years. Each injection event was tailored to the plume conditions. The ISCO remediation reduced ETU mass by over 90 percent. One year of post-remediation monitoring has shown further reductions and, assuming continued progress, should allow for the submittal of an MNA plan leading to unrestricted closure.

2:00 **Increased In-Situ Remediation Efficacy via Innovative Injection**

Patrick Hicks, PhD, Principal, Wavefront Technology Solutions USA Inc., Raleigh, NC

Groundwater at a site was impacted by chlorinated aliphatic hydrocarbons. Based on results of a pilot test, a full-scale bioremediation via emulsified vegetable oil injection was implemented. The full-scale injection using Primawave™ technology with a combination of readily-degradable sodium lactate and slow-release EVO was used to sustain a biological reaction zone. Injections were designed to stimulate anaerobic biodegradation of CAHs in groundwater. Wavefront Technology Solutions USA Inc. provides Primawave™ technology for pressure pulsing to enhance the introduction of fluid into saturated porous media. Primawave™ technology is applied to environmental remediation projects to increase the effective distribution of remedial products through standard injection wells or direct push rods. The application of a pressure pulse through the injected liquid is modulated by controlling the frequency of the pulsing to maximize injection rates at minimal pressures to minimize blow-by and day-lighting, and also optimize the radius of influence and distribution of the injected fluid in the aquifer. During the full-scale injection event, Primawave™ technology was used to increase the injection flow rate, minimize day-lighting and to reduce field time. The average flow rate achieved during the second full-scale injection was between 7.6 and 11.4 liters per minute without significant day-lighting. In the period from two to seven months after the second full-scale injection, CA concentrations decreased at all locations but still remained above clean-up goals in one small area up-gradient of the source area that will be addressed with a final injection.

2:30 **Field Demonstration of Supersaturated Water Injection for Enhanced NAPL Recovery in Source Zones**

Gary Birk, PE, Managing Partner, Tersus Environmental, Wake Forest, NC

Supersaturated water injection is an effective technology for non-aqueous phase liquid recovery. Carbon dioxide supersaturated water injected into the subsurface results in the nucleation of CO2 bubbles at and away from the injection point. As the supersaturated liquid flows through the porous medium, gas evolution occurs in-situ as the system returns to thermodynamic equilibrium. The nucleating bubbles coalesce, rise and volatilize residual NAPL ganglia. SWI offers the following benefits: Light NAPL and dense NAPL recovery enhancement system for trapped and immobile NAPL mass; uses CO2 to strip volatile NAPL component for capture in the unsaturated zone, and mobilizes liquid NAPL trapped in aquifer matrix for recovery. SWI technology is focused on the enhancement of NAPL recovery and is operated in conjunction with conventional recovery systems. SWI uses the gPRO® system by inVentures

Technologies to supersaturate water CO2 for injection below the water table. The CO2 gas is dissolved at a pressure higher than the prevailing subsurface pressure. Following injection, carbonated water moves out away from the injection well and begins to release dissolved gas forming a treatment zone. Discrete volumes of gaseous CO2 grow and rise due to buoyancy. Because of the oil's intermediate wettability, some of the oil contacted by gas remains associated with it and is mobilized. This NAPL can then be recovered by conventional systems. Volatile NAPLs are transferred to the gas phase during the SWI process and mobilized up for vapor phase recovery. SWI is more effective at mobilizing residual NAPL than sparging because gas saturation develops in-situ, leading to greater microscopic sweep efficiency. The CO2 gas phase becomes mobile when the gas saturation reaches approximately 12 percent, at which point advective gas flow is initiated. Considerable lateral, and therefore uniform, expansion of the gas phase occurs prior to the onset of upward mobilization of growing gas clusters under the action of buoyancy forces. Gas mobilization is accompanied by fragmentation and stranding of the gas clusters, which prevents fingering of the gas phase and stabilizes the displacement.

3:00 **The Triple Benefits of Ozone Sparging: A BISCO Concept**

William Kerfoot, PhD, Principal, Kerfoot Technologies, Mashpee, MA

Three major benefits have been shown with recent ozone sparging: 1)petroleum carbon oxidation with total oxygen supplied, not ozone alone; 2)capacity to break reversibility of in-situ stripping, allowing two-log additional removal for MCL attainment; and 3) ability to degrade new compounds unable to be attacked by oxygen alone. By maintaining ozone and ozone/peroxide concentrations within ranges compatible with bacteria action and use of pulsed sequential gas introduction, bacterial populations flourish during ozone sparging. The combination of a free-radical first step predigests bacterial-resistant long-chain carbon compounds (aliphatics) and substitutes oxygen on the alkane or alkene short chains, preparing the mixture for rapid bacteria action with enhanced oxygen from stage one reaction and air. The critical mass proportion of ozone to oxygen approaches 1:10 for stage one and close to 2 total oxygen to 1 hydrocarbon for stage two. This is substantially less than estimates of greater than 1 mole ozone to 1 mole hydrocarbon destruction, which ignores biological action and the total oxygen role. Secondly, the presence of ozone within bubbles stops the process of reverse migration to dissolved forms when vertically migrating bubbles with VOCs enter low organic concentration regions of groundwater. Ozone degrades the HVOCs in the bubble, ceasing back-migration. Under field monitoring in similar situations, the HVOC content is drastically reduced, allowing MCLs to be achieved. Thirdly, both the U.S. Environmental Protection Agency and certain states have added new organic compounds beyond BTEX compounds for required removal in petroleum spills, particularly TBA, naphthalenes, and more recently, EDB and 1,2 DCA. Ozone and particularly Perozone® are reactive with these compounds, whereas normal oxygen from air with normal biological activity is not highly efficient for removal.

3:30 Afternoon break

Session 4: Assessment Enhancements

4:00 **The Rise of Incremental Sampling Methodology**

Steve Packard, Project Chemist, Columbia Analytical Services, Jacksonville

In today's challenging economic climate, scientists performing environmental site assessments are looking for ways to save money, without compromising the thoroughness and integrity of field sampling and analytical support-related activities on which environmental decisions are made. Incremental Sampling Methodology introduces a relatively new technique that provides an alternative to historically utilized discrete field sampling techniques. ISM procedures call for a different method of identifying where on a site should soil samples be taken, and also include additional steps taken to ensure sample representativeness once the samples are received by the laboratory prior to analysis. And as an additional benefit, overall project costs related to site characterization can often be reduced. ISM is now beginning to gain awareness and acceptance by some states, including Florida, as an alternative to traditional sample collection procedures. Two key factors that influence accurate and precise soil contamination representativeness during field sample collection and laboratory subsampling are: 1) the inherent heterogeneity of soils and sediments at many sites, and 2) variable levels of contaminant concentrations distributed across a site, and even in individual samples. Therefore, the use of traditional methods for field sampling and laboratory subsampling have always included the possibility of missing contamination hot spots at sites, or generating site characterization reports that are not necessarily representative of actual site conditions. The first projects using ISM have now been carried out here in Florida, or are underway at the present time. As time goes on, the use of ISM will be more accepted into the mainstream of site characterization procedures.

4:30 **The Effect of Multiple Hydraulic Features on Assessment Activities of a Dissolved Petroleum Hydrocarbon Plume**

Joshua Hirten, PG, Project Manager, URS Corp., Orlando

Assessment activities have been completed in association with two former retail petroleum facilities that were in operation from approximately 1933 to 2000. The general extent of dissolved petroleum hydrocarbon concentrations associated with retail petroleum facilities are typically confined to the site boundaries and the immediate vicinity. This was the traditional methodology when one downgradient monitor well indicated concentrations that were above Chapter 62-777, FAC NADC criteria. After site access delays, an additional monitor well was installed downgradient that also indicated concentrations that were above criteria. It was at this point that a more aggressive assessment approach was utilized that included grab groundwater sampling, mobile laboratory analysis and nested monitor wells. During the course of assessment activities, numerous challenges were encountered in determining the driving forces in groundwater movement and the appropriate scope of work. One factor appears to be the preferential flow within the surficial ground-

water around the stormwater system that leads away from the effected properties. Additionally, while the nearest water body is over 1,500 feet away, it appears to have a significant effect on the flow path and depth at which dissolved petroleum hydrocarbons are encountered. Finally, upon migration of the dissolved petroleum hydrocarbon plume towards the water body, the influence of another water body is encountered and has led to movement to the north towards the lake. The various hydraulic features have provided unique challenges during the assessment. The data collected will be utilized to develop a targeted remedial approach for this dissolved petroleum hydrocarbon plume.

FRC 2011 Day One Adjourns ... FRC 2011 Reception, 5:00 - 6:30 PM ... *Sponsors:* **Advanced Environmental Labs**
EQ-The Environmental Quality Co.
Carbon Service & Equipment

Day 2 Friday, October 14, 2011

Session 5: A Grab Bag of Innovative Projects

8:00 **Remedial Design of a Multi-Component Hydraulic Control and Treatment System for Addressing VOCs, 1,4-Dioxane and Pesticides**

Jeffrey Ahrens, PE, Project Engineer, Geosyntec Consultants, Boca Raton

The confidential cleanup site has operated as a light industrial facility. Several volatile organic compounds as well as 1,4-dioxane and chlorinated pesticides—collectively referred to as contaminants of concern—have been detected at the site. A hydraulic control and treatment system approach utilizing an air stripper, bag filtration, an advanced oxidation plug flow reactor, and liquid- and vapor-phase carbon treatment was selected as the remedial approach in order to utilize existing groundwater treatment equipment already at the site, capture affected groundwater in proximity to higher concentration areas and to holistically address the various site COCs, which are collectively challenging to many other candidate remedial technologies. Remedial design challenges at the site included: retrofitting an existing treatment system that was incapable of treating off-gassing, 1,4-dioxane, and pesticides; flowrate selection to help optimize the client's objectives vs. system capital and operational costs; and positioning of remedial equipment in the treatment train for effective treatment at a reduced operational cost. This presentation will focus on the remedial feasibility study evaluation for technology selection as well as an evaluation of the design considerations that factored into the remediation system design and component selection. Additionally, we will embark on a virtual tour of the constructed remediation system, which was recently completed, and evaluate the system operation performance.

8:30 **Cutter Soil Mixing at the Brunswick Wood Preserving Superfund Site**

George Onorato, PE, Senior Construction Engineer, Golder Associates Inc., Tampa, FL

Golder Associates recently completed the first CSM hydraulic barrier wall system ever constructed at a U.S. Environmental Protection Agency-funded Superfund site in the U.S. at the Brunswick Wood Preserving Site in Brunswick, GA. CSM technology, along with Golder's technical approach, brought innovation and elevated levels of precision and quality control compared to what is typically expected in barrier wall construction. The Brunswick site had been used for wood treatment operations since 1958 using chemical agents causing extensive contamination to soil, groundwater and also the nearby creek. Most of the remedial activities were performed between 1996 and 2009, but the EPA discovered additional groundwater contamination that extended off-site which crossed through an extensive network of overhead and underground utilities. Despite these obstructions, the EPA had determined that the most appropriate approach was to construct an outer barrier wall. Golder was contracted to design and construct the barrier wall using the specialized soil mixing technique, CSM, in order to contain the migration of impacted groundwater. Soil mixing for barrier wall construction involves blending the native soil with a variety of admixture binder types, such as cement and bentonite, to create a barrier wall with low permeability properties. One of the advantages of CSM over conventional soil mixing systems is that it creates rectangular columns of soil-cement-bentonite that can be effectively and efficiently interlinked to create a continuous subterranean barrier wall. A performance criteria of 1 x 10-6 cm/sec or lower was established for the site. Golder was able to meet this criteria using the CSM. The project involved extensive coordination with utility companies. Interfering utilities produced project challenges, however due to the skill of the crew and maneuverability of the equipment, the project was completed on time, on budget and without any safety incidents.

9:00 **Horizontal Well Design, Installation and Performance for Biosparging a PAH Plume**

Cal Butler, PG, Geologist VI, and Ernest Mott-Smith, PE, Remedial Technology Practice Leader,
Black & Veatch Special Projects Corp., Tampa

The site is an abandoned wood preserving facility located in Pensacola, FL, that released PAH compounds to groundwater with much of the contaminant plume residing at and above 100 feet below ground surface. Impacted groundwater flows east under a railroad switching yard thereby limiting access and treatment options. In-situ enhanced bioremediation with injection of oxygen to stimulate indigenous bacteria and form a biological treatment zone was selected for dissolved-phase remediation. Horizontal directional drilling beneath the railroad switching yard was proposed for initial pilot testing of the biosparge remedy. A bundle of three wells comprised of different construction materials and slot configurations was installed in the double-ended HDD bore. Well screen mate-

rials included stainless steel with longitudinal slots and air diffusion system HDPE with microslots that open and close depending on pressure of the injection medium. Specialized HDD well installation techniques included a steel carrier casing, grouting pipes and biopolymer drilling fluid. The final well construction was 1,450 feet long set at 100 feet bgs. A limited number of downgradient monitoring wells were installed to gauge the performance of the HDD well bundle during two oxygen injection pilot tests. Overall, the pilot tests indicated that the HDD well screens provided excellent biosparging capabilities. Concerns for full-scale treatment include potential occlusion of the well slots.

9:30 **Which Way is Up? Evaluating Contaminant Mass Flux and Vapor Migration during SVE Operation**

Aaron Cohen, Project Manager, DEP, Tallahassee; and Rachel Klinger, EI, Engineer, and David Riotte, PE, Associate, Geosyntec Consultants, Jacksonville

Asymptotic low-level tetrachloroethene detections are observed in soil vapor extraction system effluent following a year or more of active remediation at many active drycleaner sites in Florida. To evaluate if the low-level PCE detection in the SVE system effluent are associated with active drycleaning operations, the Florida Department of Environmental Protection and Geosyntec Consultants conducted a two-week vapor migration study at an active drycleaner in Tallahassee, FL. The study encompassed three types of vapor monitoring equipment at three different locations and was designed to capture the normal facility operation cycles, drycleaner machine operation, business hours, production rates and SVE system operation. Distinct cyclical trends in PCE concentrations were observed at each of the three locations suggesting the migration of indoor air PCE concentrations into the vadose zone, via preferential pathways and the applied SVE vacuum beneath the drycleaners foundation.

10:00 Morning Break

Session 6: Petroleum Program and Oil Spill Identification and Cleanup

10:30 **Florida DEP Petroleum Program/Waste Cleanup Panel**

Glenn MacGraw, PG, Principal, The FGS Group, Tallahassee

Jorge Caspary, PG, Director, Division of Waste Management, FL Dept. of Environmental Protection, Tallahassee *(invited)*

Robert. C. Brown, PE, Chief, Bureau of Petroleum Storage Systems, FL Dept. of Environmental Protection, Tallahassee

This panel discussion will allow conference particpants to hear from two new appointees to key management positions with the Florida Department of Environmental Protection. They will share their thoughts on where they would like to see their programs enhanced and streamlined, where possible, and how they plan to go about increasing the number of site closures in the state.

11:30 **Case Study of Dual Tanker Spill Events onto a Roadway Embankment with Assessment of Multiple Remediation Strategy Effectiveness and Carbon Footprint Analysis**

Timothy Harman, PE, General Manager, Handex Consulting & Remediation - Southeast LLC, Delray Beach

HCR responded to a call of a fuel tanker rollover as an emergency response. The spill involved fuel impacts to the travel lanes, the embankment supporting the on ramp and the retention pond at the toe of the embankment. HCR conducted a number of subsequent interim source removal activities including soil excavation, free product recovery, multiphase extraction events and a series of chemical oxidation injection events, performed as a remediation pilot study. As remediation progress ensued and a remedial action plan was being considered, a second spill event occurred at the same location. The second event underwent additional assessment and two parties moved forward with a shared remediation design and implementation. The recent remediation plan implementation consisted of two chemical injection events into the shallow portion of impacted groundwater, with the first injection event consisting of a chemical oxidation reagent and the second injection event consisting of a mixture of chemical oxidation and biostimulation reagents. The third injection event is comprised of a deeper injection interval with a biostimulation reagent only. This case study will chronicle the implementation of multiple assessments and remediation implementations for multiple spill events for a similar location, for a site with multiple stakeholders and multiple constraints including work alongside an active roadway and in advance of the proposed roadway construction project corridor. Analysis of the carbon footprint for each stage of the remediation sequencing will also be presented.

12:00 **Fingerprinting of Crude Oil Spill Sources**

Kesavalu Bagawandoss, PhD, JD, Technical Director, Accutest Laboratories, Houston, TX

Environmental characterization of oil spills in coastal areas requires fingerprinting analysis. All oil spill characterization efforts require sound sampling techniques to obtain representative samples and these samples must be processed by strictly following approved laboratory protocol. Fingerprinting analysis provides essential information required to identify the source of an oil spill and facilitate the evaluation of environmental risks, natural resources damage assessments and litigation. Fingerprinting is complex in nature. Standard materials are not available for all the oil constituents of concern in the source, therefore parent versus alkyl response factors have to be developed to quantify the constituents present. Several analytes and methods are employed to identify and compare two sources of oil to each other to determine if they are related or unrelated. This presentation will outline the laboratory methods involved in fingerprinting natural and anthropogenic sources of oil. Complex gas chromatography mass spectrometric single ion monitoring techniques are employed to determine if the sources are petrogenic, pyrogenic, diagenic or biogenic in nature. Key indicators and diagnostics will be outlined for each of the processes. Diagnostic ratios, histograms and ion chromatographic patterns for the various hydrocarbons, isoprenoids, parent polycyclic aromatic hydrocarbons, alkyl substituted polycyclic aromatic hydrocarbons and biomarkers for the identifications will be presented. Comparisons will be presented for each of the classifications and groups.

Sustainable Remediation Workshop:

Developing Successful Implementation Strategies

Friday, Oct.14, 1:00 - 5:00 pm

This four-hour hands-on workshop will provide a forum for discussing successful implementation strategies when using remediation technologies listed in the Florida Department of Environmental Protection's Innovative Technology Database.

Environmental industry presenters will explain how the U.S. Environmental Protection Agency, International Organization for Standardization and ASTM International guidelines for implementing a sustainable remediation and assessment plan can be applied to projects in Florida.

Regulatory agency presenters will discuss the information needed to obtain approval of a sustainable or risk-based remedial action plan.

A panel of vendors from the approved database will discuss how their technology can be used to reach cleanup target levels using the same case study. Additional cost proposals from vendors not included on the panel will be made available in the workshop manual/CD.

Workshop attendees will be assigned to teams to select the most sustainable technology or technologies that will reach the cleanup targets levels. Each team will then justify their selection to the other attendees.

The goal of the workshop is to ensure that attendees become familiar with how in-situ and risk-based remedial action plans are developed and evaluated.

Moderator: Laura Gimpelson, PE, President, LG Environmental Engineering, Orlando
Addtional Speakers: William Lais, PE, Sr. Engineer, HSW Engineering, Tampa
Davis Jones, PE, Engineer III, Orange County EPD, Orlando

Registration fee: $125. Please use the form in this flyer to register.

ADaPT Workshop:

Regulatory Update, Software Demonstration and Data Usability

Friday, Oct.14, 1:00 - 5:00 pm

This interactive workshop is offered to environmental professionals interested in, or in need of, using ADaPT. While last year's workshop focused more on the need for data validation, this year we will focus on actual ADaPT software demonstrations and will include a Q&A session on handling actual electronic data deliverables.

Consulting/engineering firms will present how the validated data is being used in their firms.The Florida Department Environmental Protection is invited to present regulatory updates for the waste program and an overview of ADaPT usage within the agency.

ADaPT was developed to comply with quality assurance requirements and provides many functions. The DEP Division of Waste Management recently announced its intent to incorporate the use of ADaPT in its statewide quality assurance document. This will expand the use of ADaPT to include data submitted under programs administered by the state bureaus of Waste Cleanup and Petroleum Storage Systems.

ADaPT performs an error check for correctness and completeness of the data, checks blank contamination rules, and checks accuracy and precision criteria for each method and sample matrix.

Workshop attendees are encouraged to bring in EDDs with any questions regarding EDD completion, data review or submittal.

Moderator: Cathy Katsikis, Sr. Scientist, LDCFL, Royal Palm Beach
Addtional Speakers: Linda Hoffman, Sr. Engineer, HSW Engineering, Tampa
Tom Lubozynski, PE, Administrator, Waste Management, FL Department of Environmental Protection Central District, Orlando *(invited)*

Registration fee: $125. Please use the form in this flyer to register.

2nd Annual Charity Golf Tournament

You're invited to participate in our 2nd Annual *Florida Specifier*/FRC Charity Golf Tournament set for Wednesday, Oct. 12, 2011, from 1:00 until 6:00 PM.

The tournament will be held at the Celebration Golf Club in Celebration, FL (www.celebrationgolf.com), just a few short minutes from conference headquarters at the Doubletree on I-Drive.

This award-winning course has hosted events such as the U.S. Senior Open Qualifier, Robert Gamez Celebrity Invitational, Florida State Public Links Championship, Buick Scramble National Championships and The Golf Channel's Drive, Chip and Putt Finals.

The fee is $125 for golf and lunch. In addition, we are again seeking corporate sponsors for holes, lunches, drinks and several other categories of sponsorship. This year, all proceeds from the tournament will be donated to the Florida SIDS Alliance.

For complete information and to register for the golf outing, visit www.enviro-net.com and click on "FRC Golf Tourney 2011" under the FRC logo. If you have any questions or would like more information about playing or sponsoring, contact Eric Brown at (727) 546-6193 or eric.brown@swsenvironmental.com, or Mike Eastman at (407) 671-7777 or mreast@enviro-net.com.

2011 FRC Exhibitors and Sponsors

Current List of Exhibitors

A&D Environmental Services
Aarco Environmental Services Corp.
Accutest Labs
Adler Tank Rentals
Advanced Environmental Labs
Adventus Group
Aerotek
A-C-T Environmental & Infrastructure Inc.
BakerCorp.
BioManagement Services
Blackhawk Technology Co.
Boart Longyear
Carbon Service and Equipment
Carbonair Environmental
Carus Corp.
Clark Environmental
Clean Earth Systems
Clean Harbors
Columbia Analytical Services
Custom Drilling Services
DeepEarth Technologies
DeWind One-Pass Trenching
Enviro-Equipment
EnviroTek
Env. Remediation Services
EQ-The Environmental Quality Co.
ESC Lab Sciences
ESD Waste2Water
ETEC LLC
The FGS Group
Flowers Chemical Laboratories
FMC Corp.
Geo-Cleanse International
Geotech Environmental Equipment
GES
Golder Associates
GWTTI
Handex Consulting & Remediation
Hanna Instruments
Huss Drilling
In-Situ
Innovea Technologies
ISOTEC
JRW Bioremediation LLC
Jupiter Env. Laboratories
KB Labs
Kerfoot Technologies
Lakeland Laboratories
LDCFL
Liquid Environmental Solutions
Microbac Laboratories
Microbial Insights
MLE Equipment
Monarch Environmental
NASA Kennedy Space Center
Pace Analytical Services
Palm Beach Env. Labs
Panther Technologies
Performance Technologies LLC
Petrotech Southeast
Pine-Environmental Services
Regenesis
Republic Services
RFP Services
Siemens Industry Inc.
SiREM
SM Stoller Corp.
Stillwater Technologies
Subsurface Evaluations
SunLabs
SWS Environmental Services
Terra Systems
Terraine Inc.
TestAmerica
Vironex Inc.
Waste Management
Waste Services of Florida
XENCO Laboratories
ZEBRA Environmental Corp.

Luncheon Sponsor

Jamson Environmental

Reception Sponsors

Advanced Environmental Laboratories
Carbon Service and Equipment
EQ-The Environmental Quality Co.

Registration and Hotel Information

17th Annual
FLORIDA REMEDIATION CONFERENCE

FRC 2011 Conference

For general questions about participating in the 2011 Florida Remediation Conference or attending one of the half-day workshops on the afternoon of Day Two, call (407) 671-7777, toll-free 1-800-881-6822 or e-mail mreast@enviro-net.com. Check our website at www.enviro-net.com for conference updates, technical agenda, current list of exhibitors and booth availability, speaker updates and more.

Charity Golf Tournament

For questions regarding the 2nd Annual *Florida Specifier*/FRC Charity Golf Tournament, contact Eric Brown at eric.brown@swsenvironmental.com or call (727) 546-6193; or Mike Eastman at mreast@enviro-net.com or call (407) 671-7777. The 2011 Charity Golf Tournament registration form is available on-line at www.enviro-net.com under the FRC logo.

Continuing Education Credits: PE and LEP

National Technical Communications Co. Inc., 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 Professional Development Hours for FRC 2011 to professional engineers who are licensed in Florida (and other states) as follows: Attend both days, earn 11 PDHs; attend Day One only and earn 7 PDHs; Day Two only, earn 4 PDHs. **Sign-in is mandatory for PEs and your PE license number is required.**

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 1 CE credit for every actual hour of instruction. LEP's may enter their credits on the LEP Center Section of the INSTEP website.

Hotel Information

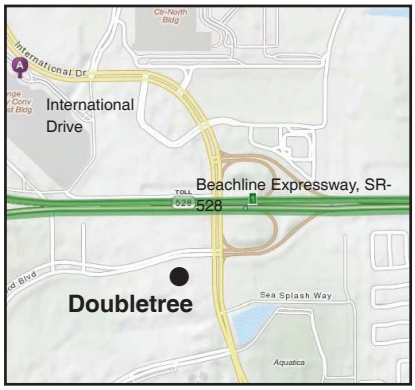
The Doubletree by Hilton Orlando at Sea World is our new home for FRC 2011. The hotel is conveniently located on International Drive, near the Beachline Expressway (SR-528), just south of the Orange County Convention Center. The resort facility has just completed a $35 million renovation. Their website is www.doubletree orlandoidrive.com.

Hotel Reservations

Make your room reservations directly with the Doubletree. Go to our website at www.enviro-net.com and click on "Doubletree Hotel Reservations" under the FRC logo or call 800-327-0363. If you call, please identify yourself as an attendee of the Florida Remediation Conference when booking your room. Rooms are $95. **This special room rate will be available until Sept. 26 or until the group block is sold-out.**

Directions

The Doubletree is located at 10100 International Drive, Orlando, FL 32821. Visit www.doubletreeorlandoidrive.com for directions.



Registration

Registration for the full 2011 Florida Remediation Conference (a day and a half) is $365. Day One only is $265 and Day Two only is $145. The fee includes registration for the conference, conference manual or flash drive, continental breakfasts, beverage breaks, and luncheon and reception for Day One registrants only. **On-site registrants will be required to pay an additional $30 to register.**

To register for the conference, complete and return the form on the next page with payment in full (Purchase order numbers are accepted for government employees) to: NTCC, Inc., P.O. Box 2175, Goldenrod, FL 32733, or fax your completed registration form with credit card information to (407) 671-7757. This is a secure fax number.

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 Sept. 13, 2011, 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. Substitutions will be accepted at any time, preferably with advance notice.

17th Annual

FLORIDA REMEDIATION CONFERENCE

2011 Conference Registration

October 13-14, 2011, Orlando, FL

If registering more than one person,
please copy and complete a separate page.

Check registration type and provide payment information below.

--- Please type or print contact information legibly ---

Full 2011 Conference ___ (Both days) $365

One Day Only (Indicate which day)
__ **Day 1** (Thursday, 10/13/2011) $265
__ **Day 2** (Friday, 10/14/2011) $145

On-site registration premium (additional fee for on-siters) $30

Post-Conference Workshops:
(1:00 - 5:00 PM) __ Sustainable Remediation Workshop (10/14) $125
(1:00 - 5:00 PM) __ ADaPT Workshop (10/14) $125

TOTAL: $ _____

Name _____

Title _____

Organization _____

Address _____

City _____ State _____ Zip _____

Phone _____

E-Mail _____

You have a choice between receiving a traditional three-ring binder
or a flash drive. Please select one below. (If you do not make
a selection, you will receive the conference materials on a flash drive.)
____ Traditional binder or ____ Flash drive

Payment Information:

Check enclosed for $ _____ **Payable to NTCC, Inc.**
(Fed. ID # 59-3036689)

Charge $ _____ to my AmEx Visa Mastercard

Credit Card Account #_____

Exp. Date _____ / _____ Security Code: _____

Card Holder _____

Authorized Signature _____

Return with payment in full to: **NTCC, Inc.**
P.O. Box 2175
Goldenrod, FL 32733
or fax completed registration form with credit card info to (407) 671-7757 (secure fax).

For more information, call 1-800-881-6822 or (407) 671-7777