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www.gasinfusion.com
www.isocinfo.com

24 Bay View Avenue, Plymouth MA USA 02360
T 508 732-0121 • F 508 732-0122 • E jim.begley@inventures.ca

June 23, 2006

Mark E. McGary, P.E.
Duke Energy Corporation
PO Box 1006
Charlotte, NC 28201

**Re: iSOC® PILOT TEST FOR SPARTANBURG – PINE STREET MGP SITE SPARTANBURG, SOUTH CAROLINA**

Dear Mark:

As requested the following outline has been prepared for a proposed pilot test of the iSOC® system for the Pine Street MGP site. We understand that Groundwater at the site is contaminated with volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), with benzene and naphthalene being the primary contaminants of concern. The proposed pilot test will evaluate the feasibility of enhanced bioremediation of these contaminants at the site stimulated by the infusion of dissolved oxygen through monitoring/treatment wells.

**iSOC® Technology**

The iSOC® gas delivery system is based on inVenture's patented Gas inFusion technology, a unique method of infusing supersaturated levels of dissolved gas into liquids. At the heart of iSOC® is a proprietary structured polymer mass transfer device that is filled with micro-porous hollow fiber material that provides a large surface area for mass transfer (7000 m2/m3). The system efficiently delivers gas to groundwater by mass transfer without sparging.

In an aerobic bioremediation application, the iSOC® supersaturates the treatment well with low decay dissolved oxygen (DO), typically 40-200 PPM depending on the immersion depth of the iSOC® in groundwater. The dissolved gas is stable at the pressure delivered. A natural convection current established in the well by a designed release bubble from the top of the iSOC® fills the well with a uniform DO concentration. A curtain of DO rich water disperses around the well into the adjacent groundwater forming a treatment zone and enhanced bioremediation removes target contaminants. Placement of injection wells depends on site-specific conditions and treatment objectives. Treatment well screens typically span the full thickness of the contaminated groundwater zone. At this particular site, treatment wells will most likely be needed in

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the upper unconsolidated aquifer along with separate treatment wells screened in the bedrock.

iSOC® is constructed of high quality SS316 stainless steel, PVC and a polymer mass transfer device (iSOC module). iSOC® is 1.62" (41 mm) in diameter and 12.65" (321 mm) long with a barb connector for 0.167" ( or 4 mm) ID polyurethane tubing. The housings for the pressure and flow control unit and the drain plug are made from nylon. iSOC® has a lifting ring for connecting to a suspension line for insertion in 2" (50 mm) or larger monitoring wells. The unit is connected to a regulated supply of industrial-grade compressed oxygen.

Experience in the field has shown that in each treatment well where an iSOC® is installed, high levels dissolved oxygen levels are achieved with the concentration depending on the height of the water column in the well. Each atmosphere of pressure allows for a maximum of 40 ppm of dissolved oxygen. Oxygen is continuously infused into the aquifer over a period of several months to up to several years, as needed. During this time, a continuous supply of oxygen is infused into the groundwater system to provide significant enhanced degradation of hydrocarbons, including VOCs and SVOCs. Oxygen is infused from the iSOC® into the well at a typical rate of 15 to 20 cubic centimeters/minute delivering up to 34 grams of oxygen per day.

**Design/Proposal Assumptions**

Estimated costs for the pilot are summarized below. Two iSOC units would be provided for the pilot by inVentures Technologies. Final design, permitting, additional equipment and implementation services would be provided by your environmental consultant and/or remediation contractor. inVentures would continue to provide technical support services to advise you and your contractors as the pilot progresses.

Based on a review of site data, pilot operations focused on the vicinity of monitoring well MW-13 are recommended. Considering the relatively slow groundwater flow rate in both the overburden and bedrock units we believe both pilot treatment and performance monitoring can be achieved in the same wells. Based on the boring logs and MW-13S construction details, a new treatment well installation is recommended adjacent to MW-13S, screened from the water table at approximately 9 ft BLS to auger refusal depth at approximately 24 ft BLS. The existing MW-13S boring was terminated at approximately 15 ft BLS spanning only a limited vertical thickness of the overburden groundwater unit. Hi-flow screen is recommended for the treatment well to maximize groundwater exchange with the well. The existing MW-13D can be used as a pilot treatment well for the bedrock unit. The pilot operation would include the following steps:

- Installation of the overburden treatment well near MW-13
- Collection of baseline samples for contaminants of concern and additional parameters including ammonia, nitrate, phosphate, total and dissolved iron and manganese, carbon dioxide and petroleum degraders (BTEX degraders and naphthalene degraders). Low flow sampling with collection of field parameters including dissolved oxygen is recommended.
- Initiating iSOC treatment operations with iSOC units installed in the two target wells and operating the treatment system for a period of two to three months

- Discontinuing operation and sampling of groundwater from the treatment wells to evaluate bioremediation performance.

A general costing of the (2) iSOC pilot study including all necessary accessories and O2 usage for (1) year is included below. Cost to run the (2) iSOCs for additional time would run approximately $400-500 per year.

(2) iSOCs.....8,500.00
(1) dual phase regulator.....250.00
iSOC shipping.....235.00
Polyurethane tubing.....150.00
PVC conduit.....300.00
A shed to house O2.....500.00
O2 usage and canister rental.....500.00
Installation of tubing/iSOCs.....1,000.00 (est. 2 people one day)
TOTAL ESTIMATED PILOT COST.....$11,435.00*

* Consultants time on site and analytical costs are additional

If you have any questions, please call me at (508) 732-0121 (office) or (508) 360-2859 (cell).

Very truly yours,

*James F. Begley*

Jim Begley, LSP
inVentures Technologies Incorporated

CC

Aaron Archibald
Craig Marlow