



**FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION**

BOB MARTINEZ CENTER
2600 BLAIRSTONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

RICK SCOTT
GOVERNOR

JENNIFER CARROLL
LT. GOVERNOR

HERSCHEL T. VINYARD JR.
SECRETARY

January 31, 2013

Via Electronic Mail
Mike@EcoUSA.us

Michael Mangham
EcoUSA
5144 West Dartmouth Avenue
Denver, Colorado 80236

Re: KRIA-EcoUSA Industrial Water Purifier

Dear Mr. Mangham:

The Division of Waste Management (Division) hereby accepts the KRIA-EcoUSA Industrial Water Purifier (KRIA Ionizer) for the remediation of petroleum and other suitable contaminants in groundwater and soil, in situ and ex situ. Enclosure 1 contains regulatory information, and Enclosure 2 contains supplemental information.

Water enters the inlet port of the KRIA ionizer and emerges from the outlet port laden with ionized and dissolved oxygen, from which it can then be injected into the groundwater and soil for in situ remediation of contaminants, or to an ex situ treatment process that requires oxygen for the destruction of contaminants. The ionized oxygen (not ozone but rather oxygen that carries a negative charge) serves to make contaminants more readily available for treatment. The high concentration of dissolved oxygen serves to support aerobic contaminant-degrading microorganisms in the case of bioremediation, whether they are indigenous to the cleanup site or added as a commercial product. The source of the oxygen that the KRIA loads into the water passing through it is the atmosphere (79% oxygen, 21% nitrogen) but it first concentrates the oxygen to 93% by removing some of the nitrogen.

The Division does not provide endorsement of specific or brand name remediation products or processes, but it does recognize the need to determine their acceptability in the context of environmental regulations, safety and the protection of public health. For that reason, the Division issues an "acceptance" letter, not an approval. In no way shall an acceptance be construed as a certification of performance. Additionally, vendors, upon receipt of an acceptance, must market their product or process on its own merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace.

Remedial Action Plans that propose the use of an accepted product or process should include a copy of the acceptance letter in the plan's appendix, and reference it in the text of the document.

January 31, 2013

It is not a requirement that a particular remediation product or process have an official acceptance letter in order for it to be proposed in a site-specific Remedial Action Plan. The plan, however, must contain sufficient information about the product or process to show that it meets all applicable rules and regulations.

The Division reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Additionally, Division acceptance of any product or process does not imply it has been deemed applicable for all cleanup situations, or that it is preferred over other treatment or cleanup techniques in any particular case. A site-specific evaluation of applicability and cost-effectiveness must be considered for any product or process, whether conventional or innovative, and adequate site-specific design details must be provided in a Remedial Action Plan submitted for Department review and approval. If you have any questions, please contact Rick Ruscito at (850) 877-1133, extension 3722 or by e-mail at rruscito@ene.com.

Sincerely,



Rick Ruscito, P.E.
Ecology and Environment, Inc.
Petroleum Cleanup Section 6
Bureau of Petroleum Storage Systems



Rebecca S. Lockenbach
FDEP Section Leader
Petroleum Cleanup Section 6
Bureau of Petroleum Storage Systems

enc: (1) Regulatory Information
(2) Supplemental Information

c: Dale Gilbert, The TechBlue Center, P.O. Box 3594, Ponte Vedra, Florida 32004
dale@cleanwaterfront.net

Tom Conrardy, P.E. – FDEP/Tallahassee

History:

Rev. 0: 01/31/2013
PPL #461
ITR 65800
BurLab (1393)
INN_196

ENCLOSURE 1

REGULATORY INFORMATION

- a. Regulations: Users of the KRIA ionizer shall comply with all applicable regulations. Those that are likely to apply most frequently are listed in this paragraph. For purposes of an acceptance letter tailored to the KRIA ionizer, the applicable regulations can be divided into two categories. Category 1 contains those chapters of the Florida Administrative Code (F.A.C.) within the jurisdiction of the Division of Waste Management, for the cleanup of petroleum and hazardous wastes. One or more of the chapters in this first category will always apply when the KRIA ionizer is used in the cleanup of a contaminated site: 62-770, Petroleum Contamination Site Cleanup Criteria; 62-780, Contaminated Site Cleanup Criteria; 62-782, Dry Cleaning Solvent Cleanup Criteria; 62-785, Brownfields; and 62-777, Contaminant Cleanup Target Levels.

Category 2 contains those chapters that apply when the fluid exiting the KRIA ionizer is injected into the subsurface of a cleanup site, directly into the water table, or into the soil above the water table such that it reaches the underlying groundwater by percolation. These chapters of the Florida Administrative Code are within the jurisdiction of the Division of Water Resource Management, and they will apply in addition to those chapters within the jurisdiction of the Division of Waste Management when the fluid exiting the KRIA ionizer is injected into the subsurface: 62-520, Groundwater Classes, Standards, and Exemptions; 62-528, Underground Injection Control (UIC), particularly Part V, for Class V, Group 4 aquifer remediation projects; and 62-550, Drinking Water Standards.

- b. Underground Injection Control notification is required for category 2: Remedial Action Plans proposing the injection of KRIA water into an aquifer for in situ remediation shall include information pursuant to Rules 62-528.630(2)(c)1 through 6, F.A.C., for the inventory purposes of the UIC program. Reviewers of those plans, upon issuance of an enforceable Remedial Action Plan Approval Order, must submit a completed copy of the UIC inventory notification form to the UIC program in Tallahassee.
- c. Checkboxes on the UIC Notification form: The chemical composition of the KRIA water to be injected will determine whether it is necessary to seek permission for a temporary injection zone of discharge (ZOD). Even if the chemical composition is such that permission for a temporary injection ZOD is not needed, it is still necessary for reviewers to notify the UIC Section when an Approval Order has been issued for a Remedial Action Plan proposing the injection of KRIA water.

There are more than two checkboxes on the UIC Notification form but the Division of Waste Management anticipates that reviewers, when completing the form for the injection of KRIA water, will most often be choosing one of two possible checkboxes. Samples of those two checkboxes, as they appear on the UIC Notification form in use on the date of this KRIA acceptance, are shown below, along with instructions for deciding which checkbox applies.

Situation 1 - Direct one-time injection of clean KRIA water: If potable municipal water or potable groundwater was fed to the inlet of the KRIA, for the addition of ionized and

dissolved oxygen, then use the checkbox on the UIC Notification form labeled “No ZOD needed” as shown below if the outlet stream is to be injected, because it meets injection standards (i.e., clean enough to drink) and therefore does not need permission for a temporary ZOD.

- ☐ No ZOD needed. The fluid to be injected meets the primary and secondary groundwater standards of Chapter 62-550, F.A.C., and the minimum groundwater criteria of Chapters 62-520 and 62-777, F.A.C.

Situation 2 – Re-injection of the cleanup site’s own contaminated groundwater: If the cleanup site’s own contaminated groundwater was brought to the surface and fed to the inlet of the KRIA, for the addition of ionized and dissolved oxygen, then use the checkbox on the UIC Notification form labeled “ZOD permission by Rule 62-520.310(8)(c)” as shown below if the outlet stream is to be re-injected, because it is still contaminated, and therefore in need of permission for a ZOD.

- ☐ ZOD permission by rule 62-520.310(8)(c) [†], F.A.C., for the following contaminants of concern that exceed their groundwater standards in the fluid to be re-injected as part of a closed-loop re-injection system for which the approved Remedial Action Plan identifies zone size and duration, and groundwater monitoring:

Contaminants of concern: _____
Zone size (sq. ft.) _____ Duration (mos.) _____ Yes, monitoring addressed. ☐

- d. UIC and ZOD permits: Per Rule 62-528.630(2)(c), F.A.C., the issuance of an enforceable, site-specific Remedial Action Plan Approval Order by the Department for injection-type aquifer remediation constitutes the granting of a Class V injection well construction/clearance permit. And per Rule 62-520.310(8)(c), F.A.C., if a temporary ZOD is necessary, and permissible by way of that rule, then the issuance of the site-specific Remedial Action Plan Approval Order also constitutes the granting of permission for the temporary ZOD.
- e. General information about temporary ZODs: For groundwater remediation, the composition of an injected fluid must meet the primary and secondary drinking water standards set forth in Chapter 62-550, F.A.C., and the minimum groundwater criteria of Chapter 62-520, F.A.C., pursuant to UIC Rule 62-528.600(2)(d), F.A.C. Injection-type aquifer remediation products (or in this case KRIA water) that do not meet these requirements must seek relief from water quality criteria by one of two mechanisms. Permission for a temporary ZOD may be obtained via Rule 62-520.310(8)(c), F.A.C. If a ZOD cannot be obtained by rule, it will be necessary to seek a variance from Department rules in accordance with Section 120.542, Florida Statutes.

Rule 62-520.310(8)(c), F.A.C., allows for a temporary ZOD for closed-loop re-injection systems, for the prime constituents of the reagents used to remediate site contaminants, and for groundwater secondary standards. In order to obtain permission for a temporary ZOD by rule, a site-specific Remedial Action Plan must indicate: (a) the chemicals of concern in the fluid to be injected that will be present in excess of groundwater standards; (b) the size of the

ZOD that is needed; (c) the amount of time that the ZOD will be needed; and (d) a plan for monitoring the injected chemicals of concern. The size of the temporary ZOD will usually be the injection well radius of influence when the treatment system is a single injection point. For a multiple point system, the ZOD can usually be expressed and illustrated as the total area of the cluster formed by all the injection points, located side-by-side with overlapping radii of influence.

Upon expiration of the time period granted for a ZOD, the concentration of each chemical for which a ZOD was permitted must meet its respective groundwater standard or its natural-occurring background value at the specific cleanup site, whichever is less stringent. In the case of re-injected KRIA water containing petroleum and/or hazardous waste contaminants of concern that are not naturally present in groundwater, the "less stringent" option does not apply.

- f. Specific ZOD information for re-injection of KRIA water: For situation 2 above, in which the site's own contaminants are present in the KRIA water to be re-injected, site-specific Remedial Action Plans shall indicate the injection flow rate and the period of time over which the injection will occur (from which the total volume to be re-injected can be calculated by multiplication) and the concentrations of the site's contaminants of concern in the re-injection fluid, and seek permission for a temporary ZOD by way of Rule 62-520.310(8)(c), F.A.C., as described in paragraph e above. Since the concentrations of contaminants in the re-injection fluid will change constantly as they decrease over the life of the cleanup, it may not be possible to predict the rate of decrease in advance, with certainty, when seeking permission for a ZOD, and for UIC Notification purposes. One possible and prudent way to express the concentrations would be a worst case assumption that the concentration of each contaminant in the re-injection fluid is equal to its highest concentration in the groundwater at the cleanup site, prior to startup of the KRIA, and that it does not decrease with time. Although it is unlikely that such a worst case assumption would come to fruition, it does ensure that all possible contaminants are covered at all times for the purposes of ZOD permission and UIC Notification.
- g. Utilization of wells: If a remediation site happens to have an abundance of monitoring wells, then the Division has no objection to the use of some wells for the injection or re-injection of KRIA water. However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to inject KRIA water. This will avoid premature conclusion that the entire site meets cleanup goals. By making sure that designated tracking wells are not also used for treatment, there will be more assurance that the treatment process has permeated the entire site and that it did not remain localized to the area immediately surrounding each injection well.
- h. Avoidance of migration: For injection-type, in-situ aquifer remediation projects, pursuant to Rule 62-528.630(3), F.A.C., injection of KRIA water shall be performed in such a way, and at such a rate and volume that no undesirable migration of the cleanup site's contaminants, the chemicals of concern in the injection fluid, or remediation byproducts results.

- i. Abandonment of wells: Upon issuance of a Site Rehabilitation Completion Order, injection wells shall be abandoned pursuant to Section 62-528.645, F.A.C., and the Underground Injection Control Section of the Department shall be notified so that the treatment wells can be removed from the injection well inventory-tracking list.
- j. Open-pit application: If the depth to which a pit has been excavated is sufficient to expose a site's contaminated groundwater, and the KRIA ionizer is used to treat that water, the application is not an injection, and notification of the UIC Section is not required.
- k. Additives: If KRIA water, prior to direct injection or re-injection as discussed in paragraph c above, is amended with treatment chemicals and/or commercial remediation products, then the site-specific Remedial Action Plan proposing this type of cleanup strategy must include a complete chemical description of their composition, their physical properties, the concentration of the additive(s) in the fluid to be injected or re-injected, the volume of the fluid to be injected or re-injected, and seek permission for a temporary ZOD as described in paragraph e above if the fluid does not meet primary, secondary, and minimum groundwater standards. Upon expiration of the time period for which a temporary ZOD is granted, the residual concentrations of the treatment chemicals and the commercial remediation products, and any byproducts of concern produced by chemical and biological reactions induced by them must meet their applicable groundwater cleanup target levels, or their natural-occurring concentrations at the cleanup site, whichever is less stringent.

ENCLOSURE 2

SUPPLEMENTAL INFORMATION

- a. KRIA ionizer performance summary (from KRIA publications):
- Flow rate: 60-600,000 gallons per day
 - Dissolved oxygen level of the outlet stream: Up to 12.8%
 - Concentration of negative ions in the outlet stream: Up to 1,145,000 ions per milliliter.
 - pH of the outlet stream: The pH of the water fed to the KRIA is not affected.
- b. KRIA-USA, at the request of the Division of Waste Management during its review of the KRIA ionizer, provided additional information and clarifications, which the Division would like to pass along.
- The KRIA ionizer produces negatively charged oxygen, and it increases the dissolved oxygen content of the water that passes through it. It does not produce ozone, and there is no electrolysis of water involved.
 - The KRIA ionizer produces a single outlet stream of water containing ionized and dissolved oxygen. It is not like a household water ionizer that produces two outlet streams, with one being alkaline, and the other being acidic.
 - The pressure of the KRIA's outlet stream is approximately 35-40 pounds per square inch. The Division suggests that designers of Remedial Action Plans contact EcoUSA about pressure requirements if the KRIA will be the only source of pressure to force the ionized water into injection or re-injection wells for in situ treatment of contaminated groundwater and soil.
- c. Volatilization: The Division of Waste Management does not anticipate that contaminants will be volatilized when the outlet stream of the KRIA, laden with ionized and dissolved oxygen, is injected or re-injected into a contaminated aquifer during a cleanup. If significant volatilization does occur, then the problem might possibly be addressed by making adjustments at the KRIA ionizer itself, if adjustments are possible, or by the installation of a vapor extraction system at the cleanup site.