



Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Noah Valenstein
Secretary

November 30, 2017

Via Electronic Mail to Bill Newman at BNewman@masinc.com

Mr. William Newman
RNAS Remediation Products
6712 West River Road
Brooklyn Center
Minnesota 55430

Re: **Neutral Zone®**
The FDEP Innovative Technology Application Number: 1496

Dear Mr. Newman:

The Florida Department of Environmental Protection's Division of Waste Management (Division) hereby accepts Neutral Zone® product for enhancing the in-situ bioremediation of chlorinated hydrocarbons and other suitable contaminants in groundwater and soil. Common applications for the use of Neutral Zone® include maintaining a neutral pH during the anaerobic bioremediation for chlorinated solvents.

Enclosure 1 is a voucher for a confidential disclosure of the proprietary ingredients submitted by RNAS Remediation Products for Neutral Zone® formulations listed above. Enclosure 2 contains regulatory information. Enclosure 3 provides supplemental information.

For vadose remediation, where the underlying groundwater will not be affected by the leaching of Neutral Zone® formulation, there are no special concerns beyond those that would normally need to be addressed in preparing a Remedial Action Plan and conducting a cleanup in accordance with Chapters 62-780 and 62-777, F.A.C. However, for in situ groundwater remediation, via direct injection of Neutral Zone® product into an aquifer, there are underground injection control regulations that must be observed. Since injection-type, in situ aquifer remediation is likely to be the most common application of Neutral Zone® formulation, the bulk of the regulatory requirements discussed herein will be directed to that topic.

While the Florida Department of Environmental Protection (FDEP) does not provide endorsement of specific or brand name remediation products or processes, it does recognize the need to determine their acceptability from an environmental standpoint with respect to applicable rules and regulations, and the interests of public health safety. Vendors, upon receipt of an acceptance, must market their product

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or process on its merits regarding performance, cost, and safety in comparison to competing alternatives in the marketplace. This acceptance letter shall not be construed as either an approval of the product or a certification of its performance.

Additionally, Department 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.

It is not a requirement that a remediation product or process obtain an acceptance from the Department in order to be proposed for use in a site-specific Remedial Action Plan, but the plan must contain information to show that it meets all applicable and appropriate rules and regulations. For Neutral Zone® product listed in this letter, a copy of this acceptance letter containing regulatory compliance advice should be included in the appendix of each site-specific Remedial Action Plan that proposes its use.

The Department reserves the right to revoke its acceptance of a product or process if it has been falsely represented.

If you have any questions, contact Elena Compton at (850) 245-8911, through Mail Station 4580 at the letterhead address, or by e-mail at Elena.Compton@dep.state.fl.us.

Sincerely,



Elena Compton, M.S., P.E.
Professional Engineer II
PRP Team 2, FDEP
850-245-8911

Enclosures: (1) Voucher; (2) Regulatory Information; (3) Supplemental Information

ec: Brian Dougherty, Ph.D. – FDEP/Tallahassee - Brian.Dougherty@dep.state.fl.us

ENCLOSURE 1
VOUCHER

Neutral Zone®



**Florida Department of
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RNAS Remediation Products
6712 West River Road
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Minnesota 55430

Re: **Proprietary Ingredients Voucher for Neutral Zone®**

Dear Mr. Newman:

The Division of Waste Management hereby acknowledges the submittal of confidential disclosures dated September 5, 2017 (received September 13, 2017) and October 11, 2017 (October 11, 2017) by RNAS Remediation Products. The disclosures provided the proprietary ingredients and their concentrations in Neutral Zone®. Having reviewed the disclosures, the Division hereby vouches for the information.

Without this voucher for the disclosures and the advice provided by the Division in Enclosure 2 based on its review of all the ingredients, users of Neutral Zone® listed above would not know how to comply with the requirements of Rule 62-520.310(8)(c), Florida Administrative Code (F.A.C.) for a temporary Zone of Discharge.

For underground injection control purposes, aquifer remediation plans proposing the use of Neutral Zone® must indicate the volume and complete chemical composition of the fluid to be injected. Since the identities of some ingredients are proprietary, it will suffice to indicate just the overall volume, concentration of the Neutral Zone® product to be injected, and then provide a footnote indicating that the confidential disclosure dated September 5 and October 11, 2017, is already on file with the Division. Please direct questions regarding this voucher to Elena Compton at 850-245-8911.

Sincerely,

A handwritten signature in blue ink that reads "Elena G. Compton".

Elena Compton, M.S., P.E.
Professional Engineer II
PRP Team 2, FDEP
850-245-8911

1. Groundwater cleanup standards: The onus shall be on users of Neutral Zone® to ensure that all applicable groundwater standards will be met at the time of project completion for the contaminants of concern being remediated, and any by-products produced as a result of chemical or biochemical reactions induced or assisted by Neutral Zone® listed in the subject letter. The following chapters of the Florida Administrative Code (F.A.C.) are cited: Chapter 62-550, F.A.C., for primary and secondary water quality standards; Chapter 62-520, F.A.C., for groundwater classes and standards; Chapter 62-522, F.A.C., for groundwater permitting and monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapters 62-780 F.A.C., for cleanup criteria, allowance of alternative cleanup target levels and conditional closure requirements; and Chapter 62-777, F.A.C., for cleanup target levels.
2. Injection well permit: 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.
3. Underground Injection Control (UIC): Remedial Action Plans proposing injection-type aquifer remediation shall include the information required by Rules 62-528.630(2)(c)1 through 6, F.A.C., for the purposes of the UIC program. Reviewers of those plans, upon issuance of a Department-enforceable Remedial Action Plan Approval Order, must transmit this information to the UIC program in Tallahassee by submitting a completed copy of the "UIC Notification". The notification is in the form of a memorandum currently located on the Internet at www.dep.state.fl.us/waste/categories/pcp/pages/innovative.htm.
4. General information about temporary Zones of Discharge (ZOD): For groundwater remediation, the composition of a fluid to be injected 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. [and Chapter 62-777], pursuant to UIC Rule 62-528.600(2)(d), F.A.C. Aquifer remediation products that do not meet these requirements must seek relief from water quality criteria by one of two mechanisms as follows. Permission for a temporary ZOD may be obtained via Rule 62-520.310(8)(c), F.A.C. If permission for a ZOD cannot be obtained by rule, then 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 chemical ingredients 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 chemical ingredients 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 covered by all the injection points, located side-by-side with overlapping radii of influence.

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5. Site-specific Remedial Action Plans shall describe the volume and concentration of Neutral Zone® that will be injected.
6. Specific ZOD information for Neutral Zone®:
 - a. Obtain permission for a temporary injection ZOD by way of Rule 62-520.310(8)(c), F.A.C., for Sodium, Ethanol, Foaming Agents (nonionic surfactants), and TDS (Total Dissolved Solids).
 - b. For the ZOD parameters Sodium, Ethanol, Foaming Agents (nonionic surfactants), and TDS, reviewers of Remedial Action Plans, when filling out the UIC Notification memorandum, should check the box labeled as follows:
“☒ ZOD permission by rule 62-520.310(8)(c), F.A.C., for reagent chemical species and/or parameter(s) in the fluid to be injected (or re-injected) that exceed secondary groundwater standards. ...”.
7. Required UIC ZOD compliance monitoring for Neutral Zone®:
 - a. In order to comply with Rule 62-520.310(8)(c), F.A.C., the receiving groundwater must be monitored for Sodium, Ethanol, Foaming Agents (nonionic surfactants), and TDS.
 - b. Quarterly monitoring should suffice in most cases. Upon expiration of the time period granted for the ZOD by way of Rule 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their natural-occurring background values at the specific cleanup site, whichever is less stringent. Sodium is a primary groundwater contaminant, Ethanol is in a category of the minimum criteria standard, and Foaming Agents and TDS are secondary groundwater contaminants with current standards as follows: Sodium = 160 mg/L, Ethanol = 10 mg/L, Foaming Agents = 0.5 mg/L, and TDS = 500 mg/L.

Conditional closure is also allowable provided the closure criteria of Chapter 62-780.680, F.A.C. are met and there are no exceedances of a primary standard due to impurities in the product. Note that such conditional closure may require a modification of the size or duration of the ZOD. This modification must be approved in an enforceable order of the department, such as a conditional Site Rehabilitation Completion Order.

8. Analytical method for surfactants: Per Chapter 62-550, F.A.C., Standard Method 5540 (SM 5540) can be used to determine the concentrations of surfactants in water samples. Method SM 5540 C is for the measurement of anionic surfactant concentrations, and method SM 5540 D is for the measurement of nonionic surfactant concentrations.
9. Utilization of wells: If a remediation site happens to have an abundance of monitoring wells, then the Division of Waste Management has no objection to the use of some wells for the injection of Neutral Zone® if the wells are suitable for the purpose. However, no “designated” monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply Neutral Zone® product. This will avoid a premature conclusion that the entire site meets cleanup goals. By making sure that designated tracking wells are not used for treatment, there will be more assurance that the

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treatment process has permeated the entire site and that it did not remain localized to the area immediately surrounding each injection well.

10. Three categories of groundwater monitoring:

- a. Active remediation monitoring for a cleanup site's contaminants of concern: During the period of active remediation, groundwater shall be monitored in accordance with the requirements set forth in Section 62-780.700, F.A.C.
- b. Post Active Remediation Monitoring for a cleanup site's contaminants of concern: At least one (1) year of quarterly post remediation groundwater monitoring for the contaminants of concern shall be conducted at a minimum of two (2) wells: one located in the area of highest contamination, the other at the downgradient edge of the contamination plume, pursuant to Section 62-780.750, F.A.C.
- c. Monitoring of the UIC zone of discharge for Sodium, Ethanol, Foaming Agents, and TDS, as discussed in paragraph 6a (six a) above.

11. Injection operations:

- a. Avoidance of migration: For injection-type in-situ aquifer remediation projects, injection of Neutral Zone® shall be performed in such a way and at such a rate and volume that no migration of either the Neutral Zone® or the contaminants of concern in the aquifer or surface water results, pursuant to Rule 62-528.630(3), F.A.C.
- b. Underground Injection Control operating permit: Although an operating permit is not required for aquifer remediation wells pursuant to Rule 62-528.640(1)(b), and 62-528.640(1)(c), F.A.C., since no movement of the contamination plume is expected to accompany the treatment process, the Department requests that the information items listed in Rule 62-528.640(1)(b), F.A.C., be considered and included in Remedial Action Plan proposals as a matter of good and thorough design practice. Briefly summarized, they are: quality of water in the aquifer, quality of the injected fluid, existing and potential uses of the affected aquifer, and well construction details.

12. Abandonment of wells: Upon issuance of a Site Rehabilitation Completion Order or a declaration of "No Further Action", injection wells shall be abandoned pursuant to Section 62-528.645, F.A.C. The Underground Injection Control Section of the Department shall be notified so that the injection wells can be removed from the inventory-tracking list.

13. Open-pit application: There is no objection to the introduction of Neutral Zone® to an open excavation pit in which the groundwater has been exposed. Open-pit application is not injection, and it is not necessary to notify the Underground Injection Control Section, but this should not be construed as carte blanche to introduce to the pit any substance at any concentration with no regard to potential toxicological effects. The Division of Waste Management therefore recommends that the groundwater in the area of the pit be monitored for the same zone of discharge parameters that would have been monitored (if any) had the application actually been an injection.

1. Manufacturer/Distributor: RNAS Remediation Products – <http://rnasinc.com>
2. Description: Per the manufacturer's Safety Data Sheets and other provided information:
 - a) Neutral Zone® is a colloidal buffer that contains 50% food grade calcium carbonate by weight. In distilled water the sparingly soluble calcium carbonate may make a pH as high as 10.5, but when even a trace of acidity is present in water, soluble bicarbonate dominates the buffer system producing a pH of 8.5 or lower.
 - b) Neutral Zone® buffer solids are mobile at typical injection flow velocities, but not at typical ground water flow velocities. The solids are mobile during injection and then retained in the treatment area where they are needed. The sparingly soluble calcium carbonate may be available for years, but is rapidly converted to bicarbonate buffer in the presence of the acids released from the other bioremediation processes.
 - c) Common applications for the use of Neutral Zone® include maintaining a neutral pH during the anaerobic bioremediation of chlorinated solvents like perchloroethylene (PCE) and trichloroethylene (TCE). Many microbial processes produce acid including the fermentation of electron donors to volatile fatty acids such as acetic acid and the dechlorination of chloroethenes resulting in hydrochloric acid. Complete conversion chloroethenes to ethene requires the presence of *Dehalococcoides* (Dhc) bacteria and the Dhc bacteria are very sensitive to low pH. A pH below 6.25 may slow Dhc microbial growth and may result in little or no production of ethene. Addition of a buffer such as Neutral Zone® should facilitate maintaining an optimal pH between 6.5 and 8.5.
 - d) The typical injection concentration of Neutral Zone® formulations is between 2% solids (or 4% undiluted Neutral Zone). The typical maximum injection concentration of Neutral Zone® is 4% solids (or 8% undiluted Neutral Zone®).