FLORIDA DEPARTMENT OF
Environmental Protection

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

Ron DeSantis
Governor

Alexis A. Lambert
Secretary

April 25, 2025

Via Electronic Mail JFreim@Regenesis.com

John Freim
Director of Material Science
Regenesis Bioremediation Products, Inc.
1011 Calle Sombra
San Clemente, CA 92673

Re: **PlumeStop®**
Innovative Technology Application Acceptance Letter

Dear Mr. Freim:

The Florida Department of Environmental Protection's Division of Waste Management (Division) hereby accepts *PlumeStop*® (a proprietary activated carbon-based technology) for in-situ remediation of groundwater and saturated soil impacted by contaminants of concern.

PlumeStop® must be diluted to at least 15% concentration by weight prior to injections into the aquifer, approximately to 1:6 (1 part of the solution of *PlumeStop*® to 6 parts of water by weight).

Due to the presence of activated carbon in *PlumeStop*®, the attached "Sampling Protocol for Petroleum Cleanup Projects Using In-Situ Activated Carbon Injections" is required to be followed when *PlumeStop*® is implemented on petroleum cleanup and non-petroleum cleanup projects.

Enclosure 1 is a voucher for a confidential disclosure of the proprietary ingredients submitted by Regenesis. Enclosure 2 contains regulatory information.

For in-situ injections of *PlumeStop*® there are underground injection control regulations that must be observed.

For vadose zone remediation, such as soil blending, the underlying groundwater may be affected by the leaching of the *PlumeStop*® formulation. Although this remediation approach is not subject to the regulatory requirements of Chapters 62-528 and 62-520, Florida Administrative Code (F.A.C.), a regulatory advisory for Remedial Action Plan preparers and reviewers is included in Enclosure 2 for assistance with compliance with Chapters 62-780 and 62-777, F.A.C.

The Florida Department of Environmental Protection (FDEP) does not provide endorsement of specific or brand name remediation products or processes, however, 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 are responsible for marketing their product 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 any particular cleanup situation, or that it is preferred over other treatment or cleanup techniques. A site-specific evaluation of applicability should 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 *PlumeStop®* 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 any component has been falsely represented.

This acceptance letter is valid for a period of ten (10) years from the issuance date above. At the end of the ten-year period, the acceptance can be renewed subject to an updated review of the product's use and formulation. The purpose of the updated review is to determine if the use conditions and monitoring requirements for this product need to be modified.

If you have any questions, contact Elena Compton at (850) 245-8911, through Mail Station 4535 at the letterhead address, or by e-mail at Elena.Compton@FloridaDEP.gov.

Sincerely,

Elena Compton

Digitally signed by Elena Compton
Date: 2025.04.25 11:48:29 -04'00'

Elena Compton, M.S., P.E.
Professional Engineer III
District Support Program, FDEP
850-245-8911

Enclosures: (1) Voucher; (2) Regulatory Information, (3) Sampling Protocol for Petroleum Cleanup Projects Using In-Situ Activated Carbon Injections

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John Freim
Director of Material Science
Regenesis Bioremediation Products, Inc.
1011 Calle Sombra
San Clemente, CA 92673

Re: **Proprietary Ingredients: *PlumeStop®***

Dear Mr. Freim:

The Division of Waste Management hereby acknowledges the submittal of a confidential disclosure by Regenesis. The disclosure provided the proprietary ingredients and their concentrations in *PlumeStop®* 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 *PlumeStop®* would not know how to comply with the requirements of paragraph 62-520.310(8)(c), Florida Administrative Code (F.A.C.), for a temporary Zone of Discharge.

For underground injection control purposes, remediation plans proposing the use of *PlumeStop®* 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 just specify the overall volume and concentration of *PlumeStop®* and then provide a footnote indicating that the confidential disclosure and analytical results were received on January 25, 2025. Please direct questions regarding this voucher to Elena Compton at 850-245-8911.

Sincerely,

Elena Compton

Digitally signed by Elena Compton
Date: 2025.04.25 11:48:14 -04'00'

Elena Compton, M.S., P.E.
Professional Engineer III
District Support Program, FDEP

1. Groundwater cleanup standards: The onus shall be on users of *PlumeStop*® 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 byproducts produced as a result of chemical reactions induced or assisted by *PlumeStop*®. 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, for groundwater permitting, and for monitoring requirements; Chapter 62-528, F.A.C., for underground injection control, particularly Part V, for Class V, Group 4 aquifer remediation projects; Chapter 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 paragraph 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 subparagraphs 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 for sites that are impacted with contaminants of concern is in the form of a memorandum currently located on the Internet at https://floridadep.gov/waste/district-business-support/documents/uic-notice-remediation-products

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, F.A.C.], pursuant to UIC paragraph 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 paragraph 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.

   Paragraph 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.

5. Upon expiration of the time-period granted for the ZOD by way of paragraph 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their site-specific background values, whichever is less stringent.

   Conditional closure is also allowable provided the closure criteria of Rule 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.

6. Site-specific Remedial Action Plans shall describe the volume and concentration of *PlumeStop*® that will be injected.

7. Specific ZOD information for *PlumeStop*®*:*

   - Prior to injections:

   a. *PlumeStop*® must be diluted to at least 15% concentration by weight prior to injections into the aquifer, approximately to 1:6 (1 part of the solution of *PlumeStop*® to 6 parts of water by weight).

   b. *PlumeStop*® must be diluted to at least 15%.

   c. Please note: Chapter 62-528, F.A.C, requires that the quality of the fluid (or non-liquid substance) introduced to the sub-surface be compared to the primary and secondary drinking water standards and the minimum criteria for groundwater before it is injected (i.e., before it is diluted by the receiving groundwater). A non-compliance with dilution of *PlumeStop*® to at least 15% prior to its introduction into aquifer, may result in a violation of

      a. Primary drinking water standard for **fluoride** (4,000 micrograms per liter [ug/L]),
         Primary drinking water standard for **mercury** (2 ug/L),
         Primary drinking water standard for **sodium** (160,000 ug/L)
         Primary drinking water standard for **thallium** (2 ug/L),
         Secondary drinking water standard for **chloride** (250,000 ug/L),
         Secondary drinking water standard for **fluoride** (2,000 ug/L),
         Secondary drinking water standard for **iron** (300 ug/L), and
         Secondary drinking water standard for **sulfate** (250,000 ug/l).

      b. The outlined above parameters (fluoride, mercury, sodium, thallium, chloride, iron, and sulfate) are not the ZOD monitoring parameters - but they should be included in the baseline sampling and then annually following treatment to demonstrate and verify compliance with Chapter 62-528, F.A.C.

   d. For the ZOD parameter: **aluminum** shall be monitored.

e. If *PlumeStop*® is proposed to be delivered into the aquifer via injection wells, reviewers of Remedial Action Plans should check the box as shown below when filling out the UIC Notification memorandum:

"☐ *ZOD permission by paragraph* 62-520.310(8)(c), F.A.C., for <u>*reagent*</u> *chemical species and/or parameter(s) in the fluid to be injected (or re-injected) that exceed secondary groundwater standards. …".*

f. If *PlumeStop*® is proposed to be delivered into the aquifer by means other than injection wells (for example, most excavations [except by large diameter augers], infiltration galleries, trenches, etc.), the UIC Notification memorandum is not required to be filed but monitoring for the UIC parameters is required.

g. Required UIC ZOD compliance for *PlumeStop*® to comply with paragraph 62-520.310(8)(c), F.A.C.: <u>pre-injection dilution at least to 15% by weight</u>.

8. The attached "Sampling Protocol for Petroleum Cleanup Projects Using In-Situ Activated Carbon Injections" is required to be followed when *PlumeStop*® is implemented on <u>petroleum cleanup and non-petroleum cleanup projects</u>.

9. Quarterly monitoring should suffice in most cases. Upon expiration of the time period granted for the ZOD by way of paragraph 62-520.310(8)(c), F.A.C., the concentrations of the above referenced analytes must meet their respective groundwater standards or their site-specific background values, whichever is less stringent, or appropriate controls are put in place to allow conditional closure under Rule 62-780.680, F.A.C.
    a. **Aluminum** is a secondary drinking water pollutant with the following standard: Al = 200 ug/L.

10. Utilization of wells: If a remediation site has sufficient monitoring wells, then the Division of Waste Management has no objection to the use of some existing monitoring wells for the injection of *PlumeStop*® However, no "designated" monitoring well, dedicated to the tracking of remediation progress (by sampling) shall be used to apply *PlumeStop*®. Nor shall wells be used for the injection of *PlumeStop*® as dedicated wells for tracking remediation progress. This will avoid a premature conclusion that the site meets cleanup goals. By making sure that designated tracking wells are not 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.

11. Baseline Sampling: Baseline sampling (prior to any injection) for the ZOD monitoring parameters (and the impurities) is not required but is strongly recommended. The baseline sampling data is very useful for evaluating when the aquifer has returned to the pre-injection conditions. Analyses for <u>aluminum, fluoride, mercury, sodium, thallium, chloride, iron, and sulfate</u> must be included in the baseline sampling.

12. 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 of the approved RAP as set forth in Rule 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 Rule 62-780.750, F.A.C.

c. Quarterly monitoring of the UIC zone of discharge: When *PlumeStop*® is utilized, in order to comply with paragraph 62-520.310(8)(c), F.A.C., the ZOD shall be *PlumeStop*® monitored for **aluminum**, as discussed in paragraph 7c above.

d. Annual monitoring for **aluminum, fluoride, mercury, sodium, thallium, chloride, iron,** and **sulfate** treatment to demonstrate and verify compliance with Chapter 62-528, F.A.C., as discussed in paragraph 7b above.

13. Injection operations:

a. Avoidance of migration: For injection-type in-situ aquifer remediation projects, injection of *PlumeStop*® shall be performed in such a way and at such a rate and volume that no migration of *PlumeStop*® ® (beyond the ZOD) or the contaminants of concern in the aquifer, or surface water, results, pursuant to subsection 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 paragraphs 62-528.640(1)(b) and (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 paragraph 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 the quality of water in the aquifer, quality of the injected fluid, existing and potential uses of the affected aquifer, and well construction details.

14. 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 Rule 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.

Sampling Protocol for Petroleum Cleanup Projects Using In-Situ Activated Carbon Injections

During the course of evaluating petroleum contaminated sites for closure, there is some question as to how we can ensure that any injected product has completed the remediation of the groundwater contamination and that there is no residual contamination that could result in a rebound in groundwater concentrations after the site is closed. A key component of this assurance is a demonstration that the product has reacted completely or that insufficient contaminant mass remains to cause a rebound. For reactive products, this can be a straightforward demonstration that the reactants are no longer present. For products that work by adsorbing contaminants, whether to permanently immobilize or to provide a substrate for breakdown, it is more difficult to evaluate.

To help ensure that remediation is complete, the following sampling and monitoring protocol should be used on all petroleum/hydrocarbon contaminated sites where when using products that employ adsorption to injected activated carbon as part of the treatment process at a site. This protocol eliminates concerns that residual contamination could cause rebound after the site is closed. This protocol is in addition to the product-specific use and monitoring requirements in the Innovative Technology (IT) acceptance letter. The current list of IT products known to be subject to this protocol follows below.

Cleanup Stage	**Comments**	**Sampling**
Prior to Injection for Pilot Test and Active Remediation (Baseline)	This should be the level of contamination in both matrices in equilibrium at that time. Include total organic carbon (TOC) in soil and CO_2 and methane in groundwater for baseline sampling.	3-5 saturated soil and groundwater samples*
When Groundwater reaches Cleanup Target Levels and PARM begins	Not verifying that soils have reached any target but at this new equilibrium, it should show that whatever contamination remains on soil is not contributing to groundwater contamination because the groundwater concentrations are remaining steady or decreasing.	3-5 saturated soil and groundwater samples. Include TOC in soil and CO_2 and methane in groundwater.
When Groundwater Maintains Cleanup Target Levels for 1 Year	Monitor GW for a year, and if it stays at or below cleanup target levels, the site can move forward with Risk Management Option I under 62-780, F.A.C., unless Soil levels exceed those at the beginning of PARM.	3-5 saturated soil and groundwater samples. Include TOC in soil and CO_2 and methane in groundwater

* Saturated soil and groundwater samples should be collected in area of highest contamination based on pre-injection concentrations. This table only lists the additional sampling, contaminants of concern, Underground Injection Control parameters, and secondary drinking standards are still evaluated as with all other petroleum sites. Sample collection and analysis should follow standard protocols.

Additional comments

1. The 3-5 soil samples from each campaign are intended to be replicates of the previous sampling events. Each of the 3-5 samples should be collected at roughly the same location and discrete depth within the targeted carbon-treatment saturated zone.
2. Collected samples should also be analyzed for the petroleum contaminants of concern that were present prior to the initial treatment.

3. Variability in the soil sample results is expected. An estimate of that variability can be derived from the baseline sampling and that estimate can be used to calculate the expected error range for subsequent sample events.
4. Pilot Test Plans and Remedial Action Plans for petroleum sites that include in-situ injection of activated carbon injections should incorporate this sampling protocol.
5. For sites where in-situ injection of activated carbon has occurred but the PARM Plan has not yet been approved, then the additional soil sampling outlined in rows 2 and 3 of the table will be incorporated into the PARM plan.
6. For sites where post in-situ injection of activated carbon PARM has already begun via an approved PARM Plan or an Approved Purchase Order with PARM Sampling scoped, then the additional soil sampling will not be performed.
7. For any questions about this protocol please e-mail ODBS_Review@FloridaDEP.gov.

List of Accepted Innovative Technologies Subject to the Sampling Protocol for Petroleum Projects Utilizing In-Situ Activated Carbon Injections (as of July 19, 2022). This list may be amended or expanded as information on these or other technologies becomes available.

#	**Technology Name**	**IT Acceptance #** (linked to letter)	**IT Acceptance Date**
1.	Bioavailable Absorbent Media (BAM-C formulation)	1661	09/13/2019
2.	CarbonOx	1530	04/18/2016
3.	GR-320-IRC	1450	02/24/2014
4.	MetaFix (formulations I-3 and I-7A)	1487	10/20/2020
5.	Nutribind	1534	04/22/2016
6.	PetroFix with Electron Acceptor Blend – Regular and Nitrate Free	1833	05/14/2019
7.	PlumeStop Colloidal Biomatrix	1476	08/31/2015
8.	Trap & Treat BOS 100	1365	04/19/2007
9.	Trap & Treat BOS 200	1366	04/17/2007