



FLORIDA DEPARTMENT OF Environmental Protection

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

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

October 20, 2020

Via Electronic Mail to Patrick Hicks at patrick.hicks@peroxychem.com

Mr. Patrick Hicks, PhD
PeroxyChem LLC
One Commerce Square
2005 Market Street
Suite 3200
Philadelphia, PA 19103

Re: **MetaFix: only for I-3 and I-7A formulations**
The FDEP Innovative Technology Application Number: 1487

Dear Mr. Hicks:

The Florida Department of Environmental Protection's Division of Waste Management (Division) hereby accepts MetaFix I-3 and MetaFix I-7A for remediation of suitable contaminants in groundwater and soil. MetaFix I-3 and MetaFix I-7A are proprietary iron-based formulations that combine reduction with adsorption and precipitation of priority heavy metals.

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

For vadose remediation such as soil blending, the underlying waters may be affected by the leaching MetaFix I-3 and MetaFix I-7A formulations. This remediation approach is not subjected to the regulatory requirements of Chapters 62-528 and 62-520, Florida Administrative Code (F.A.C.). Therefore, only a regulatory advisory for a Remedial Action Plan preparers and reviewers is included in Enclosure 2 to ensure compliance with Chapters 62-780 and 62-777, F.A.C. For in situ groundwater remediation, via direct injection of MetaFix I-3 or MetaFix I-7A, 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 MetaFix I-3 and MetaFix I-7A, 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 or process on its merits regarding performance, cost, and safety in comparison to competing alternatives

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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 MetaFix I-3 and MetaFix I-7A, 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.

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, M.S., P.E.
Professional Engineer III
DBSP, FDEP
850-245-8911

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

Burlab # 1487

ENCLOSURE 1
VOUCHER

MetaFix I-3 and MetaFix I-7A



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PeroxyChem LLC
One Commerce Square
2005 Market Street
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Philadelphia, PA 19103

Re: **Proprietary Ingredients: MetaFix I-3
MetaFix I-7A**

Dear Mr. Hicks:

The Division of Waste Management hereby acknowledges the submittal of confidential disclosures, dated April 28, 2020 (received May 1, 2020) by PeroxyChem LLC. The disclosures provided the proprietary ingredients and their concentrations in MetaFix I-3 and MetaFix I-7A.

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 MetaFix I-3 and MetaFix I-7A 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 MetaFix I-3 and MetaFix I-7A 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 specify the overall volume and concentration of MetaFix I-3 and MetaFix I-7A and then provide a footnote indicating that the confidential disclosure dated April 28, 2020, 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 III
DBSP, FDEP

ENCLOSURE 2
REGULATORY INFORMATION

MetaFix I-3 and I-7A
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1. Groundwater cleanup standards: The onus shall be on users of MetaFix I-3 and MetaFix I-7A 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 MetaFix I-3 and MetaFix I-7A 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, 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; 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 https://floridadep.gov/sites/default/files/UIC-Notice-RemediationProducts-032411_PETROLEUM.pdf
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. 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.

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 MetaFix I-3 and MetaFix I-7A that will be injected.
7. Specific ZOD information for MetaFix I-3:
- a. The concentration of MetaFix I-3 in pre-injection fluids must not exceed 15% concentration.
 - b. For the ZOD parameters: arsenic, antimony, cadmium, iron, lead, manganese, thallium, fluoride, sulfate, and Total Dissolved Solids (TDS) shall be monitored. Reviewers of Remedial Action Plans should check the box as shown below when filling out the UIC Notification memorandum:
“☒ 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. ...”.
8. Specific ZOD information for MetaFix I-7A:
- a. The concentration of MetaFix I-7A in pre-injection fluids must not exceed 15% concentration.
 - b. For the ZOD parameters: arsenic, antimony, cadmium, cobalt, iron, lead, manganese, thallium, fluoride, sulfate, and TDS shall be monitored. Reviewers of Remedial Action Plans should check the box as shown below when filling out the UIC Notification memorandum:
“☒ 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. ...”.
9. Required UIC ZOD compliance monitoring for MetaFix I-3 and I-7A to comply with Rule 62-520.310(8)(c), F.A.C.:
- a. For MetaFix I-3, the receiving groundwater must be monitored for arsenic, antimony, cadmium, iron, lead, manganese, thallium, fluoride, sulfate, and TDS.
 - b. For MetaFix I-7A, the receiving groundwater must be monitored for arsenic, antimony, cadmium, cobalt, iron, lead, manganese, thallium, fluoride, sulfate, and TDS.

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10. 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, or appropriate controls are put in place to allow conditional closure under rule 62-780.680, F.A.C.
 - a. Arsenic, antimony, cadmium, lead, nickel, and thallium are primary drinking water contaminants with current standards as follows: arsenic = 10 ug/ L (microgram per liter), antimony chromium = 100 ug/L, lead = 15 ug/L, nickel = 100 ug/L, nitrite = 1,000 ug/L, nitrate = 10,000 ug/L, and sodium = 160,000 ug/L.
 - b. Iron, manganese, sulfate, and TDS are secondary drinking water pollutants with the following standards: iron = 300 ug/L, manganese = 50 ug/L, sulfate = 250,000 ug/L, and TDS = 500,000 ug/L.
 - c. Fluoride has primary and secondary drinking water standards: 4,000 ug/L and 2,000 ug/L respectively.
11. 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 MetaFix I-3 or MetaFix I-7A, 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 MetaFix I-3 or MetaFix I-7A. Nor shall wells used for the injection of MetaFix I-3 or MetaFix I-7A be used 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.
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 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:
 - (1) When MetaFix I-3 is utilized, in order to comply with Rule 62-520.310(8)(c), F.A.C., the ZOD shall be monitored for arsenic, antimony, cadmium, iron, lead, manganese, thallium, fluoride, sulfate, and TDS, as discussed in paragraph 7c above.

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- (2) When MetaFix I-7A is utilized, in order to comply with Rule 62-520.310(8)(c), F.A.C., the ZOD shall be monitored for arsenic, antimony, cadmium, cobalt, iron, lead, manganese, thallium, fluoride, sulfate, and TDS, as discussed in paragraph 8c above.

13. Injection operations:

- a. Avoidance of migration: For injection-type in-situ aquifer remediation projects, injection of MetaFix I-3 or MetaFix I-7A shall be performed in such a way and at such a rate and volume that no migration of MetaFix I-3 or MetaFix I-7A, 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 (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.
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.
15. Open-pit application: 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. There is no objection to the introduction of MetaFix I-3 or MetaFix I-7A to an open excavation pit in which the groundwater has been exposed, as long as at least six (6) parts of water are available for each one (1) part of MetaFix I-3 or MetaFix I-7A, aiming not to exceed 15% of MetaFix I-3 or MetaFix I-7A concentration in the pit. The Division of Waste Management also recommends that the groundwater in the area of the pit be monitored for the same zone of discharge parameters that would have been monitored, had the application actually been an injection.
16. For soil blending in vadose zone:
- a) Prior to considering MetaFix I-3, it is recommended to perform the following batch test: take one (1) part of MetaFix I-3, mix it with six (6) parts of soils that are proposed to be blended with. Collect two samples of the mix and analyze them for arsenic, antimony, cadmium, lead, nickel, manganese, and thallium, utilizing the Synthetic Precipitation Leaching Procedure (SPLP).
 - b) Prior to considering MetaFix I-7A, it is recommended to perform the following batch test: take one (1) part of MetaFix I-7A, mix it with six (6) parts of soils that are proposed to be blended with. Collect two samples of the mix and analyze them for arsenic, antimony, cadmium, cobalt, lead, nickel, manganese, and thallium, utilizing the Synthetic Precipitation Leaching Procedure (SPLP).

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- c) If no primary drinking water standards exceedances are reported and technology is selected for site remediation, the Division of Waste Management recommends that the groundwater in the area of the blended soils to be monitored for the same zone of discharge parameters that would have been monitored, had the application actually been an injection.