



**FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION**

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April 25, 2013

Via Electronic Mail

dt@cleaningupoil.com (Dennis Traina)

paula@cleaningupoil.com (Paula Cella)

Paula Cella
Oil Solutions International
35 Mill Street
Amityville, New York 11701

Re: Oil Solutions: In Powder and Liquid Forms

Dear Ms. Cella:

The Bureau of Petroleum Storage Systems (the Bureau) hereby accepts Oil Solutions encapsulation-type absorbent for the cleanup of petroleum contaminants. As your literature indicates, Oil Solutions can also be used for the encapsulation of other suitable types of hydrocarbons and contaminants, and that it is available as a powder or a two-step liquid. The resultant of its application, even for the two-step liquid, is the precipitation of low permeability, low leachability, solid agglomerates that are a matrix of amorphous silica-trapped micelles of the contaminant species. In the case of free product recovery, the solid is collected for disposal, and in the case of a soil cleanup, it can be left in place, the latter of which the Bureau discusses in Enclosure 1 from a regulatory standpoint. Enclosure 2 contains supplemental information.

This acceptance is applicable to the regulatory jurisdiction of the Bureau of Petroleum Storage Systems, which is the cleanup of petroleum contaminants pursuant to Chapter 62-770, Florida Administrative Code (F.A.C.), typically in the subsurface as a result of leaking underground storage tank systems. The Bureau is not responsible for applications of this product beyond its jurisdiction. Additionally, the Bureau does not endorse 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 Bureau issues an "acceptance" letter, not an approval. In no way shall such acceptance be construed as a certification of performance. Vendors, upon acceptance, must then 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 its entirety in the plan's appendix, and reference it in the text of

the document. It is not a requirement that a particular product or process have a general regulatory acceptance letter in order for it to be proposed in a site-specific Remedial Action Plan, provided the plan contains sufficient information about the product or process to show that it meets all applicable rules and regulations.

The Bureau reserves the right to revoke its acceptance of a product or process if it has been falsely represented. Additionally, Bureau 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 to the Department for review and approval. Please direct any questions about this acceptance to Rick Ruscito at telephone (850) 877-1133, extension 3722, or by e-mail at rruscito@ene.com.

Sincerely,



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



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

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

c: Tom Conrardy - FDEP/Tallahassee

REGULATORY INFORMATION

- a. Regulations: Chapters of the Florida Administrative Code (F.A.C.) that may be applicable, either in part or in their entirety, include but are not necessarily limited to 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 62-770, 62-780, 62-782, and 62-785, F.A.C., for cleanup criteria; and Chapter 62-777, F.A.C., for cleanup target levels.
- b. Interim Source Removal pursuant to Section 62-777.300, F.A.C.: It is not necessary to obtain prior approval from the Florida Department of Environmental Protection or one of its contracted local programs for the passive use of absorbents to recover free product as an Interim Source Removal in accordance with Rule 62-770.300(1)(b)1, F.A.C. An example of passive free product recovery using Oil Solutions powder would be the loading of it into retrievable socks that can be lowered into monitoring wells. The use of non-passive free product recovery methods without prior approval is not allowed by Section 62-770.300, F.A.C. Non-passive methods must be proposed as active remediation pursuant to Section 62-770.700, F.A.C., for approval by the Department prior to implementation.

It is also not necessary to obtain prior approval from the Department for the excavation of petroleum contaminated soil as an Interim Source Removal pursuant to Rule 62-770.300(3), F.A.C. The use of in situ chemical additives that will be left in place in conjunction with such excavation is not permitted, but Oil Solutions powder can be used to absorb free product that seeps into the pit if it is removed prior to backfilling. All other in situ applications in which Oil Solutions remains in place must be proposed as active remediation pursuant to Section 62-770.700, F.A.C., for approval by the Department prior to implementation.

- c. Disposal: Oil Solutions indicates that its microencapsulation technology will remediate hazardous waste to within most regulatory guidelines. In its literature it cites the results of analyses performed on the leachate obtained by Toxic Characteristic Leachate Procedure (TCLP) (EPA Method 1311) for applications of the product on 10W-30 motor oil, crude oil, and 1,1,1-trichloroethane. Per Solid Waste Management Facilities Rule 62-701.300(1)(b), F.A.C., recovered used oil as a result of spills or accidental releases can be disposed at a permitted, lined, Class I landfill. (Note. As of July 1, 2010, Class II landfills that receive an average of less than 20 tons of nonhazardous waste per day were no longer being permitted in Florida.) Spent Oil Solutions solid that is laden with encapsulated petroleum, much like petroleum-contaminated soil that is already being disposed at Class I landfills in accordance with Rule 62-701.520(4), F.A.C., must not be classifiable as a hazardous waste due to ignitability, corrosivity, reactivity and toxicity. See Chapter 62-730, F.A.C., Hazardous Waste, for additional information about hazardous waste classifications. The onus shall be on the user of Oil Solutions to properly dispose of the resultant solid-encapsulated matrix. If there is uncertainty about the status of the material, then perform a TCLP test to determine whether or not it requires disposal as a hazardous waste.

- d. In situ soil treatment: Site-specific Remedial Action Plans proposing the use of Oil Solutions powder and liquid for in situ treatment of petroleum contaminated soil pursuant to Section 62-770.700, F.A.C., shall be submitted to the Department for approval prior to implementation. The discussion below focuses on the cleanup criteria for soil.

Take confirmatory samples and review the analytical results to determine if each contaminant of concern has met its soil cleanup target level (SCTL), which is the lower of two values set forth in Table II of Chapter 62-777, F.A.C.: (1) the direct residential exposure level; and (2) the leachability target level based on groundwater criteria. The leachability-based target level is usually (but not always) the lower of the two values to be met. The contaminants of concern that are usually of interest during a cleanup pursuant to Chapter 62-770, F.A.C., include but are not limited to benzene, toluene, ethylbenzene, xylene, MTBE, TRPH, and a list of PAHs of which the most prevalent are usually naphthalene, 1-methylnaphthalene, 2-methylnaphthalene.

Unconditional meeting of the soil cleanup criteria: If the lower of the two values discussed above is met for a petroleum contaminant of concern, then the contaminant has been successfully and unconditionally remediated to both its exposure target level and its leachability target level. But if the contaminant's concentration is less than its direct exposure target value (meets), but greater than its leachability-based target value (does not meet), then use the Synthetic Precipitation Leaching Procedure (SPLP) Test (Method 1312) in an attempt to prove that the contaminant is not leaching into the underlying groundwater in unacceptable concentrations. If the contaminant passes the SPLP test then it has been successfully and unconditionally remediated with respect to both exposure and leachability.

Conditional meeting of the soil cleanup criteria: It appears that this outcome is most likely to occur when Oil Solutions is used for the in situ cleanup of soil, given its ability to quickly prevent the leaching of petroleum contaminants without necessarily having to reduce their concentrations. If the results of confirmatory sampling show that the concentrations of petroleum contaminants of concern in the treated soil are in excess of direct residential exposure target levels, then a conditional closure of the cleanup by way of a Site Rehabilitation Completion Order (SRCO) with Conditions is necessary, regardless of the degree to which Oil Solutions may have reduced their leachability. Even so, it may still be worthwhile to perform the Synthetic Precipitation Leaching Procedure (SPLP) Test (Method 1312) at this point on the specific contaminants that exceeded their leachability target, to prove that Oil Solutions is preventing them from leaching into the underlying groundwater in unacceptable concentrations. If these contaminants pass the SPLP test, then the SRCO with Conditions does not have to include an engineering control for the prevention of leaching, such as a surface cap. In order for the Department to issue an SRCO with Conditions, a site owner must agree to restrictions on the soil, and to actions that must be taken in the future if it is disturbed. Additionally, at some time in the distant future, if there is reason to believe that the petroleum contaminants entrapped by Oil Solutions have degraded to regulatory target levels, then the results of a resampling of the treated site can be presented to the Bureau along with a request to convert the conditional SRCO to an unconditional SRCO.

- e. Laboratory analysis: When soil is treated in situ by Oil Solutions, the result is not a monolithic solidification of the entire treatment area. Instead, the soil particles at the treatment site remain loose, with loose interspersed particles of the silica encapsulation matrix that --- per a photograph

shown in the Oil Solutions literature --- appear to be approximately 1/8th inch in diameter on average. It appears to the Bureau that a confirmatory sample will scoop up a representative mixture of the two types of particles, and that laboratory equipment can accommodate the particle size. But whether or not standard laboratory procedures and solvents are capable of extracting all of the petroleum from the encapsulation matrix particles for subsequent analysis is not known, as the main purpose of Oil Solutions is to immobilize the petroleum. Crushing to a finer grain size prior to extraction might produce a greater and more readily accessible surface area on which the extraction solvents can work, but accessibility alone might not guarantee that the solvents can overcome the attractive force that binds the petroleum to the silica. Nevertheless, an effort should be made to measure the concentration of the petroleum contaminants of concern in the treated soil, as the information can still be of use. For example: If the concentrations of petroleum contaminants are found to be in excess of direct residential exposure levels with an extraction efficiency suspected of being less than 100 percent, then the concentrations would be higher still, had the efficiency been 100 percent. If the concentrations of the petroleum contaminants of concern in confirmatory soil samples cannot be measured within an acceptable degree of certainty after in situ treatment by Oil Solutions, then it might be reasonable to make the conservative assumption that they are still present in excess of direct exposure cleanup target levels and seek closure by way of an SRCO with Conditions. If it is desired that the SRCO with Conditions not include an engineering control for the prevention of leaching, such as a surface cap, then attempt to show by way of SPLP Test 1312 that unacceptable levels of leaching will not occur.

- f. This approval does not extend to the application of Oil Solutions for in situ remediation of dissolved petroleum contaminants in groundwater, as more information about the bulk ingredients is needed: the concentration of the sodium silicate in the Step 1 liquid, and the specific types and concentrations of the acids in the Step 2 liquid. It appears from a search of the literature that information about other possible ingredients and their proportions may be needed, such as surfactants, dispersible polymers, water soluble hydrotropes, flocculants, and activating agents. This additional information would have to be evaluated to determine which chemical species, in addition to pH, would require zone of discharge (ZOD) permission for injection-type, in situ aquifer remediation. For injections in Florida, the chemical composition to be evaluated is that of the remediation fluid before it is injected, not after it is diluted by the receiving groundwater. Any ingredients of concern that are present in that fluid in excess of their groundwater standards must be granted permission for a temporary injection ZOD by way of Rule 62-520.310(8)(c), F.A.C., or by variance if the chemical composition of the fluid is such that it does not qualify for ZOD permission by rule. It is probably feasible to inject Oil Solutions two-step liquid into an aquifer for in situ encapsulation of dissolved petroleum hydrocarbons. The Bureau's first impression is that the greatest use of the product within the jurisdiction of Chapter 62-770, F.A.C., may be free product recovery, and the immobilization of petroleum contaminants in soil.

SUPPLEMENTAL INFORMATION

- a. Description: Per Oil Solutions International Material Safety Data Sheets, Oil Solutions Powder is a thermoplastic copolymer mixture. Oil Solutions liquid Step 1 is a water-soluble sodium silicate solution of pH 11.5 and specific gravity of 1.18. Liquid Step 2 is a blend of dilute acids and water of pH 3.6, and specific gravity of 0.91. The resulting pH after the two liquids are applied in a 1:1 volumetric ratio is neutral.
- b. Uses: On the surface of water, hard surfaces, and soil.
- c. Liquid: The two liquid parts of Oil Solutions are applied in 1:1 ratios. Upon mixing they change form and encapsulate petroleum into a solid silica matrix that can be collected for disposal, or left in place in the case of in situ soil treatment. See Enclosure 1 for considerations to be taken into account for the in situ treatment of soil.
- d. Powder: Oil Solutions Powder changes to the color of the spill on contact. It floats on water before and after use to facilitate collection and disposal. Instructions indicate that 30-60 minutes should be allowed for best absorption results. Oil Solutions International indicates that the powder can absorb more than ten (10) times its weight.
- e. Stability of the silica matrix: As literature by Oil Solutions and others indicate, silica microencapsulation matrices are a stable material.
- f. Degradation of the petroleum: While it is not possible for the Bureau to conduct an exhaustive literature search to perform a treatise on every product submitted for regulatory evaluation and acceptance, it does to the greatest extent possible attempt to identify additional information that may be helpful. It appears that silica microencapsulation-type technologies do not necessarily have to degrade hydrocarbons such as gasoline and diesel in order to work, but that some degree of oxidation may occur. Whether degradation continues once the hydrocarbons are encapsulated, and the rate of the degradation, are not known to the Bureau, but it seems reasonable to think that beneficial degradation might continue, albeit at a slower rate due to the protective effect of the encapsulation.