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# **OIL SPILL EATER II**

## **TECHNICAL INFORMATION**

### **Natural Biological Enzyme**



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## COMPANY HISTORY

The *Oil Spill International Corporation* (originally Sky Blue Chemicals) began operation in 1989. The OSEI Corporation manufactures and markets a bioremediation product, *Oil Spill Eater II*, which is an EPA listed liquid nutrient with enzymes for cleaning up hydrocarbons or other organic base contaminants.

OSE II is not a fertilizer or a bacterial product, but rather vigorously stimulates the growth of indigenous (local) bacteria, which bacteria, then devour the contaminant, with the only harmless residues left being carbon dioxide and water.

The OSEI Corporation is marketing OSE II throughout the world. All five branches of the United States Military use OSE II, and OSE II has also been used by the Canadian military.

OSE II has been used in clean ups in over 40 countries and has distributors in 35 countries.

Our overseas market is growing rapidly as the OSEI Corporation continues to prove to and demonstrate to new customers that *Oil Spill Eater II* is the most tested, most effective and efficient bioremediation product in the world.

We know you will agree that the information in this Technical Package contains the most thorough and extensive test data and application information published for any bioremediation product.

In this Package we show you why OSE II is so significantly better than bacterial products, fertilizers, nutrients, dispersants and surface washing agents. Even the U.S. Environmental Protection Agency proves to you that bacterial products and nutrients simply do not work.

We urge you to use *Oil Spill Eater II* for cleaning up hydrocarbon and virtually all organic based contaminants. We know you will find OSE II to be as effective as we claim.

Sincerely,

Steven Pedigo  
Chairman/CEO

OAL/eem



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April 25, 2002

## USING CONTRACTORS

It has been our experience in the U.S. since 1989, that cleanup contractors are reluctant to use OSE II because it is too cost effective and efficient.

One large contractor, who tested OSE II, said "It works great, but we make more money the old-fashioned way," i.e. using lots of labor, material, and time. Their preferred method is to dig and haul.

Unfortunately, when you "dig and haul" your contamination, all you have done is move your problem and you still own the contaminated soil!

Contractors should use OSE II. It would allow them to do a more effective cleanup and would allow them to earn more profit. They merely need to adjust the pricing structure from cost plus 10% to the cost of OSE II plus 10% for the labor, and equipment portion of the clean up. With OSE II there is a dramatic reduction in labor and equipment which allows a contractor to actually do a better more complete job, for less money to the responsible party, and more profit for the contractor.

Responsible parties should require that your cleanup contractors use OSE II! It will save you money and you eliminate your problem – permanently, instead of paying for a secondary clean up that just moves your problem.

Steven Pedigo  
Chairman/CEO OSEI Corporation

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## INTRODUCTION

This Technical Package contains a multitude of tests proving that ***“OIL SPILL EATER II”*** (OSE II) can rapidly and effectively mitigate hydrocarbons from Alaskan Crude Oil to BETX, as well as many other organic contaminants.

When comparing our product to competitors, we urge you to ensure you are comparing *“apples”* to *“apples.”* Please consider that OSE II:

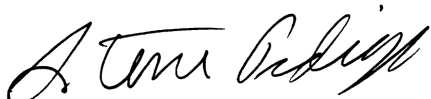
1. Is one of the ten biological products tested by the EPA at NETAC (National Environmental Technology Applications Center) listed at the University of Pittsburgh Applied Research Center. NETAC chose the ten best biological additives to test.
2. Has been tested by the EPA/NETAC as a biological agent and proved to biodegrade oil (hydrocarbons) and to be non-toxic. The attached EPA/NETAC Test Reports prove that OSE II does biodegrade oil (Alaskan Crude) and is non-toxic.
3. Does not just biodegrade “itself” and leave the hydrocarbon or contaminant. Many competitors are selling “soap” at \$600.00 per drum. OSE II does (in fact) biodegrade the contaminant.
4. Uses “indigenous” bacteria to biodegrade the hydrocarbon. OSE II grows indigenous bacteria rather than introducing foreign “bugs” into the local ecosystem.
5. Is not listed as a dispersant by the EPA, since a dispersant will simply break up the contaminant (oil) and sink the oil, but will not stimulate biodegradation.
6. Is not a fertilizer since ***“OIL SPILL EATER II”*** gives you the following benefits over using fertilizers:
  - A. COST CONTROL. We know how much “OSE II” is required on any given spill.
  - B. OWN CARBON SOURCE. OSE II contains its own carbon which aids in bacterial growth.

- C. BACTERIA. OSE II uses indigenous bacteria.
  - D. PRODUCT ADHERES TO OIL.  
OSE II molecularly adheres to hydrocarbons.
  - E. CATALYST. OSE II enzymes are catalysts for  
breaking down hydrocarbon walls and rapid bacterial growth.
  - F. REDUCES FIRE HAZARD 3 minutes after being  
applied.
  - G. REDUCES hydrocarbon's adhesion properties.
7. Is not a bacterial product since:
- A. Fresh diesel or other hydrocarbons will kill  
bacterial products.
  - B. Bacterial products cannot determine how much  
product to use.
  - C. Foreign bacteria and indigenous bacteria will fight  
each other for the food source, and the U.S. EPA  
claims the indigenous bacteria will overtake the  
added non indigenous bacteria.
8. Last, but very important, how much product do you need (cost)  
to biodegrade a gallon or cubic yard of contaminant? With OSE  
II you know exactly because the information is published in our  
literature.

We hope this will assist you in your decision process in purchasing a bioremediation product that is time, cost and environmentally effective. We urge you to go with a proven product ***"OIL SPILL EATER II"***.

Thank you for your consideration.

Sincerely,



Steven Pedigo  
Chairman/CEO  
OSEI Corporation

OAL/eem



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OIL SPILL EATER II  
May - 1993  
GENERAL DESCRIPTION

OIL SPILL EATER II is a unique Biocatalytic System of preformed multi-enzyme liquid concentrate. OIL SPILL EATER stimulates and accelerates natural biological reactions. When combined with fresh or salt water and oxygen, OSE II will cause crude oil and other organic substances to rapidly decompose; eventually biodegrading them to carbon dioxide and water.

OIL SPILL EATER II is non-toxic to humans, animals, plants and marine life. It is nonpoisonous, even if accidentally ingested. It is non-irritating to the most sensitive skin. OSE II contains no known allergens to cause skin, respiratory or other allergic reactions. Birds bathed in OSE II should be quarantined until their own natural oils are restored.

OIL SPILL EATER II is 100% Biodegradable. OSE II has a 5 year shelf life when stored at temperatures below 120 degrees F. Freezing does not harm OSE II; however, cold temperatures can slow it's reaction rate somewhat. The product is completely stable and reactive in a pH environment of 3.5 to 11.7.

OSE II contains no corrosive chemicals or metal trace elements, and will not damage electrical insulation or painted surfaces. No special protective clothing or safety equipment is required - as determined by OSHA - Anchorage, Alaska.

OSE II assists in controlling unpleasant odors associated with hydrocarbons. OSE II will destroy - not mask - odors through a natural Biodegradation process.

OSE II will reduce fire hazard once emulsification and the solubilization process is started. This process begins the instant OSE II is applied to crude oil, gasoline or spilled hydrocarbons.

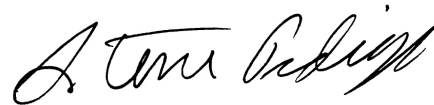
OSE II can be applied easily using a pumper-truck or fire hose, or even a pump-up hand sprayer. On water, OSE II can be applied by omni barge, helicopter, plane or any eductor system.

OSE II eliminates the need for skimmers and it eliminates the problem of disposal (cleans docks, driftwood, boats, rubber gear and shorelines) since No secondary cleanup is required because OSE II converts the hydrocarbons to CO<sub>2</sub> and water.

OIL SPILL EATER II  
May - 1993  
GENERAL DESCRIPTION  
(Continued)

#### AGE OF CONTAMINATED HYDROCARBONS

The older or more weathered hydrocarbon contamination increases the time for Bioremediation to occur. When contamination is exposed to the open air and weather, it can form a skin, similar to the way gelatin sets up. The older the hydrocarbon and the more it is exposed to the elements, the thicker the skin becomes; hence, eventually becoming asphaltene. The thicker this skin - the longer Bioremediation will take to reduce the contamination's TPH. Therefore, the sooner a contamination is addressed and mitigated, the contamination cleanup will be less expensive and less time consuming.



Steven R. Pedigo  
CEO/ Chairman  
OSEI Corporation

SRP/AJL



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## CHEMICAL PROCESS

February 1991

Once OIL SPILL EATER II is applied to a hydrocarbon spill, the enzymes and other product constituents start emulsification and solubilization of the hydrocarbon substrate. Emulsification and solubilization generally take from a few minutes up to a few hours for weathered heavy-end hydrocarbons, once OSE II is applied with a temperature of 40 degrees F. or greater. Once solubilization is completed, the hydrocarbon substrate is less toxic (and the hazard of fire is diminished) so the enhanced - naturally occurring bacteria will have a higher affinity for the solubilized hydrocarbon substrate.

NOTE: There is no hydraulic loading with the use of OSE II and therefore related hydrocarbons are not pushed into the lower depths of the water column. During these reactions, OSE II offers up a complete nutrient system to promote the rapid growth or colonization of naturally occurring indigenous bacteria.

OSE II is also formulated so that once application to the hydrocarbon substrate occurs, molecular adhesion takes place. This prevents OSE II from being removed from the hydrocarbons easily. The above reaction forms the substrate complex.

Once the outer molecular walls of the hydrocarbon substrate complex have been weakened or broken, then this allows bacteria better access to the hydrocarbon substrate. The nutrients in OSE II's product matrices (readily available nitrogen, phosphorous, carbon and vitamins) rapidly populate naturally occurring bacteria. There are certain product constituents to specifically enhance various hydrocarbon degrading bacteria.

The naturally enhanced hydrocarbon degrading bacteria rapidly populate until product nutrients are depleted, at which time they readily convert to the only food source left (the weakened or broken hydrocarbon substrate). The transition- state complex is when the enhanced naturally occurring hydrocarbon degrading bacteria start converting hydrocarbons to CO<sub>2</sub> and water.



Chemical Process (continued)  
February 1991

The enhanced naturally occurring hydrocarbon degrading bacteria convert the solubilized hydrocarbons to CO<sub>2</sub> and water which is the end point of the Bioremediation of the hydrocarbon substrate. Any OSE II product components left are 100% Biodegradable and will be used up naturally.

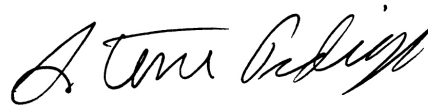
This process emulates mother nature completely!

NOTES:

OSE II's optimum temperature range is 40 degrees F. to 110 degrees F. - however OSE II is effective in the range of 28 degrees F. to 120 degrees F.

OSE II has a five (5) year shelf life if stored in a covered area where the temperature does not exceed 102 degrees F.

Our research has determined that the age and weathering of hydrocarbons (if weathered over 1 to 2 years) may slow Bioremediation somewhat.

A handwritten signature in black ink, appearing to read "Steven Pedigo".

Steven Pedigo  
CEO/Chairman  
OSEI Corporation

SRP/AJL



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## **EMULATING MOTHER NATURE**

### HOW BIOREMEDIATION OCCURS IN MOTHER NATURE

We would like to first explain what happens In Mother Nature when a hazardous material is spilled.

There is a myriad of bacteria everywhere, where the spill comes in direct contact with bacteria; that bacteria is killed or dies off. The bacteria that is proximal to the spill but not in direct contact, reacts in several ways.

First, the bacteria separate themselves far enough away so as to protect themselves from the toxicity of the spill.

Second, the bacteria then releases enzymes and bio surfactants to attack the spill.

Third, the bio surfactants emulsify and solubilize the spill. What this means IS the bio surfactants will break up the spill and partition the spill into a manageable consistency. This is also breaking down the molecular structure of the spill or detoxifying it, so it can be used as a food source.

The enzymes then form binding sites on the emulsified or solubilized spill and this is where the bacteria will initially attach themselves and start the digestive process. For this process to occur there has to be large amounts of bacteria, and it is a long process for bacteria to acclimate themselves to a spill. Then it takes time for the bacteria to release enzymes and surfactants. One of the limiting factors is the number of bacteria present to produce, and release enough enzymes and surfactants to get the process started. This is why you hear scientists talk about adding nutrients to jumpstart the rapid growth of bacteria so enough enzymes and bio surfactants can be released to affect the mitigation of the spill.

However, nutrients alone are limited because of concentration (washed away or diluted) and the time it takes to grow a large population of bacteria. Wouldn't it be nice if there was a means of emulating Mother Nature and at the same time speeding up the process to mitigate in hours or days what Mother Nature takes days, months and years to handle on her own?

Emulating Mother Nature continued

#### OIL SPILL EATER II

OIL SPILL EATER II (OSE II) contains the enzymes, bio surfactants, nutrients and other necessary constituents for complete life cycles and biodegradation. When OSE II is added to a spill, it is not necessary to wait on the proximal bacteria to release enough enzymes or bio surfactants since they are already supplied in our product. Therefore, the minute you apply OSE II, there is enough bio surfactant to start the emulsification and solubilization process. This process generally takes a few minutes to several minutes, depending on the consistency of the spill. As the bio surfactants do their job, the enzymes are attaching themselves to broken down hydrocarbon structures, forming digestive binding sites.

Note: Once this process has occurred, several things are true:

1. The fire hazard has diminished.
2. The toxicity of the spill is rapidly diminished.
3. The odor or smell is almost non-existent.
4. The oil or spill will no longer adhere to anything.
5. The spill is caused to float, OSE II will prevent the oil from sinking.

If the spill has not reached a shoreline yet, but does so after application, it will not adhere to sand, rock, wood, metal or any vegetation.

If the spill has already attached itself, once application occurs, the spill will be lifted from sand, rock, wood, metal or vegetation.

The spill is detoxified to the point, that indigenous (natural) bacteria can now utilize the oil as a food source. This also diminishes toxicity to marine organisms, birds or wildlife.

OSE II causes the oil to float on the surface of the water, which reduces the impact to the sub-surface - preventing secondary contamination of the water column or tertiary contamination on the floor of the body of water associated with the spill area. The spill being held on the surface will make it easy to monitor.

OSE II also has an extremely efficient nutrient system that is activated once you mix OSE II with natural water. While the spill is being broken down, detoxified the indigenous bacteria in the natural water used to mix OSE II starts rapidly colonizing or proliferating the growth of large numbers of indigenous bacteria. Once the bacteria run out of the OSE II readily available nutrients they convert over to the only food source left the detoxified spill. The spill is then digested to CO<sub>2</sub> and water. In some cases you can see bacteria growing on the spill, and the oil will be digested to CO<sub>2</sub> and water before your eyes on a contained spill. In laboratory test once you see the water in the test beaker or aquarium become turbid, you know it is only a matter of time before the contaminant is remediated to CO<sub>2</sub> and water.

Unlike mechanical cleanup, which cleans up a maximum of 20% of the oil spilled, OSE II will actually address 100% of a spill. This information is substantiated by the EPA's listing of OSE II on the National Contingency Plan for oil spills or the NCP list, which contains the efficacy test performed for the EPA at LSU University. You can see this information at [www.osei.us](http://www.osei.us), click in the icon that looks like a flower moving across the page. This will link you to the EPA's site with the OSE II listing, and information.

Oil Spill Eater II emulates (copies) mother nature's process exactly.

The US Congress mandated through the Clean Water Act, that the US EPA would keep a list of products that may be legally used on US Navigable waters

Link to the above regulation under the US Clean Water Act Law  
[http://www.epa.gov/oem/docs/oil/cfr/900\\_920.pdf](http://www.epa.gov/oem/docs/oil/cfr/900_920.pdf)

#### **Subpart J—Use of Dispersants and Other Chemicals**

SOURCE: 59 FR 47453, Sept. 15, 1994, unless otherwise noted.

##### **§ 300.900 General.**

(a) Section 311(d)(2)(G) of the CWA requires that EPA prepare a schedule of dispersants, other chemicals, and other spill mitigating devices and substances, if any, that may be used in carrying out the NCP. This subpart makes provisions for such a schedule.

(b) This subpart applies to the navigable waters of the United States and adjoining shorelines, the waters of the contiguous zone, and the high seas beyond the contiguous zone in connection with activities under the Outer Continental Shelf Lands Act, activities under the Deepwater Port Act of 1974, or activities that may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States, including resources under the Magnuson Fishery Conservation and Management Act of 1976.

(c) This subpart applies to the use of any chemical agents or other additives as defined in subpart A of this part that may be used to remove or control oil discharges.

##### **§ 300.905 NCP Product Schedule.**

(a) *Oil Discharges.* (1) EPA shall maintain a schedule of dispersants and other chemical or bioremediation products that may be authorized for use on oil discharges in accordance with the procedures set forth in § 300.910. This schedule, called the NCP Product Schedule, may be obtained from the Emergency Response Division (5202-G), U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Wash-

ington, DC 20460. The telephone number is 703-603-8760.

(2) Products may be added to the NCP Product Schedule by the process specified in § 300.920.

(b) *Hazardous Substance Releases.* [Re-served]

[59 FR 47453, Sept. 15, 1994, as amended at 65 FR 47325, Aug. 2, 2000] **§ 300.910**

How to get a product on the US EPA NCP list

## **The US Congress required the US EPA to keep a list of products that can be legally used on US Navigable waters, which is why there is a list of products.**

<http://www2.epa.gov/emergency-response/national-contingency-plan-subpart-j#howto>

### **Emergency Response**

#### **National Contingency Plan Subpart J**

One of EPA's top priorities is to prevent, prepare for, and respond to oil spills that occur in and around inland waters of the United States. EPA is the lead federal response agency for oil spills occurring in inland waters. The [U.S. Coast Guard](#) is the lead response agency for spills in coastal waters and deepwater ports. Subpart J of the [National Oil and Hazardous Substances Pollution Contingency Plan \(NCP\)](#) directs EPA to prepare a schedule of dispersants, other chemicals, and oil spill mitigating devices and substances that may be used to remove or control oil discharges.

#### [NCP Product Schedule](#)

[Environmental Monitoring for Atypical Dispersant Operations: Including Guidance for Subsea Application and](#)

[Prolonged Surface Application](#)

[Revisions to Subpart J of the NCP under Consideration](#)

[NCP Product Schedule Technical Notebook](#)

[How to List a New Product on the NCP Product Schedule](#)

[NCP Subpart J Regulations](#) [Effectiveness and Toxicity Testing](#) [Disclaimer Information](#) [For More Information](#)

The [NCP Product Schedule \(April 2014\) \(PDF\)](#) is also available for download in its entirety.

EPA maintains the NCP Product Schedule, which lists the following types of products that are authorized for use on oil discharges:

Bioremediation agents   Dispersants   Surface washing agents   Surface collecting agents   Miscellaneous oil spill control age

See [Definitions of Product Categories](#)   See [Alphabetical List of NCP Product Schedule Products with Links to Technical Product Summaries](#)

#### **Design for the Environment**

**Note:** Products may be eligible for recognition by EPA's [Design for the Environment \(DfE\) Program](#) as a safer oil spill treatment. The DfE Program labels products that have met its stringent criteria for human health and environmental

safety.

## NCP Product Schedule Technical Notebook

The [NCP Product Schedule Technical Notebook \(April 2014\) \(PDF\)](#) presents **manufacturer's** summary information on the conditions under which each of the products is recommended to be used. **Manufacturer** information may provide handling and worker precautions, storage information, recommended application procedures, physical properties, and toxicity, effectiveness, or other analyses.

**Disclaimer:** The listing of a product on the Product Schedule does NOT mean that EPA approves, recommends, licenses, certifies, or authorizes the use of the product on an oil discharge. The listing means only that data have been submitted to EPA as required by Subpart J of the National Contingency Plan, [Section 300.915](#). (Source: [40 CFR § 300.920](#) (e))

There is an established process that manufacturers must follow to have a product listed on the NCP Product Schedule.

Begin by reviewing data requirements in section 300.915 of Subpart J of the NCP Product Schedule.

Determine [product category](#) (e.g., dispersant, surface washing agent, etc.)

Fulfill each of the data requirements for selected product category, including effectiveness and toxicity testing (if applicable). If you need assistance locating a laboratory to help fulfill these requirements, please call the [NCP Product Schedule Information Line](#).

Send a hard copy of **all** data requirements for review to: NCP Product Schedule Manager U.S. Environmental Protection Agency Ariel Rios North Building - Mail Code 5104-A Room 6450T Washington, D.C. 20460

If you have further questions or require more information, please call the [NCP Product Schedule Information Line](#).

## Subpart J Regulations

EPA is currently making revisions to the Subpart J regulation to clarify and update the Product Schedule listing procedures. These updates may include effectiveness and toxicity testing. Once the proposed rule is posted to the docket, there will be a public comment period for providing questions and concerns. The compiled comments will be addressed in the final rule. Office of Management and Budget Agenda: [Revisions to the National Oil and Hazardous Substances Pollution Contingency Plan; Subpart J Product Schedule Listing Requirements](#).

[NCP Subpart J: Use of Dispersants and Other Chemicals - 40 CFR 300.900 - 300.920 \(PDF\)](#)

[NCP: Definitions - 40 CFR 300.5 \(PDF\)](#)

[Relevant Federal Register Notices](#)

## Effectiveness and Toxicity Testing

For the products on the schedule, EPA provides [NCP Product Schedule Toxicity and Effectiveness Summaries](#) for each product category. Appendix C to 40 CFR part 300 describes methods for required effectiveness and toxicity tests for specific product categories. See: [40 CFR part 300 Appendix C](#) | [PDF](#) (22 pp, 284 K, [About PDF](#))

The listing of a product on the NCP Product Schedule does not constitute approval of the product. To avoid possible misinterpretation or misrepresentation, any label, advertisement, or technical literature that refers to the placement of the product on the NCP Product Schedule must either reproduce in its entirety EPA's written statement that it will add the product to the NCP Product Schedule under Sec. 300.920(a)(2) or (b)(2), or include the disclaimer shown below. If the disclaimer is used, it must be conspicuous and must be fully reproduced. Failure to comply with these restrictions or any other improper attempt to demonstrate the approval of the product by any National Response Team (NRT) or other U.S. Government agency shall constitute grounds for removing the product from the NCP Product Schedule. [40 CFR 300.920(e)]

[PRODUCT NAME] is on the U.S. Environmental Protection Agency's NCP Product Schedule. This listing does NOT mean that EPA approves, recommends, licenses, certifies, or authorizes the use of [PRODUCT NAME] on an oil discharge. This listing means only that data have been submitted to EPA as required by subpart J of the National Contingency Plan, Sec. 300.915.

**The US Congress required the US EPA to keep a list of products that can be legally used on US Navigable waters, which is why there is a list of products.**





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

SEP 18 2009

OFFICE OF  
SOLID WASTE AND  
EMERGENCY RESPONSE

Mr. Steven Pedigo  
Chairman/CEO  
Oil Spill Eater International, Corp.  
P.O. Box 515429  
Dallas, TX 75251-5429

Dear Mr. Pedigo:

Thank you for providing the technical product data required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300, for your product "Oil Spill Eater II (OSE II)." Our review shows that your submission has satisfied the requirements contained in Title 40 of the CFR section 300.915 of the NCP. Therefore, "Oil Spill Eater II (OSE II)" will be listed on the NCP Product Schedule under the Bioremediation Agent category and may be authorized for use by Federal On-Scene Coordinators in accordance with 40 CFR section 300.910. The technical data for this product will be kept on file by the EPA Office of Emergency Management, Regulation and Policy Development Division pursuant to 40 CFR section 300.920.

Enclosed are some of the relevant provisions in the NCP on restrictions regarding the listing of your product. Please note that you are required to notify the Environmental Protection Agency (EPA) of any changes in composition, formulation, handling procedures, or application of your product. Based on this notice, EPA may require retesting of the product.

Also note that the listing of "Oil Spill Eater II (OSE II)" on the NCP Product Schedule does not constitute approval, certification, authorization, licensing or promotion of the product; nor does it imply compliance with any criteria or minimum standards for such agents. Failure to comply with these restrictions or the making of any improper reference to EPA in an attempt to demonstrate approval or acceptance of the product will constitute grounds for removal of the product from the schedule.

Please review the enclosed information and contact Ms. Leigh DeHaven in the Office of Emergency Management at (202) 564-1974 if you have any questions.

Sincerely,

A handwritten signature in dark ink, appearing to read "R. Craig Matthiessen", is written over a horizontal line.

R. Craig Matthiessen, Director  
Regulation and Policy Development Division  
Office of Emergency Management

Enclosure



LINK <http://www2.epa.gov/emergency-response/oil-spill-eater-ii>

## Emergency Management

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OIL SPILL EATER II

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## OIL SPILL EATER II



TECHNICAL PRODUCT BULLETIN #B-53  
USEPA, OFFICE OF EMERGENCY MANAGEMENT  
REGULATION AND POLICY DEVELOPMENT DIVISION  
ORIGINAL LISTING DATE: AUGUST 26, 1996  
REMOVAL DATE: AUGUST 16, 2005  
RELISTING DATE: SEPTEMBER 18, 2009  
"OIL SPILL EATER II (OSE II)"

### I. NAME, BRAND, OR TRADEMARK

OIL SPILL EATER II (OSE II)

Type of Product: Bioremediation Agent (Biological Enzyme Additive [previously listed as a Nutrient Additive])

### II. NAME, ADDRESS, AND TELEPHONE NUMBER OF MANUFACTURER/CONTACT

OSEI Corporation (Formerly Sky Blue Chems)  
P.O. Box 515429  
Dallas, TX 75251-5429  
Phone: (972) 669-3390  
E-mail: [oseicorp@msn.com](mailto:oseicorp@msn.com)

Web Site: [www.osei.us](http://www.osei.us)  
(Mr. Steven Pedigo, Chairman, CEO, Inventor)

### III. NAME, ADDRESS, AND TELEPHONE NUMBER OF PRIMARY DISTRIBUTORS

OSEI Corporation (Formerly Sky Blue Chems)  
P.O. Box 515429  
Dallas, TX 75251-5429  
Phone: (972) 669-3390  
E-mail: [oseicorp@msn.com](mailto:oseicorp@msn.com)  
Web Site: [www.osei.us](http://www.osei.us)  
(Mr. Steven Pedigo, Chairman, CEO, Inventor)

### IV. SPECIAL HANDLING AND WORKER PRECAUTIONS FOR STORAGE AND FIELD APPLICATION<sup>o</sup>

1. Flammability: Water-based, non-flammable
2. Ventilation: Needs no ventilation; aqueous-based product; does not emit hazardous vapors
3. Skin and eye contact; protective clothing; treatment in case of contact: OSE II is not a primary dermal irritant. Avoid eye contact, and wear goggles if possible for the spray to come in direct contact with eyes. Facilities for quick and copious eye flushing should be provided and prompt medical attention should be sought if exposure and irritation persists. Protective rubber gloves are suggested during handling. Before mixing the product has a smell of fermentation. The product does not give off any harmful vapors.
- 4.a. Maximum storage temperature: 120°F
- 4.b. Minimum storage temperature: None; OSE II can freeze and thaw without adverse effects
- 4.c. Optimum storage temperature range: 72°F
- 4.d. Temperatures of phase separations and chemical changes: 120°F

### V. SHELF LIFE

OSE II has a recommended shelf life of 5 years. After 5 years at optimum storage temperature, there is an approximate 10% decrease per year in product capability.

### VI. RECOMMENDED APPLICATION PROCEDURE

#### 1. Application Method:

A. Use surface spray apparatus, such as small hand held tanks, back pack, large mixing tanks with mechanical pumping devices, vessels with booms for spraying wide paths, or spray devices on airplanes or helicopters.

B. OSE II can be applied by eductor systems from vessels, fire trucks, etc. Set the eductor system to 2% and apply 1 gallon of mixed OSE II to each spilled gallon of hydrocarbon.

#### 2. Concentration/Application Rate:

General - OSE II generally takes 3 to 30 minutes to penetrate the molecular walls of hydrocarbons. However, once you spray OSE II on the hydrocarbons, OSE II



attaches itself and will eventually engulf the hydrocarbons regardless of where the hydrocarbons may spread on the surface of salt or fresh water. Additionally, once you spray OSE II, the hydrocarbons cannot attach itself to the shoreline, rocks, or any equipment in its path. OSE II breaks down the adhesion properties of hydrocarbons and causes hydrocarbons to float, thereby, eliminating secondary contamination of the water column or any other areas, and holding the contaminated area to the waters surface, the original contaminated area.

If OSE II is to be used on ocean spills or on intertidal zones OSE II should be mixed with ocean water.

If OSE II is to be used on lakes, rivers, streams, ponds, or on land mix the product with water from a lake, stream, or pond.

If you are performing a clean up, make sure the water used to mix with OSE II, and the water used to keep the area saturated, is the type of water normally associated with that area.

If you use fresh water in an area normally contacted with salt water or vice versa, the different types of bacteria and competition could occur, not to mention the problems with salinity for fresh water organisms.

[Note: Do not mix tap water with OSE II if possible: Chlorine in tap water slows bacterial enhancement]

#### Spills on Water:

Dilute each gallon of OSE II with 50 gallons of fresh, brackish, or salt water - depending on the water associated with the area that has been impacted by the spill. Apply OSE II at a ratio of 1 gallon mixed OSE II to each gallon of hydrocarbon spilled. Apply using hand held sprayers, tank sprayers, booms from vessels, helicopters, or airplanes; by spraying the perimeter first then working toward the middle of the spilled area. Next spray the entire surface of the spill. If the spill is very heavy (more than 2 inches thick) it is recommended that OSE II be applied every day until you have met a 1:1 ratio of OSE II and water mixture to spilled oil/hydrocarbons.

Use 1 gallon OSE II for every 50 gallons of hydrocarbons.

Use 1 drum of OSE II for every 2,750 gallons of hydrocarbons.

If you know gallons of hydrocarbons spilled, multiply gallons of hydrocarbons by 0.02 to get amount of OSE II needed [gallons of hydrocarbons x 0.02 = gallons of OSE II].

If you know barrels of crude oil spilled, multiply barrels of crude oil by 0.015 to get drums of OSE II needed [barrels of crude oil x 0.015 = drums of OSE II].

If you do not know gallons of hydrocarbons or barrels of crude oil, multiply size of spill by 0.0023 to get drums of OSE II needed or by 0.12 to get gallons of OSE II needed [(yards long x yards wide x inches thick) x 0.0023 = drums of OSE II or (yards long x yards wide x inches thick) x 0.015 = gallons of OSE II].

#### Intertidal Zone:

Mix each 55 gallon drum of OSE II with 2,750 gallons of fresh, brackish, or salt water. The water used is determined by the type of water associated with the site. OSE II should be applied as the tide recedes (if there is a tide) and once the tide comes in the application should cease until the tide recedes again. Additional applications should only be warranted if spill has been allowed time to percolate into the depths of the soil.

If there is no tide, but waves have pushed the spill into the intertidal zone, then there will be direct access to the spill at all times. If possible use string or stakes to grid off the beach or intertidal zone area, and then you can calculate how much premixed OSE II to apply to a given area. If unable to grid off an area then calculate how much OSE II to apply and then determine how much premixed OSE II will flow through a nozzle (gallons per minute) then let application technician know how many gallons to apply in a given area and this can be determined by applying product for a certain time period to get the correct amount of OSE II applied to gain the 1:1 ratio.

Note: If the intertidal zone is associated with the sea then mix OSE II with salt water. If the spill area is in an area of brackish water then mix OSE II with brackish water. If the intertidal zone is associated with fresh water such as lakes, rivers, streams, ponds, creeks, aquifers, or drinking water wells then use fresh water to mix OSE II.

### 3. Conditions for Use:

OSE II can remediate hydrocarbon-based material including chlorinated hydrocarbons, PCB's, dioxins, and some pesticides.

As the age of spilled hydrocarbons increases, the time necessary for bioremediation increases. In general, fresh crude, gasoline or BTEX takes from 72 hours to 30 days to completely bioremediate.

Variations of sea water salinity should have no effect, but as long as microbial life can exist, then OSE II will be effective.

OSE II bioremediation slows somewhat at temperatures below 40°F. OSE II however, will continue to work at any liquid water temperature that will sustain microbial life.

## VII. TOXICITY AND EFFECTIVENESS

### a. Effectiveness:

#### Summary Data Table:

DAYS	PRODUCT 3 REPS/PROD	TOTAL MEAN ALKANES (ppm)	RED% 28 DAYS	TOTAL MEAN AROMATICS (ppm)	RED% 28 DAYS
0	CONTROL	43,170	-	11,435	-
	NUTRIENT	40,569	-	11,785	-
	OSE II	41,730	-	12,155	-
7	CONTROL	39,250	9.1	10,355	9.4
	NUTRIENT	34,815	14.2	9,898	16.0
	OSE II	26,316	36.9	8,072	33.6
28	CONTROL	35,797	17.1	9,534	16.6
	NUTRIENT	26,507	34.7	8,938	24.2
	OSE II	4,273	89.8	1,268	89.6

Results of Gravimetric Analysis:  
Percentage (%) Decrease in Weight of Oil on Day 28  
Control: 16.5%  
Nutrient: 52.0%  
Product: 85.4%

#### VIII. MICROBIOLOGICAL ANALYSIS

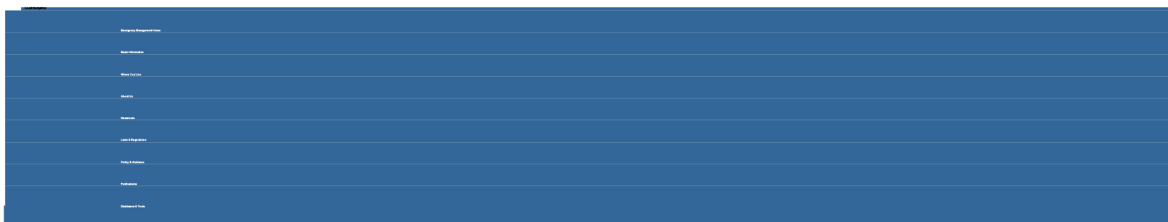
1. Listing of each component of the total formulation, other than enzymes, by chemical name and percentage by weight: CONFIDENTIAL
2. Enzyme Names: CONFIDENTIAL
3. I.U.B.: CONFIDENTIAL
4. Source of Enzymes: Fermentation process
5. Units: No less than 1% and no more than 50% by weight
6. Specific Gravity: 1.05
7. Optimum Conditions:
  - a. pH: 7.0
  - b. Temperature: 72°F
  - c. Salinity Ranges: Fresh water to salt water
  - d. Maximum and Minimum pH: 3.5 - 8.0
  - e. Maximum and Minimum Temperature: 28°F - 128°F
  - f. Maximum and Minimum Salinity Levels - Salinity level above that will support microbial activity will adversely effect OSE II's performance
  - g. Enzyme Shelf Life: Up to 5 years when properly stored
  - h. Enzyme Optimal Storage Conditions: 72°F is optimal, enzyme range is freezing to 120°F, never leave OSE II in direct sunlight for more than a couple of hours

#### IX. PHYSICAL PROPERTIES

NA

#### X. ANALYSIS OF HEAVY METALS, CYANIDE, AND CHLORINATED HYDROCARBONS

NA



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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
SOLID WASTE AND  
EMERGENCY RESPONSE

Mr. O.A. Lively  
OSEI Corp.  
5545 Harvest Hill  
Suite 1116  
Dallas, TX 75230

AUG 26 1996

Dear Mr. Lively:

Thank you for providing the technical product data required by the revised National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300, on the Bioremediation Agent "Oil Spill Eater II (OSE II)." Your data submission satisfies the requirements contained in Title 40 of the CFR section 300.915 of the NCP. "Oil Spill Eater II (OSE II)" will be listed on the NCP Product Schedule under Bioremediation Agents and may be authorized for use by Federal On-Scene Coordinators in accordance with 40 CFR section 300.910. The technical data for this product will be kept on file by the Oil Program Center pursuant to 40 CFR section 300.920.

Enclosed are some of the relevant provisions in the NCP on restrictions regarding the listing of your product. Please note, you are required to notify the Environmental Protection Agency (EPA) of any changes in composition, formulation, handling procedures, or application of your product. Based on this notice, EPA may require retesting of the product. Also, note that the listing of "Oil Spill Eater II (OSE II)" on the NCP Product Schedule does not constitute approval, certification, authorization, licensing or promotion of the product; nor does it imply compliance with any criteria or minimum standards for such agents. Failure to comply with these restrictions or the making of any improper reference to EPA in an attempt to demonstrate approval or acceptance of the product will constitute grounds for removal of the product from the schedule.

If you have questions, please contact Ms. Gail Thomas in the Oil Program Center at (703) 603-8790 or our information line at (202) 260-2342

Sincerely,

A handwritten signature in black ink, appearing to read "David Lopez", written over a horizontal line.

David Lopez, Director  
Oil Spill Prevention and Response Center (5203G)

Enclosure



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P.O. Box 515429  
Dallas, Texas 75075  
Ph: (972) 669-3390  
Fax: (469) 241-0896  
Email: oseicorp@msn.com  
Web: <http://www.osei.us>

January 16, 2000

#### EPA REGULATIONS

The statement (direct quote) below was received from Mr. Donald Smith of REGION VI of EPA's Superfund Division, Response and Prevention Branch on January 11, 2001. This statement is quite clear that for oil spills on soil, concrete or asphalt (or other surfaces that do not involve U. S. Navigable Water) the Spiller is free to use OIL SPILL EATER II to clean up the spill.

O. A. (George Lively)

"The United States Environmental Protection Agency's policies for the use of dispersants, bioremediation and chemical agents for responding to spills of petroleum or vegetable oils are outlined in Title 40 Code of Federal Regulations Part 300.900 which is entitled the National Contingency Plan. The use of these products relative to federal authorities is regulated to spills that threaten to or have spilled into or upon the waters of the United States. The definition of the waters of the United States can be found in Title 40 Code of Federal Regulations Part 110.2. Generally speaking, the waters of the US include, but are not limited to lakes, rivers, streams, creeks, city storm sewers and drainage ditches. If a discharge threatens or has discharged as described in the aforementioned scenario, then the use of chemical or biological 'agents must have the permission of a Federal On Scene Coordinator. If the discharge does not meet these parameters as previously described then the permission of the Federal On Scene Coordinator is not required.

How ever since OSE II is on the EPA NCP list it can be approved for use on U.S. Navigable waters just as the EPA Region VI approved the use of OSE II, on the Osage Indian Reservation spill.





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Dallas, Texas 75075  
Ph: (972) 669-3390  
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April 26, 2002

To: ALL USERS OF "*OIL SPILL EATER II*" (OSE II)

All storm drains discharge into the navigable waters of the United States.

The OSEI Corporation guarantees that OSE II, after being properly applied, will biodegrade all non-halogenated hydrocarbons (such as gasoline, jet fuels, diesel, ethylene glycol, crude oil, hydraulic fluid, engine oil, etc.) and some halogenated hydrocarbons. OSEI Corporation further guarantees that these treated contaminants, when washed down storm drains, will have no adverse effect on the environment, nor endanger life, health, or property or constitute a public nuisance, compared to Correxite the pre approved product for U.S. navigable waters and OSE II will have toxicity levels substantially below the toxicity level already established by the Environmental Protection Agency (EPA) as the acceptable standard for the navigable waters of the United States.

That standard is currently 2.61 as determined by the EPA's LC50 Test on the following page. The EPA has pre approved Correxite as seen on the following page for use on U.S. Navigable Waters, which has established the precedent for acceptable toxicity values in U.S. navigable waters "*OIL SPILL EATER II's*" toxicity value, using the same LC50 Test on the same species, is 2900 (the lower the LC50 test value, the higher the toxicity).

For specific application details, please contact our office.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven R. Pedigo", is written in a cursive style.

Steven R. Pedigo  
Chairman  
SRP/eem



Table 14. Characteristics of Dispersants Listed on the NCP Products Schedule (as of August 1999).

	Corexit 9500	Corexit 9527	Dispersit SPC	Mare Clean 200	Neos AB 3000
<b>Dispersant Type</b>	Concentrate, Solvent is ethylene glycol monobutyl ether	Concentrate, Solvent is ethylene glycol monobutyl ether	(Just added in April 1999) Concentrate, Solvent is water based	Concentrate; Solvent are paraffinic hydrocarbons	Concentrate, Solvents are paraffinic hydrocarbons
<b>Availability</b>	Get from NSFCC	Get from NSFCC	NP	Get from NSFCC	Get from NSFCC
<b>Application Rate</b>	Apply undiluted at 2-10 gal per acre, or a dispersant: oil ratio of 1:50 to 1:10	Apply undiluted at 2-10 gal per acre, or a dispersant: oil ratio of 1:50 to 1:10	Apply undiluted at 2-10 gal per acre, or a dispersant: oil ratio of 1:50 to 1:10	Apply a dispersant: oil ratio of 1:5 (53-66 gal per ton of oil)	Apply a dispersant: oil ratio of 1:4 to 1:2.4 (75-125 gal per ton of oil)
<b>Application Method</b>	Spray neat as droplets	Spray neat as droplets	Spray neat as droplets	Spray neat as droplets	Spray neat as droplets
<b>Temperature Limitations</b>	Above -30°F	Above -30°F	Above -25°F	Above 21°F	Above 32°F
<b>EPA Dispersant Effectiveness Test (%)</b>	Prudhoe Bay crude: 45 S. Louisiana crude: 55 Average of above: 50	Prudhoe Bay crude: 37 S. Louisiana crude: 63 Average of above: 50	Prudhoe Bay crude: 52 S. Louisiana crude: 50 Average of above: 51	Prudhoe Bay crude: 64 S. Louisiana crude: 84 Average of above: 74	Prudhoe Bay crude: 20 S. Louisiana crude: 90 Average of above: 55
<b>Vendor Lab Report on Effectiveness (%)</b>	Prudhoe Bay crude: 45 S. Louisiana crude: 55 Average of above: 50	Prudhoe Bay crude: 37 S. Louisiana crude: 63 Average of above: 50	Prudhoe Bay crude: 40 S. Louisiana crude: 105 Average of above: 73	NP	NP
<b>Use in Fresh Water?</b>	Not effective	Not effective	NP	Not effective	Not effective
<b>Use in Salt Water?</b>	Yes	Yes	Yes	Yes	Yes
<b>Worker Safety (Level of Protection)</b>	Level D	Level D	Level D	NP	NP
<b>NCP Reported Toxicity of Dispersant Alone (LC-50, ppm)</b>					
Note: a low value = high toxicity					
Inland silversides (96h)	25.2	14.6	3.5	1,996	91.1
Mysid shrimp (48h)	32.2	24.1	16.6	938	33
<b>NCP Reported Toxicity of Dispersant &amp; No. 2 Fuel Oil (1:10 ratio) (LC-50, ppm) Note: a low value = high toxicity</b>					
Inland silversides (96h)	<u>2.61</u>	<u>4.49</u>	7.9	42.0	57.0
Mysid shrimp (48h)	<u>3.4</u>	<u>6.6</u>	8.2	9.84	25.0

# ***US Safety Data Sheet***

***Issued: June 1, 2015***

## **1. IDENTIFICATION OF THE SUBSTANCE PREPARATION AND COMPANY**

Product Name:	Oil Spill Eater II, OSE II
Product Code, GHS code: (Export Code)	3821000000
Product Type:	Hydrocarbon Bioremediation Product
Supplier:	Oil Spill Eater International Corporation
Address:	P.O. Box 515429 Dallas, Texas 75251 USA
Contact Numbers:	
Telephone:	(972) 669-3390
Fax:	(469)241-0896
E-mail:	<a href="mailto:oseicorp@msn.com">oseicorp@msn.com</a>
Emergency Telephone Number:	(972) 669-3390
Emergency Covers:	24 hours a day 7 days a week

## **2. HAZARDOUS IDENTIFICATION**

Human Health Hazards:	None. Potentially toxic if more than 1 liter ingested.
Safety Hazards:	Will not burn. Is, in fact, a fire retardant.
Environmental Hazards:	None. Protects environment; 100% biodegradable; no known allergens.

### 3. COMPOSITION INFORMATION ON INGREDIENTS

Preparation Description:

A hydrocarbon bioremediation product containing all natural nonhazardous ingredients.

**Contains:**

<u>Ingredient</u>		<u>CAS Number</u>
1) Water	80-90%	7732-18-5
2) Nitrogen (Urea)	0.01-0.09%	57 -13-6
3) Molasses	1-2%	None
4) Bio Surfactant	0.06-0.08%	68131-40-8
5) Sugar	1.5%-2%	50-99-7
6) Protease	0.01-0.03%	9000/90/2
7) Amylase	0.01-0.03%	9014-01-1
8) Malt	1-2%	8029-43-4

### 4. FIRST AID MEASURES

Symptoms and Effects:

Prolonged exposure would have minimal effect, if any at all.

First Aid - Inhalation:

Inhalation of vapors from this product pose no acute or chronic hazard.

First Aid - Skin:

Prolonged exposure to skin may cause some drying of the skin. Wash off with water.

First Aid - Eye:

Flush eyes with copious quantities of water. If irritation persists, seek medical attention.

First Aid - Ingestion:

If less than 59 ml / 2 ounces is ingested, no toxic symptoms should occur, to most humans  
Wash out mouth and seek medical attention if more than 59ml or 2 ounces *is ingested*.

Advice to Physicians:

Treat symptomatically. Wash skin or eyes thoroughly. Treat as you would for any large ingestion of mild soap or tooth paste.

### 5. FIRE FIGHTING MEASURES

Specific Hazards:

OSE II is a fire retardant. However, if applied to a burning fire, there can be a slight flash before fire goes out.

Extinguishing Media:

None required. Product is a fire retardant.  
Method - ASTM-D56.

Unsuitable Extinguishing Media:

None required. Product is a fire retardant.

***Page 3 of 9 US Safety Data Sheet***

Protective Equipment:	Proper protective equipment including breathing apparatus must be worn when approaching any fire.
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**6. ACCIDENTAL RELEASE MEASURES**

Personal Precautions:	Avoid contact with eyes. Wash from skin or eyes as needed.
Personal Protection:	Wear goggles if applying in windy conditions. Wear protective rubber gloves if applying directly in a prolonged situation.
Environmental Precautions:	Wash down with water. Will help clean soil, drains, or water.
Clean-up methods - small spillage:	Wash down with water. Non-toxic to the environment.
Clean-up methods - large spillage:	Same as for small spills.

**7. HANDLING AND STORAGE**

Handling:	When handling product in drums, safety footwear should be worn. However No special handling procedures required.
Storage:	Keep in cool, dry area. Avoid direct sunlight and excessive heat.
Storage Temperatures:	Do not store where temperature exceeds 120 F.
Recommended Materials:	Polyethylene drums or PVC are acceptable.
Unsuitable Materials:	None known.
Other Information:	Product can freeze / thaw without any negative effect on product.

## **8. EXPOSURE CONTROL/PERSONAL PROTECTION**

Occupational Exposure Standards:	None established (none toxic).
Hygiene Measures:	Wash hands before eating or drinking.
Respiratory Protection:	Not normally required.
Hand Protection:	Any plastic or rubber glove if needed; not normally required.
Eye Protection:	Wear safety glasses or goggles if applying in windy conditions.
Body Protection:	Not normally required.

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

Physical State:	Liquid with the same density of H <sub>2</sub> O.
Color:	Amber to brown.
Odor:	Some smell of ferment.
Vapor Pressure:	Same as H <sub>2</sub> O.1.0215
Density:	Same as H <sub>2</sub> O.1.0215
Vapor Density:	Same as H <sub>2</sub> O.1.0215
Dropping Point:	Same as H <sub>2</sub> O.
Flash Point:	Same as H <sub>2</sub> O in excess of 7000°F.
Flammability Limit - Lower:	Nonflammable.
Flammability Limit - Upper:	Nonflammable.
Auto-ignition Temperature:	Non-igniting.
Solubility in Water:	100%
N-octanol/water Partition Coefficient:	100% soluble - non partitioning
Elements Content:	None.

## **10. STABILITY REACTIVITY**

Stability:	Stable.
Conditions to Avoid:	Temperatures in excess of 120° F and direct sunlight during storage or transporting.
Materials to Avoid:	Strong oxidizing agents.
Hazardous Decomposition Products:	None decomposes to CO and H <sub>2</sub> O.

## **11. TOXICOLOGICAL INFORMATION**

Basis for Assessment:	Toxicity tests have been performed Determining OSE II is (virtually nontoxic).
Acute Toxicity - Oral:	Can become toxic if more than 60 ml or 2 ounces is ingested.
Acute Toxicity - Dermal:	None.
Eye Irritation:	Slight irritant alleviated by copious eye washing.
Skin Irritation:	Skin can dry slightly if prolonged direct exposure occurs.
Respiratory Irritation:	Virtually none.
Skin Sensitization:	Not expected to be a skin sensitizer.
(Sub )chronic Toxicity:	None expected.
Carcinogenicity:	Not a carcinogen.
Mutagenicity:	Not a mutagenic.
Human Effects:	None expected.
Other Information:	Not applicable.

## **12. ECOLOGICAL INFORMATION**

Basis for Assessment:	Ecotoxicological data has been determined specifically for this product. Information given is for specific sensitive (aquatic) species in fresh and salt water.
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**Page 6 of 9 US Safety Data Sheet**

Mobility:	Liquid that floats on water and solubilizes rapidly. If it comes in contact with soil will percolate at the same rate as H <sub>2</sub> O and will biodegrade rapidly.
Persistence/Degradability:	Product completely biodegrades in water or soil environments and will not persist. 100% biodegradable as testing has confirmed
Bioaccumulation:	None
Ecotoxicity: US EAP	100% soluble. <b>LC50 Brine shrimp:</b> >1,900 mg/l up to 10,000 mg/l. <b>LC50 Fundulus Heterocletus</b> 96 hour: 5,258 mg/l. <b>LC50 Rainbow Trout:</b> 10,000 mg/l.
Environment Canada	<b>LC50 Fathead Minnows</b> (Pimephales promelas): 9,300 mg/l.
OSEI with the city of Plano, TX	<b>IC10 (milky oyster, Saccostrea echinata):</b> 11.0 (10.0-11.9) mg/l/48h <b>EC50 (milky oyster, Saccostrea echinata):</b> 16.5 (16.0-17.1) mg/l/48h <b>NOEC (milky oyster, Saccostrea echinata):</b> 10.0 mg/l <b>LOEC (milky oyster, Saccostrea echinata):</b> 20.0 mg/l <b>EC10 (mussel, Mytilus galloprovincialis):</b> >20.0 mg/l/72h <b>EC50 (mussel, Mytilus galloprovincialis):</b> >20.0 mg/l/72h <b>NOEC (mussel, Mytilus galloprovincialis):</b> 20.0 mg/l <b>LOEC (mussel, Mytilus galloprovincialis):</b> >20.0 mg/l
Australia NATA test results:	



**13. DISPOSAL CONSIDERATIONS**

Waste Disposal: No special disposal.

Product Disposal: No special disposal.

Container Disposal: No special disposal.

Local Legislation: Not applicable.

**14. TRANSPORT INFORMATION**

Not dangerous for conveyance under UN, IMO, ADRIRID.  
Marine Transport (IMO/IMDG): Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea.

Air Transport (ICAO/IATA): Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air.

**IMDG Marine No**

**15. REGULATORY INFORMATION**

EC Classification: Not Known.

EC Symbols: Not Known.

EC Risk Phrases: Not Known.

EINECS (EC): Not Known.

TSCA (USA):

Other Information: US DOT class 55 non hazardous

Dangerous Constituents: None.

## **16. OTHER INFORMATION**

Only bioremediation product successfully used to permanently remove oil on U.S. navigable waters under U.S. EPA Government observation.

### **Government approvals or approved listings:**

US EPA NCP # B53,  
New Zealand EPA SOS # 1001797,  
Australia #OBA  
Oil Spill Control agent Greek registration ID  
no:17554  
Gulf States MEMAC approval Ref:337/12-  
RHD,  
Philippine accreditation #PCG-14-06-112  
Nigeria NOSDRA cert: 189,  
Mexico Coatzacoalcos.Ver.,a 30 de Julio de  
2014,  
Israel approval,  
UK approval #ODA 241/2015 ,  
Trinidad and Tobago approval#  
MEEA:12.1.5 Vol. XXXXII, South Korea cert  
no: S-007

### **Uses and Restrictions:**

Bioremediation product that converts  
hydrocarbons, chlorinated  
hydrocarbons,  
and most organic based material or  
waste to CO<sub>2</sub> and H<sub>2</sub>O.

### **Technical Contact Point:**

Steven Pedigo

### **Technical Contact Number:**

(972) 669-3390

### **Fax Number:**

(469) 241-0896

### **E-Mail:**

[oseicorp@msn.com](mailto:oseicorp@msn.com)

### **SDS History:**

Not Applicable

### **Revisions Highlighted**

None.

**last revision of SDS**

**Literature References**

SDS Created: June 2015

Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice. Standard for the Uniform Scheduling of Medicines and Poisons. Australian Code for the Transport of Dangerous Goods by Road & Rail. Model Work Health and Safety Regulations, Schedule 10: Prohibited carcinogens, restricted carcinogens and restricted hazardous chemicals. Workplace exposure standards for airborne contaminants, Safe work Australia. American Conference of Industrial Hygienists (ACGIH). Globally Harmonised System of classification and labelling of chemicals. ...End Of MSDS...

STEVE COWPER, GOVERNOR

**DEPARTMENT OF LABOR**

**OCCUPATIONAL SAFETY AND HEALTH  
LABOR STANDARDS AND SAFETY DIVISION**

3301 EAGLE STREET, SUITE 303  
P.O. BOX 107022  
ANCHORAGE, ALASKA 99510-7022  
PHONE: (907) 264-2597

**August 23 1989**

**North Country Investment  
2522 Arctic Blvd.  
Anchorage, Alaska 99503**

Corporate Office as of Oct. 1996:  
OSEI, CORP.  
13127 Chandler Drive  
Dallas, Texas 75243

**Attn: Steve Kacz**

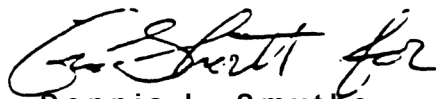
**Dear Mr. Kacz:**

An inquiry was made to this office concerning Sky Blue Chems "Oil Spill Eater." Specifically, we were asked to assess whether or not the use of this product would pose any health concerns by reason of the properties of the constituents.

Upon review of the material safety data sheet and other documents, we see no special toxicological concern with the ingredients that would pose a significant health concern with its application as described.

We would appreciate knowing in advance of any field tests or uses of this product.

Sincerely,



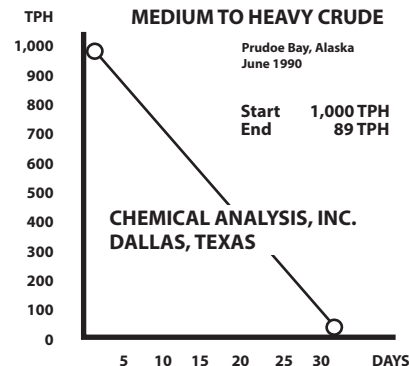
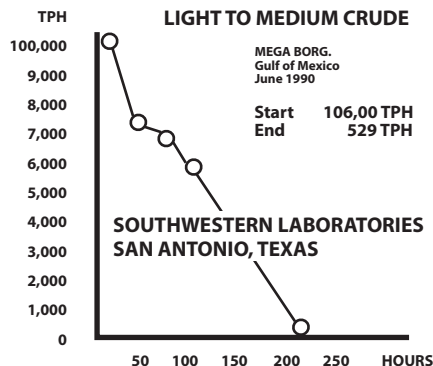
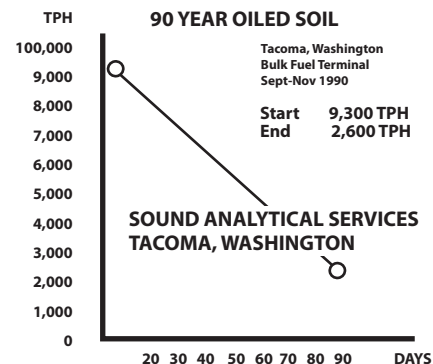
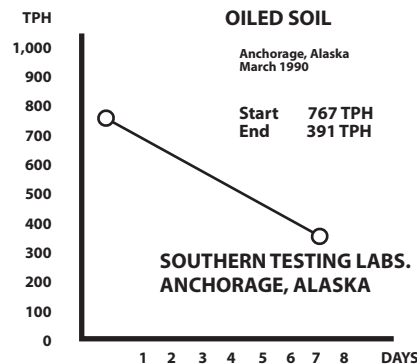
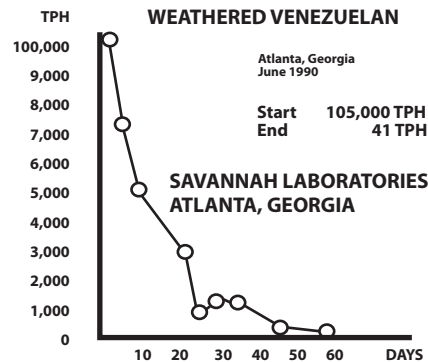
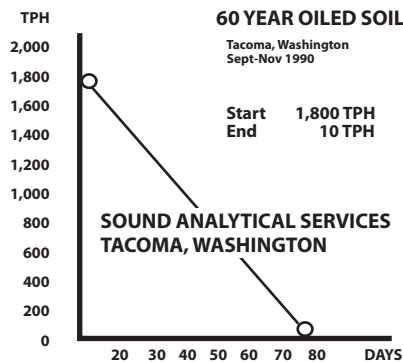
Dennis L. Smythe  
Chief of Compliance

cc: Ron Biggers



P.O. Box 515429  
 Dallas, Texas 75075  
 Ph: (972) 669-3390  
 Fax: (469) 241-0896  
 Email: oseicorp@msn.com  
 Web: www.osei.us

## TPH BIODEGRADATION TESTS OF OSE II PERFORMED BY INDEPENDENT LABORATORIES



*This page represents a sampling of laboratory test reports available upon request.*



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## SUMMARY

### *U.S EPA and NETAC EFFICACY TESTING*

The United States Environmental Protection Agency spent one and one-half years testing and evaluating protocols using OIL SPILL EATER II.

Mr. Tom Merski (August 18, 1993) explained the control (oil and seawater only) showed such an insignificant change (no reduction in TPH) that the control results were not even released.

NOTE - that OIL SPILL EATER II Biodegraded Alaskan Crude Oil 98% in 21 days in NETAC's Tier II Test. This test specifically shows the reduction of Polynuclear Aromatic Hydrocarbons that are the Hydrocarbons that are more persistent and difficult to Bioremediate!

This test proves that using OIL SPILL EATER II is beneficial over doing nothing, and that 98% of a spill can be mitigated as opposed to mechanical cleanups, which after 30 days or more can only blot up 20% of a spill. Using OIL SPILL EATER II can reduce the impact to marine organisms and ECO systems faster and more efficiently than mechanical cleanups. This means huge savings on the cleanup costs and environmental damage assessment fees.

By: Steven R. Pedigo  
Chairman  
OSEI, CORP.

SRP/AJL



## National Environmental Technology Applications Center

UNIVERSITY OF PITTSBURGH APPLIED RESEARCH CENTER  
615 William Pitt Way · Pittsburgh, PA 15238  
Facsimile (412) 826-5552  
(412) 826-5511

**July 22, 1993**

**Mr. George Lively  
President**

**OSEI Corporation**

**Oil Spill Eater International  
Suite 1116, 5545 Harvest Hill  
Dallas, TX 75230**

New address as of Oct. 1999  
13127 Chandler Drive  
Dallas, TX 75243

**Dear Mr. Lively:**

**Subject:     *Oil Spill Eater II Methods Validation Data***

Per your request, enclosed is the efficacy data generated with "Oil Spill Eater II" from the development and validation of our oil spill response bioremediation evaluation methods. The Toxicity data from this process will be provided as soon as it is released from the EPA Office of Research and Development laboratories. We have included information on the experimental methods and objectives intended to assist you in understanding the meaning of the numbers generated for this report.

On behalf of NETAC and all the members of our Oil Spill Product Protocol Development Panel, we wish to express our appreciation for the contribution of your bioremediation agent for use in validating these methods and for your availability to answer questions about how this agent was intended to be used. Your patience and cooperation over the past two years has been commendable.

As you are aware, these experiments were conducted by the NETAC and EPA Office of Research and Development laboratories in Cincinnati, OH and in Gulf Breeze, FL. These data give you a general idea of how your product may behave in an open environment. Note that these data were obtained during the development of our methods. Numerous refinements have been made to increase the sensitivity of these tests; therefore, your product may provide different results in future tests due to this increased sensitivity as well as from the natural variability of the product and the constituent(s) used in the test sequence.

Please bear in mind that, although the Tier II methods have been finalized, we anticipate that all of the methods will be refined and updated periodically as we learn more about these systems. This means that data which was incidentally obtained for your product during the development of the protocols as it currently stands may change as the protocol is further refined. We must emphasize the research nature of the data we are providing to you today!

**Mr. George Lively**  
**July 22, 1993**  
**Page 2**

These data are provided to give you an indication of how your product behaved in this particular phase of the research. Different results may occur with the newly refined methods. We recommend that you evaluate this information as another set of intermediate data. We strongly suggest that you initiate additional testing applying the final Tier II method to develop a product performance baseline.

We also wish to emphasize that the participation of any bioremediation agent in the development of validation of the protocol does not constitute endorsement, approval or recommendation on the part of either NETAC or the EPA Office of Research and Development.

Enclosed for your convenience are the tabulated results of the Day 21 Shaker flask experiment for efficacy testing, and a Statistical Method Summary used to generate data about your product. This statistical method can be found in the July 1993 issue of the *Evaluation Methods Manual for Oil Spill Response Bioremediation Agents*. This document is currently being printed and a copy of the manual will be sent to you as soon as possible.

If you have questions about the data which we have provided, its potential use or application, or development of the protocol please call me at (412) 826-5511.

Sincerely,



A. Thomas Merski  
Vice-Chairman,  
Treatability Protocol Development Subcommittee  
Bioremediation Action Committee

ATM\MRM:tmw  
H:\public\bpec\OSEI-2.ltr  
310-2015-141

cc: W.M. Griffin





## RESULTS:

### TIER II EFFICACY DATA PERCENT REDUCTION

#### OIL SPILL EATER II (DAY 21)

<u>ANALYTE</u>	LAB A (n = 3) (%)
<u>PRISTANE</u>	88
<u>C18</u>	66
<u>PHYTANE</u>	82
<u>C30</u>	83
<u>TOTAL n- PARAFFINS</u>	77
<u>FLUORENE</u>	92
<u>PHENANTHRENE</u>	97
<u>CHRYSENE</u>	165
<u>TOTAL AROMATICS</u>	98



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## SUMMARY

### SECOND U.S. EPA/NETAC (Bioremediation Test) Using OIL SPILL EATER II February 28, 2001

The second U.S. EPA/NETAC Test was more thorough with different days for testing the amount of bioremediation occurring. EPA/NETAC wanted to determine if there was a statistical difference between the control (doing nothing at all), the nutrient control (EPA – Dr. Venosa’s nutrients) and the test product, **OIL SPILL EATER II**.

Table 2 shows the raw data where on day 0 the control, nutrient control and OSE II started at approximately 8,000 ppm (parts per million). In seven (7) days, OSE II had remediated the oil to an average of 6,529 ppm. The control and nutrient control were still around 8,000 ppm. On day twenty eight (28), OSE II had remediated the oil to 3,658 ppm. While the control was where it started and the nutrient control showed only minimal reduction of the oil.

In fact, OSE II remediated more of the oil in seven (7) days than the nutrient or nutrient control remediated in twenty eight (28) days.

EPA/NETAC through scientifically valid testing wanted to determine through an Anova Table if there was significant statistical difference between the nutrient, nutrient control, and the test product, OSE II.

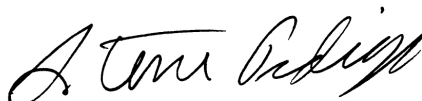
In this very limited closed system, OSE II reduced the oil over 50%, while very little reduction occurred in the control or nutrient control. In fact, on Page 3, in the last paragraph, EPA/NETAC explains that for OSE II (Group 3) “at day 7 and day 28 are significantly different from (Group 1) and (Group 2).”

This test is reproduced as the example in the U.S. Code of Federal Regulations under Bioremediation Efficacy Test.

Page Two

EPA/NETAC conclude, "Therefore in terms of total aromatic degradation, the test indicates the desired statistically significant difference between the mean of the product (OSE II) and the mean of the non-nutrient control.

EPA/NETAC's scientifically valid Bioremediation Test proves that OSE II is a very significant oil spill cleanup product.

A handwritten signature in black ink, appearing to read "Steven R. Pedigo". The signature is fluid and cursive, with a large initial "S" and a distinct "Pedigo" at the end.

By: Steven R. Pedigo  
Chairman

SRP/AJL



## National Environmental Technology Applications Center

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### **OIL SPILL RESPONSE BIOREMEDIATION AGENTS EVALUATION METHODS VALIDATION TESTING DISCUSSION OF RESULTS**

The following data are provided for the oil spill response bioremediation agent producer as a means to begin to assess how this bioremediation agent may behave in response to an oil spill in the environment. The data we are providing are limited to the gas chromatographic/mass spectrometer (GC/MS) results.

Note that a total of 69 analytes (components naturally occurring in oil) were measured in these experiments. These analytes constitute a small but highly representative fraction of the toxic and biodegradable portion of oil. We are providing you with a summary of the ultimate results and a summary of the most germane analytes to facilitate our reporting of this information and to reduce confusion in reporting caused by the modification of the selected test results.

The following table of GC/MS results indicate the percent reduction of analyte(s) versus the same analyte(s) present in the control (i.e., product results/control results x 100). For example, if 100 percent of an analyte is present at Day 21 after mixing oil, seawater and product as compared to the control (oil and seawater only) then the product did not stimulate the decomposition of hydrocarbons in oil. Note, that the greater the number of analytes with a low percentage the more capable the product of enhancing the biodegradation of oil.

From this experiment, the results indicated that there was sufficient comparability of the data between the laboratories conducting this experiment. The resultant data presented for this bioremediation agent and the comparative nutrient treatment did not show a significant statistical difference between the product mean and the control mean at the  $p \leq 0.05$  level of significance. That is, biodegradation was occurring but not significantly faster than the control. We note that even though these treatments did not produce statistical significant degradation of the test oil, several of the products in this research did achieve this standard.

An analysis of the total aromatic data (in ppm) was conducted for the following three groups:

GROUP 1: Non-nutrient Control  
 GROUP 2: Nutrient Control  
 GROUP 3: Test Product – OSE II

The raw data is shown in Table 2 below. Note the three replications for each group-time combination.

TABLE 2

PRODUCT TEST DATA TOTAL AROMATICS (PPM)			
	GROUP 1	GROUP 2	GROUP 3
DAY 0	8153	7912	7711
	8299	8309	8311
	8088	8111	8200
DAY 7	8100	7950	6900
	8078	8200	6702
	7999	8019	5987
DAY 28	8259	8102	4000
	8111	7754	3875
	8344	7659	3100

Table 3 gives the summary statistics (number of observations, means, and standard deviations) for each group-time combination.

TABLE 3

SUMMARY STATISTICS FOR PRODUCT TEST DATA TOTAL AROMATICS (PPM)			
	GROUP 1	GROUP 2	GROUP 3
DAY 0	8153	7912	7711
	8299	8309	8311
	8088	8111	8200
DAY 7	8100	7950	6900
	8078	8200	6702
	7999	8019	5987
DAY 28	8259	8102	4000
	8111	7754	3875
	8344	7659	3100



Table 4 shows the results of the two-way ANOVA.

TABLE 4  
TWO-WAY ANOVA TABLE

Source	df	Sum of Squares	Mean Square	F-Statistic	p-Value
GROUP	2	23944857.41	11972428.70	151.94	0.0001
TIME	2	10954731.19	5477365.59	69.51	0.0001
INTERACTION	4	19347589.04	4836897.26	61.39	0.0001
ERROR	18	1418303.33	78794.63		
TOTAL	26	55665480.96			

From the ANOVA table, we see that the F-statistic for INTERACTION is significant ( $F=61.39$ ,  $p=0.0001$ ). This indicates that group differences exist for one or more days. Protected LSD mean separations were then conducted for each day to determine which group differences exist. The results are summarized in Table 5. Note that means with the same letter (T grouping) are not significantly different.

TABLE 5  
PAIRWISE PROTECTED LSD MEAN SEPARATION

T Grouping	Mean	n	Interaction
A	8238.0	3	Group 1, Day 28
A	8180.0	3	Group 1, Day 0
A	8110.7	3	Group 2, Day 0
A	8074.0	3	Group 3, Day 0
A	8059.0	3	Group 1, Day 7
A	8056.3	3	Group 2, Day 7
A	7838.3	3	Group 2, Day 28
B	6529.7	3	Group 3, Day 7
C	3658.3	3	Group 3, Day 28

Significance Level = 0.05  
Degrees of Freedom = 18  
Mean Square Error = 78794.63  
Critical Value = 2.10  
Least Significant Difference = 481.52

The grouping letters indicate that the product mean values (group 3) at day 7 and day 28 are significantly different from those of both the nutrient control (group 2) and the non-nutrient control (group 1) for those days. No other significant differences are shown. Therefore, in terms of total aromatic degradation, the test indicates the desired statistically significant difference between the mean of the product and the mean of the non-nutrient control.



## EXPERIMENTAL DESIGN

The shaker flask evaluation conducted in Tier II is an experiment designed to determine the product's ability to degrade crude oil components at a rate or extent greater than a natural seawater microbial population. The experimental design includes a control, nutrient treatment, and the product treatment. The resultant data are compared and tested statistically using a two-way analysis of variance to determine data trends. The experimental design for Tier II testing is known as a factorial experiment with two factors. The first factor is product/control group; the second factor is time (as measured in days). For example, if two groups (product A and a non-nutrient control) are tested at each of three points in time (day 0, 7, and 28), the experiment is called a 2x3 factorial experiment. There were three replications (replicated shaker flasks) of each group-time combination.

## DATA ANALYSIS METHODS

For each analyte and each product used in Tier II, a product is deemed a success by the demonstration of a statistically significant difference between the mean analyte degradation by the product and the mean analyte degradation by the non-nutrient control. Such a determination will be made by performing a two-way analysis of variance (ANOVA) on the sample data. The technical aspects of this procedure are outlined in Snedecor and Cochran (1980). Most statistical software packages support the use of two-way ANOVA. However, the format required for the input data differs among the various commercial packages. Whichever package is used, the following ANOVA table will be provided as part of the output.

**TABLE 1**  
**TWO WAY ANOVA TABLE**

Source	df	Sum of Squares	Mean Square	F-statistic	p-value
Group	p-1	SSG	MSG = MSG/MSE	MSG/MSE	*
Time	t-1	SST	MST = MST/MSE	MST/MSE	*
Interaction	(p-1)(t-1)	SSI	MSI = MSI/MSE	MSI/MSE	*
Error	pt(n-1)	SSE	MSE = SSE		
TOTAL	npt-1	SSTOT			

\* To be determined from the value of the F-statistic

In the degrees of freedom column (df) of Table 1, p denotes the number of product/ control groups, t denotes the number of days at which each group is analyzed and n denotes the number of replications. For the example of the 2x3 factorial experiment discussed in the previous section, p=2, t=3, and n=3. The significance of the F-statistics (as indicated by their corresponding p-value) are used to interpret the analysis.



## INTERPRETATION

If the F-statistic for the INTERACTION is significant at the 0.05 level (i.e. the p-value is less than 0.05), the data indicate that the mean response of at least two groups being tested differ for at least one point in time. In order to find out which groups and at which points in time the difference occurs, pairwise comparisons between the group means should be conducted for all time points. These comparisons can be made using protected least squared difference (LSD) or Dunnett mean separation techniques. The protected LSD procedure is detailed in Snedecor and Cochran (1980); the Dunnett procedure is outlined in Montgomery (1991). For both methods, the mean square error (MSE) from the two-way ANOVA table should be used to compute the separation values.

If the F-statistic for the INTERACTION is not significant at the 0.05 level (i.e. the p-value is not less than 0.05), but the F-statistic for the GROUP is significant (i.e. the p-value is less than 0.05), but data indicate that any differences which exist among the group means are consistent across time. To find out which group means differ, a pairwise comparison of the group means should be carried out by pooling data across all points in time. Again, the mean square error (MSE) from the two-way ANOVA table should be used to compute the separation values.

If the F-statistic corresponding to both INTERACTION and GROUP are not significant at the 0.05 level, the data indicate no difference between the group means at any point in time. In this case, no further analysis is necessary.

Finally, Snedecor and Cochran (1980) caution about the use of multiple comparisons. If many such comparisons are being conducted, then about 5 percent of the tested differences will erroneously be concluded as significant. The researcher must guard against such differences causing undue attention.

## REQUIRED DOCUMENTATION

The following documents should be included to summarize findings from a product test.

- Data listings for each analyte that was analyzed. These should show all raw data.
- A table of summary statistics for each analyte. The table should include the mean, standard deviation and sample size for each group at each day.
- An ANOVA table for each analyte. The table should be of the same format as Table 1.
- A clear summary of the mean separations (if mean separations were necessary). The mean separation methods (LSD or Dunnett), the significance level, the minimum significant difference value and the significant differences should be clearly marked on each output page.
- All computer outputs should be included. No programming alterations are necessary. The specific computer package used to analyze the data should be included in the report.







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Dallas, Texas 75075  
Ph: (972) 669-3390  
Fax: (469) 241-0896  
Email: oseicorp@msn.com  
Web: www.osei.us

**OSEI CORPORATION'S SUMMARY**  
**of**  
**Texas A&M's**  
**Microbial Petroleum Degradation Enhancement**  
**By Oil Spill Bioremediation Products**

The General Land Office for the state of Texas (USA) asked the University of Texas A&M to perform a study on 13 bioremediation products listed in the EPA National Contingency Plan for oil spills.

The efficacy tests were to be performed using the EPA / NETAC guidelines in their test protocol for bioremediation agents.

The test covered the total oil and grease (O&G), the aliphatic fraction of oil, the aromatic fraction of oil, and the plate counts on the numbers of hydrocarbon degraders grown or colonized during this test.

***OIL SPILL EATER II*** IS PRODUCT 10.

***Oil Spill Eater II*** was one of the best products at reducing the oil and grease. ***Oil Spill Eater II*** was the most effective product at reducing the aliphatic fraction of the oil.

***Oil Spill Eater II*** was the most effective product at reducing the Polar-aromatic (PAH, more toxic) fraction of the oil.

***Oil Spill Eater II*** grew the most hydrocarbon degraders, an acceptable product grew  $10^5$  numbers of hydrocarbon degraders while ***OSE II*** outperformed them all at enhancing hydrocarbon degraders at  $10^{7.5}$ .

***Oil Spill Eater II*** proved it was the most efficient product at biodegrading Alaskan North Slope crude oil out of the 13 EPA / NCP Listed products tested.

Steven R. Pedigo  
Chairman

**Microbial Petroleum Degradation Enhancement By  
Oil Spill Bioremediation Products**

**A Report Submitted to the Texas General Land Office**

**October 12, 1995**

**Principal Investigators:**

**James S. Bonner**

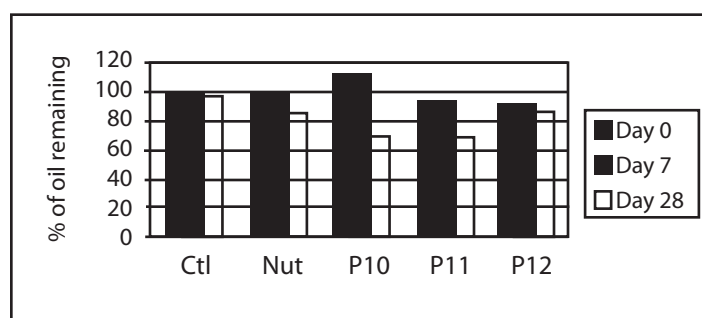
**Robin L. Autenrieth**

**Contributing Students:**

**Salvador Aldrett**

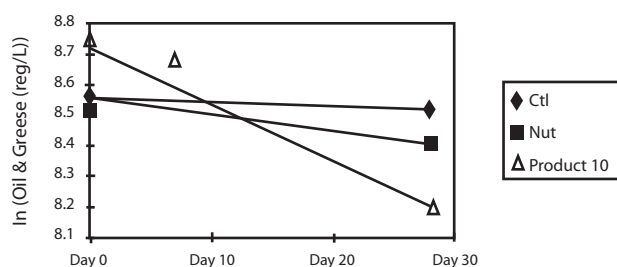
**Marc A. Mills**

**Frank Stephens**



**Figure 4 – Oil and Grease results (Batch D)  
P10 is OSE II**

High O&G numbers can be a result of a high production of extractable materials such as biomass or metabolites. As shown in Batch D, Product 10 is causing an increase in the O&G values at day 0 and 7, with an average value of 11% more of the initial weight. However, microbial counts indicate a high aliphatic degrader population through this period, as will be shown later Figure 16. After 28 days the oil was degraded more extensively by Product 10 than by the nutrient control. This suggests that the polar fraction is possibly being increased by the product's contents, on days 0 and 7, but does not imply that the oil is remaining undegraded. Microbial degradation of Product 10 could be producing metabolites that are being completely oxidized between day 7 and day 28.



Treatment	Slope	R square
Control	-0.0013	0.9505
Nutrient	-0.00563	0.8041
Product 10	-0.01859	0.9228

**Figure 10 – Ln concentration change with time for product 10 (P10)  
as compared with the nutrient and non-nutrient control**

Figure 10 suggests a lag phase for Product 10 between day 0 and 7, after this period the microbial population shows a high degradation rate, achieving a final degradation extent higher than that of the nutrient and non-nutrient control.

The rate of oil removal is an important factor to consider when comparing the performance of each product. Table 7 presents a summary with the different rates of oil removal as well as the average.

**OSE II**→

Product	Rate	Non-nutrient control	Nutrient control
Product	0.007	0.00013	0.004
Product	0.012	0.00013	0.004
Product	0.014	0.002	0.005
Product	0.017	0.0003	0.014
Product	0.018	0.00013	0.005
Product	0.011	0.00013	0.005
Average	0.013	0.0005	0.005

Table 7 - Rates of oil removal for the products passing the O7G criteria (mg of oil/L-Day)

**OSE II** had the highest rate of oil removal of the 13 EPA NCP Listed Products tested.

According to these results the average half-life of the petroleum mixture for this specific experiment is approximately 40 days. Prior studies suggest a half-life for petroleum mixtures of approximately 2 months (Stewart et. al., 1993).

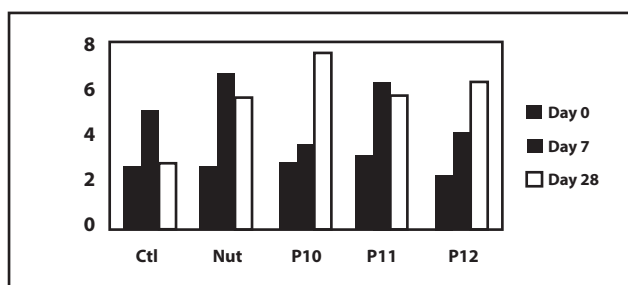


Figure 16 – MSN aliphatic degraders results (Batch D)

**OSE II** grew the highest number of oil degrading bacteria at  $10^{7.5}$ .

Products with a significant extent of oil removal show microbial counts in the order of  $10^5$  for the aliphatic degraders as presented in Figure 14, Figure 15, Figure 16, and Figure 17. Treatments with higher microbial populations, but similar degradation extents a compared with the control suggest the addition of an alternative carbon source other than the petroleum hydrocarbons.

Figures 32-34 show the composition of aliphatics, aromatics, and polars for batch D. As presented earlier for batches A and B, the aliphatic fraction is being degraded more severely than the aromatic fraction. The same results are found in the next two figures. Microbial counts for aliphatic degraders (Figure 16) show a higher number for Product 10, with a value of  $4.06 \times 10^7$  at day 28, as compared with the rest of the treatments in this batch, with values in the order of  $10^6$  at the most. This is reflected as a decrease in the aliphatic fraction composition from a 100% to 46% after 28 days.

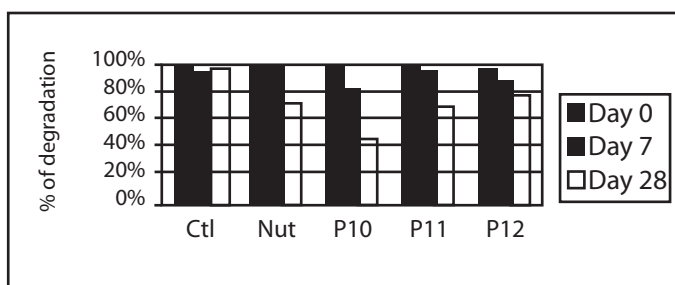


Figure 32 – Aliphatic fraction composition through time (% of degradation (Batch 1))

**OSE II** had the highest rate of degradation.

Products 10, 11, and 12 are decreasing in aliphatic and aromatic composition up to 50% for the aliphatic fraction and 25% for the aromatic. It is clear from these results that the oil is being degraded, and therefore, changing its composition. However, the aliphatic fraction is being degraded at a greater extent than the aromatic fraction, as mentioned before. Product 10 is showing a significant extent of hydrocarbons removal as presented in Figure 33 and Figure 34 for Product 10.

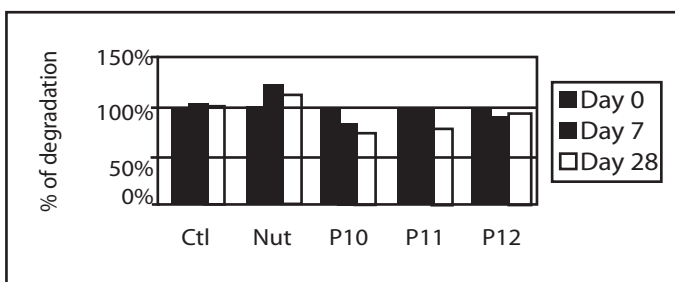


Figure 33 – Aromatic fraction composition through time (% of degradation (Batch D))

**OSE II** had the most (highest rate of) degradation of the aromatic fraction of the oil.

As presented in Figures 23 and 33 show the average of aliphatic fraction biodegraded was 34% (54% decrease for OSE II), while only 21% of the aromatic fraction showed to be biodegraded. The most degradation was by OSE II.

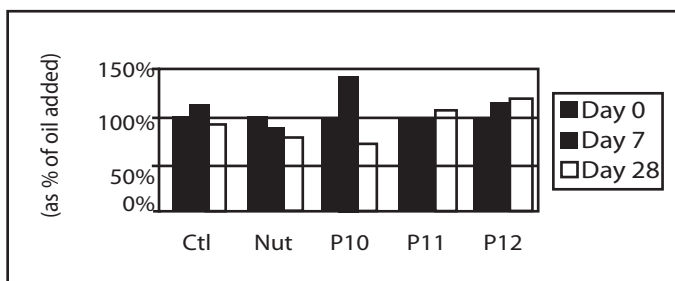


Figure 34 – Polar fraction composition through time as a percentage of the amount initially present (Batch D)

**OSE II** had the most or highest rate of (Polar) aromatic hydrocarbon degradation.



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OIL SPILL EATER II  
EPA TEST – MARCH 1993  
OIL SPILL EATER II – RESPIROCITY TEST - SUMMARY

This Respirocity Test was developed by NETAC and the Environmental Protection Agency to verify if a product could actually mitigate hydrocarbons to an end point of CO<sub>2</sub> and water. The test was designed to measure the amount of oxygen-enhanced bacteria used. This would confirm the bacteria are in fact breaking the hydrocarbons down to CO<sub>2</sub> and water.

At 100 parts Alaskan Gulf Seawater to 1 part OIL SPILL EATER II – applied at a 1 to 1 ratio to 1,000 parts per million Alaskan Prudhoe Bay Crude, the oxygen uptake is dramatic. This dramatic oxygen uptake proves a large amount of bacterial growth and decomposition of Prudhoe Bay Crude. The Chart on Page 2 shows an 86% decrease in heavy-end hydrocarbons and a 50% decrease in the aromatics. The test was stopped at 30 days; the test time prescribed by the EPA.

Our Standard Application Instructions for crude oil are 50 parts water to 1 part OIL SPILL EATER II applied at a 1 to 1 ratio to crude oil. The test results may be extrapolated to determine that with a 50 to 1 dilution, a 98% decrease in heavy-ends would occur in 24 days while an 85% decrease in aromatics would occur in 30 days. OIL SPILL EATER II can very effectively mitigate an oil spill.

After reviewing copies of the EPA Test on 10 other products, a comparison was initiated on the 2 products EPA claimed out-performed the other 9 products they tested. One product reduced the TPH approximately 158 parts per million and the other product reduced to 157 ppm of TPH. OIL SPILL EATER II reduced the TPH to 870 PPM. We feel this is a significant difference in efficacy.

March 1993  
Respirocity Test

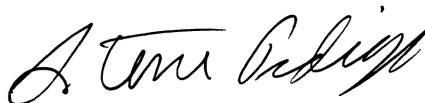
The Prudhoe Crude was supplied by the EPA, and was supposed to be the same crude used on the other two products. The crude sent to us for testing had a higher TPH (1,000 PPM) compared to the bacteria products tested by the EPA which only had a TPH of 168 ppm. Additionally, this crude did not have aromatics which the crude oil OSE II was tested on, did. The aromatics were reduced 50%.

It is our opinion that if you apply bacteria directly to a hydrocarbon with aromatics, that the toxicity of the aromatics will kill the bacteria. OIL SPILL EATER II first breaks the hydrocarbon walls, then grows bacteria so the toxicity is reduced first.

The accumulate oxygen uptake was also tested which shows bacterial activity. One of the products the EPA tested, they claim, performed well, had an uptake of 280 mg/L in 10 days and 460 mg/L in 30 days. The other product the EPA tested had 40 mg/L at 10 days and 440 mg/L at 30 days. OIL SPILL EATER II had an uptake of 520 mg/L at 10 days and 810 mg/L at 30 days. OSE II had more oxygen uptake at 10 days than the best bacterial products had at 30 days; on the 30 day comparison, OSE II had almost double the oxygen uptake any other product.

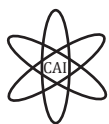
The EPA screened 31 products and tested 10. This test shows OIL SPILL EATER II reduced dramatically more TPH than these other products. OSE II produces more microbial activity than products with bacteria, and additionally, OSE II reduces aromatics. This test should help prove why we feel OSE II is the better product.

NOTE: In the summer of 2000 – Dr. Al Venosa (one of the EPA's top scientists at the time, on oil spills) reviewed this test. Dr. Venosa concluded that OSE II did, in fact biodegrade alkanes and aromatics. Dr. Venosa went on to explain that OSE II may be effective in degrading oil.

A handwritten signature in black ink, appearing to read "Steven R. Pedigo".

By: Steven R. Pedigo  
Chairman  
OSEI, Corp.

SRP/AJL



# CHEMICAL ANALYSIS, INC.

Chemical \* Polymer \* Design

Research and Development  
Consultation  
Legal and Expert Witness

July 3, 1990

Failure Analysis  
Formula Analysis  
Engineering Design

Mr. Steve Pedigo

Sky Blue Chems

13355 Noel Road

NEW ADDRESS AS OF 10/96

1 Galleria Tower, Suite 500

Dallas, Texas 75240

OSEI, CORP.

13127 Chandler Drive

Dallas, TX 75243

Subject: Oil Spill Eater Respirocity Evaluation

CAI Lab. No. 3265

Dear Mr. Pedigo:

Chemical Analysis, Inc. being an independent third party laboratory was employed to evaluate an oil spill additive for respirocity efficacy. The oil spill additive submitted to the laboratory was a product identified as Oil Spill Eater batch No. 124-E. The additive was evaluated at two different concentrations which included 1/100 and 1/500, additive parts to solution parts, respectively.

The concentration of the oil was 1000 parts per million (ppm). The oil and seawater was submitted to the laboratory to be similar to field material.

The results of our evaluation are attached to the report. Observing the results, it can be seen that the additive has a meaningful and significant effect on decreasing the oil concentration and increasing the oxygen take up.

The effect on decreasing the aliphatic content of the oil was in the range of 80 percent and the decrease of the aromatic content was in the range of 40 percent. An additive concentration of 1/500 appears to be effective. The concentration of the additive may have an adequate effect at even a lower concentration than 1/500.

The inherent effect of oxygen take up was observed to be 178 mg/L for the additive (1/500), 12 for the seawater, and 8 for the oil. The net effect of the additive was 512 mg/L.

If there are any questions or if we may be of further assistance, please advise.

Sincerely yours,  
CHEMICAL ANALYSIS, INC.

Galen Bartman

Laboratory Director

GWH:es



# Oil Spill Eater (OSE) Respirocity Results

Percent	Sample	Oil	Additive	Accumulated Oxygen Uptake				Aliphatic Content				Aromatic Content				Percent	
				0	10	20	30 days	0	10	20	30 days	0	30 days	0	30 days	Aliphatic Decrease	Aromatic Decrease
				mg/L	mg/L	mg/L	mg/L	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm		
1	+	1/500	+	16	380	620	690	712	570	233	151	246	133			79	46
2	+	1/500	+	18	410	660	730	693	542	274	138	240	149			80	38
3	-	1/500	+	5	152	174	186	-	-	-	-	-	-			-	-
4	-	1/500	+	5	141	168	194	-	-	-	-	-	-			-	-
5	-	-	+	0	5	8	12	-	-	-	-	-	-			-	-
6	-	-	+	0	6	8	11	-	-	-	-	-	-			-	-
7	+	-	+	2	12	18	22	705	710	695	682	251	248			3	1
8	+	-	+	3	13	16	19	684	680	681	675	238	237			1	0
9	+	1/100	+	26	460	680	770	690	512	210	105	245	115			85	53
10	+	1/100	+	33	520	740	810	695	486	260	89	250	127			87	49
11	Spill Eater Batch No. 124-E																



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March 23, 1990

OIL SPILL EATER II  
BIODEGRADATION TESTS  
CONCLUSIONS

These tests were conducted by the University of Alaska in Fairbanks, AK. The first test was on a heavy-end hydrocarbon (Hexadecane), which is left over once the light-ends volatilize off. The mineral nutrients in nature refers to the use of Alaskan Sea Water used to perform the test. At 50 to 1, it shows good reduction and if the test would have continued another 48 hours, the results would have been substantially increased. The OIL SPILL EATER II has a good food source for bacteria and there was more food source than sea water ratio to grow a large colony quickly; therefore, the bacteria engulfed the food sources in the OSE II and slowly converted to hydrocarbons. Once all the OSE II food source runs out, then the only food source left are the hydrocarbons—so they switch over to stay alive. At 1 to 500 and 1 to 1000 absolute biodegradation was proven, the bacteria colonized quickly and ran out of food source because they started with less food source. The bacteria switched over quickly and a dramatic reduction in hexadecane was accomplished.

The second test was run on Naphthalene using minerals and nutrients (Alaskan Sea Water). Naphthalene is a polynuclear aromatic hydrocarbon and are harder to break down than heavy-end hydrocarbons and they are the most toxic. These tests also show that OIL SPILL EATER II is a very effective means of mitigating naphthalene, a PAH which EPA's Dr. Al Venosa deems the hardest target compounds to Bioremediate!

By: Steven R. Pedigo  
Chairman



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## OIL SPILL EATER II

### A PROTEIN POWER PACKAGE

The lack of knowledge about biological treatment of hydrocarbons has led to slow acceptance of proven methods of Bioremediation, particularly with respect to oil spills. However, following the EXXON VALDEZ incident, the U.S. Environmental Protection Agency undertook the first major governmental effort to use biological methods for site remediation. Although the early results are mixed, EPA is to be commended for its efforts which included application of a French Product (Inipol EPA 22) to enhance microbial degrading of weathered crude oil from beaches. Inipol has been described as "Popeye's Spinach" supplement to enhance the rate and extent of hydrocarbon degradation by naturally occurring microbial populations. The Inipol formulation probably does enhance the growth of hydrocarbon degradation bacteria (although this has not been clearly shown in the field portion of the EPA Study), but suffers in that it contains the potentially toxic solvent, 2-butoxyethanol.

There are many other agents which have potential to stimulate hydrocarbon removal from contaminated environments. These range from the solvent based cleaners and dispersants to simple water soluble inorganic fertilizers. One such product that has shown great potential for enhancing hydrocarbon biodegradation in standardized laboratory tests at the University of Alaska Fairbanks is OIL SPILL EATER II. If Inipol is a "Popeye's Spinach" formulation for hydrocarbon degrading micro-organisms, OIL SPILL EATER II is a "Protein Power Package" of mineral nutrients, enzymes and a carbon source concentrated in a non-toxic oleophilic surfactant. The surfactant base dissolves into hydrocarbon matrices with the aid of protease and amylase enzymes that act as micro-surface cleaners. The mineral nutrients enhance growth of natural hydrocarbon degrading micro-organisms with the pulse of easily metabolized carbon to quickly increase bio-mass. The high bio-mass, then begins to degrade hydrocarbon substrates and to product biosurfactants until the hydrocarbon substrate is depleted.

OIL SPILL EATER II  
A PROTEIN POWER PACKAGE

In the aftermath of the EXXON VALDEZ Oil Spill, researchers from the University of Alaska evaluated the potential for naturally occurring micro-organisms to biodegrade oil contaminated beaches. Their studies showed that while natural micro-organisms have the potential to biodegrade both linear alkanes and aromatic hydrocarbons, their numbers and related metabolic activities can be substantially increased. In standard laboratory tests, these researchers showed that the marine formulation of OIL SPILL EATER II diluted into artificial seawater containing a consortium of micro-organisms and hydrocarbons from Prince William Sound, Alaska will degrade Hexadecane—300% faster than the same consortium amended with mineral nutrients and hydrocarbons without OIL SPILL EATER II.

By: Dr. Ed Brown  
University of Alaska

DEB/AJL

OIL SPILL EATER CONCENTRATE  
MINERALIZATION OF HEXADECANE BY A MICROBIAL CONSORTIUS FROM  
PRINCE WILLIAM SOUND, ALASKA (1)

Sample	Mineral Nutrients in nature HO OSE	Mineral Nutrients in nature 1/50 Dilution of Oil Spill Eater II Eater II	Mineral Nutrients in nature 1/500 Dilution of Oil Spill Eater II Eater II	Mineral Nutrients in nature 1/1000 Dilution of Oil Spill Eater II Eater II	Mineral Nutrients in nature 1/10 Dilution of Oil Spill
Hexadecane Transformation (I transformed to CO <sub>2</sub> ) Mean of 3 trials	16	19.3	50	43.7	0
		Need more time so bacteria can use up molasses & convert to Hydrocarbon	300 increase  proven efficacy		
			Should totally eliminate Hydrocarbons		

1. Consortius was incubated for 70 hours with 100 mg of labeled hexadecane per sample.

Test Conducted at University of Alaska-Fairbanks

OIL SPILL EATER II CONCENTRATE  
Mineralization of Naphthalene by a Microbial Consortius From  
Prince William Sound, Alaska (1)  
Alaskan Seawater

Sample	MINERAL Nutrients in nature No OSE	MINERAL Nutrients in nature 1/50 nature Dilution of Oil Spill Eater II	MINERAL Nutrients in nature 1/500 Dilution of Oil Spill Eater II	MINERAL Nutrients in nature 1/1000 Dilution of Oil Spill Eater II
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N A P H T H A L E N E  
Transformation  
(% transformed  
To CO<sub>2</sub> Mean of 3  
3 trials

29

46

27

More time  
would have  
been allowed  
for the  
bacteria to  
completely  
use up the  
molasses and  
completely  
convert to  
hydrocarbon  
for its food  
source

1 5 3 3 %  
increase  
p r o v e n  
efficacy  
s h o u l d  
t o t a l l y  
eliminate  
raphthalene  
hydrocarbons

1. Consortium (Alaska Sea Water) was incubated for 51 hours with 100 mg of labeled Naphthalene per 10 ML sample.

Test conducted at the University of Alaska  
1/9/90



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August 13, 1990

MEGA BORG BIODEGRADATION TEST

Southwest Research Institute – one of the United States largest and most respected labs performed TPH reduction tests and residual weight tests using OIL SPILL EATER. This product, OSE, was applied to South African Crude Oil – spilled from the Mega Borg Tanker off the coast of Galveston, Texas. The sample of crude was supplied by the U.S. Coast Guard – Sky Blue Chems sent the sea water from Galveston to the Lab.

The initial TPH was 100,070 ppm; in 216 hours the TPH was reduced to 529 for a 99.5% reduction. This is a dramatic decrease and it proves Oil Spill Eater is a very viable Bioremediation product. This dramatic decrease shows how effective Oil Spill Eater is in reducing the chemical (toxic) constituent of the crude oil. The TPH was reduced approximately 90% in 48 hours rendering the crude oil virtually harmless quickly.

The physical reduction of the crude oil was also determined. In 216 hours, 94.7 of the residual weight of the South African Crude was remediated.

These tests prove "OIL SPILL EATER" is an extremely effective Bioremediation product that decreases not only the chemical components of crude oil, but it also Biodegrades the physical components as well.

Steven R. Pedigo  
Chairman

SRP/AJL

# SOUTHWEST RESEARCH INSTITUTE

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August 3, 1990

CHEMISTRY AND CHEMICAL ENGINEERING DIVISION  
DEPARTMENT OF ENVIRONMENTAL SCIENCE

Attention: Mr. Steven R. Pedigo

Subject: Second Test for Sky Blue Chemical 01-3108-092

A sample of Megaborg oil and seawater was analyzed as per your instructions. The results of this initial test were inconclusive and a second test was requested. The second test was more extensive and included more time points. Samples were taken at 48, 72, and 96 hours for the sample and control. The sample consisted of 600 ml seawater, 6 ml Megaborg oil, and 6 ml of the oil-eater provided. The control consisted of 600 ml seawater, and 6 ml Megaborg oil. The sample and control were stirred constantly at a very low speed. Sampling procedure: Vigorously stir the solution and remove 100 ml. Extract for TRPH analysis. After 90 hours the client requested addition of more seawater to improve the efficiency of the oil-eater, this was performed. A final analysis for TRPH was performed at 216 hours and was a complete sample extraction. In order to better compare the control and oil-eater results, results are shown in % Recoverable Oil, assuming that 1 gram of oil is equal to 1 ml of oil (since oil density is unknown). The percent recoverable oil is calculated as follows:

equation	TRPH g/ml	100 ml			
not clear		1000 g/ml	100	=	%
	theoretical amount of oil		1000 mg/g		
	extracted in each aliquot = 1 g				

TRPH and % Recoverable Oil for each time are shown for the sample and control in tables 1 and 2, respectively. Megaborg oil itself was found to have a TRPH of 1,070,000 mg/l.

Sincerely,



Mary Riddle  
Research Scientist

Approved:



Donald E. Johnson, Ph.D.  
Director



SAN ANTONIO TEXAS



Table 1

01-3108-092  
Sample With Oil-Eater II

Time Elapsed	TRPH (mg/10)	% Recoverable Oil
48 hours	7520	75.2
72 hours	6910	69.1
96 hours	5990	59.9
*216 hours	529	5.3

95% Reduction of  
TPH in 216 hours.  
Chemical reduction  
of TPH.

oil.

94.7% residual weight  
reduction in 216 hours.  
Physical reduction of

\* Total sample analyzed



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### SUMMARY OF BETX TEST

The objective was to have a third party testing laboratory show how OSE II (OIL SPILL EATER II Concentrate) worked well even on Benzene, Ethyl Benzene, Toluene and Xylene. The final composition – after all dilutions were performed, was 2,000 parts water to one (1) part OSE II Concentrate.

Even at this low level, the total BETX was reduced 32%. The correlation of strengths should prove that at 1,000 to one (1) reduction would have been 64%, a 500 to one (1) reduction would have been 80%; a 100 to one (1) reduction would have been 98%, almost completely Biodegraded.

At 2,000 to one (1) OSE II is a cost-effective product for Ballast Water Treatment.

The reduction correlation's with the increasing ratios also show that OSE II is an effective product for gasoline and diesel spills. OSE II would reduce gasoline or diesel spills on the surface and around leaking Underground Storage Tanks. OSE II would also be a good product to clean up any oil sheen on water surfaces and concrete surfaces.

Steven R. Pedigo  
Chairman



# CHEMICAL ANALYSIS, INC.

Chemical \* Polymer \* Design

Research and Development  
Consultation  
Legal and Expert Witness

March 14, 1990

Failure Analysis  
Formula Analysis  
Engineering Design

Mr. Steve Pedigo

Subject: BETX Analysis  
CAI Lab. No. 3229

Dear Mr. Pedigo:

Chemical Analysis, Inc. being a third party independent laboratory was employed to evaluate a product identified as Oil Spill Eater and its affect on BETX solution. The procedural method was provided to our laboratory which outlined the preparation of several solutions.

Solution I: BETX

<u>COMPONENTS</u>	<u>% BY VOLUME</u>
Benzene	5.0
Ethylbenzene	5.0
Toluene	5.0
Xylene	5.0
Florida Sea Water	<u>80.0</u>
TOTAL	100.0%

Solution II: OSE-Florida Sea Water

<u>COMPONENTS</u>	<u>% BY VOLUME</u>
Oil Spill Eater	0.20
Florida Sea Water	<u>99.80</u>
TOTAL	100.0%

The percentage ratio of these two components represents a 1 to 500 mix ratio respectively.

3001 Skyway Circle North, Suite 100. Las Colinas Irving, Texas 75038 (214) 255-4100

Solution III: BETX/OSE-Florida Sea Water

<u>COMPONENTS</u>	<u>% BY VOLUME</u>
Solution I	50.00
Solution II	<u>50.00</u>
TOTAL	100.0%

Solution IV: BETX/OSE-Florida Sea Water Solution

<u>COMPONENTS</u>	<u>% BY VOLUME</u>
Solution III	50.00
Florida Sea Water	<u>50.00</u>
TOTAL	100.0%

Final Solution Composition:

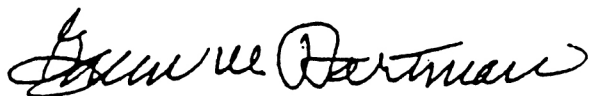
<u>COMPONENTS</u>	<u>% BY VOLUME</u>
Aromatics	5.00
OSE Additive	0.05 (1:2000 weight ratio)
Florida Sea Water	<u>94.95</u>
TOTAL	100.0%

The final solution identifies the composition of the final mixture when the various solutions are prepared and mixed together based on the procedural instructions. The resultant final solution was allowed to stir for a period of (96) hours and the volume of BETX aromatic content was evaluated. The initial percent volume of aromatic discontinuous phase in the final solution represented five percent after the test. As a result of the evaluation, it was observed that 1.6% of the BETX solution had decreased from the discontinuous aromatic phase; this represented a 32% volume reduction in the aromatic content. Turbidity was observed to have increased in the water phase which indicated that incompatible components were incorporated into the water phase.

The 1:2000 weight ratio concentration of OSE in the final solution is based on the assumption that the OSE additive is 100% active; if the OSE is less than 100% active then one needs to proportionate the concentration accordingly.

If there are any questions or if we can be of further assistance, please advise.

Sincerely yours,  
CHEMICAL ANALYSIS, INC.

A handwritten signature in black ink, appearing to read "Galen W. Hartman". The signature is fluid and cursive, with the first name "Galen" and last name "Hartman" clearly distinguishable.

Galen W. Hartman  
Laboratory Director

GWH/cmc

All information and recommendations made by Chemical Analysis, Inc. ("Company") verbally or in writing, are based upon tests and data believed to be reliable, and/or upon experience of the Company representative involved; however, because of the variable characteristics of analytical procedures and samples, and the inability of Company to control its customers' uses of the information and recommendations, or the related products or materials, Company makes NO WARRANTY, EXPRESS OR IMPLIED as to the accuracy of the information or recommendations or that such are fit for any general or specific purpose whatsoever. Company shall have NO LIABILITY arising from the use by its customers or any third parties of the information and recommendations, and it shall be each customer's sole responsibility to determine the suitability for its own use of any information or recommendations provided by Company. Submitted material will be retained for 90 days unless otherwise notified. Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our Letters and reports apply to the sample tested and/or inspected, and are not necessarily indicative of the qualities of apparently identical or similar materials.



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Ph: (972) 669-3390  
Fax: (469) 241-0896  
Email: oseicorp@msn.com  
Web: <http://www.osei.us>

## SUMMARY

### CHEVRON CRUDE OIL TEST

A client of OSEI requested that we perform a basic test on Chevron crude oil to show the potential for OSEI to bioremediate this oil.

A basic test where crude oil was placed on water and OSEI was applied was performed. The initial TPH count was 95,200 ppm. OSEI was applied on 1-18-91. The next test was performed 12 days later where the TPH had dropped to 7,720 ppm. Then 12 days later, the final test was performed and the TPH had dropped to 690 ppm.

This was a simple test to show the client that indeed OSEI would remediate the type of contamination on their site.

A handwritten signature in black ink, appearing to read 'Steven R. Pedigo', is positioned above the printed name.

Steven R. Pedigo  
Chairman



**NATIONAL  
ENVIRONMENTAL  
TESTING, INC.**

NET Gulf Coast, Inc.  
Dallas Division  
1548 Valwood Parkway  
Suite 118  
Carrollton, TX 75006  
Tel: (214) 406-8100  
Fax: (214) 484-2969

**ANALYTICAL REPORT**

Mailing Address:  
P.O. Box 815006  
Dallas, TX 75381

**OSE**  
**5545 Harvest Hill Lane**  
**Suite 1116**  
**Dallas, TX 75230**

**02-04-91**  
**Job No.: 903119**  
**Sample No: 157555-157556**  
**Page: 1**

**Sample Description: SEE BELOW**

**Date Received: 01-18-91**

**157555 Chevron Crude – Sherman TX**  
**Taken: 01-18-91**

**Total Petroleum Hydrocarbon 952,000\* ug/g x density 95,200\***

**157556(1) Chevron Crude – Remediation Treated**  
**Taken: 01-18-91**

**Total Petroleum Hydrocarbon 77,100\* ug/g x density 7,720\***

**On January 30, 1991 sample was mixed and total TPH analyzed.**

**157556(2) Chevron Crude – Remediation Treated**  
**Analyzed 2/12/91**

**Total Petroleum Hydrocarbon 6,900\* ug/g x density 690\***

**On February 12, 1991 sample was mixed and total TPH was analyzed.**

**\*Freon Extract Discolored.**

**Donna L. Bowlin, Manager**  
**Dallas Division**

## STANDARD QUALITY CONTROL DATA REPORT

SAMPLE/PROJECT 157555-157556

PARAMETER	ANALYST	DATE	TIME	METHOD	EXTERNAL STANDARD	BLANK
TPH	DWT	013091	1000	E418.1	1880/1700	BDL
TPH	DWT	021291	1000	E418.1	2270/2440	BDL

Method – Codes, i.e.

A – refers to APHA, Standard Methods for the Examination of Water and Wastewater, 16th Edition

E – refers to EPA's 1979 Methods for Chemical Analysis of Water and Wastes – for Inorganic Analyses

E – refers to EPA's 1979 Methods for Organic Chemical Analysis of Municipal and Industrial Wastes – for Organic Analyses

S – refers to SW846, 3rd edition

D – refers to ASTM

M – Method has been modified

\* – refers to Other Reference

External Standard – the Actual/Theoretical value for that batch of analysis. Acceptance Criteria – must be within 10% of the true value, except where EPA methods state otherwise.

Blank – samples are not blank corrected by the laboratory





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**“OIL SPILL EATER II”**  
**HYDROCARBON REDUCTION TEST**  
**FOR**  
**GAF INDUSTRIES**  
**SUMMARY**

GAF Industries in Savannah, Georgia has a site contaminated with Venezuelan crude, #6 fuel oil and diesel fuel. The site has been contaminated for approximately 10 years. Sky Blue Chems designed a lab test that would mimic the actual cleanup plan. The contaminated site had approximately 85% aliphatic (heavy end) hydrocarbons, 6% aromatics (light ends) and 9% asphaltenes (weathered crude).

The initial hydrocarbon count was 100,000 mg/L. Oil Spill Eater II was mixed 50 to 1 with Savannah river water and applied at a 1 to 1 ratio to the hydrocarbons. In 96 hours all the aromatics and all the aliphatics were reduced to CO<sub>2</sub> and water. The weathered asphaltenes were the hardest to breakdown and consumed most of the testing time.

GAF asked us to demonstrate that we could mitigate their hydrocarbon contamination to less than 100 ppm so they could meet their NPDES discharge permit needs. This was a rigorous test for Oil Spill Eater II that proves the product is effective on light ends, heavy ends and weathered asphaltenes.

Steven R. Pedigo  
Chairman

LOG NO: SO-06430

Received: 24 MAY 90

CC: Pedigo/Franklin

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	SAMPLED BY
06430-1	GAF Waste Comp. Initial Test 6/1/90	Savannah Laboratories
PARAMETER	06430-1	
Petroleum Hydrocarbons (418.1), mg/kg	100000	
Percent Solids, %	56%	

CC: Pedigo/Franklin

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
06430-2	GAF Waste Composite Second Test 6/8/90	Savannah Laboratories
06430-3	GAF Waste Composite Third Test 6/11/90	
06430-4	GAF Waste Composite Fourth Test 6/15/90	
PARAMETER	06430-2	06430-3 06430-4
Petroleum Hydrocarbons (418.1), mg/l	6800	5400 5000

*Laboratory locations in Savannah, GA • Mobile, AL • Tallahassee, FL • Deerfield Beach, FL*

LOG NO: SO-06430

Received: 24 MAY 90

CC: Pedigo/Franklin

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES					SAMPLED BY
06430-5	GAF Waste Composite Fifth Test 6/22/90					Savannah Laboratories
06430-6	GAF Waste Composite Sixth Test 6/26/90					
06430-7	GAF Waste Composite Seventh Test 6/29/90					
06430-8	GAF Waste Composite Eighth Test 7/3/90					
06430-9	GAF Waste Composite Ninth Test 7/6/90					
PARAMETER	06430-5	06430-6	06430-7	06430-8	06430-9	
Petroleum Hydrocarbons (418.1), mg/l	2800	990	1500	1500	1100	

Methods: 1) EPA SW-846.

2) Sky Blue Chem Procedure "Testing  
Proposal OSE Bioremediation of  
Hydrocarbons."

Note: Extraction protocol described in Method 2  
followed. Verbal instructions received on  
6/22/90 to maintain volume by replacing  
each 100 ml aliquot removed for analysis  
with 100 ml of river water. A total volume  
of 500 ml OSE was added in seven  
applications.

*Laboratory locations in Savannah, GA • Mobile, AL • Tallahassee, FL • Deerfield Beach, FL*

LOG NO: SO-06430

Received: 24 MAY 90

CC: Pedigo/Franklin

REPORT OF RESULTS

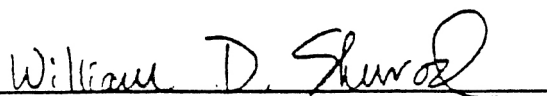
Page 4

LOG NO	SAMPLE DESCRIPTION . LIQUID SAMPLES	SAMPLED BY			
06430-10	GAF Waste Composite Tenth Test 7/10/90	Savannah Laboratories			
06430-11	GAF Waste Composite Eleventh Test 7/13/90				
06430-12	GAF Waste Composite Twelfth Test 7/17/90				
06430-13	GAF Waste Composite Thirteenth Test 7/20/90				
PARAMETER		06430-10	06430-11	06430-12	06430-13
Petroleum Hydrocarbons (418.1), mg/l		700	350	360	41

Methods: 1) EPA SW-846.

2) Sky Blue Chem Procedure "Testing  
Proposal OSE Bioremediation of  
Hydrocarbons."

Note: Extraction protocol described in Method 2  
followed. Verbal instructions received on  
6/22/90 to maintain volume by replacing  
each 100 ml aliquot removed for analysis  
with 100 ml of river water. A total volume  
of 500 ml OSE was added in seven  
applications.



William D. Sherrod



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## DIESEL CONTAMINATION CLEANUP SUMMARY

27 July 1993

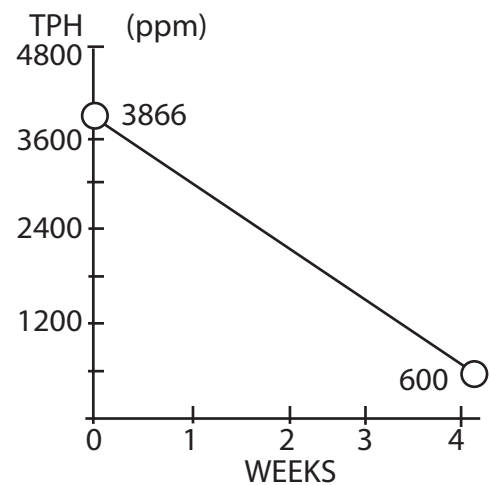
U.S. Marine Corps, 29 Palms, CA

### CONTAMINANT:

89 cubic yards of aged Diesel Contaminated Soil. The soil was spread out in a rectangle approximately 33 inches deep. NOTE: Our instructions specify no deeper than 18 inches.

### PROCEDURE:

29 Palms initial composite sample was 3,986 ppm TPH using EPA Test 8015 modified. 29 Palms applied 40 gallons of OSE II mixed with 2,000 gallons of pond water to the contaminated soil. They used a tanker truck and fire hose to apply the liquid.



29 Palms did not disc or add any additional water to the contaminated soil for the next four (4) weeks. NOTE: Our instructions specify to disc the soil at least once a week and keep the soil at a level of approximately 30% humidity.

29 Palms took samples after 4 weeks and had a composite reading of 600 ppm TPH.  
THE ACCEPTABLE LEVEL IS 1,000 ppm TPH.

COMMENT: EVEN THOUGH 29 PALMS . . .

1. Piled the contaminated soil almost twice as deep as our instructions specify, and
2. Did not disc the contaminated soil at all during the 4 weeks, and
3. Did not add additional water to the contaminated soil in the desert climate –

"OIL SPILL EATER" II W O R K E D!!

4. Think of what the TPH level might have been had 29 Palms followed our OSEI Procedures?

A handwritten signature in black ink that reads "George". The signature is stylized with a large, looping 'G' and a cursive 'e'.

Q. A. (George) Lively  
Rear Admiral (RET)  
President

**UNITED STATES MARINE CORPS  
NATURAL RESOURCES and ENVIRONMENTAL AFFAIRS  
Marine Corps Air Ground Combat Center  
Box 788110  
Twentynine Palms, California 92278-8110**

5090

9

15 Oct 93

MEMORANDUM

From: Installation Restoration (IR) Specialist  
TO: FILE

SUBJ: TESTING AND EVALUATION OF ENZYMATIC CATALYSIS FOR THE  
REMEDICATION OF PETROLEUM CONTAMINATED SOILS.

1. On 20 July 1993, MCAGCC began a testing and evaluation demonstration of a commercially available product of a natural biological enzymatic catalyst for the remediation of petroleum contaminated soils. The product, Oil Spill Eater II (OSE II), is on the National Contingency Plan Product Schedule of Biological Additives and is authorized for use by On-Scene Coordinators on releases of petroleum oil.
2. Before the Combat Center deploys this additive on a petroleum spill site or in the remediation of soils resulting from a spill, the Command decided to try the product on a small scale for its effectiveness. A summary of the results are as follows:
  - A control pile was constructed by berming and double lining (2–40 mil thick HDPE Liners) of a test area 21 feet x 42 feet. Non-hazardous soils under 40 CFR or Title 22 of CFR was placed in a 2' 9" high lift on top of the liner; resulting in approximately 69 cubic yards of petroleum contaminated soils from oil/water separators (OWS) to be tested with the product.
  - Three soil samples were obtained on 26 July 93 within the pile and were sent to an off-site laboratory for the analysis of BETZ by EPA 8020. Total Fuel Hydrocarbon by EPA 8015 (modified) as Diesel and Organic Lead by DHS Method.
  - On 28 July 1993, the test product was mixed according to manufacture application specifications of 40 gallons of product to 2,400 gallons of water. Application over the pile was accomplished by spraying with a 1,000 gallon water truck equipped with a 50 gpm pump. The pile was then covered with a black 12 mil thick plastic.
  - On 30 August 1993, three additional samples were taken to check progress of remediation. The samples were sent to an offsite laboratory for the same analysis of the initial sampling event. Due to lack of manpower, sampling could not begin being conducted at a two week interval.

TESTING AND EVALUATION OF ENZYMATIC CATALYSIS FOR THE  
REMEDICATION OF PETROLEUM CONTAMINATED SOILS

3. The results are as of the testing as follows:

INITIAL SAMPLING EVENT OF 26 July 93 (1)

	Sample Number	OS-1	OS-2	OS-3
Analyte	Reporting Limit mg/kg		Concentration mg/kg	
Benzene	0.005	<0.05	<0.05	<0.05*
Toluene	0.005	<0.05	<0.05	0.77
Ethylbenzene	0.005	<0.05	<0.05	0.26
Xylene, total	0.015	<0.15	<0.15	1.6
BTEX, total	---	---	---	2.6
TPH as diesel	10	2000	1400	8200
Organic Lead**	0.5	0.5	0.5	1.2

SAMPLING EVENT OF 30 AUGUST 1993

	Sample Number	OS1-A*	OS1-B*	OS1-C*
Analyte	Reporting Limit mg/kg		Concentration mg/kg	
Benzene	0.005	<0.05	<0.05	<0.05
Toluene	0.005	<0.05	<0.05	<0.05
Ethylbenzene	0.005	<0.05	<0.05	<0.05
Xylene, total	0.015	<0.15	<0.15	<0.15
BTEX, total	---	---	---	---
TPH as diesel	10	820	380	600
Organic Lead	0.5	<0.5	<0.5	<0.05

(1) Holding time was missed due to shipping of initial sampling delays.

\* Reporting limit raised due to matrix effect (foaming).

\*\* Extraction by DHS Method. Results are calculated on a wet weight basis. Total Organic Lead in Soil by Flame AA – DHS.



**Subj: TESTING AND EVALUATION OF ENZYMATIC CATALYSIS FOR THE  
REMEDICATION OF PETROLEUM CONTAMINATED SOILS.**

- 4. It is assumed the reason for the matrix foaming of the samples are due to surfactants in the soil and from the test product.**
- 5. On the 30 August 1993 sampling event, soil samples were moist to saturated from the application of product. No tilling or turning of soils were required as recommended by the contractor.**
- 6. Results indicate bioremediation of soils within acceptable levels required by the Regional Water Quality Control Board (RWQCB) for the soils to be used as landfill cover.**
- 7. A request for disposal of remediated soils at the MCAGCC Class III landfill will be forwarded to the RWQCB.**
- 8. Additional, test piles will be run in the future utilizing OWS, JP-5 and diesel contaminated soils based on the availability of manpower.**

A handwritten signature in black ink, appearing to read "L. Bowling", is positioned above the printed name.

**LEON BOWLING**



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## **“OIL SPILL EATER II”**

### **SOIL TPH TEST**

### **CONCLUSION**

The contaminated soil was extracted from a site in Anchorage, Alaska. The initial total parts hydrocarbon (TPH) was 767 and after three (3) diluted applications, applied per oil spill instructions for soil contamination cleanup, the TPH reduced to 391. This soil had been contaminated for approximately one (1) year which means the contaminant had weathered substantially. The more weathered, the more resistant the hydrocarbons are to remediation, which takes slightly longer for OSEI to help remediate the TPH. The test was carried out using sterile deionized water, which means bacteria take longer to colonize. If natural sea water or fresh water with naturally occurring bacteria already in it had been used, biodegradation would have been more rapid and a higher reduction of TPH would have occurred.

One of the concerns is once OSEI is applied, did bioremediation actually occur, or were the hydrocarbons simply mobilized into the water column (aqueous phase)? A test on the Supernate of the treated soil (the water used in the test) was then tested for its hydrocarbon content. The test showed only 2% hydrocarbon count which could be expected since the water is covering the contaminated soil. It does, however, definitely prove that the hydrocarbons are being converted to CO<sub>2</sub> and water, and are not being held in the water. This proves that the use of Oil Spill Eater II would not affect the ground water where treatment takes place.

This was a tough test for OSEI using older contaminated soil and sterile water, but it proves substantially that OSEI is a very viable bioremediation product to reduce the TPH from the soil.

This test was stopped short of obtaining the State of Alaska's 100 ppm reduction level. The reason the test was stopped short was because the cleanup company wanted to verify that biodegradation did occur and they felt that once it starts, only some outside action could stop bioremediation. The cleanup company was in a hurry to get their cleanup started.

Steven Pedigo  
Chairman



# NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET  
600 UNIVERSITY PLAZA WEST, SUITE A

ANCHORAGE, ALASKA 99503  
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645  
907-479-0115 • FAX 479-0847

March 21, 1990

Mr. Steve Karcz

P.O. Box 190151  
Anchorage, AK 99519

Dear Mr. Karcz:

This letter is to report the results of the test that was performed by Northern Testing Laboratories, Inc. on Sky Blue Chems Oil Eater II.

A sample of soil contaminated with the petroleum hydrocarbons was provided to Northern Testing on March 7, 1990. A pretreatment EPA 418.1 determination was done in duplicate, using approximately 15 grams of soil per sample. Pretreatment levels were found to be 737 and 603 mg/dry kg.

The measurement for the soils were conducted by volume since the treatment instructions are based on soil volume. Five hundred milliliters of soil were divided into two portions of 250 ml each, for treatment and control. Each portion was spread evenly in the bottom of a clean, freon-rinsed 2000-ml beaker, forming a layer approximately two centimeters deep. Seven milliliters of product were diluted to 700 ml with deionized water.

The treatment consisted of three applications (approximately 233 ml each) of diluted product at approximately 48-hour intervals. The liquid was simply poured over the top of the soil layer. At the time of each application, the control portion received 233 ml of deionized water. Between treatments, the beakers were covered tightly with aluminum foil and held at approximately 62 degrees Fahrenheit.

Treatment      1: Friday March 9 at 5:00 p.m.  
                     2: Sunday March 11 at 2:00 p.m.  
                     3: Tuesday March 13 at 4:45 p.m.

The treatment ended Thursday March 15 at 7:00 p.m. when the treated and control soils were drained. On Friday March 16, samples of approximately 15 grams were taken from each portion and analyzed for TPH, yielding the following results:

Control sample: 767 mg/dry kg  
Treated sample: 391 mg/dry kg

Sincerely,

Eileen Herring  
Chemist



# NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET  
600 UNIVERSITY PLAZA WEST, SUITE A

ANCHORAGE, ALASKA 99503  
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645  
907-479-0115 • FAX 479-0847

## Quality Control Report

Client: Blue Sky Chems.  
ID#: A030790-4

Listed below are quality control assurance reference samples with a known concentration prior to analysis. The acceptable limits represent a 95% confidence interval established by the Environmental Protection Agency or by our laboratory through repetitive analyses of the reference sample. The reference samples indicated below were analyzed at the same time as your sample, ensuring the accuracy of your results.

Sample #	Parameter	Unit	Result	Acceptable Limit
EPA 379-1	Oil & Grease	mg/l	19.1	16.6 – 23.4

Reported By:

Date: 03/20/90

Francois Rodigari, Anchorage Operations Manager



# NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET  
600 UNIVERSITY PLAZA WEST, SUITE A

ANCHORAGE, ALASKA 99503  
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645  
907-479-0115 • FAX 479-0847

P.O. Box 190151  
Anchorage, AK 99519

Attn: Steve Karcz

Date Arrived: 03/07/90  
Time Arrived: --  
Date Sampled: 03/02/90  
Time Sampled: 1151  
Date Completed: 03/19/90

Source: Firestone-Northern Lights

Sample ID#: A030790-4

NTL ID#	Client ID	mg/dry kg	% Solids %
---------	-----------	-----------	---------------

Total Petroleum Hydrocarbons: EPA Method 418.1

A030790-4	Pre-treatment	737/603	75.9
	Treated	391	75.8
	Control	767	79.0

Reported By:

Date: 03/20/90



# NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET  
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ANCHORAGE, ALASKA 99503  
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645  
907-479-0115 • FAX 479-0847

Date Arrived: 03/07/90

Time Arrived: --

Date Sampled: 03/02/90

Time Sampled: 1151

Date Completed: 03/23/90

Attention: Steven Pedigo

Source: Supernate of treated soil

Sample ID#: A030790-4

NTL ID#

Client ID

mg/l

Total Petroleum Hydrocarbons: EPA Method 418.1

A030790-4

Supernate of treated soil  
from test of Oil Spill Eater II  
conducted 03/09/90 – 03/19/90

2.0

Reported By:

Date: 03/23/90

Francois Rodigari, Anchorage Operations Manager



# NORTHERN TESTING LABORATORIES, INC.

2505 FAIRBANKS STREET  
600 UNIVERSITY PLAZA WEST, SUITE A

ANCHORAGE, ALASKA 99503  
FAIRBANKS, ALASKA 99709

907-277-8376 • FAX 274-0645  
907-479-0115 • FAX 479-0847

## Quality Control Report

Client: Blue Sky Chem  
ID#: A030790-4

Listed below are quality control assurance reference samples with a known concentration prior to analysis. The acceptable limits represent a 95% confidence interval established by the Environmental Protection Agency or by our laboratory through repetitive analyses of the reference sample. The reference samples indicated below were analyzed at the same time as your sample, ensuring the accuracy of your results.

Sample #	Parameter	Unit	Result	Acceptable Limit
EPA WP379-1 Oil and Grease		mg/l	19.7	16.6 – 23.5

Reported By:

Date: 03/23/90

Francois Rodigari, Anchorage Operations Manager

BILLY E. (GENE) MCGOWEN



## Rent-A-Can Toilet Co.

POST OFFICE BOX 433  
EAGLE RIVER, ALASKA 99577



PHONE: 694-9202  
ANS. SER. 272-3722

STATE OF ALASKA  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
ANCHORAGE DISTRICT OFFICE  
800 E. DIAMOND BLVD. SUITE 3-470  
ANCHORAGE, ALASKA 99515

ATTN: ROBERT WEIMER, ENVIRONMENTAL SPECIALIST

RE: SPILL # 91-2-1-1-295-1 FILE # L55138

ENCLOSED FOR YOU IS A REPORT PERTAINING TO THE CLEANUP OF THE CONTAMINATED SOIL INVOLVED WITH THE ABOVE SITE SPILL #. WE WANTED TO SEE IF THE COMMERCIAL PRODUCT OIL SPILL EATER, MANUFACTURED BY OSEI CORPORATION, WOULD MITIGATE THE HYDROCARBON CONTAMINATION. BECAUSE OF THE SMALL QUANTITY OF CONTAMINATION, WE TREATED ALL THE SOIL AT THE SAME TIME INSTEAD OF JUST A SMALL TRIAL PLOT. AS YOU CAN SEE IN THE REPORT, THE SOIL HAS BEEN CLEANED TO BELOW THE ADEC GUIDELINE OF 100 PPM. THEREFORE, WE REQUEST THAT YOU ACCEPT THIS REPORT AS A REMEDIATION PLAN AND ALSO GRANT US A SITE CLOSURE PER THE RESULTS OF THE INCLUDED FINAL TEST RESULT OF THE BIOREMEDIATION. WE ALSO ARE REQUESTING TO SPREAD THE CLEAN SOIL ON OUR PARKING LOT AS ADDITIONAL AERATION WILL CONTINUE THE BIOREMEDIATION PROCESS TO UNDETECTABLE LIMITS ASSUMING THERE IS NO RUN OFF FROM SPRINGBROOK DRIVE WHICH WE FRONT ON AND IS OILED REGULARLY. WE WILL NOT SPREAD THE SOIL UNTIL AFTER YOUR REVIEW AND APPROVAL.

REGARDS,

WAYNE CROMWELL  
MANAGER

WC/CS





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P.O. Box 190151  
Anchorage, Alaska 99519  
907/248-9955  
907/248-2604 (fax)  
(Obsolete address/  
phone)

## **RENT A CAN**

**EAGLE RIVER, ALASKA**

### ***BIOREMEDIATION OF CONTAMINATED SOILS***

**AUGUST 28, 1992**

For: Mr. Wayne Cromwell  
Rent a Can  
P.O. Box 770433  
Eagle River, Alaska  
99577

Prepared by: Steve Karcz  
OSEI of Alaska  
PO Box 190151  
Anchorage, Alaska  
99519

This report represents the results of the bioremediation of contaminated soil located at the Rent a Can Shop, 12211 Springbrook Drive, Eagle River, Alaska. The goal was to reach a total petroleum hydrocarbon (TPH) level acceptable to the Alaska Department of Conservation (ADEC) by bioremediation using Oil Spill Eater (OSE), a biocatalytic nutrient, to enhance the growth of the local indigenous bacteria found in the contaminated soil. The acceptable level to be low enough to dispose of the soil as back fill on site. This report shows that independent companies with petroleum contaminated soils can clean the soil very inexpensively on site.

## THE NUTRIENT

Oil Spill Eater is a biodegradable, non-toxic, water soluble, liquid nutrient. Oil Spill Eater stimulates and accelerates natural biological reactions. There are no petroleum components or any cultured bacteria in OSE. Oil Spill Eater rapidly grows the existing hydrocarbon degrading bacteria into large colonies quicker than fertilizers due to its nutrient components. Oil Spill Eater's use in Alaska and abroad has been proven as a most effective means of mitigating hydrocarbons.

## CONTAMINATED SOIL

The contamination was believed to be diesel fuel which leaked from an underground storage tank. The soil was removed and stockpiled outside on a poly membrane. The amount was estimated to be 1 1/2 cubic yards. The TPH test showed a level of 3060 ppm by EPA test method 8100 MOD. Other EPA test methods, 8015 and 8020, also indicated diesel fuel was the probable contamination. The soil was permeable, consisting of mostly gravel up to two inches mixed with organics.

## REMEDIATION PLAN

A remediation plan was designed allowing the clean up to be conducted in treatment cells on location inside the Rent a Can shop. The amount of contaminated soil was relatively small allowing for remediation of all the material in a controlled environment. This also allowed easy and convenient access by their employees for the daily remediation labor.

## TREATMENT CELL

The treatment cells consisted of 55 gallon drums without lids. A six inch tall wooden grate was constructed to create a void at the bottom as a recovery sump. Filter fabric was then placed on top of the grate to prevent any soil from migrating into the sump. A two inch hole was drilled in to the grate in which a piece of two inch diameter PVC pipe was placed. The pipe was one-fourth of an inch from the bottom and reached to the rim of the drum. The pipe served as both a monitoring tube and as recovery access. A hand pump could then be placed into the PVC pipe and the effluent water/nutrient pumped back up so to percolate back down through the soil. The smallest aquarium air pump that could be found was obtained and air was injected through rubber tubing into the water in the sump. The drums were placed in the middle of the shop so to prevent any foreign contamination from entering the cells.

## WORK PLAN

The work plan consisted of placing the contaminated soil into the drum, treating it with Oil Spill Eater, and recycle the nutrient water mixture through the soil daily. The contaminated soil was mixed in a small loader prior to placement in the drum. This was done to help get a consistent TPH level throughout the drums of soil. Previous projects have shown that consistency of contamination throughout a soil pile is not naturally congruent due to excessive excavation of cleaner soils. Approximately 5.6 cubic feet fit into each created treatment cell.

The amount of Oil Spill Eater used was determined by the manufacturers formula. The treatment for light petroleums required .22 gallons of Oil Spill Eater per cubic yard of soil. The amount of OSE required 5.8 ounces for 5.6 cubic feet of soil. This amount was then mixed at a 1 to 100 ratio with unchlorinated water. A well located on site was the water source for this project. Five hundred eighty ounces of water was mixed with the 5.8 ounces of OSE per drum.

The nutrient mixture was applied with a sprinkler type watering can at the surface of the drum. The rate of application was slow enough to prevent ponding on the surface to ensure a consistent percolation through the soil matrix.

The nutrient solution was pumped to the surface daily so it could percolate back down through the soil. This kept the soil at a high moisture content. The treatment began on April 9, 1992, and the pumping schedule continued through July 10, 1992 on a regular basis. There was no pumping on the weekends. Plain, unchlorinated water was added as needed to maintain moisture content.

## *SAMPLING*

An initial sample was taken prior to the nutrient application to determine a starting TPH. Twelve weeks later, the first treated sample was extracted after the initial treatment. The sample was taken approximately 10 inches down into the matrix with the exact location marked. This would provide that both the initial and treated samples came from the exact location which would lessen any contamination inconsistency throughout the soil. The ten inch depth was chosen to assure volatilization or evaporation would not be a factor on the lighter end hydrocarbons. The samples were then taken to Chemical & Geological Laboratory in Anchorage for testing. The initial sample was tested by EPA Method 8100 Modified. This test was chosen as previous tests were available using the 8100 modified. The after treatment test was done by EPA Method 418.1.

## *RESULTS*

The initial TPH value after the soil had been homogenized in the back hoe bucket was 572 ppm. Test results prior to the bioremediation project showed 3060 ppm with the sample being taken from the known "hot" spot. The homogenizing was necessary for this project to show a consistent level of contamination throughout the soil so the testing would represent the entire drums of soil. Due to OSE's many test results, the first treated sample was not extracted for twelve weeks. This time frame was chosen as previous tests have shown the biodegradation curve and testing would not be economic. The first treated sample by Method 418.1 had a value of 76.6 ppm. With this value being below the Alaska Department of Environmental Conservation's acceptable value of 100 ppm as being clean, the tests were terminated.

## *CONCLUSION*

After 12 weeks of bioremediation, the homogenized soil which had a consistent contamination of 572 ppm (8100 Modified) was reduced to 76.7 ppm (418.1).

With this final value achieved below ADEC's acceptable guidelines limits, I submit this report to you and recommend you contact ADEC for their approval to spread the cleaned soil on your lot. This report should suffice as both a Remediation Plan and a Closure Request.

# STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

## DEPT. OF ENVIRONMENTAL CONSERVATION

ANCHORAGE DISTRICT OFFICE  
800 E. DIMOND BLVD., SUITE 3-470  
ANCHORAGE, ALASKA 99515

(907) 349-7755

December 7, 1992

Wayne Cromwell  
Rent-A-Can Toilet Co.  
P.O. Box 433  
Anchorage, AK 99577

Subject: 12211 Springbrook Drive, Eagle River site – Soil Disposal  
File#: L55.138

Dear Mr. Cromwell:

The Department has completed the review of the information you submitted and the file regarding the 1.5 cubic yards of remediated soils in drums at the above referenced site. The soils have been remediated to the most stringent cleanup levels and are approved to be spread on-site (as per verbal approval to you on 9/21/92).

If you have any questions concerning this letter, please contact me at the Anchorage District Office at 349-7755.

Sincerely,



Robert Weimer  
Environmental Specialist

RW/cf



P.O. Box 515429  
Dallas, Texas 75075  
Ph: (972) 669-3390  
Fax: (469) 241-0896  
Email: oseicorp@msn.com  
Web: <http://www.osei.us>

### **In-Situ Underground Cleanup of Heating Oil**

In November, 1996 Alpha Geoscience used **OSE II** to perform an "In-Situ Cleanup" of 115 cubic yards of kerosine contaminated soil in a trailer park in Highland Falls, New York. The in-situ cleanup was necessary since removing the contaminated soil could not be done without moving buildings and porches.

Attached is Alpha Geoscience's December 1, 1997 letter to the New York State Department of Environmental Control (NYSDEC) reporting their final data collected and requesting a "*closure letter*" from the state of New York.

The NYSDEC report form and "*closure letter*" follows the Geoscience's report and their request for a closure letter. Note that the NYSDEC states "***Cleanup Complete. NFA (No Further Action).***"

This cleanup proves how effective **OSE II** is for "in-situ cleanups" under buildings and concrete or asphalt areas.

O.A. (George) Lively  
Rear Admiral (RET)  
President

OAL/eem

Enclosure



Geology

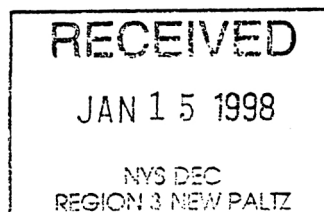
Hydrology

Remediation

Water Supply

December 1, 1997

Mr. David Traver  
NYSDEC Region 3  
21 South Putt Corners Road  
New Paltz, New York 12561-1696



Re: Summary and Results of In Situ Soil Remediation  
42 Hudson View Terrace, Highland Falls, New York  
NYSDEC Spill No. 95-16786

Dear Mr. Traver:

This letter report summarizes the remediation efforts performed on November 7 and 8, 1996, July 24 and November 3, 1997, at the above referenced site. The work was performed in accordance with the Revised Remedial Work Plan, prepared by Alpha Geoscience, dated September 25, 1996, and approved by the New York State Department of Environmental Conservation (NYSDEC) on October 21, 1996. A description of the work performed is presented below.

#### November, 1996 Activities

A pre-remediation composite soil sample (SS-1) was collected for laboratory analysis. The sample was collected to provide a baseline for comparison with post-remediation sampling to determine the effectiveness of remediation. Composite sample SS-1 was collected from a depth of 0.5 to 2.5 feet at four locations identified as being within the contaminated area during the previous spill investigation. The approximate sampling locations are shown on the attached Figure 1. The composite sample was retained in laboratory-supplied containers, placed on ice in a chilled cooler, and delivered to a NYS Department of Health (DOH)-certified laboratory following chain of custody protocol. The sample was analyzed for volatile organic compounds (VOCs) via EPA Method 8021, and semi-VOCs via EPA Method 8270, in accordance with the NYSDEC Petroleum-Contaminated Soil Guidance Policy, STARS Memo #1. A copy of the laboratory analytical report is provided in Attachment No. 1. The results indicate elevated levels of VOCs in the soil, totaling approximately 35 parts per million (ppm). No semi-VOCs were detected; however, the detection limit was elevated (2.0 ppm) because of the high VOC concentrations, possibly masking the presence of semi-VOCs.

An earth berm was constructed to prevent surface water runoff to the small stream during application of the bioenhancement product. The berm was constructed between trailers number 42 and 43 on the east side of the stream (Figure 1). The berm is approximately 10 inches high and is covered and secured with plastic sheeting to prevent erosion of, or infiltration through, the berm.

After construction of the berm, the soil was prepared by rototilling the accessible affected area. Remedial efforts were implemented by applying a NYSDOH-approved bioenhancement product known as Oil Spill Eater II (OSE II). Application of the OSE II was performed by mixing the soluble blend with water and spraying the mixture onto the entire area to be treated. The OSE II was applied at a concentration of approximately 0.38 gallons per cubic yard of soil. Approximately 19 gallons of OSE II was applied each day for two consecutive days. The soil was tilled again following application on the first day. Saturated surface soil conditions precluded tilling following the OSE II application on the

second day. The OSE II was applied according to the manufacturers specifications for application. The accessible areas were covered and secured with black plastic sheeting to facilitate bacterial growth by warming the soil via solar convection.

#### July, 1997 Activities

The plastic sheeting was removed and a landscaping company installed a new grass sod lawn in the area of the OSE II application during June, 1997. Alpha personnel revisited the site on July 24, 1997 to screen the sub-surface soil and monitor the progress of remediation. A soil sample was collected at or very near each of the four sampling locations shown on Figure 1. The soil samples were screened via headspace analysis utilizing an HNU DL-101 photoionization detector (PID) calibrated with isobutylene gas. The results of PID screening indicated significantly reduced measurements compared to PID screening during the initial site characterization performed in May, 1996, indicating the bioremediation was working effectively. A copy of the organic vapor screening log is provided in Attachment No. 2.

A composite soil sample, designated Comp-1, was collected from the four sampling locations using the same sampling procedures used in November, 1996. The sample was analyzed for total petroleum hydrocarbons (TPH) to provide a relative indication of the amount of contamination remaining. The results of the analysis indicated a TPH concentration of 88 milligrams per kilogram (mg/kg). A copy of the laboratory analytical report is provided in Attachment No. 3.

#### November, 1997 Activities

On November 3, 1997, Alpha personnel collected soil samples, designated CS-1, CS-2, CS-3, and CS-4, at or near each of the four locations shown on Figure 1. A surface water sample, designated W-1, and a sediment sample, designated SW-1, were collected from the nearby small stream. Headspace screening of the soil, water and sediment samples was performed utilizing the PID. Screening of samples W-1, SW-1, CS-1 and CS-4 via the PID indicated measurements at the instrument background level. Soil samples CS-2 and CS-3 measured 3.8 parts per million (ppm) and 14 ppm above instrument background, respectively. A copy of the organic vapor screening log is provided in Attachment No. 2.

A composite soil sample, designated CS-1, was collected from the four locations using the methods described above. The sample was analyzed for STARS VOCs via TCLP EPA Method 8021 and STARS semi-VOCs via TCLP EPA Method 8270, in accordance with the approved work plan. The results of analysis indicated no semi-VOC compounds were detected. The results of analysis for VOCs indicated four compounds were detected in concentrations slightly exceeding their respective NYSDEC STARS guidance values. The compounds are 1,3,5-trimethylbenzene detected at 8 parts per billion (ppb), tert-butylbenzene (coelutes with 1,2,3-trimethylbenzene) at a total of 16 ppb, and naphthalene at 18 ppb. A copy of the laboratory analytical report is attached.



### Summary and Recommendation

A summary of the site remediation and recommendations is presented below.

- The petroleum-impacted soil area was treated in accordance with the NYSDEC-approved Work Plan and the manufacturers recommendations utilizing a bioremedial enhancement product called OSE II.
- The results of PID screening of individual soil sample locations indicates a significant reduction of petroleum compounds since remedial efforts were initiated in November, 1996.
- The results of PID screening of water and sediment collected from the nearby small stream indicated contamination has not migrated to the stream.
- The analytical results of post-remedial soil samples indicates the OSE II has effectively stimulated activity of indigenous bacteria resulting in substantial breakdown and reduction of petroleum compounds. The soil generally meets NYSDEC soil cleanup guidance criteria specified in STARS Memo #1. Continued bacterial activity will further reduce and breakdown petroleum compounds.

No further investigations or remediation is necessary for this site, based on the investigation and analytical data. We hereby request the NYSDEC close the spill file for this site.

If you have any questions regarding this report, please contact me or Tom Johnson.

Sincerely,  
Alpha Geoscience

A handwritten signature in black ink, reading "Michael S. Ralbovsky". The signature is fluid and cursive, with the first name "Michael" being the most prominent.

Michael S. Ralbovsky  
Hydrogeologist

MSR:ce  
attachment  
cc: Mr. Don Abel (La Marche)  
d:/../highland/closure.ltr

# **NYSDEC SPILL REPORT FORM**

**DEC REGION#** 3 (New Paltz) **SPILL NUMBER** 9516786  
**SPILL NAME:** SAMADI RESIDENCE **DEC LEAD:** MCCARTHY  
**CALLER'S NAME:** VICTROIA SAMADI **NOTIFIER'S NAME:** VICTROIA SAMADI  
**CALLER'S AGENCY:** CITIZEN **NOTIFIER'S AGENCY:** CITIZEN  
**CALLER'S PHONE:** (914) 446-0519 **EXT.**  **NOTIFIER'S PHONE:** (914) 446-0519 **EXT.**

**SPILL DATE:** 03/28/96 **TIME:** 12:00  
**CALL RECEIVED DATE:** 03/28/96 **TIME:** 15:38 **RECEIVED BY CID #:** 257

Material Spilled	Mat. Class	Am't Spilled	Units	Am't Recovered
1) <u>KEROSENE</u>	<u>Pet-Haz-Other-Unk.</u>	<u>Unknown</u>	<u>Gal</u> - Lbs	<u>Unknown</u>
2) <u></u>	<u>Pet-Haz-Other-Unk.</u>	<u></u>	<u>Gal</u> - Lbs	<u></u>
3) <u></u>	<u>Pet-Haz-Other-Unk.</u>	<u></u>	<u>Gal</u> - Lbs	<u></u>
4) <u></u>	<u>Pet-Haz-Other-Unk.</u>	<u></u>	<u>Gal</u> - Lbs	<u></u>

<b>SPILL LOCATION</b>		<b>POTENTIAL SPILLER</b>	
<b>PLACE:</b> <u>SAMADI RESIDENCE</u>	<b>NAME:</b> <u>SAMADI RESIDENCE</u>	<b>STREET:</b> <u>42 HUDSONVIEW TERR</u>	<b>STREET:</b> <u>42 HUDSONVIEW TERR</u>
<b>STREET:</b> <u>42 HUDSONVIEW TERR</u>	<b>CITY:</b> <u>HIGHLAND FALLS</u>	<b>STATE:</b> <u>NY</u>	<b>ZIP:</b> <u></u>
<b>T/C/V:</b> <u>HIGHLAND FALLS</u>	<b>CO:</b> <u>ORANGE</u>	<b>STATE:</b> <u>NY</u>	<b>ZIP:</b> <u></u>
<b>CONTACT:</b> <u>VICTROIA SAMADI</u>	<b>CONTACT:</b> <u>VICTROIA SAMADI</u>	<b>PHONE:</b> <u>(914) 446-0519</u>	<b>PHONE:</b> <u>(914) 446-0519</u>

<b>SPILL CAUSE</b>		<b>SPILL SOURCE</b>	
Human Error	Tank Test Failure	Tank Failure	Gas Station
Traffic Accident	Housekeeping	Tank Overfill	Passenger Vehicle
Equipment Failure	Deliberate	Other	Comm. Vehicle
Vandalism	Abandoned Drums	Unknown	Tank Truck
			Private Dwelling
			Vessel
			Railroad Car
			Major Facility
			Non-Maj Facility
			Comm/Indust
			Non-Comm/Inst
			Unknown

<b>RESOURCE AFFECTED</b>		<b>SPILL REPORTED BY</b>	
<u>On Land</u>	Groundwater	<u>Responsible Party</u>	Tank Tester
In Sewer	Surface Water**	Affected Persons	DEC
		Police Department	Citizen
		Fire Department	Health Dept.
			Local Agency
			Federal Gov't
			Other

**\*\*WATERBODY:**

**CALLER REMARKS:** tank leaked unknown if company did cleanup when they replaced tank

*PBS Number	Tank Number	Tank Size	Test Method	Leak Rate
<u></u>	<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>	<u></u>	<u></u>

**PRIMARY CONTACT CALLED DATE:**  **TIME:**  **hrs.** **REACHED DATE:**  **TIME:**   
**SECONDARY CONT. CALLED DATE:**  **TIME:**  **hrs.** **FAXED BY CID#:**  **TIME:**

PIN #	T & A	Cost Center	ISR to	Central Office
Cleanup Ceased	Meets St'ds	YES	Last Inspection	Penalty NO
RP-CUI	ENF-INIT	INVS-COM	CAP	
UST Trust Eligible NO	Site: A B C D E	Resp. Party 1 2 3 4 5 6	Reg Close Date	12/19/97
Created on 03/28/96	Last Updated on 01/06/98	Is Updated: NO	EDO	DATA INPUT [ ]

Date Printed: 03/04/98

**Spill Number:** 9516786 **Spill Name:** SAMADI RESIDENCE

**Printed on:** 03/04/98

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**DEC REMARKS**

12/19/97 RECEIVED REPORT OF REMEDIAL ACTION FROM ALPHA  
GEOSCIENCE. CLEANUP COMPLETE. NFA;

---



P.O. Box 515429  
Dallas, Texas 75075  
Ph: (972) 669-3390  
Fax: (469) 241-0896  
Email: oseicorp@msn.com  
Web: <http://www.osei.us>

## SUMMARY

### BIOREMEDIATION OF CHLORINATED HYDROCARBONS

Key Bank in Anchorage, Alaska was in possession of a contaminated property which contained dichloralbenze, low levels of BETX and a total TPH of 7,500. This test verified what had previously been hypothesized about OSEI. OSEI Corporation had predicted OSEI would bioremediate chlorinated hydrocarbons, as well as PCBS and various other toxic wastes.

The chlorinated hydrocarbons were reduced to undetectable levels and the TPH was reduced from 7,500 to 1,890 in less than 30 days. However, the lab ran out of test material, but the testing performed definitely shows the extent to which OSEI can biodegrade chlorinated hydrocarbons.

Steven Pedigo  
Chairman



# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

February 12, 1991

Mr. Steve Karcz  
P.O. Box 190151  
Anchorage, AK 99519

Dear Mr. Karcz:

This letter is to report the results of the test that was performed by Northern Testing Laboratories, Inc. on Sky Blue Chems Oil Eater II.

A sample of contaminated soil was provided to NTL on January 3, 1991. 100 grams of soil was measured to be approximately 62.5 mls in volume. On January 4 the soil was spiked with a 1ppm, 1,2 Dichlorobenzene spike. A dilution of 1:100 OSE II was made with the provided well water and OSE concentrate. This solution was then applied to the soil sample at a rate of 22 gallons per yard of soil and mixed well with the soil sample. A sample of soil was then extracted for an EPA 418.1 (TPH) and an EPA 8020 and a percent solid.

The 8020 was analyzed on day one and the 418.1 on day three. Because the 418.1 was not analyzed on day one, a second portion of the original provided sample (without a spike) was extracted and treated with the OSE II at above rate and analyzed for 418.1 only to provide an approximated day one baseline to compare with the next seventh day reading.

The sample was then covered with foil and held with a rubber band and left at room temperature (approx. 20 deg C.) to incubate.

The moisture content was visually determined and an amount of well water added to the soil at seven day intervals. The amount of well water to be added was determined by visually estimating the moisture content of the soil; water was added to increase the visible moisture but without leaving standing water.

Additional portions of the sample were extracted for 8020's and 418.1's on the following days: January 11:Day 8, January 18:Day 15, January 25:Day 22 and February 4:Day 32. For the second sample used to determine the 418.1 baseline a second portion of the sample was extracted and analyzed on January 11:Day 7.

SKYBLUE.DOC



# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

February 12, 1991

The following results were found after analysis:

Day	NTL ID#	418.1 ppm	8020 ppm 1,2 DCB	1,3 DCB	1,4 DCB	Xyl.	Tol.
1	A107826	----	0.7	0.3	0.2	2.5	<0.1
3	A107826	7500	----	----	----	---	----
8	A107829	7310	2.1	<.02	<.1	2.2	<.05
15	A108082	6320	----	----	----	---	----
15	A108348	----	<0.2	<0.2	<0.2	1.3	<0.1
22	A108175	4035	<0.2	<0.2	<0.2	1.5	<0.1
32	A108299	1890	----	----	----	---	----

(For second 418.1 baseline sample)

1	A108042	11900	----
8	A108054	11600	----

The elevated level of 1,2 DCB on Day 8 was apparently due to an inability to homogeneously mix the concentrated spike throughout the sample. However all the other parameters evidenced a steady decrease in concentration.

The experiment procedure was terminated because of lack of remaining spike-treated soil. If further soil had been available the procedure would have continued until no amount of parameters for the TPH or 8020 remained.

Sincerely,

Donna Sherwood  
Environmental Analyst

SKYBLUE.DOC



# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

Sky Blue Chems  
P.O. Box 190151  
Anchorage, AK 99519

Report Date: 01/23/91

Date Arrived: 01/03/91

Date Sampled : 01/03/91

Time Sampled: -

Collected By: SK

Attn: Steve Karcz

## Flag Definitions

U = Below Detection Limit

DL Stated in Result

B = Below Regulatory Min.

H = Above Regulatory Max.

E = Below Detection Limit

Estimated Value

Our Lab #: A107826  
Location/Project: -  
Your Sample ID: Rogers & Babler (before)1  
Sample Matrix: Soil  
Comments: Revised Transmittal.

Method	Parameter	Units	Result Flag	Date Analyzed
EPA 160.3	Solids	%	86.9	01/14/91
EPA 418.1	Total Petroleum Hydrocarbons	mg/dry kg	7500	01/07/91
EPA 8020	Benzene	mg/dry kg	0.10 U	01/11/91
	Chlorobenzene	mg/dry kg	0.10 U	
	1,2-Dichlorobenzene	mg/dry kg	0.70	
	1,3-Dichlorobenzene	mg/dry kg	0.30	
	1,4-Dichlorobenzene	mg/dry kg	0.20 U	
	Ethylbenzene	mg/dry kg	0.10 U	
	Toluene	mg/dry kg	0.10 U	
	Xylenes	mg/dry kg	2.50	

Reported By: William E. Buchan  
Anchorage Operations Manager



# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

Sky Blue Chems  
P.O. Box 190151  
Anchorage, AK 99519

Report Date: 01/23/91

Date Arrived: 01/03/91

Date Sampled: 01/03/91

Time Sampled: -

Collected By: SK

Attn: Steve Karcz

## Flag Definitions

U = Below Detection Limit

DL Stated in Result

B = Below Regulatory Min.

H = Above Regulatory Max.

E = Below Detection Limit

Estimated Value

Our Lab #: A107829  
Location/Project: -  
Your Sample ID: Rogers & Babler (after)  
Sample Matrix: Soil  
Comments: Revised Transmittal.

Method	Parameter	Units	Result Flag	Date Analyzed
EPA 160.3	Solids	%	86.9	01/21/91
EPA 418.1	Total Petroleum Hydrocarbons	mg/dry kg	7310	01/12/91
EPA 8020	Benzene	mg/dry kg	0.05 U	01/18/91
	Chlorobenzene	mg/dry kg	0.05 U	
	1,2-Dichlorobenzene	mg/dry kg	2.10	
	1,3-Dichlorobenzene	mg/dry kg	0.02 U	
	1,4-Dichlorobenzene	mg/dry kg	0.10 U	
	Ethylbenzene	mg/dry kg	0.05 U	
	Toluene	mg/dry kg	0.05 U	
	Xylenes	mg/dry kg	2.20	

Reported By: William E. Buchan  
Anchorage Operations Manager





# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

Sky Blue Chems

Report Date: 02/08/91

Attn: Steve Karcz

Date Arrived: 02/07/91

Date Sampled: 01/18/91

Time Sampled: -

Collected By: DS

Our Lab #: A108348  
Location/Project: -  
Your Sample ID: 14 Days/A108082  
Sample Matrix: Soil  
Comments:

Flag Definitions  
U = Below Detection Limit  
DL Stated in Result  
B = Below Regulatory Min.  
H = Above Regulatory Max.  
E = Below Detection Limit  
Estimated Value

Method	Parameter	Units	Result Flag	Date Analyzed
EPA 160.3	Solids	%	86.9	01/18/91
EPA 8020	Benzene	mg/dry kg	0.10 U	02/07/91
	Chlorobenzene	mg/dry kg	0.10 U	
	1,2-Dichlorobenzene	mg/dry kg	0.20 U	
	1,3-Dichlorobenzene	mg/dry kg	0.20 U	
	1,4-Dichlorobenzene	mg/dry kg	0.20 U	
	Ethylbenzene	mg/dry kg	0.10 U	
	Toluene	mg/dry kg	0.10 U	
	Xylenes	mg/dry kg	1.30	

Reported By: William E. Buchan  
Anchorage Operations Manager



# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

Sky Blue Chems  
13355 Noel Road, 5th Floor  
1 Galleria Tower 503-5999  
Dallas, TX 75240

Attn: -

Report Date: 02/01/91

Date Arrived: 01/18/91

Date Sampled: 01/18/91

Time Sampled: -

Collected By: DS

Our Lab #: A108082  
Location/Project: -  
Your Sample ID: 14 days  
Sample Matrix: Soil  
Comments:

Flag Definitions  
U = Below Detection Limit  
DL Stated in Result  
B = Below Regulatory Min.  
H = Above Regulatory Max.  
E = Below Detection Limit  
Estimated Value

Method	Parameter	Units	Result Flag	Date Analyzed
EPA 160.3	Solids	%	86.9	01/18/91
EPA 418.1	Total Petroleum Hydrocarbons	mg/dry kg	6320	01/18/91

Reported By: William E. Buchan  
Anchorage Operations Manager



# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

Sky Blue Chems  
13355 Noel Road, 5th Floor  
1 Galleria Tower 503-5999  
Dallas, TX 75240

Attn: Steve Karcz

Report Date: 02/12/91

Date Arrived: 01/25/91

Date Sampled: 01/25/91

Time Sampled: -

Collected By: SK

Our Lab #: A108175  
Location/Project: -  
Your Sample ID: 28 Days 4th Sample  
Sample Matrix: Soil  
Comments:

Flag Definitions  
U = Below Detection Limit  
DL Stated in Result  
B = Below Regulatory Min.  
H = Above Regulatory Max.  
E = Below Detection Limit  
Estimated Value

Method	Parameter	Units	Result Flag	Date Analyzed
EPA 160.3	Solids	%	86.9	01/25/91
EPA 418.1	Total Petroleum Hydrocarbons	mg/dry kg	4035	01/25/91
EPA 8020	Benzene	mg/dry kg	0.10 U	02/08/91
	Chlorobenzene	mg/dry kg	0.10 U	
	1,2-Dichlorobenzene	mg/dry kg	0.20 U	
	1,3-Dichlorobenzene	mg/dry kg	0.20 U	
	1,4-Dichlorobenzene	mg/dry kg	0.20 U	
	Ethylbenzene	mg/dry kg	0.10 U	
	Toluene	mg/dry kg	0.10 U	
	Xylenes	mg/dry kg	1.50	

Reported By: William E. Buchan  
Anchorage Operations Manager



# NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL WAY  
2505 FAIRBANKS STREET

ANCHORAGE, ALASKA 99701  
FAIRBANKS, ALASKA 99503

907-456-3116 • FAX 456-3425  
907-277-8378 • FAX 274-9645

Sky Blue Chems.

Report Date: 02/06/91

Date Arrived: 02/04/91

Date Sampled: 02/04/91

Time Sampled: -

Collected By: SK

Attn: Steve Karcz

## Flag Definitions

U = Below Detection Limit

DL Stated in Result

B = Below Regulatory Min.

H = Above Regulatory Max.

E = Below Detection Limit

Estimated Value

Our Lab #: A108299

Location/Project: -

Your Sample ID: -

Sample Matrix: Soil

Comments:

Method	Parameter	Units	Result Flag	Date Analyzed
EPA 160.3	Solids		86.9	02/04/91
EPA 418.1	Total Petroleum Hydrocarbons	mg/dry kg	1890	02/04/91

Reported By: William E. Buchan  
Anchorage Operations Manager



DEPARTMENT OF THE AIR FORCE  
AIR FORCE BASE CONVERSION AGENCY

11 Sep 96

FROM: AFBCA/OL-H  
6550 White Settlement Rd.  
Ft. Worth, TX 76114

TO: Mr. George Lively  
Oil Spill Eater International Corp.  
5545 Harvest Hill, #1116  
Dallas, TX 75230

current address as of 10/96  
13127 Chandler Drive  
Dallas, TX 75243

Dear Mr. Lively

This letter gives you some background information on our circumstances and reports the results of our clean up pertaining to the petroleum hydrocarbon stained concrete floor.

During the transfer of the PCB Storage Facility to the Navy, a Texas Natural Resource Conservation Commission (TNRCC) representative found a petroleum hydrocarbon stain on the concrete floor. The stain was 4 ft x 6 ft, and hidden under a larger transformer. The TNRCC representative required a swipe testing be conducted to determine the levels of PCB contamination. The results of the swipe test detected high levels of PCB contamination that required mitigation before transfer.

We received bioremediation proposals of \$5,000.00 and higher from local environmental companies. However, we made an in-house effort to mitigate this stain to save funds. We used a denatured alcohol to mitigate the stain and then had it tested a second time. The test results came back and the PCB levels were almost three times higher at 120 ug/ft<sup>2</sup>.

A member of the Navy gave us a half gallon of your product, Oil Spill Eater II, to try. We mixed the half gallon of Oil Spill Eater II with a gallon of water. I placed the application on the stain and kept it moist for two weeks. After two weeks, we tested the stain again for a third time. The levels of PCB contamination went from 120 ug/ft<sup>2</sup> to only 8.2 ug/ft<sup>2</sup>. These levels are far below the limits set forth in CFR 40 Part 761.125(3)(b)(i) and in TNRCC's Chapter 335.551, Subchapter S.

We saved the tax payers over \$5,000.00. I will personally recommend your product to everyone I meet in the environmental field. All lab reports are attached.

Sincerely,

A handwritten signature in black ink, reading "Elliot Smith", is written over a white background.

Elliot Smith  
Engineering Technician



P.O. Box 515429  
Dallas, Texas 75075  
Ph: (972) 669-3390  
Fax: (469) 241-0896  
Email: oseicorp@msn.com  
Web: <http://www.osei.us>

## MARINE TOXICITY TEST SUMMARY

OSEI Corporation, in its attempt to prove “*Oil Spill Eater II*” is virtually non-toxic, had the following tests performed:

The **MYSIDOPSIS BAHIA (or Mysid)** is one of the more sensitive marine organisms found in the oceans. LC50's (Lethal Concentration) is the level in which there is mortality with 50% of the species being tested. The lethal concentration calculated for OSEI on the Mysid was calculated once 10% of the test species showed equilibrium problems or mortality. At 96 hours, only 10% of the test species showed equilibrium problems or mortality at a calculated level of 2100 mg/L or 2,100 parts per million. This shows OSEI to have a low toxicity level, and had a true LC50 been performed the toxicity level would have been even lower.

The **MUMMICHOG (Fundulus Heteroclitus)** a somewhat larger organism (1 to 1.5 inches long) was tested to see how toxic OSEI was to it. 5,258 mg/L was established. 5,285 parts per million shows a very little toxicity for the Mummichog when exposed to Oil Spill Eater II.

**MEDIAN LETHAL CONCENTRATIONS (LG50's)** were calculated on Artemia Salina. The tests were run for 48 hours. OSEI alone tested greater than 100 mg/L so the true LG50 was not determined, but OSEI toxicity was greater than the EPA's cut-off for approving a product for the National Contingency Plan. There were other interesting facts involved with this toxicity test. The test calculation was based on using our product at a stronger concentration than our instructions allow. So at our instructed use rate, the toxicity level would have been even lower, even though the test was based on 100 mg/L or greater value. No. 2 fuel oil was tested alone and showed a level of 12.6 mg/L at 48 hours and No. 2 fuel oil and OSEI together at 48 hours showed a level of 29.4 helping prove our point that once OSEI is applied, it immediately starts detoxifying hydrocarbons so bacteria can devour the hydrocarbons. (It is more beneficial to the environment to apply OSEI immediately, than to wait around for evaporation or to try to pick up the hydrocarbons mechanically.)

OSEI Corporation feels the toxicity tests run in conjunction with OSEII help prove OSEII is virtually non-toxic. The EPA established that 35 mg/L LC50 was acceptable for a particular product to be used on the Exxon Valdez spill. If you compare OSEII to this established toxicity of 35 mg/L, then OSEII is far less toxic than that.

OSEI Corporation had two (2) fresh water toxicity tests run also. Environmental Canada, the U.S. EPA's equivalent in Canada, performed a toxicity test on rainbow trout. Rainbow trout are very sensitive fresh water species. The LC50 was greater than 10,000 mg/L. This shows OSEII to have virtually no toxicity in fresh water as well as salt water.

The other fresh water test was run on fathead minnows for the physical engineer in Plano, Texas, USA. We were attempting to prove that hydrocarbons which have had OSEII applied to them and then washed in the storm drain would not add any toxicity to the storm drain.

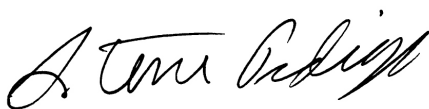
Two gallons of gasoline was poured onto a low area in a commercial business parking lot, and OSEII was applied, allowed to set 3 minutes, and then washed to another low area for collection.

Approximately 1 ½ gallons of runoff was collected and taken to the lab where a 48 hour fathead minnow survival test was initiated. The resulting LC50 test was 9,300 mg/L which shows that gasoline which has had OSEII applied to it is rendered virtually non-toxic.

This helped alleviate the physical engineer's concerns for adding anything toxic to the storm drain and ultimately to a creek, river or lake.

This test shows that using OSEII would help reduce the toxicity to storm drains from rain water runoff. If OSEII is used periodically to clean the parking lot allowing the site to stay within its NPDES permitted discharge levels.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven Pedigo". The signature is fluid and cursive, with a large initial "S" and a stylized "P".

Steven Pedigo  
Chairman

SP/eem



P.O. Box 515429  
Dallas, Texas 75075  
Ph: (972) 669-3390  
Fax: (469) 241-0896  
Email: oseicorp@msn.com  
Web: <http://www.osei.us>

## SUMMARY

### EPA/NETAC TOXICITY TEST

#### MYSIDOPSIS BAHIA

The Environmental Protection Agency in Gulf Breeze, Florida tested OIL SPILL EATER II Concentrate, for toxicity using a sensitive species named "Mysidopsis Bahia". This test was in conjunction with Efficacy Tests performed by the EPA and NETAC.

The LC50 for the acute (96 hr.) test was greater than 1,900 and up to 10,000 mg/L which shows OSE II to be virtually non-toxic.

The EPA allowed the use of Inipol during the Valdez Spill and Inipol's LC50 was 135 mg/L which would seem to OSEI, Corp to be somewhat toxic considering Environmental Canada's cut off is 1,000 mg/L.

A second LC50 was performed at 7 days to see if there was any problem with chronic toxicity. The LC50 was 2,500 mg/L, which once again shows OSE II to be virtually non-toxic even when the species was exposed in a closed environment for 7 days. It would be extremely difficult for a species to be exposed to OSE II for 7 days in an open system due to currents, wind and tidal actions.

This 3rd party, U.S. EPA Toxicity Test absolutely proves OSE II is virtually non-toxic.

By: Steven R. Pedigo  
Chairman/OSEI, Corp.

SRP/AJL



**OIL SPILL RESPONSE BIOREMEDIATION AGENTS  
EVALUATION METHODS VALIDATION TESTING  
DISCUSSION OF RESULTS**

The following data are provided for the oil spill response bioremediation agent producer as a means to begin to assess how this bioremediation agent may behave in response to an oil spill in the environment.

The Tier II 96-hour toxicity test data was conducted with Mysidopsis bahia test species. Mortality was the single measure response, therefore, survival data were used to calculate the 96-hour LC50. LC50 is the lowest concentration effecting 50% mortality of the test organism during a 96 hour exposure period. Sub-lethal and lethal responses were noted at concentrations between 1,000-10,000 mg/L (> 1,900 mg/L) following acute exposure of M.bahia to your bioremediation product.

Oil Spill Eater II was shown to cause a statistically significant reduction ( $p = 0.05$ ) in the survival of Mysidopsis when animals were exposed during a chronic estimator test for a 7 day period. In general, 7 day exposure (2,500 mg/L) correlated well with values calculated following the 96 hour exposure (> 1,900 mg/L).

## TIER II TOXICITY DATA

**TABLE 1**

### ACUTE TOXICITY VALUES FOR 96 HOUR LC<sub>50</sub> – *MYSIDOPSIS BAHIA*

Product	Max. Test Concentration (mg/L)	96 hour LC50 (mg/L)	Confidence Interval (95%)
Oil Spill Eater II	10,000	1,000-10,000 <sup>a</sup> >1,900 <sup>b</sup>	ND

LC<sub>50</sub> = Lethal concentration of product that will cause the death of 50% of the test species population within a defined exposure time.

a = LC50 presented as a range of test concentrations since data were from 96-hour acute range-finding test.

b = LC50 presented as a single, numerical value since data were from a definitive 96-hour acute toxicity test.

ND = Not Determined

**TABLE 2**

### CHRONIC TOXICITY VALUES FOR 7 DAY LC<sub>50</sub> – *MYSIDOPSIS BAHIA*

Product	Endpoints (mg/L)		Effects Measurement	7 Day LC50 (mg/L) (95% CI)
	NOEC	LOEC		
Oil Spill Eater II	1,900 1,900 633	5,700 NE 1,900	Survival Growth Fecundity	2,500(mg/L) (2,225-3,313)

NOEC = No Observable Effect Concentration

LOEC = Lowest Observable Effect Concentration

CI = Confidence Interval

NE = No Effect

Fecundity = Egg Production

As we indicated prior and to better understand the data presented above we are including a copy of the Evaluation Methods Manual. The Statistical Method Summary is found in Section 4, Method #8, page 40, of the manual and is intended to help a scientist understand the basis of the experimental objectives developed for this test.



Static Acute Toxicity of  
Oil Spill Eater II, Batch 329,  
To the Mysid, *Mysidopsis bahia*

Study Completed

March 9, 1990

Performing Laboratory

EnviroSystems Division  
Resource Analysts, Incorporated  
P.O. Box 778  
One Lafayette Road  
Hampton, New Hampshire 03842

## I. SUMMARY

The acute toxicity of Oil Spill Eater II, batch 329 to the mysid, *Mysidopsis bahia*, is described in this report. The test was conducted for Incorporated for 96 hours during March 5-9, 1990 at the EnviroSystems Division of Resource Analysts, Inc. in Hampton, New Hampshire. It was conducted by Jeanne Magazu, Peter Kowalski, Robert Boeri, and Timothy Ward.

The test was performed under static conditions with five concentrations of test substance and a dilution water control at a mean temperature of 19.5°C. The dilution water was filtered natural seawater collected from the Atlantic Ocean at Hampton, New Hampshire. Aeration was not required to maintain dissolved oxygen concentrations above an acceptable level. Nominal concentrations of Oil Spill Eater II were: 0 mg/L (control), 1 mg/L, 10 mg/L, 100 mg/L, 1,000 mg/L, and 10,000 mg/L. Nominal concentrations were used for all calculations.

Mysids used in the test were less than 5 days old at the start of the test. They were produced at Resource Analysts, Inc. and acclimated under test conditions for their entire life. All mysids were in good condition at the beginning of the study.

Exposure of mysids to the test substance resulted in a 96 hour LC50 of 2,100 mg/L Oil Spill Eater II, with a 95 percent confidence level of 100 – 10,000 mg/L. The 96 hour no observed effect concentration is estimated to be 100 mg/L.

#### IV. METHODS AND MATERIALS

##### TEST SUBSTANCE:

Oil Spill Eater II (EnviroSystems Sample Number 2351E) was delivered to EnviroSystems on March 5, 1990. It was contained in a 500 ml plastic bottle that was labeled with the following information: Oil Spill Eater II, Batch 329. The sample was supplied by           Incorporated. Prior to use the test material was stored at room temperature. Nominal concentrations were added to test media on a weight/vol basis and are reported as mg/L.

##### DILUTION WATER:

Water used for acclimation of test organisms and for all toxicity testing was seawater collected from the Atlantic Ocean at EnviroSystems in Hampton, New Hampshire. Water was adjusted to a salinity of 11-17 ppt (parts per thousand) and stored in 500-gallon polyethylene tanks, where it was aerated.

##### TEST ORGANISM:

Juvenile mysids employed as test organisms were from a single source and were identified using an approximate taxonomic key. They were produced and acclimated at the Resource Analysts, Inc. facility for their entire life. During acclimation mysids were not treated for disease and they were free of apparent sickness, injuries, and abnormalities at the beginning of the test. Mysids were fed newly hatched *Artemia salina* nauplii (EnviroSystems lot number BS01) once or twice daily before the test.

##### TOXICITY TESTING:

The definitive toxicity test was performed during March 5-9, 1990. It was based on procedures of the U.S. Environmental Protection Agency (1986, 1987). The test was conducted at a target temperature of  $20 \pm 2^{\circ}\text{C}$  with five concentrations of test substance and a dilution water control. A stock solution was prepared by combining 20.0 g of test substance with 2,000 ml of dilution water. The stock solution was added directly to dilution water contained in the test vessels without the use of a solvent. Nominal concentrations of the test material were: 0 mg/L, 10 mg/L, 100 mg/L, 1,000 mg/L, and 10,000 mg/L.

Twenty mysids were randomly distributed among a single replicate of each treatment. The test was performed in 2 liter glass dishes (approximately 25 cm in diameter and 8 cm deep) that contained 1.0 liter of test solution (water depth was approximately 4 cm). Test vessels were randomly arranged in an incubator during the 96 hour test. A 16 hour light and 8 hour dark photoperiod was automatically maintained with cool-white fluorescent lights that provided a light intensity of 40 eEs<sup>-1</sup>m<sup>-2</sup>. Aeration was not required to maintain dissolved oxygen concentrations above acceptable levels. Mysids were fed newly hatched *Artemia salina* nauplii once per day during the test.

The number of surviving organisms and the occurrence of sublethal effects (loss of equilibrium, erratic swimming, loss of reflex, excitability, discoloration, or change in behavior) were determined visually and recorded initially and after 24, 48, 72, and 96 hours. Dead test organisms were removed when first observed. Dissolved oxygen (YSI Model 57 meter; instrument number PRL-3), pH (Beckman model pHI 12 meter; instrument number PRL-4), salinity (Labcomp SCT meter, instrument number PRL-6), and temperature (ASTM mercury thermometer; thermometer number 2211) were measured and recorded daily in each test chamber that contained live animals.

#### STATISTICAL METHODS:

Results of the toxicity test were interpreted by standard statistical techniques. Computer methods (Stephan, 1983) were used to calculate the 96 hour median lethal concentration (LC50). The no observed effect level is the highest tested concentration at which 90% or more of the exposed organisms were unaffected.

## V. RESULTS

No insoluble material was observed in any test vessel during the test. Biological and water quality data generated by the acute toxicity test are presented in Table 1 and Appendix A, respectively. One hundred percent survival occurred in the control exposure.

The dose – response curve for organisms exposed to the test substance for 96 hours is presented in Figure 1. Exposure of mysids to the Oil Spill Eater II, batch 329, resulted in a 96 hour LC50 of 2,100 mg/L, with a 95 percent confidence interval of 100 – 10,000 mg/L. The 96 hour no observed effect concentration is estimated to be 100 mg/L.

**Table 1. Survival data from toxicity test**

Nominal Concentration (mg/L)	Number Alive						Number Affected				
		0hr	24hr	48hr	72hr	96hr	0hr	24hr	48hr	72hr	96hr
0 (control)	1	10	10	10	10	10	0	0	0	0	0
1	1	10	10	9	9	9	0	0	0	0	0
10	1	10	10	9	9	9	0	0	0	0	0
100	1	10	10	10	9	9	0	0	0	0	0
1,000	1	10	9	9	8	8	0	0	0	0	0
10,000	1	10	0	0	0	0	0	-	-	-	-



**Acute, Definitive Toxicity Tests of the Material  
OSE II  
to the Mummichog (Fundulus heteroclitus)**

**Toxicity Test Report**

**Submitted by:**

**Biomonitoring Services Laboratory  
6600 East Bay Boulevard  
Gulf Breeze, Florida 32561  
(904) 932-2717**

**Project Number: 52-01-AA467-AA469  
Report Number: 52-AA467-469-1-BSL-8-90**

**August 1990**

## **Toxicity Test Summary Sheet**

**Client Contact:** Carol Wilson

**Report Date & Number:** August 1990, 52-AA467-469-1-BSL-8-90

**Project Number:** 52-01-AA467-AA469

**Study Director:** Dan Johnson/Jamie McKee

**Test Material:** OSE II alone, #2 Fuel alone, OSE II #2 Fuel Oil

**Description:** Brownish, odorless liquid

**Dates Materials Received:** June 1990

**Dates of Definitive Test:** 28 June through 2 July 1990

**Test Conditions:** Static, aerated, 96-hour duration

**Test Procedure:** U.S. Environmental Protection Agency. 1989.  
National Oil and Hazardous Substance Pollution  
Contingency Plan; Final Rule. Federal Register,  
40CFR Part 300, July 18, pp 29192-29207.

**Test Animals:** Mummichog (*Fundulus heteroclitus*); Lot number: FH-90-2

**Source:** Commercial aquaculture supply company  
**Size:** 1 – 1.5 inches

**Dilution/Control Water:** Artificial seawater at 20 parts per thousand salinity.

**Test Concentrations:** 500, 1,000, 2,000, 4,000 and 8,000 parts per million OSE II.

**Effect Criterion:** Mortality

**96-Hour LC50 for OSE II:** 5,258.09 parts per million with a 95% confidence  
interval of 4,000.0 – 8,000.0 per million.

**96-Hour LC50 for #2 Fuel Oil:** 320.03 parts per million with a 95% confidence  
interval of 129.19 – 644.39 parts per million.

**96-Hour LC50 for OSE II #2 Fuel Oil:** 125.00 parts per million with a 95%  
confidence interval of 0.0 – infinity per  
million.



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Email: oseicorp@msn.com  
Web: <http://www.osei.us>

### TOXICITY TEST

### FOR ARTEMIA SALINA

To gain acceptance on the U.S. EPA's National Contingency Plan List, we were requested to perform an additional Toxicity Test on Artemia Salina using EPA's Standard Dispersant Toxicity Test.

OSE II Concentrate was presented to the laboratory, but the laboratory refers to the product as a Dispersant throughout the write-up since it was a Dispersant Toxicity Test. The Test proved that OSE II Concentrate is once again virtually non-toxic. This particular test proved OSE II helps to detoxify the oil in some organisms. The fuel had a higher toxicity rate than did the fuel and OSE II.

OSE II gained acceptance to the EPA's National Contingency Plan once this test was presented to the EPA.

A handwritten signature in black ink, which appears to read 'Steven R. Pedigo', is positioned above the printed name and title.

By: Steven R. Pedigo  
Chairman, OSEI, Corp.

SRP/AJL

Standard Dispersant Toxicity Test with the  
OSE II, Batch #9820 and Artemia salina

Authors

Timothy J. Ward  
Robert L. Boeri

Performing Laboratory

EnviroSystems Division  
Resource Analysts, Incorporated  
P.O. Box 778  
One Lafayette Road  
Hampton, New Hampshire 03842

October, 1990

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#### IV. INTRODUCTION

The objective of the study was to determine the acute toxicity of the dispersant – Batch # 9820, No. 2 fuel oil, and a 1:10 mixture of dispersant and oil to *Artemia salina*, a marine invertebrate. The report contains sections that describe the methods and materials employed in the study, and the results of the investigation. The report also contains an appendix that presents the water quality data collected during the tests.

#### V. METHODS AND MATERIALS

##### TEST SUBSTANCE:

The dispersant – Batch # 9820 (EnviroSystems Sample Number 2591E) was delivered to EnviroSystems on August 17, 1990. It was contained in two 1,000 ml plastic bottles that were labeled with the following information: “Batch # 9820”. The No. 2 fuel oil (EnviroSystems Sample Number 2599E) was delivered to EnviroSystems on August 28, 1990. It was contained in a 1,000 ml plastic bottle that was labeled with the following information: “# 2 fuel oil”.

##### DILUTION WATER:

Water used for hatching and acclimation of test organisms and for all toxicity testing was formulated at EnviroSystems in Hampton, New Hampshire. Water was diluted to a salinity of 20 parts per thousand and stored in polyethylene tanks where it was aerated.

##### TEST ORGANISM:

Juvenile *Artemia salina* employed as test organisms were from a single source and were identified using an appropriate taxonomic key. *Artemia salina* used in the test were produced from an in-house culture and were 24 hours old at the start of the test. Prior to testing, *Artemia salina* were maintained in 100% dilution water under static conditions. During acclimation *Artemia salina* were not treated for disease and they were free of apparent sickness, injuries, and abnormalities at the beginning of the test. They were not fed before or during the tests.

##### TOXICITY TESTING:

Screening tests with the test substances were conducted during October 1 to 3, 1990. The definitive toxicity tests were performed with the dispersant, No. 2 fuel oil, a 1:10 mixture of dispersant and oil, and the standard toxicant, dodecyl sodium sulfate during October 3 to 5, 1990, according to procedures of the U.S. EPA (1984). The tests were conducted at a target temperature of  $20 \pm 1^\circ\text{C}$  with five concentrations of each test substance and a dilution water control.

The dispersant and oil stock solutions were prepared by combining 550 ml of sea water and 0.55 ml of test substance in a glass blender jar and mixing the solution at 10,000 rpm for 5 seconds. The combined dispersant and oil stock solution was prepared by mixing 550 ml of sea water at 10,000 rpm and adding 0.5 ml of oil and 0.05 ml of dispersant. This combined mixture was then mixed for 5 seconds. Nominal concentrations of each test material were: 0 mg/L (control), 10 mg/L, 25 mg/L, 40 mg/L, 60 mg/L, and 100 mg/L. Media in each test vessel was added at the beginning of the test and not renewed.

Twenty *Artemia salina* were randomly distributed to each of 5 replicates of each treatment. The tests were performed in 250 ml glass Carolina culture dishes that contained 100 ml of test solution (water depth was approximately 2.5 cm). Test vessels were randomly arranged in an incubator during the 48 hour test. A 24 hour light and 0 hour dark photoperiod was maintained below the dishes. Aeration was not required to maintain dissolved oxygen concentrations above acceptable levels. *Artemia salina* were not fed during the tests.

The number of surviving organisms was determined visually and recorded initially and after 24 and 48 hours. Dead test organisms were removed when first observed. Dissolved oxygen (YSI Model 57 meter; instrument number PRL-18), pH (Beckman model pHI 12 meter; instrument number PRL-4), salinity (Refractometer, instrument number PRL-6), and temperature (ASTM mercury thermometer; thermometer number 2211) were measured and recorded at the beginning and end of each test in one test chamber of each concentration.

#### STATISTICAL METHODS:

Results of the toxicity test were interpreted by standard statistical techniques (Stephen, 1983). The binomial method was used to calculate the median lethal concentration (LC50) values.



## VI. RESULTS

All test vessels containing dispersant appeared clear throughout the test and all test vessels containing oil or oil and dispersant had an oil slick on the surface of the test media throughout the test. Biological and water quality data generated by the acute toxicity tests are presented in Table 1 and Appendix A, respectively. Ninety-nine percent survival occurred in the control exposure. The 48 hour LC50 for *Artemia salina* exposed to the reference toxicant dodecyl sodium sulfate is 38.7 mg/L.

The 24 and 48 hour LD50s from the three toxicity tests are presented in Table 2. The 48 hour LC50s for *Artemia salina* exposed to the test substances are: dispersant - >100 mg/L, No. fuel oil – 12.6 mg/L (95% confidence interval = 10.0 – 25.0 mg/L), and a 1:10 mixture of dispersant and No. 2 fuel oil – 29.4 mg/L (95% confidence interval = 25.0 – 40.0 mg/L).

**Table 1. Survival data from toxicity tests**

Nominal Concentration (mg/L)		Number Alive								
		Dispersant			No. 2 fuel oil			Oil + Dispersant		
		0hr	24hr	48hr	0hr	24hr	48hr	0hr	24hr	48hr
rep.										
0 (control)	1	20	20	20	20	20	20	20	20	20
	2	20	20	19	20	20	19	20	20	20
	3	20	20	20	20	20	20	20	20	20
	4	20	20	20	20	20	20	20	20	20
	5	20	20	20	20	20	20	20	20	20
10	1	20	19	17	20	20	17	20	20	19
	2	20	20	17	20	20	19	20	20	18
	3	20	20	20	20	20	12	20	18	18
	4	20	20	19	20	20	9	20	20	17
	5	20	19	18	20	18	10	20	20	16
25	1	20	20	16	20	18	0	20	19	19
	2	20	19	17	20	19	3	20	18	15
	3	20	20	18	20	19	2	20	20	16
	4	20	19	12	20	20	2	20	20	17
	5	20	19	15	20	20	0	20	19	14
40	1	20	19	16	20	20	0	20	19	0
	2	20	20	14	20	19	0	20	20	0
	3	20	20	19	20	20	0	20	20	0
	4	20	20	15	20	18	0	20	14	0
	5	20	20	17	20	17	0	20	18	2
60	1	20	19	18	20	18	0	20	18	0
	2	20	19	16	20	19	0	20	19	0
	3	20	19	19	20	16	0	20	19	0
	4	20	20	17	20	19	0	20	16	0
	5	20	20	16	20	14	1	20	16	1
100	1	20	20	18	20	13	0	20	20	0
	2	20	20	18	20	8	0	20	20	0
	3	20	19	13	20	9	0	20	20	0
	4	20	20	19	20	10	0	20	20	0
	5	20	20	16	20	8	0	20	20	0

**Table 2. Medial lethal concentrations (LC50s) from toxicity tests**

Test substance	Time	LC50	95 percent confidence limits	Calculation method
Dispersant	24 hour	> 100 mg/L	--	--
	48 hour	> 100 mg/L	--	--
No. 2 fuel oil	24 hour	> 100 mg/L	--	--
	48 hour	12.6 mg/L	10 – 25 mg/L	Binomial
Dispersant and	24 hour	> 100 mg/L	--	--
No. 2 fuel oil	48 hour	29.4 mg/L	25 – 40 mg/L	Binomial

## VII. REFERENCES

Stephen, C.E. 1983. Computer program for calculation of LC50 values. Personal communication.

U.S. EPA. 1984. Revised Standard Dispersant Toxicity Test. Federal Register, Volume 49, Number 139, Wednesday, July 18, 1984, pages 29204 to 29207.

## **Appendix A. WATER QUALITY DATA FROM TOXICITY TESTS**

## I. Summary

The acute toxicity of the dispersant – Batch #9820, No. 2 fuel oil, and a 1:10 mixture of dispersant and No. 2 fuel oil to *Artemia salina*, is described in this report. The test was conducted for 48 hours during October 3 to 5, 1990, at the EnviroSystems Division of Resource Analysts, Inc. in Hampton, New Hampshire.

The test was performed under static conditions with five concentrations of each test substance and a dilution water control at a temperature of  $20 \pm 1^{\circ}\text{C}$ . The dilution water was sea water adjusted to a salinity of 20 parts per thousand. Aeration was not employed to maintain dissolved oxygen concentrations above an acceptable level. Nominal concentrations of all three test substances were: 0 mg/L (control), 10 mg/L, 25 mg/L, 40 mg/L, 60 mg/L and 100 mg/L. Nominal concentrations were used for all calculations.

*Artemia salina* used in the test were 24 hours old at the start of the test and they were all in good condition at the beginning of the study. Exposure of *Artemia salina* to the test substances resulted in the following 48 hours median lethal concentrations (LC50): dispersant 100 mg/L, No. 2 fuel oil – 12.6 mg/L (95% confidence interval = 10.0- 25.0 mg/L), and a 1:10 mixture of dispersant and No. 2 fuel oil-29.4 mg/L (95% confidence interval = 25.0 – 40.0 mg/L).



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## SUMMARY

### ENVIRONMENT CANADA'S TOXICITY TEST

Environmental Canada performs Toxicity Testing for determining if a product could gain approval for use in Canada. The level that is considered toxic is 1,000 mg/L or less. A product that exceeds this level is deemed acceptable.

Oil Spill Eater II Concentrate, tested at 10,000 mg/L – which shows OSE II Concentrate is virtually non-toxic and far exceeds the level deemed to toxic by Environment Canada.

Rainbow Trout is one of the most sensitive fresh water organisms to test. OSE II proved that even with third party testing by a Foreign Government, OSE II is virtually non-toxic.

A handwritten signature in black ink, appearing to read 'A. Tom Pedigo', is positioned above the printed name of the signatory.

By: Steven R. Pedigo  
Chairman/OSEI, Corp.



Environment Canada  
Conservation and Protection

Emergencies Science Division  
River Road Environmental Technology Centre  
3439 River Road  
Ottawa, Ontario K1A 0H3

May 17, 1993

4808-13-7

Steven R. Pedigo, Chairman,  
OSEI Corporation  
5545 Harvest Hill  
Suite 1116  
Dallas, TX 75230  
U.S. A.

Dear Mr. Pedigo,

Thank-you for participating in the development of Environment Canada's draft guidelines for assessing the toxicity and effectiveness of oil spill bioremediation agents (OSBAs).

The Tier I toxicity testing is now complete. Our preliminary screening has indicated that the *Daphnia magna* test and the Microtox test were either insensitive or erratic. Therefore, we do not consider these particular tests useful for OSBA evaluation. Comments on the toxicity of your product will thus be limited to those obtained using the 96-hour Rainbow Trout acute lethality test. 'Oil Spill Eater II' had a rainbow trout 96-hour LC50 of greater than 10,000 mg of application solution per litre of water. There was, however, a 23% mean fish mortality at this concentration. Also note that between 24 and 96 hours of exposure to the product, sublethal effects were present. The fish were noted to surface, be on their side, turn dark, exhibit rapid breathing and no swimming. These sublethal effects should be of concern. The effectiveness test analyses are still being performed. You will be notified as soon as those results are available.

If your product meets both the effectiveness and toxicity criteria it will be placed on our Standard List of Oil Spill Bioremediation Agents. Placement on this list is not an indication that the product will be used in the event of an oil spill. The list and test results are public information. They may be provided to oil spill response personnel to enable them to make informed decisions.

Please take note that the placement of a product on our Standard List does not constitute an approval or certification or licensing of your product for use in Canada. Your product may be required to comply with the New Substances Notification Regulations (NSNR) for biotechnology products under the Canadian Environmental Protection Act (CEPA). For information on the draft regulations, please contact the Chief of the New Substances Division at (819) 997-4336 or at the following address: Chief, New Substances Division, CCB, Environment Canada, P.V.M. 14th Floor, Ottawa, Ontario, K1A 0H3, CANADA.

Sincerely,

Merv Fingas  
Chief, Emergencies Science Division

**Canada**

Made from recovered materials

Fait de papiers recuperes

Think recycle



Pensez a recycle

**ENVIRONMENT CANADA**  
**TIER I TOXICITY TESTING**  
**FOR EVALUATION OF DRAFT OSBA GUIDELINES**

The testing was performed as follows. An application solution of the OSBA was prepared based on instructions provided by the manufacturer/supplier. The highest strength of solution tested was 10,000 mg of application solution per litre of water (approx. a 1:100 dilution). For products in which solids are normally added to the water, suspensions comprised of 10,000 mg of product/combined product per litre of water were prepared for use in the toxicity tests. (If several solids were to be added, they were combined in the appropriate ratio). This initial screening concentration was tested in triplicate. If this concentration was toxic to greater than 50% of the organisms, lower concentrations were tested. Sub-lethal effects on the behavior and/or appearance of the organisms were also made. The toxicity of the product in water was assessed using each of the following three biological test methods, developed and standardized by Environment Canada for these and other applications:

Environment Canada, 1990a. **Biological test method: acute lethality test using rainbow trout.** Environment Canada, Conservation and Protection, Ottawa, Ontario. Report EPS 1/RM/9, 51 pp.

Environment Canada, 1990b. **Biological test method: acute lethality test using *Daphnia* spp.** Environment Canada, Conservation and Protection, Ottawa, Ontario. Report EPS 1/RM/11, 57 pp.

Environment Canada, 1992. **Biological Test method: toxicity test using luminescent bacteria (*Photobacterium phosphoreum*).** Environment Canada, Conservation and Protection, Ottawa, Ontario. Report EPS 1/RM/24, 61 pp.

May 17, 1993



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TOXICITY TEST SUMMARY USING  
CITGO GASOLINE, OIL SPILL EATER II  
AND FATHEAD MINNOWS

To prove OIL SPILL EATER II rapidly detoxifies hydrocarbons once OSE II is applied, a Toxicity Test was set up with the Physical Engineer of the City of Plano, Texas.

One half gallon of gasoline was poured onto a concrete surface, where ½ gallon of OSE II (pre-diluted 100 to 1) was immediately applied. The treated gasoline was allowed to set for two (2) minutes at which time two (2) gallons of fresh water were used to wash this effluent into a catch basin. Approximately 1 ½ gallons were recovered and sent to Bio-Aquatic Laboratory.

Bio-Aquatic Laboratory performed a Static 48 Definitive Toxicity Test using Fathead Minnows (*Pimphales promelas*). The LC50 was 9,300 mg/L which is a relatively low toxicity level.

This test shows that OSE II when applied to a toxic constituent rapidly reduces toxicity. This detoxifying action of OSE II limits the toxicity of a spill to marine organisms, and will allow Mother Nature's Bacteria to rapidly attack this detoxified spill. The rapid detoxification of a spill shows that OSE II is a beneficial tool for first response cleanup for a spill. This test also shows that if OSE II is used to clean up a parking lot and washed into the storm drain there would be no adverse environmental impact.

By: Steven R. Pedigo  
Chairman/OSEI, Corp.

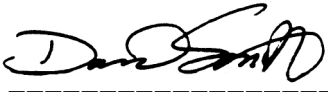


**OSEI CORPORATION**  
**OSE II/GASOLINE/WATER**

*Toxicity Test Report*

*DECEMBER 7, 1991*

**BIO-AQUATIC TESTING, INC.**

Prepared by:   
\_\_\_\_\_  
*David Smith,*  
*Aquatic Toxicologist*

# BIO-AQUATIC TESTING, INC.

1555 Valwood Parkway, Ste. 100  
Carrollton, Texas 75006  
Tel: (214) 247-5928  
Fax: (214) 241-4474

## TOXICITY TEST REPORT – ACUTE

---

Client . . . . .	OSEI Corporation	Laboratory I.D. . . . .	BO-12-91-2239
Sample . . . . .	OSE II/Gasoline/Water	Date . . . . .	December 7, 1991

Results:       The 48-hour LC50 for *Pimephales promelas* exposed to a mixture of OSE II, gasoline, and water was 9,300 mg/L.

---

### SAMPLE COLLECTION

Approximately one and a half gallons of runoff grab sample from an OSEI Corporation product demonstration was delivered to Bio-Aquatic Testing on December 5, 1991. The sample was manually collected by OSEI personnel. One toxicity test was requested: a static 48-hour definitive toxicity test using the fathead minnow (*Pimephales promelas*).

### CHEMICAL MEASUREMENTS

The sample was analyzed for residual chlorine (EPA Method 330.1, Amperometric Titration Method) and was determined to contain <0.10 mg/L. Sample and laboratory dilution water pH, temperature, conductivity, hardness, alkalinity and D.O. were analyzed and recorded daily.

### TEST PROCEDURES *Pimephales promelas*

The 48-hour fathead minnow larval survival test was initiated at 1450 hours, December 6, 1991. Five concentrations were established for testing (200 mg/L, 800 mg/L, 3,000 mg/L, 9,000 mg/L, and 30,000 mg/L) utilizing reconstituted distilled, deionized water as dilution water. The test was set up using distilled water rinsed 500 mL plastic cups as test chambers. Four replicate cups containing five organisms each in 250 mL of test solution were used per dilution. All organisms used were laboratory reared and less than 24 hours old at test initiation. The test was allowed to proceed for 48 hours during which mortality was recorded daily.

A control of four replicate chambers containing five organisms each in 100% synthetic laboratory water was conducted concurrently with the test. There was 100% survival in the control. Data on surviving organisms as well as water quality measurements were recorded on the data sheet. The test ended at 1450 hours, December 8, 1991. The acute toxicity data analysis program provided by the EPA was employed to determine the LC50 values.

**LC50 RESULTS**  
*Pimephales promelas*

LC50 value calculated using the Binomial Method:

<u>CONC. (mg/L)</u>	<u># EXPOSED</u>	<u># DEAD</u>	<u>% DEAD</u>	<u>BINOMIAL %</u>
30,000	20	20	100	0.0001
9,000	20	6	30	5.7659
3,000	20	1	5	0.0020
800	20	0	0	0.0001
200	20	0	0	0.0001

The Binomial Test shows that 3,000 and 30,000 can be used as statistically sound conservative 95 percent confidence limits since the actual confidence level associated with these limits is 99.99791 percent.

An approximate LC50 for this set of data is 11,800 mg/L.

LC50 value calculated using the Trimmed Spearman-Kärber Method:

<u>Trim</u>	<u>Var. of Ln Est.</u>	<u>LC50</u>	<u>95% Conf. Limits</u>
0.00%	0.17396D-01	9,300 mg/L	7,100 to 12,100 mg/L

**SUMMARY**

The 48-hour LC50 for *Pimephales promelas* exposed to a mixture of OSE II, gasoline, and water was 9,300 mg/L.

# BIO-AQUATIC TESTING, INC.

## 48 – HOUR *PIMEPHALES PROMELAS* ACUTE TOXICITY TEST

CLIENT	OSEI Corporation	BEGIN DATE	12/06/91
SAMPLE	OSE II, Gasoline, Water	END DATE	12/08/91
LAB ID #	<b>BO-12-91-2239B</b>	TEST ORGANISM	<i>Pimephales promelas</i>
DATE COLLECTED	12/05/91	TEST TEMPERATURE (°C)	25° ± 1
DATE RECEIVED	12/05/91	PHOTO PERIOD	16 hour light / 8 hour dark
SAMPLE TYPE	Grab	LIGHT INTENSITY	75 FT-C
TEST TYPE	Acute	ANALYST	W. Smith

## SURVIVAL SUMMARY

% EFFLUENT CONC	NUMBER LIVE PER REP												x LIVE PER CONC		
	START				24 HOURS				48 HOURS						
	a	b	c	d		a	b	c	d		a	b	c	d	x % Surv.
Control	5	5	5	5		5	5	5	5		5	5	5	5	100
200 mg/L	5	5	5	5		5	5	5	5		5	5	5	5	100
800 mg/L	5	5	5	5		5	5	5	5		5	5	5	5	100
3,000 mg/L	5	5	5	5		5	5	5	5		5	4	5	5	95
9,000 mg/L	5	5	5	5		3	3	5	5		3	1	5	5	70
30,000 mg/L	5	5	5	5		0	0	0	0		0	0	0	0	0

## EFFLUENT MEASUREMENTS

D.O. @ 30,000 mg/L<sup>1</sup> 8.6/6.6

pH @ 30,000<sup>1</sup> 8.3/8.4

CONDUCTIVITY @ 30,000 (µMHOS) 500

HARDNESS (mg/L as CaCO<sub>3</sub>) 272.4 ALKALINITY (mg/L as CaCO<sub>3</sub>) 625.0

## DECHLORINATION

RESIDUAL Cl<sub>2</sub> (mg/L) <0.10 ANALYSIS METHOD Amperometric Titration Method (330.1)

DECHLORINATION REAGENT Not Applicable

## DILUTION WATER MEASUREMENTS

D.O. @ 100% (mg/L)<sup>1</sup> 8.6/6.9

pH @ 100%<sup>1</sup> 8.4/8.3

RECEIVING WATER DILUTION WATER Laboratory adjusted

HARDNESS (mg/L as CaCO<sub>3</sub>) 160.0 ALKALINITY (mg/L as CaCO<sub>3</sub>) 107.0

<sup>1</sup> Recorded at the beginning and end of each 24-hour exposure period.

## I. Summary

The acute toxicity of the dispersant – Batch #9820, No. 2 fuel oil, and a 1:10 mixture of dispersant and No. 2 fuel oil to *Artemia salina*, is described in this report. The test was conducted for corp for 48 hours during October 3 to 5, 1990, at the EnviroSystems Division of Resource Analysts, Inc. in Hampton, New Hampshire.

The test was performed under static conditions with five concentrations of each test substance and a dilution water control at a temperature of  $20 \pm 1^{\circ}\text{C}$ . The dilution water was sea water adjusted to a salinity of 20 parts per thousand. Aeration was not employed to maintain dissolved oxygen concentrations above an acceptable level. Nominal concentrations of all three test substances were: 0 mg/L (control), 10 mg/L, 25 mg/L, 40 mg/L, 60 mg/L and 100 mg/L. Nominal concentrations were used for all calculations.

*Artemia salina* used in the test were 24 hours old at the start of the test and they were all in good condition at the beginning of the study. *Exposure of Artemia salina* to the test substances resulted in the following 48 hours median lethal concentrations (LC50): dispersant 100 mg/L, No. 2 fuel oil – 12.6 mg/L (95% confidence interval = 10.0- 25.0 mg/L), and a 1:10 mixture of dispersant and No. 2 fuel oil-29.4 mg/L (95% confidence interval = 25.0 – 40.0 mg/L).



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## **BOD COD SUMMARY**

### **(Biological Oxygen Demand / Concentrated Oxygen Demand)**

When a given area receives or becomes contaminated with a given carbon-based contaminant, the BOD/COD is automatically affected!

*Oil Spill Eater II (OSE II)* in and of itself only slightly affects BOD/COD regardless of the application rates of OSE II. The effect of using OSE II would, at most, be 5% to 10% on the BOD.

In any area where there is water movement or tidal action, the BOD/COD uptake effects would be minimal to the alternative of leaving an untreated contaminant in place where it could potentially affect the BOD/COD or harm waterfowl, birds, mammals, fish and plant life.

The potential of long-term problems of leaving a contaminant in place should be of more concern than minutely affecting the BOD/COD by using OSE II.

In our experience, BOD and COD problems really only need to be addressed where you want to treat a contaminant in a closed system or a small body of water where there is no inflow of water. Even in these systems, the BOD/COD can be maintained simply by pumping air into the system or pumping the water into the air, or by causing an inflow of water to the area that has become contaminated.

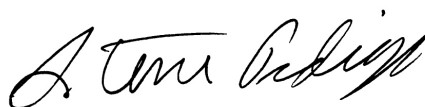
Oil Spill Eater II was used on a 3-acre pond with fish and wildlife swimming in the water where approximately 1 ½ acres of the pond were covered with crude oil from a pipeline break. We applied our product on the shoreline to remove the crude oil from the grasses, plant life and marsh area. OSE II was then applied to the main body of the spill. A circulation pump was set out in the middle of the pond where water was pumped up in the air. There were fish, snakes and turtles observed swimming in the water away from the spill and no fish or wildlife died. It took 3 days for bacteria growth to be visible to the human eye and in 5 days visible clean patches started appearing in the crude oil where the bacteria was converting the oil to CO<sub>2</sub> and water.

## SUMMARY

BOD/COD concerns where there is an open system is minimal, compared to long term problems of leaving a contaminant in place untreated. If you want to or feel addressing the BOD/COD problem is needed, then pumping air into the area or moving the water is easily performed and should be attempted over leaving an untreated contaminant in place.

The RRT/Onscene Commanders require even one gallon spills to be reported and mechanically cleaned up. How can they authorize leaving a large spill (25,000 gallons) in place and untreated. If there is enough contaminate to adversely affect the BOD/COD in any ecosystem, then the contaminant itself would choke the life out of everything.

We would think that you would want to return any given ecosystem to it's pre-spill conditions as fast as possible by utilizing a product such as OSEI.

A handwritten signature in black ink, appearing to read "Steven R. Pedigo". The signature is fluid and cursive, with a large initial "S" and "P".

By: Steven R. Pedigo  
Chairman

SRP/AJL

To Whom this may concern,

re: OSEI's product for petroleum hydrocarbon remediation in aquatic environments.

This report is in response to concerns expressed by U.S. EPA regulatory officials about the use of OSEI's product in surface waters for remediation of petroleum hydrocarbon spills. I understand that this concern is for the potential increase in biochemical oxygen demand (BOD) as a result of administering OSEI's product to remediate contaminated water. My research over the last several years has been involved in testing various aeration and management techniques used to overcome severe oxygen depletion in the hypolimnion of eutrophic lakes. I have even evaluated the use of Bact-A-Pur® for its potential to reduce sediment organic matter. Specific goals have included remedial practices for winterkill prevention, maintaining an oxidized microzone at the sediment surface to minimize dissolution of iron, manganese, sulfides, reduced organic acids and methane into the water column of eutrophic lakes. In performing these tests it has been necessary to isolate, measure and model sources of oxygen depletion including sediment chemical and biological oxygen demand, phytoplankton respiration and methanogenesis in anaerobic sediments. This research has culminated in the completion of a Ph.D. these under the direction of W.C. Mackay and Dave Schindler at the University of Alberta and several publications have been submitted or are currently being written concerning this aspect of limnology. Further, I was indirectly involved in but have extensively reviewed the data and discussed the results of bioremediation testing with the experts involved in the Exxon Valdez disaster in Alaska.

After review of information provided to me by George Lively, President of OSEI, Inc. I have the following comments.

Bioremediation, and specifically the OSEI product, is undoubtedly an effective and inexpensive approach for the remediation of petroleum hydrocarbon spills. In addition, although the efficacy of earlier tests for bioremediation products in rivers and streams was questionable, the OSEI product particularly appears to emulsify and maintain the oil at the surface as it proceeds to degrade the spill. This characteristic is particularly beneficial in its use in lentic systems and has and will continue to prove to be an ideal application of this new technology. Specifically, there are several factors which should be pointed out which support this position and explain why this application will have minimal or no impact on the BOD in lentic aquatic systems.

1. The specific species of bacteria which the enzyme and nutrient solution are designed to target are but a tiny minority of the aerobic bacterial community of freshwater and marine ecosystems. Hence, there will be only a minuscule increase in the overall bacterial community with a concomitant minuscule (although not likely measurable), increase in BOD.

The small addition of nutrients may, however, temporarily enhance the phytoplankton population in very small bodies of water.

2. This possibility would be even further reduced for a hydrocarbon spill in freshwater or coastal wetlands. This is because these systems are inherently hypereutrophic and hence already possess large amounts of organic matter with associated high rates of BOD. (I have observed such water bodies to range in DO from  $> 15 \text{ mg L}^{-1}$  in mid-afternoon to  $0 \text{ mg L}^{-1}$  for several pre-dawn hours). Hence, an additional small amount of BOD would likely neither be observed nor have any additional ecological impacts to the present system. Further, the small nutrient additions will likely not exceed background values for nitrogen and phosphorus in these productive systems.



3. One of the greatest merits of this product is that, because the oil-degrading bacteria use only petroleum hydrocarbons as substrates, these populations will diminish to pre-spill low abundance once hydrocarbons are oxidized. Hence, after just a few weeks of treatment the aquatic ecosystem will revert to pre-spill conditions.

4. Even an accidental excessive dose of the OSEI product would have no toxicological consequences and would result only in a minor and temporary increase in nutrients and possible phytoplankton growth. In comparison with other remediation techniques which require dredging, pumping, and treating or air stripping, the use of this product is much cheaper, incurs minimal collateral ecological damage and leaves no physical, toxicological, or ecological impairment.

A handwritten signature in black ink, appearing to read "T. G. Miller". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Theron G. Miller

President, Aquatic Solutions, LLC



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### **TEST ON MOBILIZING**

### **PRUDHOE BAY CRUDE**

Performed by Steve Hinton – Exxon U.S.A.

A Shaker Flask Test was performed using Prudhoe Bay Crude and “OIL SPILL EATER II” mixed 50 parts seawater to one (1) part OSE II.

Rocks covered with 400 grams of Prudhoe Bay Crude were coated with 400 ml of diluted “OIL SPILL EATER II”. Steve Hinton at Exxon claimed that OSE II mobilized all the Prudhoe Bay Crude in about 6 to 8 hours.

This shows OSE II is very effective in cleaning oil off of rocks and was proven by Exxon.

Test was performed on January 4th and 5th, 1990.

Steven R. Pedigo  
Chairman

SRP/AJL



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April 23, 1990

### Percolation Rate of Oil Spill Eater

1. Objective of experiment was to determine the depth of percolation of Oil Spill Eater the rate of percolation involving several potential beach materials.
2. 4 clear troughs 24" L x 18" W x 10" D were used with  $\frac{1}{4}$ " markings on all sides.
  - A. Trough number 1, had a sand and gravel mixture of  $\frac{1}{2}$ " sand and  $\frac{1}{2}$ ",  $\frac{3}{8}$ " gravel 6" deep. It was placed on a screen held 1" above the bottom of the trough. Screen contained slits that were 5 microns in size.
  - B. Trough number 2 had a predominately gravel base with a small amount of sand mixed in. Gravel was 1" rock diameter, and this gravel was placed on a screen held 1" above the bottom of the trough. Screen contained slits that were 5 microns in size.
  - C. Trough number 3 used small boulders 6" in diameter. Boulders were placed on a screen held 1" above the bottom of the trough. Screen contained slits that were 5 microns in size.
  - D. Trough number 4 a mixture of 1" gravel and 6" boulders was placed on a screen held 1" above the bottom of the trough. The screen contained slits that were 5 microns in size. The screen was covered with a 2" layer of 1" rock. The 2" layer of rock was then coated with an  $\frac{1}{8}$ " of inch of Prudoe Bay Crude.
3. All 4 troughs material was saturated with Alaskan sea water that was 40°F. Red dye was mixed with OSE to visually observe percolation depth.
5. A  $\frac{1}{4}$ " of an inch layer of OSE was then applied and visual data was then noted.

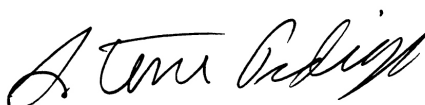
## PERCOLATION TEST

### Results

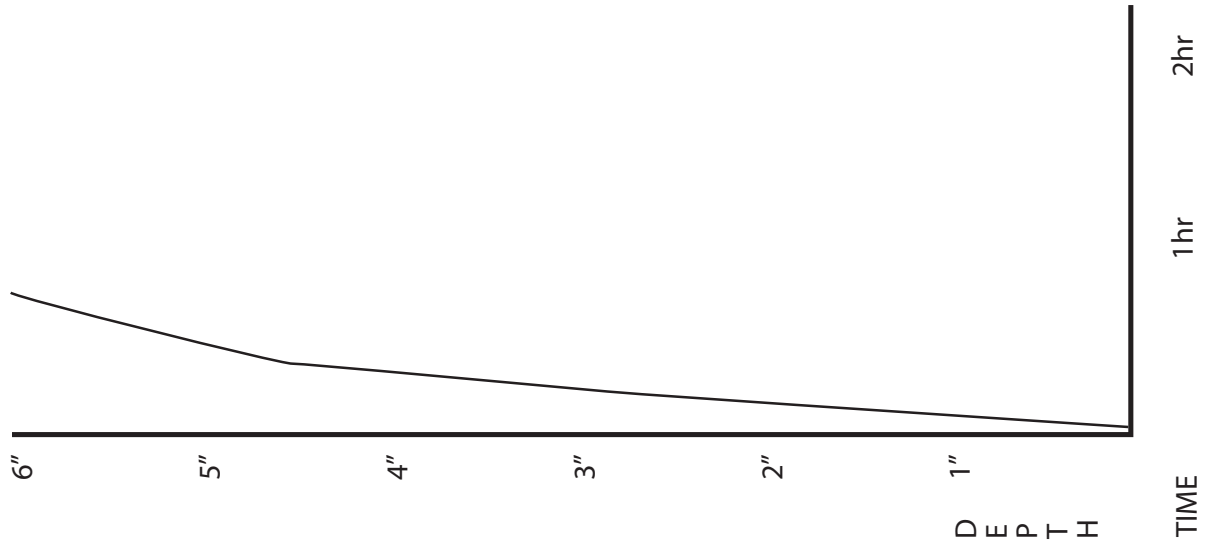
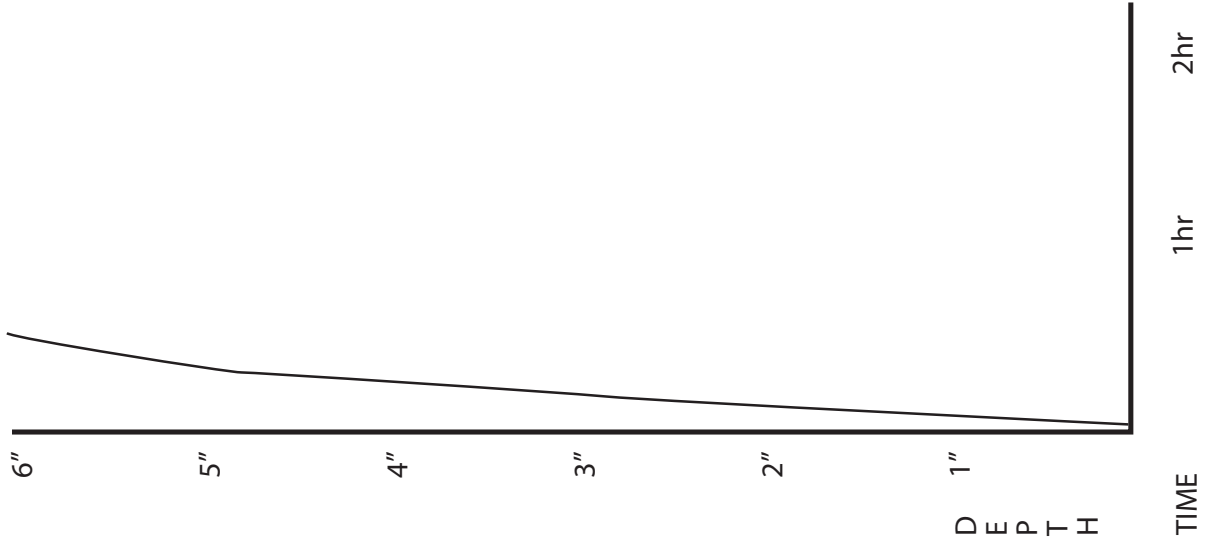
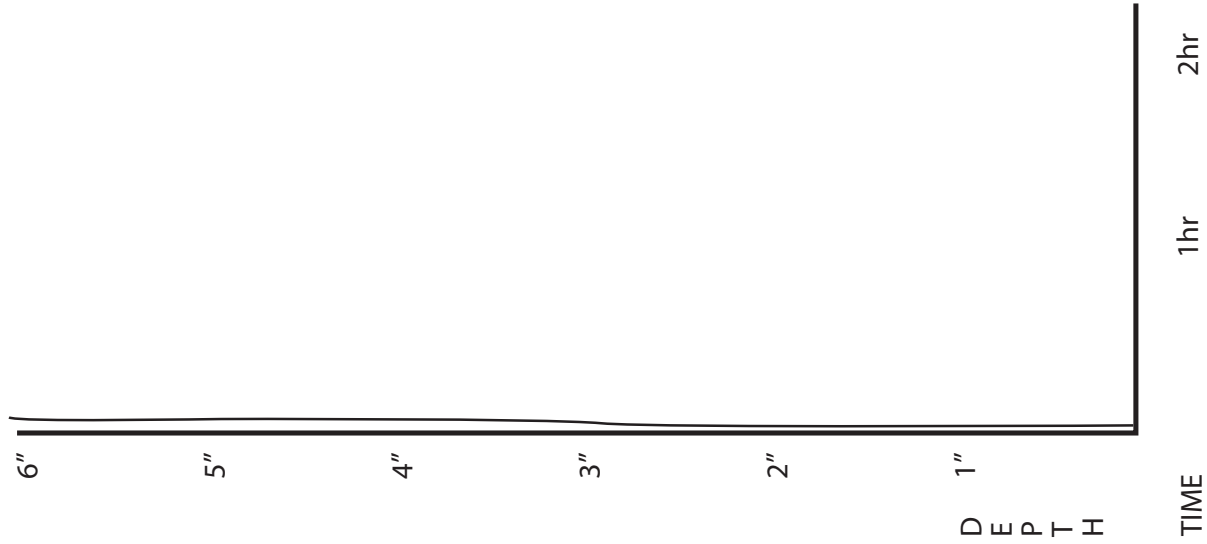
Once of the volume of the 50 to 1 OSE had percolated to the bottom of the trough, then time was noted. Depth of Red Dye was used as a leading edge indicator.

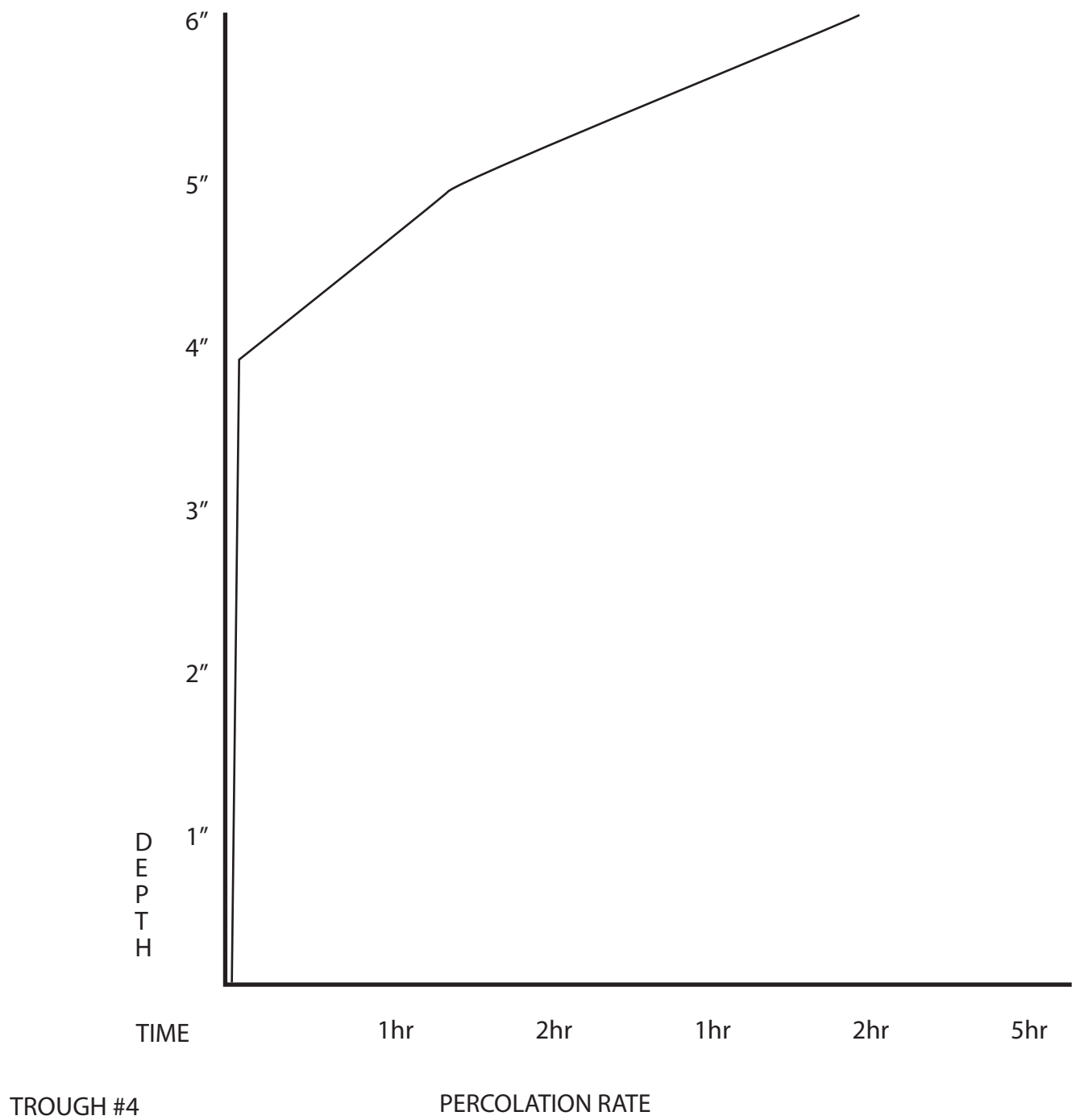
- A. Trough number 1, OSE percolated quickly to 4" then slowed somewhat, and at 47 minutes of the original OSE volume was measured in the bottom of the trough.
- B. Trough number 2, OSE percolated quickly to 4 ½ inches and still proceeded quickly and at 28 minutes, of the original OSE volume was measured in the bottom of the trough.
- C. Trough number 3, OSE percolated to the bottom of the trough about as fast as it was applied.
- D. Trough number 4, OSE percolated almost as fast as it was applied to the depth of the 1" rocks coated with the Alaskan crude. Once OSE reached the point of contact with the crude, percolation slowed substantially. What was reaching the bottom of the trough was OSE and the Alaskan crude. In 3 hours and 53 minutes, a volume of of the original OSE volume was noted. However, this may not have been precise since the crude that was being mobilized and percolating may have made up some of this volume. Percolation may have slowed due to the OSE adhering to the crude, then mobilizing the crude and then this mixture percolated slower.

Tests were performed by Steven R. Pedigo.



Steven R. Pedigo  
Chairman







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June 23, 1999

“OIL SPILL EATER” II (OSE II)  
SWIRLING FLASK DISPERSANT EFFECTIVENESS TEST

The attached test by the Southwest Research Institute in San Antonio shows the following information as to the effectiveness of “OIL SPILL EATER” II as a Dispersant for oil:

Note: Time of test is 30 minutes.

1. Percent of Dispersed Oil due to OSE II:  
Effectiveness = 0%
2. Percent Dispersed Oil without OSE II:  
Effectiveness = 62%
3. Since the molecular weight of the crude oil tested is many times that of diesel, jet fuel, or gasoline, OSE II will prevent these lighter oils from sinking into the water column.
4. When you have a spill and have to wait for the clean-up crew or contractor to rig booms and skimmers, the elapsed time could be hours. This would allow a greater percentage of the oil to sink into the water column.
5. By immediately applying “OIL SPILL EATER” II to the spill, you:
  - A. Keep the oil out of the water column.
  - B. Eliminate the fire hazard.
  - C. Protect the Eco-System.
  - D. Get rid of the oil through Bioremediation (turns into CO<sub>2</sub> and water).

  
O.A. (George) Lively  
President

# SOUTHWEST RESEARCH INSTITUTE

6220 CULEBRA ROAD • POST OFFICE DRAWER 28510 • SAN ANTONIO, TEXAS, USA 78228-05108 • (210) 684-5111 • TELEX 244846

Page 1 of 2

## PETROLEUM PRODUCTS TEST REPORT

June 22, 1999

George Lively  
Oil Spill Eater International, Corp. (OSEI)  
13127 Chandler Drive  
Dallas, TX 75243  
(972)-669-3390  
(972)-644-8359 FAX

RE: Swirl Flask Dispersant Effectiveness Test  
SwRI Project Number: 08-2326-088 Workorder: 8783

Dear Mr. Lively:

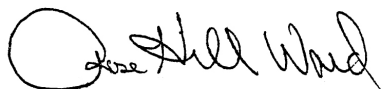
The "Oil Spill Eater II Concentrate (OSEI)" sample you submitted for Swirl Flask Dispersant Effectiveness Test has been completed. We received the 8-oz glass jar in good condition on June 8, 1999. The test results are summarized in the attached test report.

Test aliquots were taken in accordance with the manufacturer-suggested procedure. Test conditions are outlined in Federal Register/ Volume 59. Testing was performed in accordance with the test procedure used with no deviation or modifications. The analyses pertain only to the sample received by Southwest Research Institute and represent only a sampling of a batch. This report shall not be reproduced exempt in full without the expressed written permission of Southwest Research Institute.

*"SwRI shall not publish or make known to others the subject matter or results of the Project or any information obtained in connection therewith which is proprietary and confidential to Client without Client's written approval. No advertising or publicity containing any reference to SwRI or any of its employees, either directly or by implication, shall be made use of by Client or on Client's behalf without SwRI's written approval. In the event Client distributes any report issued by SwRI on this Project outside its own organization, such report shall be used in its entirety, unless SwRI approves a summary or abridgment for distribution."*

If we may be of further assistance, or if there are any questions concerning this analysis, please contact me at (210) 522-2024.

Sincerely,



Rose Hill Ward  
Research Scientist  
Petroleum Products Research Department  
Automotive Products and Emissions Research Division



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PETROLEUM PRODUCTS TEST REPORT  
**Oil Spill Eater II Concentrate (OSE II)**  
 Swirl Flask Dispersant Effectiveness Test

TEST	RESULTS	DATE TESTED
% Dispersed with no Dispersant (OSE II)	$EFF_o = (C_{mean}/C_{tot}) * 100$  $EFF_c = 62.00\%$	6/21/99
% Dispersed oil with Dispersant (OSE II) added	$EFF_o = (C_{mean}/C_{tot}) * 100$  $EFF_c = 62.00\%$	6/21/99
% Dispersed oil due to Dispersant (OSE II) only	$EFF_D = EFF_a - EFF_c$ $EFF_D = 14.56\% - 62.00\%$  $EFF_D = 0.00\%$	6/21/99

Two standards used for this testing were Prudhoe Bay and South Louisiana References oils and were obtained through Resource Technology Corporation. The standards were used to determine the response factor.

The OSEI II test dilution is a 1:10 ratio.

The “% Dispersed Oil with no dispersant (OSE II)” contained only the reference oil. The control was used to determine the maximum amount of oil that would naturally leach into the synthetic seawater.

The “% Dispersed oil with dispersant (OSE II) added” contained the oil and an OSEI II as dispersant to determine the effectiveness of the dispersant.

The “% Dispersed oil due to dispersant (OSE II) only” was a calculated average of eight determinations (four replicates from the South Louisiana reference oil and four replicates from the Prudhoe Bay reference oil).

The results of this testing determine that the OSE II product is totally **ineffective** dispersant according to “Swirling Flask Dispersant Effectiveness Test.”

s:\users\rward\loseiafv9.rep

# SOUTHWEST RESEARCH INSTITUTE

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February 19, 1991

Sky Blue Chemicals  
P.O. Box 866412  
Plano, TX 75086

Attention: Mr. Steven R. Pedigo

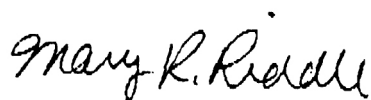
Subject: Analysis of Oil-eater Sample for Contaminants  
SWRI 01-3108-092

Dear Mr. Pedigo:

The oil-eater sample received in our laboratory on November 30, 1990 has been analyzed for lead cadmium and total chlorinated hydrocarbons as directed in my conversation with Norman Gouloy of Sign Tech on November 26, 1990. The results of these analyses are shown in the data table which was faxed to you on February 15, 1991. This table is enclosed.

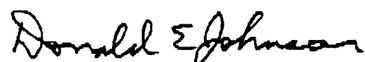
If you have any questions, please call me at (512) 522-2181. Thank you for the opportunity to be of service to your firm.

Sincerely,



Mary Riddle  
Research Scientist

Approved



Donald E. Johnson, Ph.D.  
Director



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SKY BLUE CHEM  
SwRI PROJECT 01-3108-092

SAMPLE ID: OIL EATER

RESULTS

Analyte	Amount Detected
Pb (mg/kg)	0.8
Cd (ug/kg)	<0.1
Total Chlorinated Hydrocarbons	<5.0 ppm

Resource Analysts, Inc.  
Subsidiary of MILLIPORE  
P.O. Box 778, One Lafayette Road  
Hampton, N.H. 03842  
(603) 926-7777

Mr. Tim Ward  
EnviroSystems, Incorporated  
P.O. Box 778  
Hampton, NH 03842

P.O. Number: ESI 2473E

Date Received: 06/06/90 (1130)

Lab Number: 22,118

Date Reported: 06/15/90

Parameter: Total Cyanide (mg/L)

Matrix: Water

Date Analyzed: 06/12/90

Method/Reference: 335.2/40 CFR Part 136, Friday, October 26, 1984

Field Identification:

Laboratory Number

Concentration

Oil Spill Eater II, Batch 9531

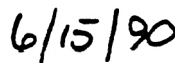
22118-1

<0.01



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Technical Director



---

Date

Resource Analysts, Inc.  
 Subsidiary of MILLIPORE  
 P.O. Box 778, One Lafayette Road  
 Hampton, N.H. 03842  
 (603) 926-7777

Mr. Tim Ward  
 EnviroSystems, Incorporated  
 P.O. Box 778  
 Hampton, NH 03842

P.O. Number: 2473E  
 Date Received: 05/25/90 (1415)  
 Lab Number: 21,986  
 Date Reported: 06/11/90

Attached please find test results for acid/base/neutral extractable organic compounds.

Field Identification: OSE BATCH 9522  
 Laboratory Number: 21986-1

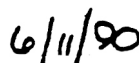
Matrix: Water

<u>Parameter</u>	<u>Concentration</u>	<u>Date Analyzed</u>	<u>Method/Ref.</u>
Arsenic, total (mg/L)	<0.01	05/29/90	7060/1
Cadmium, total (mg/L)	<0.005	05/29/90	3010,6010/1
Chromium, total (mg/L)	<0.01	05/29/90	3010,6010/1
Copper, total (mg/L)	0.04	05/29/90	3010,6010/1
Mercury, total (mg/L)	<0.0003	05/30/90	7470/1
Nickel, total (mg/L)	<0.03	05/29/90	3010,6010/1
Lead, total (mg/L)	<0.005	05/29/90	3020,7421/1
Zinc, total (mg/L)	0.06	05/29/90	3010,6010/1

References: 1) EPA SW 846, 3RD Edition



Technical Director



Date

Laboratory number: 21986-0001

Sample Designation: OSE BATCH 9522

Date Analyzed: 06/01/90

Matrix: LIQUID

DETECTION			DETECTION		
ACID/BASE/NEUTRAL	CONCENTRATION	LIMIT	ACID/BASE/NEUTRAL	CONCENTRATION	LIMIT
EXTRACTABLES	(ug/L)	(ug/L)	EXTRACTABLES	(ug/L)	(ug/L)
Phenol	BDL	130	3-Nitroaniline	BDL	630
Aniline	BDL	130	Acenaphthene	BDL	630
Bis(2-chloroethyl)ether	BDL	130	2,4-Dintrophenol	BDL	630
2-Chlorophenol	BDL	130	4-Nitrophenol	BDL	630
1,3-Dichlorobenzene	BDL	130	Dibenzofuran	BDL	130
1,4-Dichlorobenzene	BDL	130	2,4-Dinotrotoluene	BDL	130
Benzylalcohol	BDL	130	Diethylphthalate	BDL	130
1,2-Dichlorobenzene	BDL	130	4-Chlorophenyl-phenylether	BDL	130
2-Methylphenol	BDL	130	Fluorene	BDL	130
Bis(2-chloroisopropyl)ether	BDL	130	4-Nitroaniline	BDL	630
4-Methylphenol	BDL	130	4,6-Dinitro-2-methylphenol	BDL	630
N-Nitroso-di-W-propylamine	BDL	130	W-Nitrosodiphenylamine	BDL	130
Hexachloroethane	BDL	130	Azobenzene	BDL	130
Nitrobenzene	BDL	130	4-Bromophenyl-phenylether	BDL	130
Isophorone	BDL	130	Hexachlorobenzene	BDL	130
2-Nitrophenol	BDL	130	Pentachlorophenol	BDL	630
2,4-Dimethylphenol	BDL	130	Phenanthrene	BDL	130
Benzoic acid	BDL	630	Anthracene	BDL	130
Bis(2-chloroethoxy)methane	BDL	130	Di-N-butylphthalate	BDL	130
2,4-Dichlorophenol	BDL	130	Fluoranthene	BDL	130
1,2,4-Trichlorobenzene	BDL	130	Benzidine	BDL	630
Naphthalene	BDL	130	Pyrene	BDL	130
4-Chloroaniline	BDL	130	Butylbenzylphthalate	BDL	130
Hexachlorobutadiene	BDL	130	3,3-Dichlorobenzidine	BDL	250
4-Chloro-3-methylphenol	BDL	130	Benzo(A)anthracene	BDL	130
2-Methylnaphthalene	BDL	130	Chrysene	BDL	130
Hexachlorocyclopentadiene	BDL	130	Bis(2-ethylhexyl)phthalate	BDL	130
2,4,6-Trichlorophenol	BDL	130	Di-N-octylphthalate	BDL	130
2,4,5-Trichlorophenol	BDL	630	Benzo(B)fluoranthene	BDL	130
2-Chloronaphthalene	BDL	130	Benzo(K)fluoranthene	BDL	130
2-Nitroaniline	BDL	630	Benzo(A)pyrene	BDL	130
Dimethylphthalate	BDL	130	Ideno(1,2,3-CD)pyrene	BDL	130
Acenaphthylene	BDL	130	Dibenz(A,H)anthracene	BDL	130
2,6-Dinitrotoluene	BDL	130	Benzo(G,H,I)perylene	BDL	130

METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984

METHOD 625

BDL = Below detection limit

Detection limit raised by the presence of non-listed compounds.



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Dallas, Texas 75075  
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OIL SPILL EATER II  
February 12, 2001  
TESTING LIGHT-END HYDROCARBONS ON WATER

Bioremediation Test Procedure for:  
Diesel Fuel, Jet Fuel, Gasoline, etc.

Materials Needed:

1. 3 liters of natural, fresh or ocean water
2. OSE II
3. 2 liter wide-mouth beaker.
4. Small aquarium air bubbler.
5. Light-end hydrocarbons.
6. Hand spray aspirator (32 ounces)

Procedure:

1. Make a solution containing 2 ounces of OSE II in 128 ounces (one gallon) of natural, fresh or ocean water. This becomes your OSE II solution.
2. Put 1 liter of natural, fresh or ocean water in the 2 liter wide-mouth beaker.
3. Add 100 ml of light-ends hydrocarbons to the water.
4. Remove 100 ml of the oil and water solution from the beaker. Test for initial contamination level.
5. Since the spill quality of light-end hydrocarbons is known (100 ml), apply 100 ml of the OSE II solution to the beaker using a hand sprayer. Spray the outer edges first, working your way to the middle of the light-end hydrocarbons. This application will provide 1 part OSE II to 100 parts water to 100 parts light-end hydrocarbons on water which is recommended in the OSE II literature.
6. Turn on aerator (bubbler).
7. At time intervals of initial 0 day, 3 days, 7 days, and 15 days after application of OSE II, remove 100 ml samples of test water for analysis. The remaining water can be sampled at any additional time, should 15 days prove inadequate for complete degradation of hydrocarbons.
8. Perform EPA Tests 8015 and 8020 to determine degradation.

SRP/AJL

By: Steven R. Pedigo  
Chairman



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Dallas, Texas 75075  
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Email: oseicorp@msn.com  
Web: <http://www.osei.us>

OIL SPILL EATER II  
February 14, 2001  
TESTING - HEAVY-END HYDROCARBONS ON WATER

Bioremediation Test Procedures for:  
Crude Oil, Hydraulic Fluid, Motor Oil, Radiator Fluid,  
Chlorinated Hydrocarbons, Etc.

Materials Needed:

1. 3 liters of natural, fresh or ocean water.
2. One half pint of OSE II Concentrate.
3. One 2 liter wide-mouth beaker.
4. Small Aquarium (fish tank) with Bubbler for aeration.
5. Heavy-end hydrocarbons.
6. Hand spray aspirator (32 ounces).

Procedure:

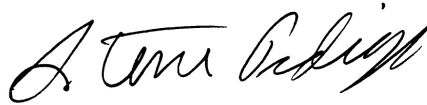
1. Make a solution containing 3 ounces of OSE II in 128 ounces (one gallon) natural, fresh, or ocean water. This becomes your OSE II Solution.
2. Put 1 liter of natural, fresh or ocean water in the 2 liter, wide mouth beaker.
3. Add 100 ml of heavy end hydrocarbon to be tested to the water.
4. Remove 100 ml of the oil and water solution from the beaker. Test for initial contamination level.
5. Since the spill quality of heavy-end hydrocarbons is known (100 ml), apply 100 ml of the OSE II mixed solution to the beaker using a hand sprayer. Spray the outer edges, first working your way to the middle of the heavy- end hydrocarbons. This application will provide 2 parts OSE II to 100 parts water to 100 parts heavy-end hydrocarbons on water. This is recommended in our OSE II literature.
6. Turn on Bubbler Aerator.
7. At time intervals of (0 day initial) day 7, day 15, and day 30, (after application), remove 10 ml sample of water for analysis. The remaining water can be sampled at any additional time should 30 days prove inadequate for complete degradation of hydrocarbons.



Testing- Heavy-End hydrocarbons on Water  
February 14, 2001  
Page two

NOTE: If the hydrocarbons are aged significantly, then sampling events will be changed and extended.

8. Perform EPA Tests 8100 and 8030 to determine degradation.

A handwritten signature in black ink, appearing to read "Steven R. Pedigo". The signature is fluid and cursive, with a large initial "S" and a distinct "P".

By: Steven R. Pedigo  
Chairman

SRP/AJL



P.O. Box 515429  
Dallas, Texas 75075  
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OIL SPILL EATER II  
February 12, 2001  
LIGHT-END HYDROCARBONS ON SOIL

Bioremediation Test Procedure for:  
Diesel, Jet Fuel and Gasoline on Soil

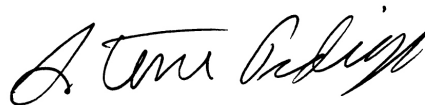
Materials needed:

1. One (1) cubic Foot of Soil.
2. OSE II
3. Pan with dimensions as follows: 2 feet x 1 foot x 6 inches.
4. Natural, fresh or ocean water.
5. Light-end Hydrocarbon.

Procedure:

1. Make a solution containing 2.0 ounces of OSE II in 128 ounces (one gallon) of water. This becomes your OSE II Solution. Use natural or fresh water for inland settings and natural ocean water for shoreline type cleanup or ocean settings.
2. Add 100 ml of light-end Hydrocarbon to the soil and mix well. Spread the contaminated soil to a depth of six inches in the pan.
3. Remove 100g of soil from the pan. This soil will be analyzed as indicated below and will provide initial contamination levels to reference and compare to all other results.
4. Thoroughly wet the soil with 60 ounces of water (either fresh water or ocean water) depending on your test.
5. Since the spill quality of light-end hydrocarbon is known (100 ml) add 100 ml of the OSE II solution to the pan of contaminated soil. This application will provide one (1) part OSE II and 100 parts water to 100 parts Light-end Hydrocarbon that is recommended in OSEI literature.

6. Maintain a 30% moisture level in the soil.
7. Mix the soil by hand two times per week to allow adequate aeration and to promote bacteria motility.
8. At time intervals of initial, 3 days, 7 days, and 15 days after OSE II application, remove a 100g sample of soil for analysis. The remaining soil can be sampled at any additional time should 15 days prove inadequate for complete degradation of hydrocarbons.
9. Perform EPA Tests 8015 or 8020 to determine degradation.

A handwritten signature in black ink, appearing to read "S. R. Pedigo".

By: Steven R. Pedigo  
Chairman

SRP/AJL



P.O. Box 515429  
Dallas, Texas 75075  
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OIL SPILL EATER II  
February 8, 2001  
TESTING - HEAVY-END HYDROCARBONS ON SOIL

Bioremediation Test Procedures for:  
Crude Oil, Hydraulic Fluid, Motor Oil, Radiator Fluid,  
Chlorinated Hydrocarbons, PCB'S, etc.

Materials needed:

1. One Cubic Foot of Soil.
2. One Half Pint of OSE II Concentrate.
3. Pan or Tray - 2 feet x 1 foot x 6" deep. (2' x 1' x 6" deep).
4. Natural, fresh or ocean water.
5. Heavy-end Hydrocarbons.

Procedure:

1. Make a solution containing 3 ounces of OSE II Concentrate in 128 ounces (one gallon) of water. This becomes your OSE II Solution.
2. Add 100 ml of the hydrocarbon to be tested to the soil and mix thoroughly. Spread the contaminated soil to a depth of six inches in the pan.
3. Remove 100 grams of soil from the pan. This soil will be analyzed as indicated below and will provide initial contamination levels to reference and compare to all other results.
4. Thoroughly wet the soil with 60 ounces of water, either fresh water or ocean water.
5. Since the spill quality of the heavy-end hydrocarbon is known (100 ml), add 100 ml of the OSE II Solution to the pan of contaminated soil. This application will provide 2 parts OSE II Concentrate to 100 parts water to 100 parts of contaminated soil as recommended in OSE literature.
6. Maintain a 30% moisture level in the soil.
7. Mix with soil by hand two times per week to allow adequate aeration and to allow bacteria motility.

8. At time intervals of 0 days (initial) 3 days, 7 days, 15 days and 30 days after OSE II application, remove a 100 gram sample of soil for analysis. The remaining soil can be sampled at any additional time should 30 days prove inadequate for complete degradation of Hydrocarbons.
9. Perform EPA Tests 8100 or 8030 to determine degradation.

A handwritten signature in black ink, appearing to read "S. R. Pedigo".

By: Steven R. Pedigo  
Chairman

SRP/AJL



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# **CLEANUP PROCEDURES**



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Dallas, Texas 75075  
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April 30, 2002

## **OIL SPILL EATER II PROCEDURE FOR OIL SPILL CLEANUP**

### **GENERAL INFORMATION**

It takes approximately 2 to 24 hours for OIL SPILL EATER II to penetrate the molecular wall of fresh crude oil. It takes OIL SPILL EATER II approximately 3 to 15 minutes to penetrate the molecular wall of light end petroleum or gasoline.

However, once you spray OIL SPILL EATER II on the soil, it attaches itself and will eventually engulf the oil regardless of where the oil or light petroleum may spread on ocean waters or on rivers and streams.

Additionally, once sprayed with OIL SPILL EATER II, the oil cannot attach itself to the shoreline, to rocks or to any equipment in its path.

If OIL SPILL EATER II is to be used on ocean spills or on Intertidal Zones, mix product with ocean water.

If OIL SPILL EATER II is to be used on lakes, rivers, streams, ponds or on land, mix with water from a lake, river, stream or pond.

If you are performing a cleanup, MAKE SURE that the water used to mix with OSEII and the water used to keep area saturated is the type of water normally associated with that area. If you use fresh water in an area normally contacted with salt water or vice versa, these are different types of bacteria and competition could occur. Competition will slow the bioremediation until the area re-stabilizes.

**NOTE:**      *Never mix tap (faucet) water and OIL SPILL EATER II (IF POSSIBLE).  
The chlorine in the tap (faucet) water slows bacterial enhancement.*

These *Procedures and Application Instructions* cover Heavy End and Light End Hydrocarbons. The OSEI Corporation defines Light End Hydrocarbons as: BETX, gasoline and light solvents. Heavy End Hydrocarbons are crude oil, halogenated hydrocarbons, heavy



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 Dallas, Texas 75075  
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## **OIL SPILL EATER II (OSE II)**

### **PROCEDURE FOR CLEANUP OF HEAVY END HYDROCARBONS ON WATER**

#### **1. To determine quantity of Oil Spill Eater II concentrate needed:**

##### **A. On a Spill:**

1. Use one (1) gallon of OSE II concentrate for every fifty (50) gallons of oil.
2. Use one (1) barrel of OSE II concentrate for every 2,750 gallons of oil.

##### **B. If you know how many gallons of oil:**

Multiply Gallons of oil (A) x .02 = OSE II concentrate needed

-OR-

If you know how many barrels of oil:

Multiply Barrels of oil (A) x .015 = Barrels of OSE II concentrate needed

##### **C. If you do not know how many gallons or barrels of oil:**

Multiply:      $\frac{A ( ) \text{ Yds}}{\text{Length of Oil Slick}}$      x      $\frac{B ( ) \text{ Yds}}{\text{Width of Oil Slick}}$      x      $\frac{C ( ) \text{ Inches}}{\text{Thickness of Oil}}$

x     (.0023)     =     Barrels of OSE II Concentrate Needed

-Or-

x     (.12)     =     Gallons of OSE II Concentrate Needed

#### **II. Application Procedure:**

##### **A. Water temperature above 40° F**

1. Dilute each gallon of OSE II concentrate with fifty gallons of fresh or sea water – depending on the area that is contaminated.



2. Using a helicopter or barge with spray booms, eductor system or hand sprayer, spray the mixed OSE II onto the perimeter of the oil spill and work toward the center.
  3. Next – spray OSE II over the entire surface of the spill. If the oil spill is very heavy (more than two or three inches deep), you may have to reapply OSE II to gain the one (1) part mixed OSE II to one (1) part heavy end hydrocarbon.
- B. Water temperature lower than 40° F
1. Cold water reduces the rate at which OSE II enhances biodegradation of crude oil. However, biodegradation will continue to 28° F in salt water and 32.5° F in fresh water.

### **III. If Testing is Required:**

- A. Items needed:
1. An extraction device that will hold 100 ml or 3 ounces of liquid and can be pushed 6 inches or 60 cm below the water's surface.
  2. 20 brown 100 ml bottles with teflon sealed caps.
  3. Ice chest and ice to transport samples to the lab.
- B. Pre OSE II Application Procedures:
1. Keep a daily log of observations.
  2. Decide on 3 areas of the spill forming a triangle ( $\triangle$ ) to extract 3 samples.
  3. Extract the 3 samples with the extraction device, pushing the collection vessel just under the surface.
  4. Place each extraction in a brown jar and seal with teflon cap.
  5. Mark jars (*Initial Untreated Samples*).
  6. Place samples in the ice chest.
- C. Perform the same steps above except pull 1 sample proximal to the spill but from an area not contaminated, affected, or impacted in any way by the spill. This is to determine what the background level or pre spill conditions are. Note the time and date of extraction.

- D. 10 minutes after applying OSE II, perform the next extractions.
1. If possible, using the same triangle extraction points, push extraction device approximately 2 to 3 inches below the surface and pull extraction.
  2. Decant extracted sample into a brown jar and mark initial sample 3 minute after applying OSE II, and note the time and date of extraction.
  3. Place brown jar samples in the ice chest and transport to the lab.
- E. Sampling Times
1. Using procedures in D above, extract samples on day 7, day 15, day 30 and every 15 days thereafter until the acceptable level of cleanup is accomplished. Obviously, testing should cease once the acceptable levels are met.
  2. In most cases, within 30 days the acceptable levels will have been accomplished.
- F. Lab Tests
1. If the spill is light end hydrocarbons, then either EPA method 8015 or 8030 should be performed.
  2. If the spill is heavy end hydrocarbons, then either EPA method 8030 or 8100 should be utilized.

#### **IV. If Toxicity Testing is required:**

- A. Items Needed
1. An extraction device that will be capable of extracting 100 ml samples 3 meters or 3 feet below the waters' surface.
  2. 12 – 100 ml brown jars with teflon seals.
  3. Ice chest with ice.
- B. Using instructions for extractions and the extraction time / date in III above to perform sampling
1. The 3 samples, once at the lab, should be homogenized and used for a toxicity test.

*Note: In the ocean mysids, or mummichogs are generally acceptable species, and in fresh water minnows or rainbow trout are generally acceptable species.*

In most cases, one toxicity test just after application of OSE II is required. However, if toxicity sampling is carried out each time efficacy testing is performed, then toxicity reduction will be proven as well.

**Note: If spill is on the ocean, use ocean water to mix “OSE II.” If spill is on a lake, river, stream, or pond, use lake, river, stream or pond water to mix with “OSE II.” To mix ocean water with anything other than ocean water and vice versa may cause adverse competition.**

**N E V E R mix “Oil Spill Eater II” with tap water – if possible!**



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## OIL SPILL EATER II

### PROCEDURE FOR CLEANUP OF LIGHT END HYDROCARBONS ON WATER

#### 1. To determine quantity of *Oil Spill Eater II* concentrate needed:

##### A. On a Spill:

1. One (1) gallon of OSE II concentrate for every one hundred (100) gallons of light end hydrocarbons.
2. One (1) barrel of OSE II concentrate for every 5,500 gallons of light end hydrocarbons.

##### B. If you know how many gallons of light end hydrocarbons spilled:

Multiply Gallons of spill (A) x .01 = Gallons of OSE II concentrate needed  
 -OR-

If you know how many barrels of light end hydrocarbons spilled:

Multiply Barrels of spill (A) x .0075 = Barrels of OSE II concentrate needed

##### C. If you do not know how many gallons or barrels of light end hydrocarbons:

Multiply:      $\frac{A ( ) \text{ Yds}}{\text{Length of Spill}} \times \frac{B ( ) \text{ Yds}}{\text{Width of Spill}} \times \frac{C ( ) \text{ Inches}}{\text{Depth of Spill}}$

(.0012) = Barrels of OSE II Concentrate Needed

(.06) = Gallons of OSE II Concentrate Needed

#### II. Application Procedure:

##### A. Water temperature above 40° F

1. Dilute each gallon of OSE II concentrate with one hundred gallons of fresh or sea water. Do not use fresh water on ocean water or vice versa or adverse competition may occur.

2. Using a helicopter or a barge with spray booms, eductor system set at 1%, or any spray system, spray a heavy coat of Oil Spill Eater II on the outside edges of the spill and work toward the center, if possible. This will help keep the spill from spreading.

As the spray reaches and saturates the light end hydrocarbon molecules, emulsion will start immediately and the fire hazard will be eliminated as quickly as complete emulsion takes place. The light end hydrocarbons will eventually be converted to CO<sub>2</sub> and water.

3. The fire hazard should be eliminated in 4 hours or less, and the hydrocarbons should be eliminated expeditiously also.

B. Water temperature below 40° F


1. Cold water reduces the rate at which OSE II enhances biodegradation of hydrocarbons. However, biodegradation will continue on salt water down to 28° F, and on fresh water down to 32.5° F.

### III. If Testing is Required:

A. Items needed:

1. An extraction device that will hold 100 ml or 3 ounces of liquid and can be pushed 6 inches or 60 cm below the water's surface.
2. 20 brown 100 ml bottles with teflon sealed caps.
3. Ice chest and ice to transport samples to the lab.

B. Pre OSE II Application Procedures:

1. Keep a daily log of observations.
2. Decide on 3 areas of the spill forming a triangle () to extract 3 samples.
3. Extract the 3 samples with the extraction device, pushing the collection vessel just under the surface.
4. Place each extraction in a brown jar and seal with teflon cap.
5. Mark jars (*Initial Untreated Samples*).
6. Place samples in the ice chest.

- C. Perform the same steps above except pull 1 sample proximal to the spill but from an area not contaminated, affected, or impacted in any way by the spill. This is to determine what the background level or pre spill conditions are. Note the time and date of extraction.
- D. 10 minutes after applying OSE II, perform the next extractions.
1. If possible, using the same triangle extraction points, push extraction device approximately 2 to 3 inches below the surface and pull extraction.
  2. Decant extracted sample into a brown jar and mark initial sample 3 minute after applying OSE II, and note the time and date of extraction.
  3. Place brown jar samples in the ice chest and transport to the lab.
- E. Sampling Times
1. Using procedures in D above, extract samples on day 7, day 15, day 30 and every 15 days thereafter until the acceptable level of cleanup is accomplished. Obviously, testing should cease once the acceptable levels are met.
  2. In most cases, within 30 days the acceptable levels will have been accomplished.
- F. Lab Tests
1. If the spill is light end hydrocarbons, then either EPA method 8015 or 8030 should be performed.
  2. If the spill is heavy end hydrocarbons, then either EPA method 8030 or 8100 should be utilized.

***Note: If spill is on the ocean, mix “OSE II” with ocean water. If spill is on a lake, river, stream or pond, mix “OSE II” with lake, river, stream or pond water.***

***N E V E R mix “Oil Spill Eater II” with tap water!***



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## PROCEDURE FOR REMOVAL OF A HYDROCARBON SHEEN ON WATER, CONCRETE, AND ASPHALT

### 1. To determine quantity of *Oil Spill Eater II* concentrate needed:

$$\begin{array}{l} \text{Multiply:} \quad \frac{A ( ) \text{ Ft.}}{\text{Length of}} \quad \times \quad \frac{B ( ) \text{ Ft.}}{\text{Width of}} \quad \times \quad .0004 \\ \quad \quad \quad \text{Spill} \quad \quad \quad \text{Spill} \\ \\ \quad \quad \quad = \text{Gallons of OSE II concentrate needed} \end{array}$$

### II. Application Procedure:

1. Dilute each gallon of OSE II concentrate with 50 gallons of fresh or sea water. Do not use ocean water with fresh water or vice versa because adverse competition may occur.
2. Using a barge with spray booms, hand sprayer or eductor system set at 2%, (depending on the size of sheen), spray a good coating of OSE II over the entire sheen. As soon as the OSE II reaches the sheen, emulsion and solubilization will start immediately and finally conversion to CO<sub>2</sub> and water.
3. The hydrocarbons should be emulsified and solubilized rapidly and any fire hazards will be eliminated rapidly. Conversion to CO<sub>2</sub> and water is expeditious.

Note: In sheen is on ocean water, mix "OSE II" with ocean water. If sheen is on a lake, river, stream or pond, mix "OSE II" with lake, river, stream or pond water.

NEVER mix OSE II with tap water if possible!



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## OIL SPILL EATER II

### PROCEDURE FOR CLEANUP OF HYDROCARBONS ON INTERTIDAL ZONES

#### 1. To determine quantity of *Oil Spill Eater II* concentrate needed:

$$\begin{array}{l} \text{Multiply:} \quad \frac{A ( ) \text{ Yds}}{\text{Length of}} \quad \times \quad \frac{B ( ) \text{ Yds}}{\text{Width of}} \quad \times \quad \frac{C ( ) \text{ Inches}}{\text{Thickness of}} \times .12 \\ \quad \quad \quad \text{Oil Slick} \quad \quad \quad \text{Oil Slick} \quad \quad \quad \text{Oil} \\ \\ \quad \quad \quad = \text{Gallons of OSE II concentrate needed} \end{array}$$

#### II. Application:

- A. Dilute each gallon of OSE II needed (from I above) with 50 gallons of ocean or fresh water, or mix 50 gallons of fresh or sea water, depending on area to be cleaned, with 1 gallon of OSE II. Do not use ocean water with fresh water or vice versa because adverse competition may occur.
- B. It is important that you apply enough OSE II mixed 50 to 1 to get 1 part mixed OSE II to 1 part spilled hydrocarbon to ensure mobilization of oil will occur.
- C. In an Intertidal Zone, it may be difficult to obtain the exact application rate, so additional applications may be necessary.
- D. If necessary, Oil Spill Eater II should be applied every 48 hours in water above 40°F and every 72 hours in water below 40°F. Application should continue until oil is completely mobilized from beach area.
- E. If subsurface oil occurs, OSE II will percolate along with the oil and once natural bacteria growth is started, the bacteria with its affinity for hydrocarbons, will follow the food source.

NOTE: *If Intertidal Zone is in an ocean setting, mix "OSE II" concentrate with ocean water. If Intertidal Zone is a fresh water setting such as a lake, river, stream or pond, mix "OSE II" with lake, river, stream or pond water.*

NEVER mix OSE II with tap water if possible!





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**PROCEDURE FOR CLEANUP OF HEAVY END HYDROCARBONS**  
**- ON LAND SURFACE**

*Surface Spills on Land*

**1. To determine quantity of *Oil Spill Eater II* concentrate needed:**

**A. On a Spill:**

1. Use one (1) gallon of OSE II for every fifty (50) gallons of oil contamination.
2. Use one (1) barrel of OSE II for every 2,750 gallons of oil contamination.

**B. If you know gallons of oil contamination:**

Multiply Gallons of oil contamination (A) x .02  
= Gallons OSE II concentrate needed

**C. If you know barrels of oil contamination:**

Multiply Barrels of oil contamination (A) x .015  
= Barrels of OSE II concentrate needed

**D. If you do not know gallons or barrels of oil contamination:**

Multiply:        A ( ) Ft.   x   B ( ) Ft.   x   C ( ) Inches x (.0125)  
  
= Gallons of OSE II Concentrate Needed

*Example:*        Oil spill is 120 ft. x 60 ft. and 1" thick

*Multiply:*        120' x 60' x 1" x .0125 = 90 gal. OSE II

- E. Once the oil has seeped into the soil, then determine cubic yards of contaminated soil:

To determine Cubic Yards:

$$\underline{L \text{ (Ft.)}} \quad \times \quad \underline{W \text{ (Ft.)}} \quad \times \quad \underline{\text{Depth (Ft.)}} \quad \times \quad \underline{.037} = (B)$$

To determine Gallons of OSE II needed for cleanup:

$$\underline{\text{Yd}^3 (B)} \times \underline{.44} = \text{Gallons of OSE II needed}$$

## **II. Procedure:**

- A. Determine logistics and equipment for the particular situation. (Sample jars, mixing tank, application method, tiller, water source etc.).
- B. Mix the required gallons of OSE II at a ratio of 50 gallons of water for every gallon of OSE II required.

**Note:** *If contamination area is in contact with ocean water or spray, then use ocean water; if not, then use fresh water from the area associated with the spill. Do not add ocean water to an area not associated with ocean water or vice versa with fresh water or an adverse competition may occur among indigenous bacteria.*

## **III. Testing:**

- A. Determine a grid formation for spill area.
- B. Take a 50 gram extraction from each grid. Mix in a plastic bag and shake to form a composite; then perform EPA 8030 or 8100 TPH test to determine the initial TPH – and note.
- C. Apply product.
- D. On day 7, day 15, day 30, and every 15 days after until an acceptable TPH level is obtained, take a 50 gram extraction from each treated grid. Mix in a plastic bag to form a composite and perform EPA 8030 or 8100 TPH test to determine the extent of bioremediation. Testing should cease once the acceptable level of TPH reduction is obtained.

## **IV. Application:**

- A. Mix the required OSE II at a ratio of 50 to 1.
- B. Apply the entire amount of mixed OSE II to the contamination as evenly as possible.

- C. Maintain a 30% moisture level within the contamination to ensure motility and O<sub>2</sub>.
- D. If the contamination is on soil and the soil absorbs the contamination, then disc the area once a week and maintain a moisture level of 30%.
- E. To determine the number of gallons of water to apply per application to maintain a 30% moisture level, take the number of gallons used to mix with OSE II concentrate and apply each time moisture content drops below 30%, and apply enough water to get the moisture level to 30%.

*Note: For oil with a TPH of 100,000 and is very weathered, then additional applications of OSE II may be required.*

- F. When average temperature remains below 40° F during daylight hours, keep contaminated area covered with a thin translucent plastic. Continually maintain the 30% moisture level.

*Note: Unless harsh winter weather persists, the plastic will help hold in the heat from the earth.*

***PLEASE NOTE:***

*The more OSE II used, the faster biodegradation will occur – up to a point. Oxygen needed for bioremediation is carried in the water and is helped by discing.*

*OSE II will eliminate oil spills from adding toxins to underground water systems. OSE II causes hydrocarbons to float on the surface.*

*These instructions are general to encompass as many situations as possible. Any specific situations should be referred to OSEI Corporation before application.*

*NEVER mix Oil Spill Eater II with tap water – if possible!*

- V. OSEI Corporation will help determine and write complete step-by-step instructions for a cleanup if you present OSEI Corporation with the complete parameters associated with a site.



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**PROCEDURE FOR CLEANUP OF LIGHT END HYDROCARBONS**  
**- FOR SURFACE SPILLS ON LAND**

**1. To determine quantity of *Oil Spill Eater II* concentrate needed:**

**A. On a Spill:**

1. Use one (1) gallon of OSE II concentrate for every one hundred (100) gallons of light end hydrocarbons or gasoline.
2. Use one (1) barrel of OSE II concentrate for every 5,500 gallons of light petroleum or gasoline light end hydrocarbons or gasoline.

**B. If you know gallons of light end hydrocarbons or gasoline spilled:**

Multiply Gallons of contaminate (A) x .01 = Gallons of OSE II needed

**C. Once light end hydrocarbons or gasoline has seeped into the soil, then determine cubic yards of contaminated soil.**

To determine cubic yards:

$$\underline{L \text{ (Ft.)}} \quad \times \quad \underline{W \text{ (Ft.)}} \quad \times \quad \underline{\text{Depth (Ft.)}} \quad \times \quad \underline{.037} \quad = \quad \underline{A \text{ (Yd}^3\text{)}}$$

To determine gallons of OSE II needed for cleanup

$$\text{Yd}^3 \quad \times \quad .22 \quad = \quad \text{Gallons of OSE II needed}$$

*Note: Once OSE II has been applied to the soil, the fire hazard will start diminishing.*

**II. Procedure:**

- A. Determine logistics and equipment for the particular situation. (Sample jars, mixing tank, application method, tiller, water source etc.).

- B. Mix the required gallons of OSE II at a rate of 100 gallons of water for every gallon of OSE II required.

*Note: If contamination area is in contact with ocean water or spray, then use ocean water from the area associated with the spill. Do not add ocean water to an area not associated with ocean water or vice versa with fresh water or an adverse competition may occur among indigenous bacteria.*

### **III. Testing:**

- A. Determine a grid formation for spill area.
- B. Take a 50 gram extraction from each grid. Mix in a plastic bag to form a composite. Then have a laboratory perform an EPA 8015 or 8020 TPH test to determine the initial TPH.
- C. Apply product.
- D. On day 7, day 15, day 30, and every 15 days thereafter until the TPH reaches an acceptable level, take a 50 gram extraction from each treated grid. Mix in a plastic bag to form a composite and have a laboratory perform an EPA 8015 or 8020 TPH test to determine the extent of bioremediation. Testing should cease once the acceptable level of TPH reduction is obtained.

### **IV. Application:**

- A. Mix the required OSE II at a ratio of 100 to 1.
- B. Apply the entire amount of mixed OSE II as evenly as possible to the contamination.
- C. Maintain a 30% moisture level within the contamination to ensure motility and O<sub>2</sub>.
- D. If the contamination is on soil and the soil absorbs the contamination, then disc the area once a week and maintain a moisture level of 30%.
- E. To determine the number of gallons to apply per application to maintain a 30% moisture level, take the number of gallons used to mix the OSE II concentrate and apply each time moisture level drops below 30%. Apply enough of the water to get the moisture level to 30% or above.

*Note: If light end hydrocarbon is weathered and aged, then additional applications of OSE II may be needed, or additional time for mitigation may be required.*

- F. When average temperature remains below 40° F during mitigation time, keep contaminated area covered with a thin translucent plastic and maintain the 30% moisture level with water.

*Note: Unless harsh winter weather persists, the plastic will help hold in the heat from the earth.*

*PLEASE NOTE:*

*The more OSE II used, the faster the bioremediation will occur – up to a point. Oxygen needed for bioremediation is carried in the water and is helped by discing. OSE II will eliminate light end hydrocarbons spills from adding toxins to underground water systems.*

*These instructions are general to encompass as many situations as possible. Any special situations should be referred to OSEI Corporation before application.*

*NEVER mix Oil Spill Eater II with tap water, if possible!*

- V. **OSEI Corporation** will help determine and write complete step-by-step instructions for a cleanup if you present OSEI Corporation with the complete parameters associated with a site.



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**PROCEDURE FOR CLEANUP OF HEAVY END HYDROCARBONS**  
**- FROM AN EXCAVATED SITE**

**1. To determine quantity of *Oil Spill Eater II* concentrate needed:**

- A. If you know the number of contaminated yards:

Multiply: Number of Yd<sup>3</sup> (A) x (.44)  
= Total Gallons of OSE II needed for oil cleanup

- B. If you do not know yards of contaminated soil:

Multiply:  $\frac{L \text{ in Ft.}}{\text{Length in Feet}} \times \frac{W \text{ in Ft.}}{\text{Width in Feet}} \times \frac{D \text{ in Ft.}}{\text{Depth in Feet}} \times .037 = A \text{ (Yd}^3\text{)}$

Use formula in A above to determine number of gallons of "Oil Spill Eater II" concentrate required.

**II. Procedure:**

- A. Determine logistics, equipment and site to spread contaminated soil for the particular situation.
- B. If the particular governmental regulating body requires, lay a plastic barrier in place.
- C. Place contaminated soil in 24" lifts or less on the plastic barrier.

**III. Application:**

- A. Mix the required OSE II at a ratio of 50 gallons to 1 for the oil.
- B. Apply the entire amount of mixed OSE II as evenly as possible to the contaminated soil.

- C. Maintain a 30% moisture level within the contaminated soil to ensure motility and O<sub>2</sub>.
- D. To determine the number of gallons of water to apply per application to maintain a 30% moisture level, take the number of gallons used to mix with the OSE II concentrate and apply each time the moisture level drops below 30%.
- E. Disc soil once a week.

*Note: If contaminated soil is weather and aged, then additional application of OSE II may be needed, or additional time for mitigation may be required.*

- F. When temperature remains below 40° F during the cleanup, keep contaminated soil covered with a thin translucent plastic and maintain a 30% moisture level.

***PLEASE NOTE:***

*The more OSE II used, the faster the bioremediation will occur – up to a point. Oxygen needed for bioremediation is carried in the water and is helped by discing. OSE II will eliminate contaminated soil from adding toxins to underground water systems. These instructions are general to encompass as many situations as possible. Any special situations should be referred to OSEI Corporation before application.*

***NEVER mix OSE II with tap water - if possible!***

**IV. Testing:**

- A. Determine a grid formation for contaminated soil once in place to be treated.
- B. Take a 50 gram extraction from each grid and mix in a plastic bag to form a composite. Then have a laboratory perform an EPA 8030 or 8100 TPH test to determine the initial TPH.
- C. Apply OSE II.
- D. On day 7, day 15, day 30 and every 15 days thereafter until the acceptable TPH level is obtained, take a 50 gram extraction from each treated grid. Mix in a plastic bag to form a composite and EPA 8030 or 8100 TPH test to determine the extent of bioremediation. Testing should cease once the acceptable level of TPH reduction is obtained.

- V. **OSEI Corporation** will help determine and write complete step-by-step instructions for a cleanup if you present OSEI Corporation with the complete parameters associated with a site.





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PROCEDURE FOR CLEANUP OF LIGHT END HYDROCARBONS  
- FROM AN EXCAVATED SITE

**1. To determine quantity of *Oil Spill Eater II* needed:**

- A. If you know the number of contaminated yards:

Multiply: Number of Yd<sup>3</sup> (A) x (.22)  
= Total Gallons of OSE II needed

- B. If you do not know the yards of contaminated soil:

Multiply:  $\frac{L \text{ in Ft.}}{\text{Length in Feet}} \times \frac{W \text{ in Ft.}}{\text{Width in Feet}} \times \frac{D \text{ in Ft.}}{\text{Depth in Feet}} \times .037 = A \text{ (Yd}^3\text{)}$

Use formula in A above to determine number of gallons of “*Oil Spill Eater II*” concentrate required.

**II. Procedure:**

- A. Determine logistics, equipment and site to spread contaminated soil for the particular situation.
- B. If the particular governmental regulating body requires, lay a plastic barrier in place.
- C. Place contaminated soil in 24” lifts or less on the plastic barrier.

**III. Application:**

- A. Mix the required OSE II at a ratio of 100 to 1 for light end hydrocarbons.
- B. Apply the entire amount of mixed OSE II as evenly as possible to the contaminated soil.

- C. Maintain a 30% moisture level within the contaminated soil to ensure motility and O<sub>2</sub>.
- D. To determine the number of gallons of water possible to apply per application to maintain a 30% moisture level, take the number of gallons used to mix with the OSE II concentrate and apply each time the moisture level drops below 30%.
- E. Disc soil once a week.

*Note: If contaminated soil is weather and aged, then additional application of OSE II may be needed, or additional time for mitigation may be required.*

- F. When temperature remains below 40° F during the cleanup, keep contaminated soil covered with a thin translucent plastic, and maintain a 30% moisture level.

#### IV. Testing:

- A. Determine a grid formation for contaminated soil once in place to be treated.
- B. Take a 50 gram extraction from each grid. Mix in a plastic bag to form a composite; then perform EPA 8015 or 8020 method TPH test to determine the initial TPH – and note.
- C. Apply product.
- D. On day 7, day 15, day 30 and every 15 days thereafter until the acceptable TPH level is obtained, take a 50 gram extraction from each grid and place in a plastic bag. Mix it to form a composite. Perform EPA 8015 or 8020 method test to determine TPH level. Testing should cease once the acceptable level of TPH reduction is obtained.

*Note: The more OSE II used, the faster bioremediation will occur – up to a point. Oxygen needed for bioremediation is carried in the water and is helped by discing. OSE II will eliminate contaminated soil from adding toxins to underground water systems. These instructions are general to encompass as many situations as possible. Any special situations should be referred to OSEI Corporation before application.*

***NEVER mix OSE II with tap water (if possible)!***

- V. **OSEI Corporation** will help determine and write complete step-by-step instructions for a cleanup if you present OSEI Corporation with the complete parameters associated with a site.



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## **PROCEDURE FOR CLEANUP OF OIL SPILLS ON CONCRETE OR ASPHALT**

### **1. LIGHT END HYDROCARBONS:**

- a. Estimate gallons of spilled fuel.
- b. Use 1.5 ounces of OSE II concentrate per spilled gallon.
- c. Use 1 gallon of water per spilled gallon.
- d. Mix OSE II with water.
- e. Spray on spill.
- f. Allow OSE II to react for 20 minutes.
- g. Either (1) wash off with water or (2) simply allow residue to evaporate.

### **2. HEAVY END HYDROCARBONS:**

- a. Follow same procedure as in 1 above, except use 3 ounces of OSE II for spilled gallons of heavy oils.
- b. If possible, use stiff brush to agitate.
- c. Allow OSE II to react for 30 minutes.
- d. Wash off with water.

### **3. THICK AND OLD OIL STAINS:**

- a. Follow procedure in 1 above.
- b. Use 4 ounces of OSE II and 1 gallon of water per every 9 square feet of contaminant.
- c. Brush vigorously with stiff brush.
- d. Allow OSE II to react for 30 minutes.
- e. Wash off with water.
- f. Repeat process, if required.

*NOTE: Old oil on concrete may imbed carbon into concrete. OSE II will not remove this black carbon. However, carbon is inert and non-toxic.*



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**PROCEDURE AND APPLICATIONS  
FOR HYDROCARBON CLEANUP  
UNDER BUILDINGS, IMMOVABLE OBJECTS, UNDERGROUND GROUNDWATER**

**OSEI Corporation will help determine and write step-by-step procedures for cleaning up these types of sites. You will have to supply OSEI Corporation with all the parameters involving your particular site.**

There are so many potential variables associated with these types of cleanups, it is difficult to write general instructions that would encompass all the variables.

Please contact us at:

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O.A. (George) Lively  
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## **OIL SPILL EATER II**

### **PROCEDURE FOR CLEANUP OF BIRDS AND MAMMALS**

Dilution for application to animals or birds should be one (1) part "Oil Spill Eater II" concentrate to sixty (60) parts water. Feathered animals should not be released after cleaning until natural oils have been restored.

*NOTE: It is OKAY to mix with tap water; however, sterile water, ocean water or fresh water is preferable.*

Steven R. Pedigo  
Chairman

SRP/eem



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A SUCCESSFUL USER OF  
OIL SPILL EATER II  
ON WATER

Dear Environmental Manager:

Mr. Steve Fry at the Navy Fuel Farm, Pt. Loma, San Diego, California, has used Oil Spill Eater II for fuel spills both on land and water for over one year very effectively. Mr. Fry has reduced his cleanup cost on water spills from \$90.00 per gallon to \$12.00 per gallon using OSEII and only \$1.00 of the \$12.00 is the cost of OSEII.

We hope you will try Oil Spill Eater II. It works and is effective!

Sincerely,

O.A. (George) Lively  
Rear Admiral (RET)  
President

OAL/MFK



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Web: <http://www.osei.us>

SUBJECT: Volunteer Groups (Homer Alaska)

SITE: Homer Alaska Beach that was contaminated by the Exxon Valdez

TEST: Performed by Bill Day

9/10/89 at 8 a.m.

Volunteers mixed 2 gallons of Alaskan sea water, 1 gallon tar balls, sticks heavily oiled and put 8 ozs of Oil Spill Eater in a 5 gallon bucket and let stand stirring every 12 hours exposed to temperature highs of 50° and lows of 30°f.

9/12/89 – Observations and Conclusions

Sky Blue's Oil Spill Eater is very effective in removing oil from sediments, rocks and organics. Sticks and debris has settled to the bottom of the bucket and is clean in appearance.

9/17/89

A final observation of bucket test shows that the heavily oiled pine needles sticks have settled to the bottom of the bucket and are free of detectable oil. They are no longer sticky to the touch. The water seems to be clean. There is no visible sheen in the bucket.

Overall Conclusions

I highly recommend further cleaning experimentation on rocks, cliffs, driftwood and sediments.

9/18/89

2 gallons of Oil Spill Eater was mixed with approximately 100 gallons of sea water pending ADEC approval for further testing.

9/19/89

Oil Spill Eater mixture was accidentally knocked over by a rock washing machine and mixture poured out onto the beach into the intertidal zone.

9/20/89

Oiled beach where OSE poured onto is free of detectable oil on the surface and subsurface with no detectable release of sheen on the water surface.

9/21/89

Oil Spill Eater mixture was very effective in breaking the oil down and removing it from the beach with no apparent side affects.

9/22/89

Homer Volunteer group will ask ADEC to fund their clean up of their beaches with Oil Spill Eater.





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OSMI COMPANY – GALVESTON, TEXAS

DIESEL SPILL CLEAN UP

In August 1990, a yacht discharged approximately 50 gallons of diesel Fuel into a yacht basin in Galveston Bay. The diesel Slick was spreading rapidly and the owner did not have a solution.

OSMI Management happened to be present and had some "OIL SPILL EATER II" (OSE) with them. They quickly filled several hand sprayer bottles with OSE and bay water. Using small boats they quickly encircled the Diesel Sheen (which was then approxi- mately 300 yards in length – and by spraying OSE around the diesel spill perimeter, OSMI Management then sprayed (covered) the entire spill.

The owner was amazed to see the Diesel Sheen disappear in a matter of minutes. Of course, the sheen disappeared in minutes but the actual bioremediation of the hydrocarbons took several hours.

Conclusion: "OIL SPILL EATER II" eliminated a hydrocarbon spill (diesel fuel) effectively and vitually immediately!.

Steven R. Pedigo  
Chairman



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Dallas, Texas 75075  
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## SUMMARY

### DALLAS NAVAL AIR STATION

#### OIL SPILL

On January 18, 1995, due to very heavy rains, there was an overflow of 2,000 gallons of JP-4, JP-8 and motor oil behind Building #193 at NAS. The overflow went through a drain pipe on to a neighboring golf course.

NAS personnel began applying OIL SPILL EATER II (OSE) on January 19, 1995 at a 50 to 1 ratio with water, which they applied with hand held sprayers. Over a period of weeks, they applied 40 gallons of OSE and 2,000 gallons of water.

NAS personnel did not perform initial TPH sampling of the contaminated soil but knew from the amount of oil, odor and visual observation of it's severity.

The attached final soil sampling was performed in four (4) different areas using EPA methods 8020/5030 for BETX and 418.1 for total hydrocarbon count. In all four (4) sampling areas the BETX and total hydrocarbons were reduced well below state acceptance levels for contaminant soil of 100 ppm.

In addition, the grass where OSE was applied to the contaminated soil is now lush green!

O.A.Lively  
Rear Admiral (ret)  
President

OAL/AJL

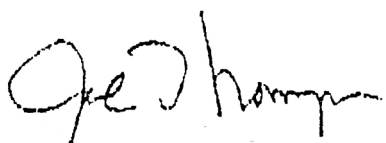
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Report #	: 95-1626 01	Date Received	: 08/29/95
Sample ID	: 10928 S-9-1	BTEX Analysis Date	: 09/05/95
Project #	: 10928	TPH Extraction Date	: 08/31/95
Sample Matrix	: Soil	TPH Analysis Date	: 08/31/95
Depth Interval	: N/A		
Analyst	: JSL		

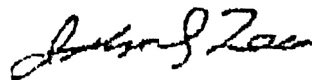
Compound	Results	Practical Quantitation Limit
Benzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Toluene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Ethylbenzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total Xylenes	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total BTEX (Calculated)	*BPQL µg/Kg (ppb)	2 µg/Kg (ppb)
Total Petroleum Hydrocarbons	43 mg/Kg (ppm)	10 mg/Kg (ppm)

\*Below Practical Quantitation Limits

Method: BTEX – EPA Method 8020A/5030 - SW-846  
TPH – EPA Method 418.1/3550 - SW-846



Joe Thompson  
Director of Technical Services



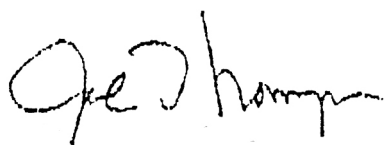
John S. Lee  
Analytical Chemist

Report #	: 95-1626-02	Date Received	: 08/29/95
Sample ID	: 10928 S-9-2	BTEX Analysis Date	: 09/05/95
Project #	: 10928	TPH Extraction Date	: 08/31/95
Sample Matrix	: Soil	TPH Analysis Date	: 08/31/95
Depth Interval	: N/A		
Analyst	: JSL		

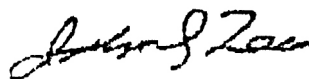
Compound	Results	Practical Quantitation Limit
Benzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Toluene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Ethylbenzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total Xylenes	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total BTEX (Calculated)	*BPQL µg/Kg (ppb)	2 µg/Kg (ppb)
Total Petroleum Hydrocarbons	96 mg/Kg (ppm)	10 mg/Kg (ppm)

\*Below Practical Quantitation Limits

Method: BTEX – EPA Method 8020A/5030 - SW-846  
TPH – EPA Method 418.1/3550 - SW-846



Joe Thompson  
Director of Technical Services



John S. Lee  
Analytical Chemist

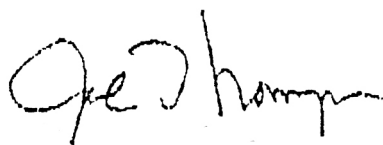
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Report #	: 95-1626-03	Date Received	: 08/29/95
Sample ID	: 10928 S-9-3	BTEX Analysis Date	: 09/05/95
Project #	: 10928	TPH Extraction Date	: 08/31/95
Sample Matrix	: Soil	TPH Analysis Date	: 08/31/95
Depth Interval	: N/A		
Analyst	: JSL		

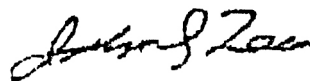
Compound	Results	Practical Quantitation Limit
Benzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Toluene	3 µg/Kg (ppb)	2 µg/Kg (ppb)
Ethylbenzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total Xylenes	2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total BTEX (Calculated)	5 µg/Kg (ppb)	2 µg/Kg (ppb)
 Total Petroleum Hydrocarbons	 27 mg/Kg (ppm)	 10 mg/Kg (ppm)

\*Below Practical Quantitation Limits

Method: BTEX – EPA Method 8020A/5030 - SW-846  
TPH – EPA Method 418.1/3550 - SW-846



Joe Thompson  
Director of Technical Services



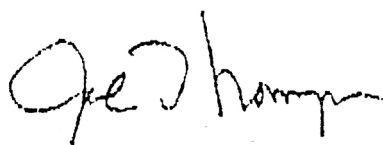
John S. Lee  
Analytical Chemist

Report #	: 95-1626-04	Date Received	: 08/29/95
Sample ID	: 10928 S-9-4	BTEX Analysis Date	: 09/05/95
Project #	: 10928	TPH Extraction Date	: 08/31/95
Sample Matrix	: Soil	TPH Analysis Date	: 08/31/95
Depth Interval	: N/A		
Analyst	: JSL		

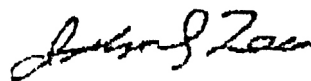
Compound	Results	Practical Quantitation Limit
Benzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Toluene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Ethylbenzene	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total Xylenes	< 2 µg/Kg (ppb)	2 µg/Kg (ppb)
Total BTEX (Calculated)	*BPQL µg/Kg (ppb)	2 µg/Kg (ppb)
Total Petroleum Hydrocarbons	23 mg/Kg (ppm)	10 mg/Kg (ppm)

\*Below Practical Quantitation Limits

Method: BTEX – EPA Method 8020A/5030 - SW-846  
TPH – EPA Method 418.1/3550 - SW-846



Joe Thompson  
Director of Technical Services



John S. Lee  
Analytical Chemist

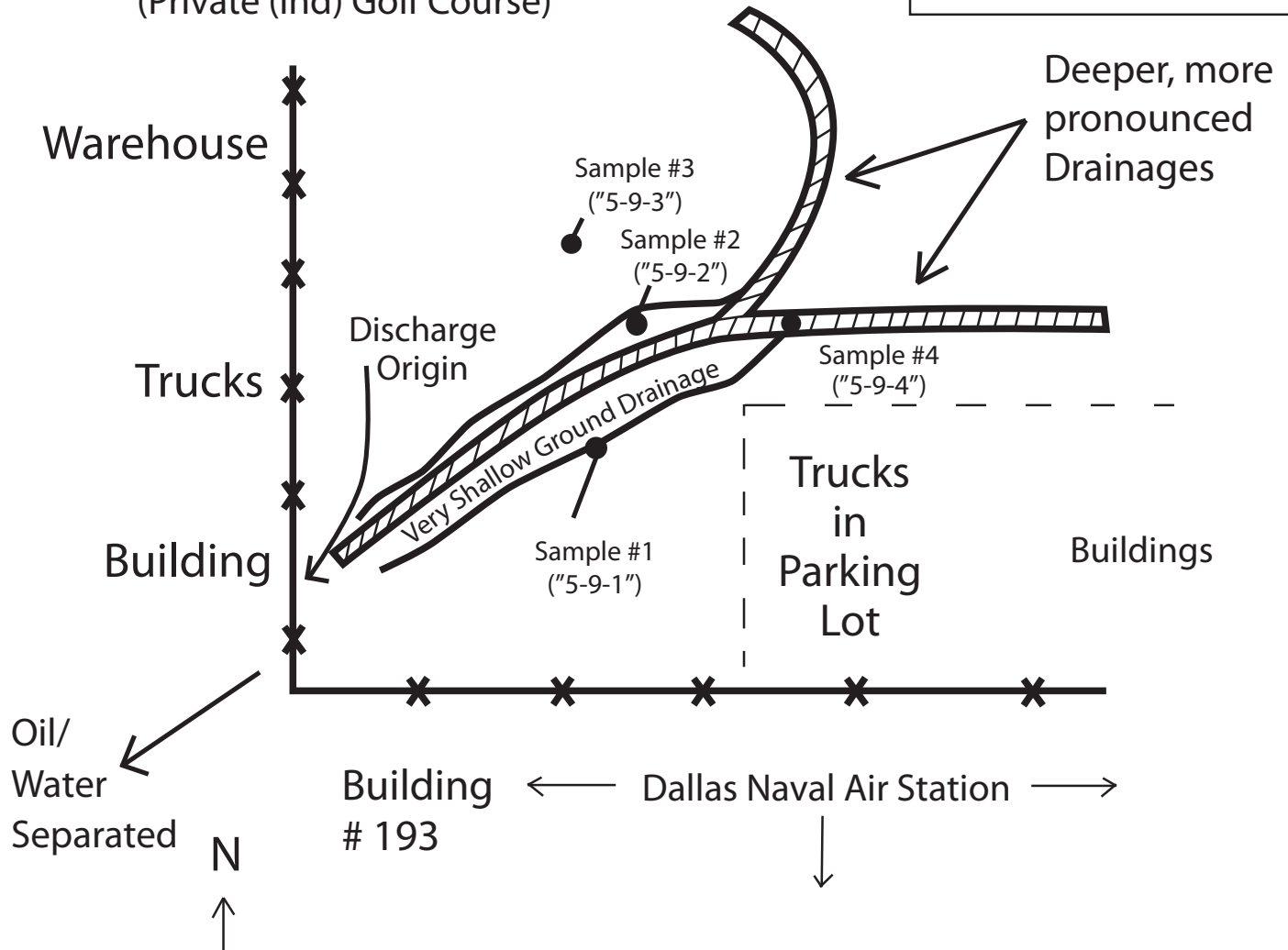
# Dallas Naval Air Station Field Notes

8/29/95  
1:00 P.M.

Outfall Behind Building #193

(Due to VERY heavy rainfall)

(Private (ind) Golf Course)



Not To Scale

To Estab. Background

Sample #1 - Top 4" in edge of drain. where may have

Sample #2 - 1' to 2' deep from depression in draining

Sample #3 - Surface to 2' deep on hill away from

Sample #4 - Surface to 1.5" deep in deep, wet drain

\*Construction debris used as fill (reportedly) prevented further sampling  
Soil was a Sandy Loam with varying amounts of clay encountered.

## SUCCESS STORY

24 August 1994

Lawrence M. Brennan, Jr.  
3400 Forest Way Court  
Arlington, TX 76017

\*Mr. Brennan is a Retired  
Commander. He was the  
Environment Manager  
for the Naval Air Station  
in Dallas, Texas.

O.A. George Lively  
Oil Spill Eater International, Corp.  
13127 Chandler Drive  
Dallas, Texas 75230

Dear George:

I would like to take this opportunity to tell you how impressed I am with your "Oil Spill Eater II" (OSE II) petroleum product remediator.

Prior to my retirement from the U.S. Navy, I was the Environmental Officer at a large Reserve Naval Air Station. Our goal was to maintain Environmental Compliance and our workload was enormous. We never had to respond to a major petroleum spill but we were constantly being called to cleanup small petroleum product spills associated with aircraft maintenance and lax housekeeping practices. The most important task when responding to a spill was to prevent harmful contaminants from entering the drainage systems. We needed a product to help us to these incidents; that was easy and quick to apply; and was economical. The product was OIL SPILL EATER II.

My staff and I were skeptical when you first demonstrated OSE II, but it did work and on the light petroleum products associated with the aviation industry, ie. JP-5 aviation fuel, hydraulic fluids, and lubricants, it worked extremely well. On numerous occasions when hydraulic fluids would be released on the ramp during aircraft maintenance operations, application of OSE II would remove the oily texture of the spent fluids generally within an hour and the resulting waters would soon evaporate. When a contractor spilled diesel fuel on a parking lot during equipment refueling, our responders had to act quickly in rainy weather. We first erected booms at the storm drain discharges then sprayed the spreading film with OSE II. The spill was not large but was moving fast in the wet conditions. After cleaning the area with absorbent pads and vacuum we pulled and analyzed water samples from the adjacent storm drains. The resulting TPH analysis showed only slight traces of petroleum product.

We used OSE II twice during aircraft crash responses. The most significant was the crash of a jet fighter aircraft. The aircraft was totally destroyed on impact and the ensuing fire. Much of the burning fuel ran into a nearby water holding tank. After securing the crash scene we sprayed all affected areas around and in the tank. The next day we prepared to remove any petroleum products visible but there were none. After coordinating with the regulators we took nineteen separate water samples from various locations on the pond and had complete BTEX/TPH analysis run. Half of the samples had no detectable findings while the rest showed only negligible traces of petroleum hydrocarbon.



Lawrence M. Brennan, Jr.  
Page 2

We used OSE II for general housekeeping around petroleum products storage areas, for product release during underground storage tank removal and numerous response situations. The product never failed to work as advertised. When we had reason to analyze water samples that had been contaminated with petroleum product and after using your Oil Spill Eater II, the results continually showed minimal petroleum hydrocarbon residues and consistently well below regulatory levels of concern. In all response situations we first contained the spill then picked it up with vacuum and absorbent materials. OSE II was used in conjunction with these other procedures. I feel your product is an excellent solution for remediating petroleum product spills when combined with standard cleanup procedures.

I strongly feel that Oil Spill Eater II will effectively and efficiently remediate any petroleum hydrocarbon contamination situation. Time will vary depending on weight of petroleum product, consistency of median and environmental conditions. Most importantly, it is a product friendly to the environment. It transforms harmful containments to more environmentally friendly substances in our soil and water.

Very respectfully,

A handwritten signature in black ink, appearing to read 'L.M. Brennan, Jr.', with a stylized, cursive script.

L.M. Brennan, Jr.



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## WHERE OSE II HAS BEEN USED

*OSE II can be used virtually anywhere that can sustain Microbial Life*

Oceans	Marshes – Estuaries
Lakes	Underground Soil
Rivers, Streams	Underground Water
Where Fresh and Ocean Water come together (Brackish Water)	Birds, Mammals, Living Creatures
All Types of Soil	Under Buildings & Immovable Objects (In-Situ)
Rocky Areas – Pebbled Areas	Animal Clinics
	Kitchens, Restaurants (Grease Traps)

## WHO CAN USE OSE II

Manufacturing Plants that use Organic Based Natural Resources	Governments
Manufacturing Plants that use Hydrocarbon Based Natural Resources	Fire Departments
Any Owner, Operator of Engines or Robotics	Ports and Harbors
All Transportation Groups Air, Rail, Bus, Water	Homeowners that spill Fuel, Oil, Pesticides, or Solvents
Utility Industry	Septic Tanks, Sewer Treatment Plants, Farms and Ranches
Refineries, Oil Tankers, Drilling Companies, Pipeline Operators	Cleanup Contractors
Military	Insurance Companies (Insurance Adjustors)

## USES OF AND CONTAMINANTS THAT OSE II CAN OR HAS BIOREMEDIATED

*This list contains most of the hazardous material OSE II has bioremediated. It is not complete. We add new compounds continually. This list is to give you an idea of what OSE II can remediate. If your particular contaminant is not listed, please call us.*

OSE II can Bioremediate  
Most Organic Based Compounds

OSE II can Bioremediate almost  
All Hydrocarbon Based Compounds

Some of the Hazardous Material  
OSE II has Bioremediated

All types of Gasoline  
Diesel Fuel  
Jet A  
JP 4  
JP 5  
JP 8

Numerous Solvents  
Crude Oils

Alaskan North Slope Crude Oil  
Texas Sweet Crude Oil  
South African Crude Oil  
Bunker C Crude Oil  
Venezuelan Crude Oil  
Mexican Crude Oil  
Louisiana Crude Oil  
Kuwait and Saudi Arabian  
Crude Oil

Pesticides

DDT  
Malathion  
Organo Pesticides

Other Compounds

Tert Butyl Ether  
Benzene

Zylene  
Toluene  
Ethyl Benzene  
Chrysene  
Hopane  
Hexadecane  
Naphthalene  
Fluorene  
Phytane  
Phenanthrene  
C18  
C30  
Pristane  
And Others  
No 2 and No 6 Heating Oils  
Kerosene  
Grease form Animals  
Grease from Vegetables  
Dioxins  
Furans  
Creosote  
PCBs (Poly  
Chlorinated Biphenols)  
Dry Cleaning Fluids -  
(Perchloraethylene)  
Ethylene Glycol -  
(Radiator Fluid)  
Deicing Agent  
Hydraulic Oil  
Brake Fluid  
Power Steering Fluid  
Motor Oils  
Co Polymers  
TNT  
Gun Powder

NRT SCIENCE AND TECHNOLOGY COMMITTEE  
Fact Sheet: Bioremediation in Oil Spill Response  
An information update on the use of bioremediation  
May, 2000

1. The purpose of this fact sheet is to provide on scene coordinators and other decision-makers with the latest information on evolving technologies that may be applicable for use in responding to an oil spill. Bioremediation is one technique that may be useful to remove spilled oil under certain geographic and climatic conditions. For the purpose of this effort, bioremediation is defined to include the use of nutrients to enhance the activity of indigenous organisms and/or the addition of naturally-occurring non-indigenous microorganisms. This fact sheet is an update of the NRT Science and Technology's 1991 Bioremediation fact sheet.
2. Bioremediation is a technology that offers great promise in converting the toxigenic compounds of oil to nontoxic products without further disruption to the local environment. Bioremediation is typically used as a polishing step, after conventional cleanup methods have been used. Bioremediation products considered for use during spill cleanup operations must be listed in accordance with the requirements of Subpart J of the National Contingency Plan (for further information on product listing, please consult EPA's Oil Program website at [www.epa.gov/oilspill](http://www.epa.gov/oilspill)). Genetically engineered organisms are not being considered for use at this time by EPA for oil spill and are therefore not discussed in this fact sheet.
6. The carrying capacity of most environments is probably determined by factors such as predation by protozoans, the oil surface area, or scouring of attached biomass by wave activity that are not affected by bioaugmentation; and.
7. Added bacteria seem to compete poorly with the indigenous population.<sup>5,6</sup>
8. Under the appropriate conditions, biostimulation has been shown to have beneficial effects in shoreline cleanup operations. The main challenge associated with biostimulation in oil-contaminated coastal areas or tidally influenced freshwater rivers and streams is maintaining optimal nutrient concentrations in contact with the oil.

#### NUTRIENT APPLICATION

#### REQUIREMENTS FOR SUCCESS

3. Several factors influence the success of bioremediation, the most important being the type of bacteria present at the site, the physical and chemical characteristics of the oil, and the oil surface area. The two main approaches to oil-spill bioremediation are: (1) *bioaugmentation*, in which oil-degrading bacteria are added to supplement the existing microbial population, and (2) *biostimulation*, in which nutrients, or other growth limiting substances, are added to stimulate the growth of indigenous oil degraders.
4. Addition of oil-degrading bacteria has not been shown to have any long-term beneficial effects in shoreline cleanup operations because:
5. The size of the hydrocarbon-degrading bacterial population usually increases rapidly in response to oil contamination, and it is very difficult, if not impossible, to increase the microbial population over that which can be achieved by biostimulation alone<sup>1-4</sup>;
9. Effective bioremediation requires that (1) nutrients remain in contact with the oiled material, and (2) nutrient concentrations are sufficient to support the maximal growth rate of the oil-degrading bacteria throughout the cleanup operation.
10. Open Water Environments. Bioremediation of open water spills is not considered to be appropriate or achievable because of the above two requirements. When nutrients are added to a floating slick, they immediately disperse into the water column, essentially diluting the background levels. At such levels rapid conversion of the hydrocarbons to biomass, CO<sub>2</sub>, and other innocuous end products would not be readily supported.
11. Marine Environments. Contamination of coastal areas by oil from offshore spills usually occurs in the intertidal zone where the washout of dissolved nutrients can be extremely rapid. In 1994 and 1995, studies were conducted on the shorelines of Delaware<sup>7</sup> and Maine<sup>8</sup> to study the rate of nutrient transport in low and high energy sandy beaches. These studies found that surface application of nutrients (including slow-release or oleophilic formulations) is ineffective on high-energy beaches because most of the nutrients are lost to dilution at high tide. However, on low

energy beach surface application of nutrients was found to be an effective and economical bioremediation strategy. Subsurface application of nutrients might be more effective on high-energy beaches but because crude oil does not penetrate deeply into most beach matrices, it is difficult to insure that the nutrients reach the oil-contaminated area near the surface.

12. Freshwater Environments. An oil spill is most likely to have the greatest impact on wetlands or marshes. Less research has been conducted in these types of environments, so it is not yet known how well bioremediation would enhance oil removal. However, the same principles apply to this type of environment as in the marine environment; nutrients must remain in contact with the oiled material, and nutrient concentrations must be sufficient to support the maximal growth rate of the oil-degrading bacteria. There is an added complication in a wetland; oil penetration is expected to be much lower than on a porous, sandy marine beach. Below only a few centimeters of depth, the environment becomes anaerobic, and petroleum biodegradation is likely to be much slower even in the presence of an adequate supply of nitrogen and phosphorus. Technology for increasing the oxygen concentration in such an environment is still undeveloped, other than reliance on the wetland plants themselves to pump oxygen down through the root system. By the year 2000, however, data will be available from an intentional oil spill study being conducted jointly by the U.S. EPA and Fisheries and Oceans-Canada on a freshwater shoreline of the St. Lawrence River in Quebec. This study is examining bioremediation with nitrate and ammonium in the presence and absence of wetland plant species (*Scirpus americanus*).
13. Soil Environments. Land-farming techniques have been used extensively by petroleum companies and researchers for treating oil spills on soil. Again, the same principles apply: nutrients must remain in contact with the oiled material, and nutrient concentrations must be sufficient to support the maximal growth rate of the oil-degrading bacteria. For surface contamination, maintenance of an adequate supply of oxygen is accomplished by tilling. The maximum tilling depth is limited to about 15 to 20 inches. If the contamination zone is deeper, other types of technologies are used, such as bioventing, composting, or use of biopiles, all of which require addition of an external supply of forced air aeration.

#### 14. FIELD EVIDENCE FOR BIOREMEDIATION

Demonstrating the effectiveness of oil spill bioremediation technologies in the field is difficult because the experimental conditions cannot be controlled as well as is

in the lab. Nevertheless, well-designed field studies can provide strong evidence for the success of a particular technology if one can convincingly show that (1) oil disappears faster in treated areas than in untreated areas and (2) biodegradation is the main reason for the increased rate of disappearance. Convincing demonstration of an increased rate of oil degradation was provided from a field study conducted during the summer of 1994 on the shoreline of Delaware Bay<sup>9</sup>. Although substantial hydrocarbon biodegradation occurred in the untreated plots, statistically significant differences between treated and untreated plots were observed in the biodegradation rates of certain hydrocarbon compounds.

15. To distinguish between oil lost by physical means and oil that has been degraded, biodegradable constituents are normalized to a resistant biomarker compound. Hopanes often serve as this biomarker compound because they are highly resistant to biodegradation and exist in all crude oils. Normalizing to hopane automatically accounts for disappearance of oil by physical washout mechanisms. In refined oils that have no hopanes biodegradation can be confirmed by normalizing to a highly substitute 4-ring PAH or by examining the relative rates of disappearance of alkanes and PAH homologs.
16. It is important to note that some bioremediation products contain surfactants and emulsifiers that change the appearance and mobility of the oil. These processes should be distinguished from true biodegradation.

#### OTHER RESEARCH

17. Research is ongoing to evaluate bioremediation and phytoremediation (plant-assisted enhancement of oil biodegradation) for their applicability to clean up oil spills contaminating salt marshes and freshwater wetlands. By December of 2000, EPA is planning to produce a draft guidance document detailing the use of bioremediation for sandy marine beaches and freshwater wetlands. EPA is also studying the biodegradability of non-petroleum oils (vegetable oils and animal fats) and their impacts on the environment during biodegradation. Reports will be available some time in 2000 and 2001.

#### CONCLUSION

18. In conclusion, bioremediation is a proven alternative treatment tool that can be used in certain oil-contaminated environments. Typically, it is used as a polishing step after conventional mechanical cleanup options have been applied. It is a relatively slow process, requiring weeks to months to effect cleanup. If done properly, it can be very cost-effective, although an in-depth economic analysis has not been conducted to date.

18. (Continued)

One of the advantages to using bioremediation products is that the toxic hydrocarbon compounds are destroyed rather than simply moved to another environment. The biggest challenge facing the responder is maintaining the proper conditions for maximal biodegradation to take place, i.e., maintaining sufficient nitrogen and phosphorus concentrations in the pore water at all times. Based on field experiments and solid evidence from the literature it has been shown that addition of exogenous cultures of microorganisms will not enhance the process more than simple nutrient addition and that bioremediation is less effective on high energy shorelines.

The NRT S&T Committee technical contact for bioremediation issues is Dr. Albert D. Venosa of the Environmental Protection Agency. He can be reached at [venosa.albert@epa.gov](mailto:venosa.albert@epa.gov).

## REFERENCES

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OIL SPILL EATER INTERNATIONAL (OSEI, CORP.) EVALUATION  
OF THE NRT SCIENCE AND TECHNOLOGY COMMITTEE FACT SHEET  
MAY 20, 2000

Paragraph 1. Is a Statement of the Fact Sheet's Purpose.

It is unfortunate that Dr. Venosa chose to only use nutrients for the tests performed for this Fact Sheet. We agree – nutrients alone will not work – and Dr. Venosa proves this fact in his Fact Sheet. Dr. Venosa keeps pushing nutrients which are very limited as to the spill conditions in which they may be used effectively, as Dr. Venosa points out.

Paragraph 2.

Explains that Bioremediation offers significant promise in converting the toxigenic compounds of oil to non-toxic products without further disruption to the environment. Again, Dr. Al Venosa (EPA Laboratory) keeps pushing nutrients but then proves they do not work. How does this help the On-Scene Coordinators?

Paragraph 3. Requirements for Success.

They describe Biostimulation as nutrients or other growth-limiting substances, but they fail to mention or test those Bioremediation Products that utilize nutrients all the other constituents to emulate Mother Nature.

Paragraphs 4 through 7.

We agree with the EPA Fact Sheet. For eleven years we have stated that using indigenous bacteria to clean up oil spills works faster and more effective than adding bacterial product.

Paragraph 8.

They explain that under the appropriate conditions, biostimulation has been shown to have beneficial effects on shorelines treatments. This statement needs to be qualified as nutrients only (which Dr. Venosa keeps pursuing) are limited as to the conditions in which they may be used.



OIL SPILL EATER II is not limited the way nutrients are. In fact, in a letter dated April 20, 2000, Mr. Venosa agreed to the fact that when OSE II is applied to oil, it adheres to the oil. This means wave action will not wash away OSE II and dilute it. This means OSE II can be used in active inter-tidal zones, as well as open ocean settings and fresh water fast moving rivers.

Paragraph 9. Nutrient Application.

OSEI, Corp. concurs with this paragraph since OSE II does exactly what Dr. Venosa states is necessary for “effective Bioremediation.” OSE II (1) adheres to the oil and (2) supplies the concentration of all nutrients necessary for effective Bioremediation.

Paragraph 10. Open Water Environments.

They state that Bioremediation of open waters is not considered appropriate or achievable. What Dr. Venosa is really stating is that what nutrients alone are limited as to where they can be used. This is not true for OIL SPILL EATER II (OSE II), since it molecularly adheres to the oil and Dr. Venosa has so stated and knows that OSE II does.

How does Dr. Venosa explain and ignore the fact that for one and one-half years OSE II has been successfully and effectively used at the Navy Fuel Farm in San Diego, CA for oil spills on U.S. Navigable Waters, with the Coast Guard and the State of California present? The oil is cleaned up and with no adverse effects to the San Diego Bay ECO System.

Furthermore, Dr. Venosa has been fully apprised of these facts. He obviously is choosing to ignore the fact that at least one Bioremediation Product does work effectively on water. Dr. Venosa needs to change this statement in the Fact Sheet since he has misled the NRT, the RRT’s and particularly the OSC’s.

Paragraph 11. Marine Environments.

OSEI, Corp. concurs with their comments, but they are only applicable to nutrients – not OIL SPILL EATER II.

Paragraph 12. Fresh Water.

OSEI, CORP. agrees with the EPA – nutrients have limited capabilities; however, OSE II breaks up the oil in small droplets, OSE II “floats” the oil (hydraulic lifting) and OSE II molecularly adheres to the oil. OSE II will only minimally increase the BOD (See Enclosure #1 – BOD statement by Dr. Theron Miller). If the BOD becomes a problem in an enclosed environment, simply aerating the oil-covered water with pumps, will allow rapid Biodegradation of the oil and eliminate the BOD problem.



Paragraph 13. Soil Environments.

Again, nutrients (fertilizers) do not adhere to the oil and, how many nutrients do you apply? OSE II has been solving this problem for 11 years. We have been cleaning up soil that is contaminated with hydrocarbons very effectively and at a tremendous savings in cost.

Paragraph 14. Field Evidence for Bioremediation.

The Fact Sheet states that it is difficult to demonstrate Bioremediation in the field vs. the lab. OSE II has cleaned up contaminated soils all over the U.S., Alaska, Korea and Japan.

Using Dr. Venosa's nutrients, it is impossible to demonstrate for the reasons mentioned previously, i.e., nutrients do not adhere to the oil; how much product (nutrients) do you use; and Dr. Venosa's nutrients do not contain all the nutrients necessary for the complete bacterial growth. OSE II provides all the nutrients needed and can tell the user exactly how much OSE II to apply.

Paragraph 15.

OSEI, Corp. has proven that OSE II does, in fact, biodegrade oil. Dr. Brown of the University of Alaska, ran a scientifically valid test to prove that OSE II does biodegrade alkanes and PAH's. Dr. Venosa has this test and is fully aware that OSE II works whereas his nutrients will not. (See Enclosure 2, a copy of Dr. Brown's Test.).

Paragraph 16.                    BIOREMEDIATION – WHAT IT REALLY IS!

OIL SPILL EATER II  
CHEMICAL PROCESS

Once OSE II is applied to a hydrocarbon spill, the enzymes and other product constituents start emulsification and solubilization of the hydrocarbon substrate. Emulsification and solubilization generally take from a few minutes up to a few hours for heavy-end hydrocarbons, once OSE II is applied, with a Temperature of 40 degrees F. or greater. Once solubilization is completed, the hydrocarbon substrate is less toxic (and the hazard of a fire is diminished) the enhanced, naturally occurring bacteria will have a higher affinity for the solubilized, hydrocarbon substrate.

NOTE: There is no hydraulic loading with the use of OSE II and therefore treated hydrocarbons are not pushed into the lower depths of the water column. During these reactions, OSE II offers up a complete nutrient system to promote the rapid growth or colonization of naturally occurring, indigenous bacteria.

OSE II is also formulated so that once application to the hydrocarbon substrate occurs, molecular adhesion takes place. This prevents OSE II from being removed from the hydrocarbons easily. The above reaction forms the substrate complex.

Once the outer molecular walls of the hydrocarbon substrate complex have been weakened or broken, then this allows bacteria better access to the hydrocarbon substrate. The nutrients in OSE II's product matrices (readily available nitrogen, phosphorous, carbon and vitamins), rapidly populates naturally occurring bacteria. There are certain product constituents to enhance various hydrocarbon- degrading bacteria specifically. The naturally enhanced hydrocarbon degrading bacteria rapidly populate until product nutrients are depleted, at which time they readily convert to the only food source left – the weakened or broken hydrocarbon substrate. The transition state complex is when the enhanced naturally occurring hydrocarbon degrading bacteria start converting hydrocarbons to CO<sub>2</sub> and water.

The enhanced naturally occurring hydrocarbon degrading bacteria convert the solubilized hydrocarbons to CO<sub>2</sub> and water which is the end point or the Bioremediation of the hydrocarbon substrate. Any OSE II product components left are 100% biodegradable and will be used up naturally.

Dr. Venosa explains that having surfactants and emulsifiers preclude a product from being true Bioremediation. This is somewhat a misrepresentation of the facts, because in Mother Nature – when bacteria become proximal to a spill they release surfactants and enzymes to help break down hydrocarbon structures (detoxify) so the bacteria can utilize the spilled contaminant as a food source. OSE II has the same nutrients that Mr. Venosa pushes, plus we have all the constituents that occur in Mother Nature to speed up Bioremediation. To call Dr. Venosa's limited, and incomplete nutrients true Bioremediation over complete products that supply all of the constituents up front that are required by Mother Nature renders this fact sheet as nonfactual itself.

#### Paragraph 17.

OSE II is ideally suited for all applications – fresh or salt water – open water – beaches and marshes.

#### Paragraph 18.

Mechanical cleanups (the method of choice) allow 80% of the oil to sink into the water. OSE II, on the other hand, FLOATS the oil, and rapidly detoxifies the oil, thereby protecting the ECO System and by rapidly Biodegrading the oil.

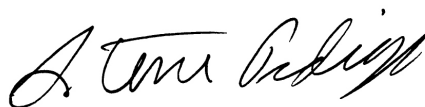
There are cost comparisons available and Dr. Venosa has this data. The Navy at the San Diego Fuel Farm has reduced their mechanical cleanup cost for oil spills on water from \$90.00/spilled gallon to \$12.00/spilled gallon and only \$1.00 of the \$12.00 cost is for OSE II.

CONCLUSION – BY: OSEI, CORP.

OSEI, Corp.'s OIL SPILL EATER II, solves all the problems spelled out in this Fact Sheet associated with Dr. Venosa's attempt to use and evaluate only nutrients.

OIL SPILL EATER II is successfully and effectively used on oil spills on soil and U.S. Navigable Waters.

OIL SPILL EATER II (OSE II) should be pre-approved by all RRT's for use on oil spills.

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## WHY OIL SPILL EATER

## INSTEAD OF FERTILIZERS

### 1. HOW MUCH PRODUCT DO YOU NEED?

FERTILIZERS are mainly nitrogen and phosphorus which need to be continually re-applied (could be costly).

OIL SPILL EATER applications have been engineered so that for most cases, one (1) application is all that is needed – plus Oil Spill Eater has nitrogen, phosphorus and readily available carbon (fertilizer's do not). You know your cost.

### 2. CARBON SOURCE.

FERTILIZERS try to utilize the carbon from the hydrocarbons to enhance bacteria; the carbon is not always accessible. Since carbon, nitrogen and phosphorus are needed to enhance bacteria and growth, if the carbon is bound up, the fertilizer will take an extended period of time to react.

OIL SPILL EATER has an available natural carbon supply plus vitamins to readily enhance bacterial growth. By not relying on the carbon from the hydrocarbons, OSE will react better in a wider range of hydrocarbon contamination problems.

### 3. BACTERIA.

FERTILIZERS need for bacteria to already exist in hydrocarbon contamination areas in order to enhance biodegradation; and if the soil is inert, fertilizers may not work at all.

OIL SPILL EATER'S application, engineering and mixture ratios allow OSE to work whether soil is inert or not since OSE uses indigenous bacteria from the water used in it's application.

### 4. PRODUCT ADHERES TO OIL.

FERTILIZERS may be washed away from pollution site, which would render it useless. This washing away may also violate EPA's new storm drain laws covering fertilizers since high concentrations of fertilizers can also cause eutrophication.

OIL SPILL EATER has ingredients in the product to cause molecular adhesion of the product to the hydrocarbons eliminating the washing away of Oil Spill Eater.

5. CATALYST.

FERTILIZERS do not contain catalysts.

OIL SPILL EATER contains all the required nutrients, vitamins and catalysts in the form of enzymes. Enzymes act as catalyst to promote the enhanced bacteria to rapidly convert to feeding on the hydrocarbons.

6. SURFACTANTS.

FERTILIZERS depend on enhanced bacteria to produce enough surfactants to breakdown the hydrocarbon walls, so the bacteria can engulf the hydrocarbon itself. This is a slow process and requires enormous amounts of bacteria. For this reason fertilizers take a long time to show any reaction at all – assuming there are bacteria to start with.

OIL SPILL EATER contains various surfactants to help break the outer walls of Betx, light ends, aliphatics and even some asphaltenes, and this allows the bacteria (a hydrocarbon ready) to be engulfed by enhanced bacteria, which reduces biodegradation time.

SUMMARY:

OIL SPILL EATER gives you the following benefits over fertilizers:

1. COST CONTROL – We know how much “Oil Spill Eater II” is required on each spill.
2. OWN CARBON SOURCE – SOE contains its own carbon which aid in bacterial growth.
3. BACTERIA – OSE uses indigenous bacteria.
4. PRODUCT ADHERES TO OIL – OSE molecularly adheres to hydrocarbons.
5. CATALYST – OSE enzymes are catalyst for breaking down hydrocarbon walls and rapid bacterial growth.
6. SURFACTANTS – OSE contains its own surfactants to help breakdown hydrocarbon walls.



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WHY USE "OIL SPILL EATER" II  
RATHER THAN NON-INDIGENOUS BACTERIA

1. YOU CANNOT DIRECTLY APPLY ANY LIVING ORGANISM (BACTERIA) TO A TOXIC SUBSTANCE WITHOUT KILLING THE ORGANISM.
2. THE ONLY WAY FOR ANY BACTERIA TO UTILIZE THE HYDROCARBON OR CONSTITUENTS AS A FOOD IS TO FIRST REDUCE THE TOXICITY.
3. BACTERIA CAN UTILIZE MOLECULARLY REDUCED HYDROCARBONS AS A FOOD SOURCE, BUT ONLY AFTER THE MOST TOXIC COMPONENTS OF THE HYDROCARBON ARE REDUCED.

WHY?

1. WHEN BACTERIA BECOME PROXIMAL TO A FRESH HYDROCARBON SPILL, THE FIRST THING THAT HAPPENS IS THE BACTERIA PRODUCE BIO- SURFACTANTS TO ALTER THE MOLECULAR STRUCTURE OF THE HYDROCARBON AND REDUCE IT'S TOXICITY. IF THERE IS TOO HIGH A CONCENTRATION OF BETX, THE BACTERIA DIE.

IF THE CONCENTRATION IS DILUTED ENOUGH AND THERE ARE ENOUGH BACTERIA PRESENT TO PRODUCE ENOUGH BIO-SURFACTANTS TO KEEP FROM BEING OVERWHELMED BY THE HYDROCARBON, THEN THEY HAVE A CHANCE TO SURVIVE. USUALLY, THIS IS ONLY POSSIBLE IN A SITUATION WHERE A LARGE QUANTITY OF WATER IS PRESENT WHERE BACTERIA CAN GET CLOSE ENOUGH TO THE HYDROCARBON TO ATTACK AND YET SWIM AWAY IF NEEDED.

IF THE BACTERIA ARE FORCED TOO CLOSE TO A TOXIC HYDROCARBON, IT DIES. IT TAKES A LONG PERIOD OF TIME FOR BACTERIA TO ACCLAMATE THEMSELVES TO A SPILL AND THEN ATTACK IT.

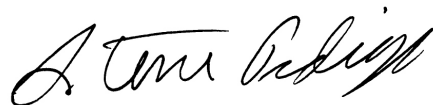
2. YOU CLEAN UP TOXIC SPILLS (HYDROCARBONS) BECAUSE THESE SPILLS CAN PREVENT LIVING ORGANISMS FROM LIVING. THEREFORE, SPILLS ARE CLEANED UP TO REDUCE OR ELIMINATE THE TOXICITY TO OUR ENVIRONMENT.

WHY USE "OIL SPILL EATER" II  
RATHER THAN NON-INDIGENOUS BACTERIA

PAGE TWO

NON-INDIGENOUS BACTERIA LIMITATIONS:

1. DIRECTLY APPLIED TO A TOXIC SPILL THEY DIE.
2. IN THE ENVIRONMENT, INDIGENOUS BACTERIA GENERALLY TAKE OVER NON-INDIGENOUS BACTERIA.
3. NON-INDIGENOUS BACTERIA HAVE A HARD TIME ACCLAMATING TO A NEW ENVIRONMENT.
4. IF YOU HAVE 10°F OR MORE TEMPERATURE VARIATION, THE NON-INDIGENOUS BACTERIA GO INTO SHOCK AND THEN HAVE TO REACCLAMATE THEMSELVES.
5. IF THERE IS A LIMITED AMOUNT OF NUTRIENTS IN THE SOIL, NON-INDIGENOUS BACTERIA WILL BE UNABLE TO SUSTAIN LIFE LONG ENOUGH TO ATTACK A SPILL.
6. YOU DO NOT KNOW YOUR COST! BACTERIA HAS TO CONTINUALLY BE ADDED UNTIL SOMETHING HAPPENS.



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## **USE OIL SPILL EATER II (OSE II ) or ORC**

### **USING ORC ONLY**

ORC is an oxygen-releasing compound. ORC can only be effective in an area where there has been a hazardous material spill and (1) oxygen is the only limiting factor and (2) there is no means of injecting oxygen through a hose from a compressor or some type of commercial blower.

If Bioremediation precursors, nutrients, or bacteria are not present, then adding ORC will have limited benefits. Without Bioremediation precursors (which are present in OIL SPILL EATER II) (OSE II), then Bioremediation will be extremely slow even with the addition of ORC.

In any system where BOD or COD or utrified water might be a problem, ORC might be a benefit. However, it seems simple to set up a gasoline compressor or electric blower and blow air through a hose into the oxygen deficient zone.

### **USING OIL SPILL EATER II**

OIL SPILL EATER II (OSE II) Concentrate is a liquid nutrient with enzymes that is mixed with water and applied to hydrocarbon spills or organic contaminants. OSE II grows indigenous bacteria using its nutrient material while enzymes form binding sites on the hydrocarbon walls. After eating OSE II Nutrients, the Bacteria then attack the hydrocarbon or contaminant; turn it into Carbon dioxide and water.

The limiting factors in remediating spills are the precursors (Bio-surfactants and Enzymes) in the correct mix of nutrients and constituents to carry out cellular metabolism, as well as cellular reproduction.

If these constituents are not present, then oxygen addition (ORC) will have little effect on a spilled material. An oxygen deficient situation is easily addressed; however knowing how much of the correct and complete constituents needed for Bioremediation is a much more difficult task to accomplish.

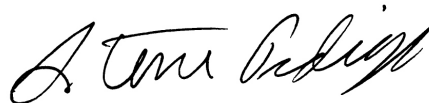


OSE II makes remediation a simple solution to a complex situation.

**SUMMARY**

Once again, the only time ORC can be a benefit is where oxygen is the limiting factor and there are nutrients available and air cannot be injected with some type of blower system.

The more efficient process is to apply OIL SPILL EATER II.

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### **Why OSE II Instead of Surface Washing Agents (Soaps)**

Surfactants wash the hydrocarbons (oil) off soil, concrete, rocks or asphalt, and simply moves your problem to a different area.

Surfactants (soap) merely break the hydrocarbons (oil) into smaller droplets which allows the hydrocarbons (oil) to sink or move and can be washed to a different area.

Surfactants, after washing or sinking hydrocarbons to a different area, can allow the hydrocarbons (oil) to recombine or reform in the new area.

Surfactants do not eliminate, remediate, or permanently solve the problem.

**Oil Spill Eater II** bioremediates the hydrocarbons to CO<sub>2</sub> and water, eliminating the problem in place.

Surfactants do not contain nutrients, enzymes, vitamins or constituents to complete metabolic life cycles, so it is impossible for surfactants to solve the problem in place.

**Oil Spill Eater II** has all the constituents to cause complete and rapid bioremediation of hydrocarbons.

Why spend money moving a problem when you can use **OSE II** and solve the problem where it is!

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## **WHY OSE II RATHER THAN ABSORBENTS**

**I. There are absorbents designed for water and absorbents designed for solid surfaces.**

**II. Absorbents designed for water are predominantly pads and absorbent boom.**

1. It is almost impossible to put enough absorbent boom or pads out to collect large spills.
2. For even small spills pads are difficult to put in place to absorb moving spills, and then to pick it up before it sinks.
3. Absorbent pads or absorbent booms, once saturated, have to be collected and stored temporarily on shore, and then hauled away. Then you have to pay to dispose of them while exposing workers to hazardous material who directly lay the pads out and collect them.
4. It is also very difficult for absorbents to absorb viscous oils.
5. Absorbents require a considerable amount of labor for a minimum cleanup.
6. Once again, absorbents move the problem; they do not solve it.

**III. Absorbents for solid surfaces can range from kitty litter to peat moss to pads.**

1. To pick up spills on concrete or asphalt is difficult because absorbents have a hard time pulling a spilled material out of the pores of the surface.
2. Anytime it rains after absorbents have been used on concrete, you can see a sheen floating up.

3. It requires a lot of hands-on labor to put the absorbent out, wait for the absorbent to absorb (which in some cases puts workers in proximity of a fire hazard), then pick the absorbent material up, haul it away, then store it, then pay to have it disposed of.
4. This is moving the problem, after performing an incomplete cleanup.

#### **IV. Recycling Absorbents**

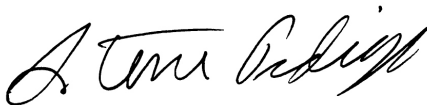
1. Some absorbents can absorb when you collect the pad or boom then take it to an area to wash or squeeze the absorbent, then store the absorbent. They may still contain some of the hazardous material (potential fire hazard).
2. This requires a lot of direct exposure by the worker/laborer to hazardous materials for an incomplete cleanup system.
3. This is a labor intensive system that, once again, moves the problem, it does not completely solve the problem.

#### **V. Overview of the simple process using OSE II**

1. OSE II has bio surfactants, enzymes, and a complete nutrient system to carry out complete metabolic processes (that emulate mother nature) to rapidly convert hazardous spilled material to CO<sub>2</sub> and water.
2. Water Spills
  - A. When OSE II is applied to a water spill, the bio surfactant rapidly emulsifies and solubilizes the spill (detoxifies the spill, reduces the fire hazard, and breaks down the spill's ability to adhere to anything).
  - B. There are constituents in OSE II that cause the spilled material to float so it does not increase the area impacted by the spill.
  - C. Enzymes form digestion binding sites to be utilized by the rapidly grown indigenous bacteria who then use the spill as a food source and convert it to CO<sub>2</sub> and water. This is the exact process mother nature uses to address spills. OSE II has the required precursors to speed up the bioremediation process.

### 3. Concrete or Asphalt Spills

- A. When OSE II is applied to concrete, asphalt, even soil, the bio surfactants and enzymes actually lift the entire spill leaving no residue to form a sheen when it rains. This also removes the potential fire hazard from the spill or from residue that could be left behind by absorbents.
- B. In the case of airports where getting refueled planes out of a terminal and in the air quickly is important. If there was a fuel spill, simply spraying on OSE II, waiting approximately 3 minutes, then you can okay the plane to depart. With labor intensive absorbents, they would increase a plane's time at the terminal while not completely removing the fire hazard.
- C. Once OSE II is applied, the process in #2 above would start and in 20 to 30 minutes you could simply wash the detoxified harmless spill residue away.
- D. OSE II has constituents to cause it to molecularly adhere to spills, so wherever a spill is washed away to or current or wind carry it to, OSE II would stay attached and continue the bioremediation process until the spilled material is converted to CO<sub>2</sub> and water.
- E. OSE II solves the spill problem effectively and in place.



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## **WHY USE OSE II INSTEAD OF COREXIT OR DISPERSANTS**

- I. Corexit is a dispersant.
- II. Dispersants generally break oil into smaller droplets and then sink the oil / hazardous material it is applied to.
  1. By breaking the oil into smaller droplets, this also spreads the spill contaminating a larger area than the initial spill itself.
  2. When using Corexit, this also means you are spreading Corexit with the oil.
  3. The oil / hazardous material then is caused to sink the oil into the water column.
    - A. To be listed on the U.S. EPA National Contingency Plan for oil spills as a dispersant, it requires that the dispersant has to sink 45% of the oil in 30 minutes.
  4. This hazardous material that is now spread out then sinks into the water column contaminating the oceans lower depths. This is creating a secondary area of contamination affecting fish, mammals or any species that survives or feeds in this area of the water under the surface.
  5. The oil then settles on the oceans' floor. Now it contaminates the ocean floor with a hazardous material affecting bottom dwelling species and potentially killing them.
  6. The sunken hazardous material then is swept along the ocean floor by underwater currents, contaminating expanding areas of the ocean floor and adversely affecting more number of living organisms.
  7. This movement of sunken oil then starts to roll over and this oil starts attaching itself (recombining to some extent) to each other forming tar balls. These tar balls then roll up on beaches now affecting species of

organisms that live and feed in intertidal zones. In the case of sandy beaches you then expose humans to these somewhat toxic sticky tar balls. The oil in a tar ball state would then persist for a protracted amount of time.

8. Affected species with dispersants use:
  - A. Species that live on the surface or feed on the surface of the ocean.
  - B. Species that live or swim in the water column.
  - C. Species that live on the bottom or forage or food on the ocean floor or spend some time on the ocean floor.
  - D. Species that live in intertidal zones or travel through intertidal zones.
  - E. In the case of sandy beaches, humans become exposed to this original surface spill.
  - F. Any human being that comes in contact with dispersants that contain toxic solvents.

### III. Toxicity

1. Most dispersants are a makeup of surfactants (a type of soap) and solvents. This makes the dispersant very toxic to living organisms.
2. In the case of Corexit 9527, the solvent utilized is ethylene glycol monobutylether (2 Butoxy – ethanol).
  - A. Ethylene glycol monobutylether is so toxic that overexposure to your skin may cause kidney failure and eventually death.
  - B. It is unfathomable that anyone would allow this or purposely apply this to the environment!
  - C. In the EPA's NCP Product Schedule, the toxicity data for Corexit only is:
    - (1) 9527 – Inland Silversides – LC50 14.6
    - (2) 9500 – Inland Silversides – LC50 25.2

Toxicity for Corexit's No. 2 Fuel are:

- (1) 9527 – Inland Silversides – LC50 4.49
- (2) 9500 – Inland Silversides – LC50 2.62

- D. During an oil spill in the Gulf of Mexico, Corexit was accidentally sprayed on a Coast Guard ship. As reported to us by the U.S. EPA, the Corexit droplets dissolved the paint on the Coast Guard vessel.

We can only imagine what happened to any of the personnel that came in contact with this Corexit overspray.

- E. Corexit's ethylene glycol monobutylether is a potential carcinogen. It is not listed as a carcinogen because it has never been tested for its carcinogenicity.

#### IV. Dispersant Summary

1. Using dispersants increases the areas impacted by the oil spill.
2. Using dispersants increases the toxicity of the oil spill.
3. Dispersants sink the problem into the water column, ocean floor, and beaches. They do not eliminate the problem; they simply move it.

#### V. Summary for Corexit Dispersants

The statements below are taken, (verbatim) from the *NALCO / Exxon Corexit Products Bulletin* from Corexit Dispersants "Material Safety Data Sheets" (MSDS).

These adverse effects to humans and the hazardous handling warnings described are NALCO/Exxon's own statements taken from the above publication.

##### A. Corexit 9500, 9527 and 9580

1. *"Caution: If unconscious, having trouble breathing, or in convulsions, do not induce vomiting."*

##### B. OSHA statements about Corexit 9500, 9527 and 9580, are quote *"Based on our hazard evaluation, the following ingredients in this product are hazardous:"*

1. "Corexit 9500: Hydrotreated lite distillate – is a skin irritant, and TWA is 5 mg/m<sup>3</sup> ACG1H/TLV"
2. "Corexit 9527: 2-butoxyethanol is an irritant, systemic effects, combustible"



3. "Corexit 9580: Hydrotreated lite distillate – is a skin irritant, and TWA is 5 mg/m<sup>3</sup> ACG1H/TLV, STEL 10 mg/ m<sup>3</sup> OSHA/PEL"

4. "Corexit 9500 – immediate (acute) health hazard"

"Corexit 9527 – immediate health hazard, chronic health hazard, and a fire hazard"

"Corexit 9580 – immediate health hazard and a fire hazard"

C. International Regulation:

This is a WHMIS controlled product from the ingredients disclosure list or has been evaluated based on its toxicological properties, to contain the following hazardous ingredient:"

"9500 – hydrotreated light distillate"

"9527 – 2-butoxyethanol"

"9580 – Hydrotreated light distillate"

D. Questions and Answers

(These statements are, again, taken from the *NALCO/Exxon Product Bulletin*).

*"A committee of scientists for the National Research Council concluded in a 1989 report that the overall impact of spilled oil is likely to be reduced by dispersion!"*

This statement "*that the overall impact is likely to be reduced by dispersion,*" is the only scientific data presented by Exxon. "Likely" does not mean it will "absolutely" lessen the impact.

We have been unable to find any scientifically valid tests to prove this. Common sense will tell you that when you add an extremely toxic non-aromatic hydrocarbon to a spill you are increasing or adding to the impact of the spill.

Where is the scientifically valid data supporting Exxon's following claim (See 2 below):

1. When describing these dispersants, Exxon very carefully did not mention the extreme toxicity of the non-aromatic solvents that are a significant part of the chemical makeup of the dispersant.
2. "*Once dispersed as fine droplets, the oil is readily biodegraded by micro organisms in the sea.*"

**OSEI Corporation Comment:**

Common sense should convince anyone that adding the toxic non-aromatic hydrocarbons found in Corexit's products to an oil spill would actually prevent and delay any biodegradation of the oil.

(If Corexit is lethal to humans, single cell organisms have no chance to use it as a food source.)

3. *"Dispersing the oil into the upper three meters of the water column keeps the oil from impacting the shoreline."*

**OSEI Corporation Comment:**

This is a misleading statement suggesting that the oil somehow remains "levitating" in the upper 3 meters of the water columns!

Once the oil is dispersed and begins to sink, there is nothing to "magically" hold the oil in the upper three meters. These toxic oil droplets descend to the ocean floor adversely impacting everything in their path.

The end results could be tar balls that so readily cover Gulf Coast beaches.

Exxon claims that *"this process results in a net environmental benefit."*

**OSEI Corporation Comment:**

We do not agree with this claim since their toxic dispersant is spreading the now very toxic oil which can cause adverse impact on all areas of the ecosystem.

4. *"When properly used, Corexit products are of very low toxicity to marine life and humans."*

**OSEI Corporation Comment:**

See Section III - 2 - C on Toxicity. With toxicity values of 4.49 and 2.61 with No. 2 fuel oil, it is hard to comprehend their claim of low toxicity to marine life and humans!

VI. Why you should use OSE II

1. OSE II rapidly emulsifies and solubilizes the spill (detoxifies it) while reducing it as a fire hazard and lessens the spill's toxic impact immediately.
2. Once emulsification and solubilization are complete, the oil will not adhere to birds, mammals, any species, wood, metal, sand, soil, rocks, ships or humans.

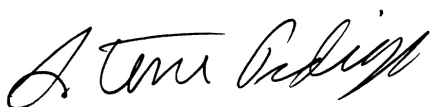
3. OSE II has all the constituents to rapidly grow bacteria and carry out all metabolic processes so the oil is rapidly converted to harmless CO<sub>2</sub> and water.
4. OSE II causes the oil to float so only the surface is impacted by the spill (which the spill impacted anyway). Thus, there is no secondary impact to the water column, no impacting of the ocean floor, or impacting of intertidal zones.
5. As associate of OSEI Corporation drank 2 ounces of OSE II on a Houston, Texas television station to prove it is non-toxic.
6. Toxicity tests on Mysids when performed by the U.S. EPA proved OSE II to be virtually non-toxic.
7. OSE II solves (remediates) the spill in place. It does not move the problem to another area. (OSE II emulates mother nature exactly).

**OSEI Corporation Comments:**

We find it difficult to understand why anyone would use dispersants on oil spills when there is a safer, more effective product available.

We find it even more difficult to understand why anyone would use Corexit Dispersants due to their hazardous, toxic and life threatening ingredients as indicated in their own publication.

Based on the adverse characteristics and hazards associated with dispersants, using OSE II is the clear choice for hazardous spill cleanup.

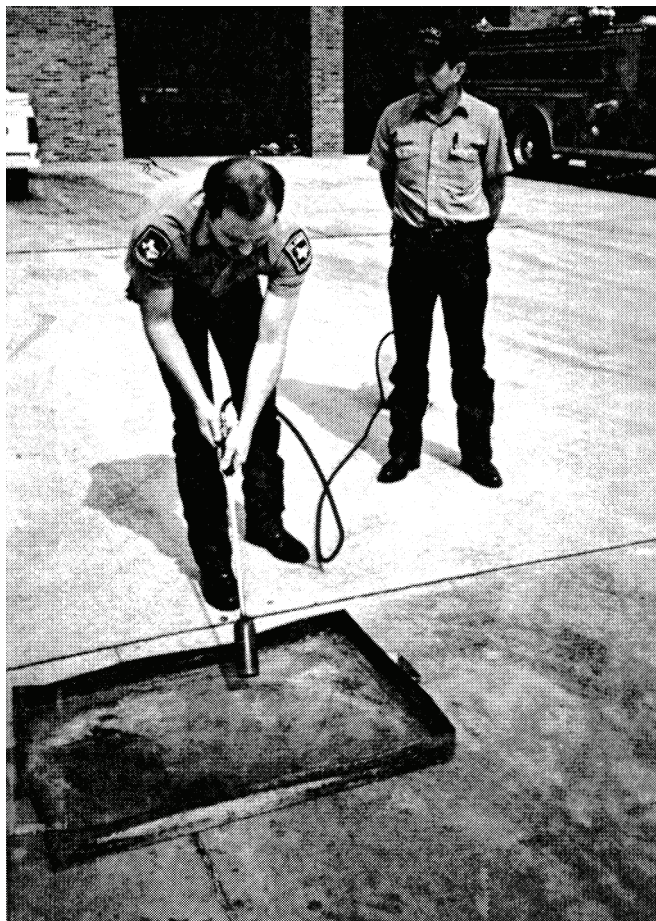


Steven R. Pedigo  
Chairman

SRP/eem



*OSE II'S TEXACO CRUDE OIL CLEANUP ON WATER*



*OSE II on DIESEL PROVING NONFLAMMABILITIES*  
*3 MINUTES AFTER APPLYING OSE II*





**JET FUEL SPILL CLEANUP USING  
OSE II JOINT RESERVE BASE - FT. WORTH, TEXAS**



**Drilling Monitoring Well**



**Applying OSE II Down  
Monitoring Well - 15' to 20'**