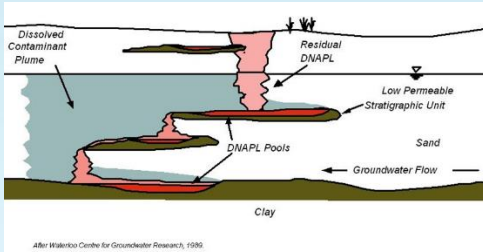


# eZVI™

## Emulsified Zero-Valent Iron A Combination Technology for DNAPL Remediation



- eZVI is an oil-soluble reverse emulsion developed and patented by NASA
- It is effective for *in-situ* treatment of DNAPL
- It's hydrophobic and dense emulsion nature absorbs DNAPL
- The highly reactive iron is protected from corrosion until it contacts DNAPL
- It is applied via direct injection or soil mixing technologies

### Principle

eZVI is a water-in-oil emulsion encapsulating powdered zero-valent iron. It is made with vegetable oils, highly reactive ZVI, water and emulsifiers. The product is specifically designed for source zone remediation where halogenated hydrocarbons (e.g. PCE, TCE, DCE, VC, TCA, CT, etc.) are constituents of concern (CoC). EZVI behaves like a DNAPL: once it contacts the targeted treatment zone, the DNAPL partitions from the soils into the EZVI. The halogenated hydrocarbons thus become exposed and react with the iron and water droplets (i.e., micelles). After serving as a DNAPL encapsulator, the food-grade vegetable oil used in EZVI serves as an electron donor for enhanced reductive dechlorination.

Containing zero-valent iron within a hydrophobic membrane protects the nano/micro scale iron from native groundwater constituents that might otherwise limit the iron's reducing capacity. This technology thus lessens the amount of ZVI needed to treat target contaminants and decreases overall project costs.

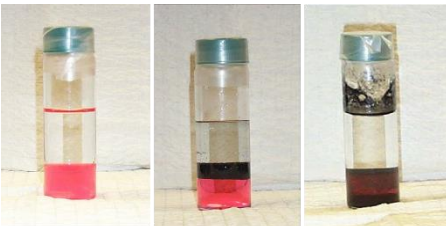
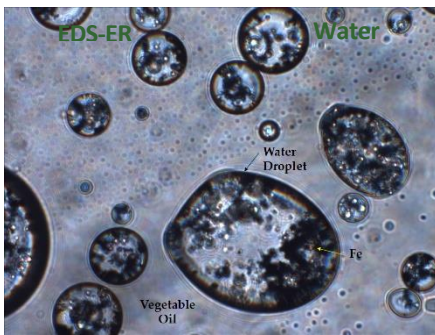
### Advantages

- Instant drop in source zone concentrations due to DNAPL partitioning
- Field-tested by the U.S. Environmental Protection Agency (EPA) under Superfund Innovative Technology Evaluation (SITE) program
- This is the only surfactant-stabilized water-in-oil emulsion containing zero-valent iron particles in the market
- Technology capitalizes both *In-situ* chemical reduction and bioremediation of chlorinated solvents to non-toxic ethene and water

### Field Application Design

eZVI applications are configured to target *in situ* DNAPL. Injection configurations are typically grid applications but soil mixing within excavations is often a cost effective approach. eZVI can be injected using direct-push injection, hollow-stem auger, hydraulic or pneumatic fracking, and large diameter auger (LDA) tools, or other soil mixing technologies.

eZVI is micron-sized ZVI suspended in a reverse emulsion (water droplets in oil)



**Emulsified Zero-Valent Iron (eZVI)**  
 DNAPL (Died TCE) may not mix with common (hydrophilic) *in situ* amendments. Illustration above shows different interactions between DNAPL and powdered ZVI in water vs. eZVI.

## Product Content

Chemical Name	CAS Number	Composition (% wt)
water	7732-18-5	40 - 50
Soybean oil	8001-22-7	30 - 40
Iron	7439-89-6	8 – 20
surfactant	26266-58-0	1 - 5

## Product Characteristics

Parameter	Specification
Specific Gravity	1.05 -1.10 @ 25 °C
Solubility in water	Insoluble
Boiling Point	>572 °F (300 °C)
Appearance	Dark grey/brown viscous liquid

## Packaging Options

- 275-gallon IBC containers

## Safety

No protective equipment is necessary under normal use conditions. All ingredients consist of food or food grade additives.