



# Guardian

America's First Choice for Environmental Restoration

A Publication of the Environmental Restoration Program

Travis Air Force Base, California

January 2016

## INSIDE

### Viewpoint:

*The ongoing drought in California and the threat of a powerful El Nino weather system this winter has brought the topic of climate change into our daily discussion. The Travis AFB Restoration Program Manager provides his view on climate change and what we can do as individuals to promote environmental awareness and stewardship.....*

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### Next RAB Meeting:

*The next Restoration Advisory Board meeting will be held on April 21, 2016 at 7 p.m. at the Office of the Northern Solano County Assn. of Realtors. The meeting agenda is forthcoming.....*

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## Acronyms

**EVO:** Emulsified Vegetable Oil is a food-grade carbon source that is injected into solvent-contaminated groundwater. The emulsion allows the vegetable oil to travel through soil with a high clay content. Microscopic organisms consume the oil and create an environment that supports the breakdown of solvents into harmless compounds.

**GSR:** Green and Sustainable Remediation reduces the demand on natural resources during cleanup and relies on renewable energy sources to power field operations more efficiently.



(Photo by Glenn Anderson)

**Panel Discussion:** Travis Installation Support Team members inspect a new set of solar panels. The panels provide power to extraction wells that recirculate contaminated groundwater to a grove of eucalyptus trees. The trees remove contaminants, so recirculation improves their effectiveness.

## Stirring the Underground Pot

### Base Looks for Ways to Improve Vegetable Oil Cleanups

By Lonnie Duke

Travis Environmental Project Manager

Percy Spencer was an American engineer who worked for the defense contractor Raytheon in 1945. His work on radar technology toward the end of World War II was very important to the national security of the USA. While testing a high-powered radar beam, Mr. Spencer walked in front of the beam with a chocolate bar in his pocket. The radar beam melted the chocolate bar in his pocket, and two years later, Raytheon's patent for the "Radarange", the first microwave oven, was issued. Sometimes work on one project can lead to an important discovery in a

completely different area.

Although not as dramatic as the above example, the earliest work on the ability of microscopic organisms to clean up solvent-contaminated groundwater started with accidental petroleum spills, when it was noticed that solvent concentrations in groundwater dropped in fuel spill areas. Over time, researchers developed a keen understanding of how the introduction of a carbon source can activate the microscopic organisms that use solvents as a source of food. The October 2010 Guardian contains several articles on biology-based cleanup strategies [bioreactor and Emulsified Vegetable Oil (EVO)] that were tested on Travis AFB, and

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Visit our Environmental Restoration Program web site at <http://www.travis.af.mil/enviro>



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# Combating Climate Change

Last month, world leaders from developed and developing countries met in Paris, France to attend the 21<sup>st</sup> Conference of the Parties (COP 21). Their goal was to hammer out a legally binding agreement that would limit global warming to under 2 degrees Celsius by the year 2100. United Nations researchers believe that this is necessary to avoid adverse impacts to both the environment and human well-being.

Since watching Al Gore's movie "An Inconvenient Truth" a while back, I have noticed a rise in evening news stories on these potentially adverse impacts: the retreat of glaciers, rising sea levels, heat waves, threats to food security, political instability, species extinction, etc. Since we are in an election year, the topic has become a part of the political conversation, and it seems that people either strongly believe we have the ability to impact climate change or think it is a pseudoscience that will adversely impact the economy.

As the Travis AFB Restoration Environmental Program Manager, I obviously care about the environment and want to ensure that base personnel are not exposed to harmful chemicals in either the soil or groundwater. As a government official, I also care about our budget and want to get the most work out of every tax dollar my team receives. So, what is my viewpoint on this controversial topic?

On a personal level, I have always tried to minimize my impact on our planet. I recycle, drive a hybrid vehicle and combine my trips as much as possible to minimize time on the road, turn off lights when leaving a room, and use recommended irrigation practices to reduce my water consumption. It may not seem like much, but I believe that a generation of people who shrink their carbon footprints could make a difference. I firmly believe that it is not my prerogative to waste resources.

On a professional level, I strive to



## VIEWPOINT

Mark H. Smith  
 Travis AFB Restoration  
 Program Manager

achieve a win-win situation: a restoration program that minimizes its energy consumption and greenhouse gas emissions while finding less expensive ways to clean up the environment. That is why we embraced many elements associated with Green and Sustainable Remediation (GSR) in our planning and programming process. The July 2010 and October 2010 Guardians introduced the GSR concept and technologies during a time when they were undergoing a thorough evaluation at Travis AFB. At the same time, we are carrying out this work under cost-conscious performance-based contracts, which I described in my January 2008 Viewpoint.

When I think of the whole climate change debate, the word that quickly comes to mind is "stewardship." When we receive resources to carry out our work, it is imperative for us to manage those resources as intelligently as possible. A restoration program that follows sound stewardship principles will achieve desired results on time and within budget while keeping the impacts that could lead to climate change to a minimum. That is the type of restoration program that we have put together, and we are proud of it.

As a father and grandfather, I want my kids and grandkids to live in a world that they respect and appreciate, but can also enjoy all that it offers, so they may hand it over to their kids and grandkids in as good or better condition than they found it. So, what is my viewpoint on climate change? Even though I have not studied all of the supporting data behind it, I tend to err on the side of caution and prefer an environmentally-friendly way of life

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## EVO

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today these strategies are the foundation of the Air Force- and regulator-approved groundwater remedies that were documented in our 2014 groundwater Record of Decision.

Once this type of technology has been proven to work at a location, the next step is to figure out how to apply it and improve its performance. For example, today's automobiles are much improved over Henry Ford's first Model T, and today's microwave ovens are significantly better than Raytheon's first commercial oven (it stood almost 5 feet 11 inches tall, weighed 750 pounds, and cost about \$5,000).

"In some ways, the use of EVO to treat solvent-contaminated groundwater is still in its infant stage," stated Mark Smith, Travis AFB Restoration Program Manager.

"Once in the ground, vegetable oil does not travel far from its injection point, and it would take a lot of wells to completely cover the footprint of a large solvent plume. Plus, it's not easy to accurately inject EVO beneath a building or aircraft hangar."

If there was a way to spread the EVO across a large area, fewer injection wells would be needed to place the EVO where it was needed. Less EVO would be needed to carry out the cleanup, and the presence of buildings and other infrastructure would not impede the cleanup progress. Even if a clay-rich layer of soil does not allow

water to readily pass through it, the EVO in adjacent layers would eventually diffuse into the clay and promote the breakdown of contaminants. If successful, an improved strategy would significantly speed up the cleanup and lower cleanup costs.

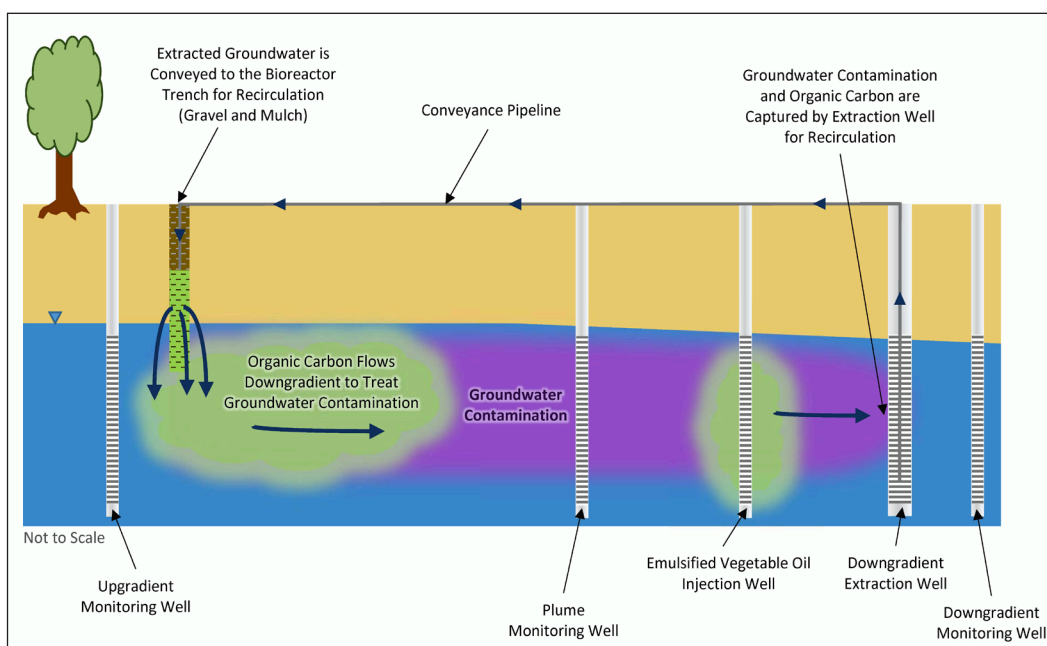
One way to achieve this EVO distribution is to create a recirculation loop between an injection point and an extraction well. Recirculation would mix the dissolved EVO with the contaminated groundwater and increase the area where biological activity takes place.

To see if recirculation in a clay-rich

a long trench that is backfilled with mulch and iron sulfate. The mulch breaks down into an organic carbon that supports biological activity, and the iron sulfate contributes to the chemical breakdown of contaminants. Infiltration trenches work well in open fields and where the water table is close to the surface. The second type of injection point, a gravel chimney, is just an infiltration trench that is placed vertically into the subsurface and capped with a traffic-rated vault cover. Gravel chimneys work well in industrial areas where it is important to work around utilities and other

subsurface obstructions. Both structures should increase the surface area that the EVO-water mix is contacting, which should also increase the overall injection rate.

If the recirculation treatment zone concept with gravel chimneys and infiltration trenches works, it will become another tool in the toolbox



**How Does It Work?:** A recirculation system is designed to distribute vegetable oil as much as possible in the horizontal and vertical direction in the subsurface. More contact that the oil has with solvent contamination will result in a quicker and more thorough breakdown of the solvents into harmless compounds. Vegetable oil is injected into an injection point (infiltration trench or gravel chimney), and extraction wells drag the oil through a solvent plume. The oil-water mix is then pumped out of the ground and transferred through pipes back to the injection point. [Figure by Jeff Gamlin (CH2M HILL)]

soil is possible, the base initiated three demonstration projects last year, and each project was designed to address a particular challenge. These three projects and the challenges they face are summarized on page 3 of the October 2015 Guardian.

A big challenge that these projects must overcome is the slow rate that the EVO-water mix can be injected into clay-rich soil. To speed up the injection process, two specialized EVO injection points will be tested. The first one, an infiltration trench, is

that may promote the cleanup at other groundwater sites on Travis AFB or another industrial facility where a solvent treatment zone needs to be installed.

"We are excited about what we may learn from these demonstration projects and the future opportunities that they may offer, said Mr. Smith. "These studies fit in well with our overall objective of finding better, faster, and cheaper ways to clean up contaminated groundwater."



Viewpoint

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that does not harm the planet. After all, who would want to visit Glacier National Park if there were no glaciers?

I do not envy those world leaders who have to look beyond the borders of their individual countries when they establish climate-change-friendly policies for their countrymen and I despise those world leaders that wreak havoc without concern for life or the environment. My family and I will continue to do what we can to reduce our carbon footprint and conserve, and we hope you will continue to do the same.



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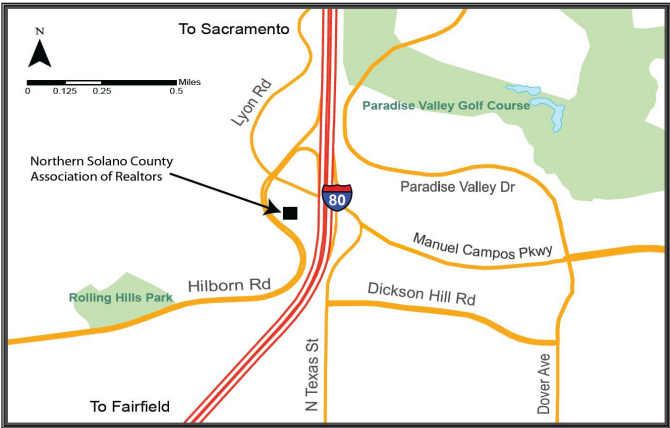


If you would like more information or need special accommodations for the RAB meeting, please contact Mark Smith, (707) 424-3062.

Travis AFB Restoration Advisory Board Meeting

April 21, 2016  
7 p.m.

Northern Solano County Association of Realtors  
3690 Hilborn Road  
Fairfield, CA



LOCATION OF INFORMATION REPOSITORIES

<b>Vacaville Public Library</b> 1020 Ulatis Drive Vacaville, CA 95688  (707) 449-6290  <b>Monday-Thursday:</b> 10 a.m. - 9 p.m. <b>Friday-Saturday:</b> 10 a.m. - 5 p.m. <b>Sunday:</b> 1 p.m. - 5 p.m.	<b>Fairfield-Suisun Com. Library</b> 1150 Kentucky Street Fairfield, CA 94533  (707) 421-6500  <b>Monday-Thursday:</b> 10 a.m. - 9 p.m. <b>Friday-Saturday:</b> 10 a.m. - 5 p.m. <b>Sunday:</b> 1 p.m. - 5 p.m.	<b>Mitchell Memorial Library</b> 510 Travis Boulevard Travis AFB, CA 94535  (707) 424-3279  <b>Monday-Thursday:</b> 10 a.m. - 9 p.m. <b>Friday:</b> Closed <b>Saturday:</b> 12 p.m. - 6 p.m. <b>Sunday:</b> 12 p.m. - 6 p.m.
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