Guardian

America's First Choice for Environmental Restoration

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Inside

Editor's Corner

In the April 2014 Guardian, we reported on a new Air Force website that allows anyone with a computer and an Internet connection to access records from Administrative Records of any Air Force facility that is cleaning up contamination under an Environmental Restoration Program. Unfortunately, we listed the wrong website address. The correct address to the Air Force Civil Engineer Center Administrative Record is: http://afcec.publicadmin-record.us.af.mil

We apologize for any inconvenience that this may have caused.

(Photo by Glenn Anderson)

Research in the Real World: Researchers from the University of California, Davis Department of Land, Air & Water Resources install a proprietary microbial testing probe into a monitoring well as part of an investigation to determine the potential of bacteria to clean up fuel additives.

The College Way to Cleanup

Travis AFB and UC Davis Take Part in Fuel Additive Study

By Lonnie Duke
Travis Environmental Project Manager

In the April 2012 Guardian, we reported on groundwater studies that evaluated the ability of naturally occurring microbes to break down dissolved chlorinated solvents. The results of these studies demonstrated that the bacteria in the groundwater beneath Travis AFB were capable of converting low concentrations of solvent contamination into harmless compounds without human intervention.

Because of the positive results of these studies, Travis AFB and three environmental regulatory agencies recently signed a Groundwater Record of Decision (see this edition's Viewpoint) that incorporates the natural breakdown of contaminants into an overall cleanup strategy to achieve cleanup levels and finish the job of restoring Travis AFB groundwater to its original condition.

Of course, this raises the question of whether other types of contaminants can be cleaned up through natural biological processes. For example, gasoline spills and leaks are relatively common occurrences at most gas stations and industrial facilities, and bacteria that use petroleum products as a food source have been studied in the laboratory for years and are fairly well understood. But the same cannot be said about the chemicals that were added to gasoline to improve automobile performance.

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Travis Air Force Base, California

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The ROD Less Travelled

VIEWPOINT

Mark H. Smith
Travis AFB Restoration Program Manager

Do you remember where you were on 20 July 1969, when Apollo 11 successfully put the first man on the moon? How about when America was attacked on 11 September 2001? Often, we remember many of the personal details of our day when a momentous event in history or in our lives takes place.

I remember where I was on 18 June 2014; I was in a conference room preparing for a regulatory meeting when I learned that Travis AFB received the last regulatory signature to its Groundwater Record of Decision (ROD), which finalized this decision document and wrapped up the last significant decisions that needed to be made concerning the environmental cleanup of the base.

Admittedly, this does not compete with putting a man on the moon, but for the members of the Travis AFB Restoration Support Team, this was a BIG DEAL. I covered the importance of this document in my April 2014 Guardian Viewpoint, and we discussed the remedy selection process in our April 2011 Guardian.

In April 2011, our estimate for completing the remedy selection process was June 2012. Why was our estimate off by two years? Because getting a ROD signed by all involved parties is HARD, and our ROD in particular was exceptionally challenging to finalize for a number of reasons.

First, unlike some RODs that cover a specific location and a handful of sites, the Travis AFB Groundwater ROD covers the entire base, addresses 19 sites, and assigns cleanup levels to all non-petroleum groundwater contaminants. In other words, it makes a lot of decisions!

Second, our ROD was signed by representatives of the U.S. Environmental Protection Agency Region 9 and two State of California environmental regulatory agencies. California has a reputation for having tough environmental laws and regulations, and EPA Region 9 also maintains stringent requirements. We knew from the start that it would take a lot of evidence and justification to gain acceptance of our preferred groundwater remedies in such a challenging regulatory climate, and it takes time to collect this amount of evidence.

Speaking of preferred remedies, our ROD is filled with innovative technologies that adhere strongly to Green and Sustainable Remediation principles. Rather than adding extraction wells, underground piping, and other treatment plant infrastructure to our existing groundwater extraction and treatment (GET) systems, all of which consume energy and require maintenance, we will create underground treatment zones through the use of injected vegetable oil. These zones use almost no electricity, or solar panels generate the energy needed to run the systems. These technologies are friendly to the environment and reduce dependence on the Travis electrical grid. If you had to choose between using electricity to run a groundwater pump or your home's air conditioner when the air temperature gets into the triple digits, which would you pick?

Probably the most significant aspect of our groundwater strategy is the reliance on Monitored Natural Attenuation (MNA) to reach cleanup levels and complete the selected actions. MNA uses physical, chemical and/or biological processes to convert contaminants into harmless compounds, so it tends to be slower than most active remedies. It can be used as a polishing step after a more active treatment strategy is finished (it is then called enhanced attenuation) or as a stand-alone cleanup approach if shown to be effective enough to achieve cleanup levels and protect human health and the environment.

One criticism of MNA is that it has the appearance of a "do nothing" remedy. Since natural processes are involved, the only thing that requires human involvement is the monitoring. If natural processes are not getting the job done, then it appears to the outside observer that the responsible party is just delaying any real

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Study

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Methyl Tertiary-Butyl Ether (MTBE) is one such fuel component. It was introduced to our gasoline supply in the 1970's as an oxygenate, because it raises the oxygen content in gasoline, allowing it to burn more completely and reduce exhaust emissions. As a result, MTBE was considered a potential solution to this country's air pollution challenges.

But what happens when MTBE-enriched gasoline that is leaked or spilled enters the groundwater? At low concentrations, MTBE gives water a bad taste, making large volumes of groundwater undrinkable. Even worse, the U.S. Environmental Protection Agency has looked at the available research data and believes that large amounts of MTBE can potentially cause cancer in people.

Travis AFB has two commercial gas stations, both of which have replaced leaking underground fuel tanks. The leaks created a MTBE plume that the base is cleaning up with a solar powered groundwater extraction and treatment (GET) system. The January 2011 edition of the Guardian discusses this system in more detail.

"Even though the GET system is making progress in cleaning up the MTBE contamination, it still requires routine maintenance and the occasional active carbon replacement, which is expensive," said Mr. Mark Smith, Travis AFB Restoration Program Manager. "It would be great to know if naturally-occurring 'bugs' could contribute to the cleanup." This is where the University of California, Davis enters the picture.

Like many other universities and commercial environmental companies, the UC Davis Department of Land, Air & Water Resources has studied the types of bacterial colonies that can break down MTBE and their genetic characteristics. Past work included small-scale lab studies and several field studies at Vandenberg AFB in southern California, which found that the native microorganisms at Vandenberg AFB could break down MTBE under oxygen-rich conditions. To gain a better understanding of how a MTBE cleanup can be accelerated, Travis AFB agreed to host a series of UC Davis studies. The first study took place last year and involved the collection of water samples from existing wells within the MTBE plume and their analysis for total bacteria and genes that are known to break down MTBE. The results of this study measured the amount of MTBE-degrading bacteria in Travis AFB groundwater and showed that MTBE does provide the carbon needed to promote the growth of microbial populations, but the lack of oxygen slows down this growth.

Tool Time: Sherry Peng, a UC Davis postdoctoral scholar, prepares the ISPT device for placement in a monitoring well downgradient from the Travis AFB gas stations. [Photo by Glenn Anderson]

This led to a second study that evaluated whether the introduction of oxygen could enhance the growth and activity of the microbes that break down MTBE. To carry out this study, UC Davis designed and built an in situ pilot test (ISPT) device. This device consists of two parts: an above-ground control system and an ISPT column set. The control system is housed in a water-proof container and consists of a small computer, a pump, a programmable timer, an oxygen tank, and a solar-powered battery. The ISPT column set is about three feet long, contains a top oxygen column and a bottom sand column, and can be installed in any standard 2" monitoring well.

To operate the ISPT, the column set is placed in a monitoring well, and the pump is activated. Contaminated groundwater receives oxygen from the oxygen column and enters the sand column. Microbes in the groundwater will cling to the surface of the sand particles and use the dissolved MTBE and oxygen to grow. Samples of groundwater that exit the sand column are collected and sent to a laboratory for analysis. At the end of the study, the ISPT is removed, and samples from the sand column are analyzed to determine the types and numbers of native microbes that grew on the sand particles during the ISPT operation. UC Davis will publish the chemical and microbiological results of the study in a report that will discuss the potential for a biology-based cleanup of MTBE-contaminated groundwater.

"We have supported this type of research project in the past with positive results," said Mr. Smith. "Even though the UC Davis studies will not prove conclusively that biology will clean up MTBE in a reasonable timeframe, they will add to the body of knowledge on MTBE bioremediation and provide an excellent first step in evaluating its potential for industrial applications."

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cleanup action.

Even before we started our first groundwater pump, we recognized that a day would come when it would be impractical to continue to build extraction well networks in order to chase residual low concentrations of groundwater contaminants. When EPA added MNA to the discussion of potential cleanup alternatives, we knew that it had to be a part of our long-term solution. We also knew that it would take a lot of data to verify that MNA actually took place at a fast enough rate to stop plume migration and reach cleanup levels.

For this reason, during the period when our GET systems were actively removing large amounts of groundwater contaminants, we developed a Natural Attenuation Assessment Plan and collected over a decade's worth of data that supported MNA. We also conducted microbial stud-

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ies through the Idaho National Laboratory that demonstrated convincingly that the bacterial colonies in the groundwater beneath Travis AFB are active and are able to break down contaminants in low concentrations. This investment of time and effort supports an effective, low-cost long-term environmental solution.

For Travis AFB, the remedy selection process is behind us, and we spent some of 18 June 2014 to celebrate this significant milestone for our restoration program. The next day, it was business as usual. We have to transition from remedy selection to cleanup action execution and optimization, and that takes more long-term planning and careful study of remedy performance. However, with a signed ROD in hand, we now know which technologies to use to reach the end of the road for the Travis AFB Environmental Restoration Program.

For the Air Force, that will be quite a milestone!

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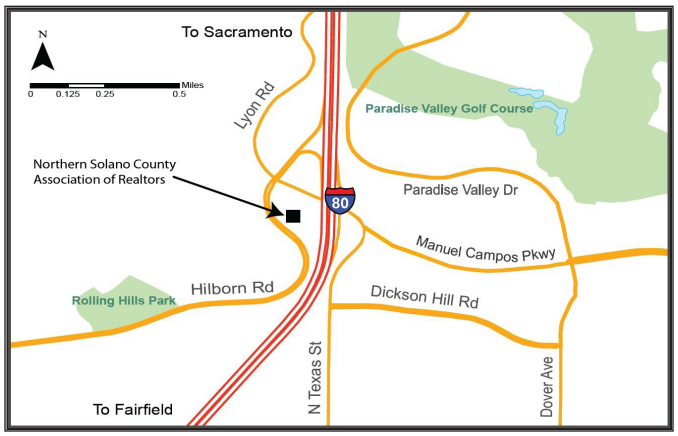
Travis AFB Restoration Advisory Board Meeting

October 23, 2014
7 p.m.

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



Location of Information Repositories

Vacaville Public Library
1020 Ulatis Drive
Vacaville, CA 95688

(707) 449-6290

Monday-Thursday: 10 a.m. - 9 p.m.
Friday-Saturday: 10 a.m. - 5 p.m.
Sunday: 1 p.m. - 5 p.m.

Fairfield-Suisun Com. Library
1150 Kentucky Street
Fairfield, CA 94533

(707) 421-6500

Monday-Thursday: 10 a.m. - 9 p.m.
Friday-Saturday: 10 a.m. - 5 p.m.
Sunday: 1 p.m. - 5 p.m.

Mitchell Memorial Library
510 Travis Boulevard
Travis AFB, CA 94535

(707) 424-3279

Monday-Thursday: 10 a.m. - 9 p.m.
Friday: Closed
Saturday: 12 p.m. - 6 p.m.
Sunday: 12 p.m. - 6 p.m.

If you would like more information or need special accommodations for the RAB meeting, please contact Mark Smith, (707) 424-8871. You can also view our web site at http://www.travis.af.mil/enviro

For more information about Travis AFB's restoration program, please contact:

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