Travis Air Force Base
Environmental Restoration Program
Restoration Advisory Board (RAB) Meeting

Meeting Minutes

21 October 2010

I. Welcome and Introduction

Mr. Smith called to order the regular meeting of the **Travis AFB RAB** at **7 pm** on **21 October 2010** in the **classroom at the Northern Solano County Association of Realtors office**. General introductions were made. Mr. Smith thanked everyone for attending. He also thanked Lt. Col Stephen Mitchell for filling in as the Air Force Co-Chair. Mr. Smith introduced Ms. Nadia Hollan Burke the new U.S. Environmental Protection Agency (EPA) representative for Travis AFB, who is the replacement for Mr. James Chang. Mr. Chang retired from the EPA earlier this year.

Roll Call

The following RAB members were present:

Name	Affiliation	Present
Lt. Col Stephen Mitchell	USAF, Travis AFB (Air Force Co-Chair)	✓
David Marianno	Suisun City Resident (Community Co-Chair)	✓
Jim Dunbar	City of Fairfield Representative	
Nadia Hollan Burke	U.S. Environmental Protection Agency (EPA)	✓
Cyrus Morad	Fairfield Resident	
Alan Friedman	SF Bay Regional Water Quality Control Board	✓
John Foster	Nat'l Association of Uniformed Services	✓
Mike Reagan	District 5, Solano County Representative	✓
Jose Salcedo	Dept of Toxic Substances Control (DTSC)	✓
Philip Velez	Travis Armed Forces Committee	✓
Kate Wren Gavlak	Travis Unified School District	✓

Public Members present:

Agencies and Contractors present:

- Mark Smith — Travis AFB 60CES/CEANR
- Glenn Anderson — Travis AFB 60CES/CEANR
- Lonnie Duke — Travis AFB 60CES/CEANR
- Gregory Parrott — Travis AFB 60 AMW/JA
- Merrie Schilter-Lowe — Travis AFB 60 AMW/PA

• Dezso Linbrunner	US Army Corps of Engineers, Omaha District
• Rachel Hess	ITSI
• Mike Wray	CH2M HILL
• Bill Cumberland	Citizen

II. Approval of minutes from last meeting

The previous meeting minutes were approved as written.

III. Additional Agenda Items and Questions

Mr. Smith asked if there were any questions about the agenda or if anyone had any additional items not already on the agenda. He stated that there will also be an opportunity at the end of the meeting to add agenda items or ask questions. Mr. Smith announced that Mr. Anderson will be presenting information on the second bioreactor that has been installed at the Base. Mr. Duke will be presenting the 2010 summer field work that was conducted at Travis AFB.

Mr. Marianno requested to speak about the dirt and concrete removal that was recently conducted on Creed Rd. Mr. Marianno said he thought that there was a lack of consideration from the Base during the dirt/concrete removal and that the debris and dust particles were getting in and on the neighboring properties. Mr. Smith pointed to a map of Travis AFB where the debris removal took place, admitted that there could have been better coordination with the local landowners at the beginning. Mr. Smith then provided a brief background on how the debris originally got there. The location was titled the "Rapid Runway Response Area". The Air Force would stage "pretend wartime scenarios" where training in response to a simulated damaged airfield was conducted. Later, in the 1990s Travis dumped other building materials and concrete at this site. The contractor that was assigned to the removal of concrete and other debris from the response area was instructed to start on the western portion of that site, but they started on the eastern portion instead. That did not allow Travis time to notify and communicate the removal schedule to the neighboring property owners. When the dust issue was brought to Travis' attention, the base immediately took corrective measures with the contractor. The contractor brought onto the response area two water trucks to wet down the dirt for dust control. Travis also talked to the property owners and apologized for the dust in and around their homes and property. Mr. Smith said the property owners appreciated the efforts Travis made to rectify the situation.

Mr. Duke added that the removed concrete is being reused for the new runway construction. This action alone saved Travis approximately three million dollars in disposal and procurement costs - "a win-win" result.

IV. Discussion Topics

a) Bioreactor "2.0"

Mr. Anderson presented information on the newly installed second Bioreactor.

A Bioreactor is a revolutionary way to treat high concentrations of solvents, primarily trichloroethene (TCE), in soil and groundwater. It starts with the excavation and proper disposal of the highly contaminated soil in the source area. The resulting hole is then backfilled with organic mulch and gravel. A bioreactor is kind of like an underground "percolator" that promotes the growth of solvent-eating microbes.

Bioreactor 1.0: The first bioreactor was installed at Site DP039, the "old battery shop", in 2008. Before the soil excavation could start, a concrete-encased vault had to be dismantled. The hole was excavated in a way that protected the original extraction well and then filled with fresh mulch and gravel, a water distribution manifold was placed on the top, and the top of the bioreactor was covered with clay soil. When the bioreactor was first turned on, the concentration of solvents going into the bioreactor was about 350 parts per billion (ppb), and the concentration of solvents leaving the bioreactor was 0.7 ppb. That is about a 99% treatment ratio. The preliminary results showed that the biological remedy was working, and the microbes were using the solvents as food. Since startup in early 2009, the influent concentration of solvents going into the bioreactor is decreasing, and the amount of solvents exiting is almost non-existent. The dual phase extraction well that is very deep and located directly beneath the bioreactor also shows that the TCE concentrations have dropped significantly. Outside of the immediate source area, some of the monitoring wells show the TCE concentration numbers are increasing. That is because water recirculation between the bioreactor and a connected extraction well is stirring up the solvents in the subsurface. This stimulates microbial growth and increases the extent of the treatment area.

<u>The observed Bioreactor Advantages include:</u>
Promotes growth of microbes that consume solvents.
Distributes dissolved organic carbon into clay soil.
Achieves almost complete breakdown of solvents.
Increases cleanup area through water recirculation.
100% solar powered.

<u>The observed Bioreactor Disadvantages include:</u>
Generates large amount of contaminated soil needing treatment or disposal.
Fresh mulch does not produce a lot of dissolved organic carbon (DOC).
It is still considered innovative.

Bioreactor 2.0: the second bioreactor was installed in 2010. Travis wanted to test this technology on its most contaminated solvent site. It is also the largest TCE groundwater plume on the Base. This site, Site SS016, is the most difficult

groundwater plume to access, because it lies mostly beneath the airfield (the runways and aircraft parking ramp). The bioreactor is located next to a very high security area and an active roadway adjacent to the airfield. Travis wanted to build a bioreactor that incorporated lessons learned from the first bioreactor. The Site SS016 bioreactor is 25% bigger (deeper) than the DP039 bioreactor and contains a mature mulch mixture for greater dissolved organic carbon production. The bioreactor was hooked up to an existing 300 foot horizontal extraction well which vastly increases its cleanup area. Mr. Anderson provided a map to show the location where the SS016 bioreactor was installed and how far the solvent plume extends to the south. The source area at Site SS016 was next to an old degreasing building.

Mr. Anderson provided before-and-after pictures, and short video clips of the SS016 bioreactor construction activities. A large metal wash rack canopy had to be dismantled before the bioreactor could be installed. The canopy has a monetary value and could potentially be used elsewhere on base. The contractors systematically removed that canopy so it could be reassembled in another industrial location.

The next step was to cut through and remove the concrete over the bioreactor footprint. Then the contaminated dirt was excavated and trucked to a temporary storage site on Base until it could be sampled and characterized.

The next steps:

- First: a layer of iron filings were placed at the bottom of the hole. Iron pyrite is capable of chemically breaking down intermediate compounds, known as daughter products.

- Second: the hole was filled up with mulch while mixing in emulsified vegetable oil (EVO). The vegetable oil is used to jump start the biological activity.

- Third: two water distribution manifolds (one is used as a backup) were placed on top of the mulch just before the hole was covered with a clay soil cap. The distribution manifold was connected to the 300 ft. horizontal well.

- Lastly: the bioreactor was covered with Astroturf for aesthetics.

Mr. Marianno asked for the definition of Bio. Mr. Anderson said it means biological, meaning it relies on mother-nature to do the cleanup work. Mr. Marianno asked how much water is pumped in from the extraction well. Mr. Duke said about 7 gallons per minute (gpm), enough just to circulate the water. Mr. Smith added that about every five years the bioreactor will need to be recharged. The cover will need to be removed to add more mulch and vegetable oil.

Ms. Burke asked if there is enough source area contamination left after the excavation to know if the bioreactor is working; how much contaminant reduction is due to source removal verses operation of the bioreactor. Mr. Anderson said that samples were collected for analysis during the excavation every five feet in depth. Baseline groundwater samples were collected before the bioreactor was turned on to compare with subsequent quarterly performance sampling.

Mr. Reagan asked if something was surrounding the bioreactor to protect it from vehicles driving over it. Mr. Anderson said yes, bollards were installed around the bioreactor to protect it from someone driving over it.

Groundwater Cleanup Status

- Interim remedial actions have achieved a significant amount of cleanup basewide over the past 12 years.

- Rebound tests are in progress for many of the plumes to evaluate the completeness of site cleanups. This is for sites where the TCE concentrations have dropped significantly. The wells are sampled to measure the TCE concentrations during the time the extraction wells are turned off to see if concentrations of the contaminants are “rebounding” or not.

- Travis has optimized all groundwater treatment systems on a continuing basis.

The Challenge

- Some sites still have relatively high solvent concentrations.

- The pump-and-treat technology that is employed at many of the sites may not achieve the required cleanup levels in a reasonable amount of time and it is also very energy intensive.

- A recent Executive Order calls for improvement of environmental and energy performance.

A Potential Solution

- The injection of emulsified vegetable oil (EVO) into the soil beneath the water table.

- Some of microscopic organisms eat the oil using up the available oxygen.

- Another type of microbe becomes active in the oxygen-poor environment and consumes the solvents as a food source.

- EVO is one of the many carbon sources that support biological cleanups. The emulsification suspends the oil in water for better distribution in the soil.

There are two different technologies in getting the EVO into the ground:

a) Multiple injections controlled and monitored from a valve station. The EVO and potable water mixture is slowly pumped into injection wells in the source area "hot spot".
b) Injection of EVO into a row of wells (called a biobarrier) across a solvent plume, creating a treatment zone. This technology is a plume control strategy. Contaminated water enters the biobarrier zone and is treated before it exits the zone.

Mr. Reagan asked what kind of contaminants can EVO treatment be used for. Mr. Anderson said it is used for chlorinated solvents; it cannot be used for methyl-tert-butyl-ether (MTBE), for example.

Mr. Duke presented on the 2010 Field Activities. Remedy in place (RIP) by 2010

Field Work Details

Mr. Duke reported on 2010 Field Work. A map of Travis was shown with all the Fieldwork locations by site and status.

- Site SS015: Site characterization has been completed. Installation of the injection wells will begin next week. Injection of the EVO will begin once the injection wells have been installed.

- Site SS016: Installation of the solar powered bioreactor 2.0 was completed.

- Site FT005: The last remaining soil site cleanup. Additional site characterization is complete and the remedial action is scheduled for next summer (2011).

- Site ST018-POCO (Petroleum only site): We are installing the extraction wells and treatment system to clean up Methyl Tertiary Butyl Ether (MTBE). The work is schedule to start next month (November 2010).

- Site SD036: Site characterization has been completed. The installation of injection wells to facilitate EVO injections will begin next week.

- Site SD037: Site characterization and injection of 37,000 lbs of EVO is complete.

- Site DP039: Site characterization and injection of 25,000 lbs of EVO into the biobarrier is complete.

- Land Use Control maintenance: A fence was installed around the CAMU, and contact information signs were placed on the fence. The grass around the Phytostabilization area was mowed. We removed some old groundwater treatment equipment that was installed in late 1990 at outfall 3 - some of the equipment is being reused at the Central plant. We removed approximately 10,000 cubic yards of metal, asphalt and concrete from site LF044.

Mr. Marianno asked for the definition of Phytostabilization. Mr. Duke said it makes use of the trees to uptake contaminated groundwater.

Mr. Duke said Travis has also been very busy cleaning up the base by getting rid of vegetation around the airfield to lessen the possibility of airplane bird strikes.

The groundwater sampling and analysis program (GSAP) semi-annual event is scheduled to start in November (2010).

Mr. Duke ended his presentation by extending an invitation to the RAB members for a tour around the base to see the fieldwork being conducted. Those interested should give him a call.

V. Cleanup Program Status

Mr. Smith talked about energy reduction accomplishments achieved in the cleanup program. All bases received executive orders to reduce energy use. In 2010 Travis started its third year of the performance based contracts (PBC). PBCs are being used Air Force wide to improve cleanup processes.

The goals of the Travis PBC include: Improve knowledge of the contamination plumes through additional site characterization, complete remaining soil and sediment cleanups, install enhanced attenuation demonstration projects (i.e., biobarrier, bioreactor, and EVO injections sites) and demonstrate that these techniques can do the same job as 'pump and treat' with a lot less energy use, and achieve final remedy in place (RIP) by 2012.

Travis Energy Goals: Reduce base energy intensity by 3% per year or 30% by 2015 using the year 2003 as a baseline (the original baseline year was 1985). Travis

started reducing energy consumption on base shortly after 1985. By implementing energy saving performance contracts, we reduced our energy use by about 10%.

Reducing energy in cleanup:

- The heavy equipment ITSI used for the sediment removal was fuel efficient, and used low-sulfur fuel. They also used only one mobilization for multiple cleanup sites.

- Energy reduction in ongoing groundwater treatment involves knowing where the contaminant concentrations are, applying the appropriate treatment technology, and continual optimization of remedial action operations.

The North Groundwater Treatment Plant before optimization: Over 82 million gallons of water has been treated since year 2000, and 500 lbs of contaminant mass has been removed. Over 10,000 kWh of electricity has been consumed monthly for treatment of the extracted groundwater. Over 13,000 lbs of CO_2 has been generated monthly.
The North Groundwater Treatment Plant after optimization: The groundwater extraction and treatment from site FT004, SD031 are completely shut-down for a long rebound study. The only treatment now is through three small granular activated carbon (GAC) units supplied by the solar extraction systems at site LF007C, which is also turned off during the winter months to protect a vernal pool.

The Central Groundwater Treatment Plant before optimization: Ultraviolet Oxidation (UV/Ox) was the primary treatment technology for extracted groundwater. The bulbs cost $2,000 each and the life of each bulb was about 3400 hours. The Thermal Oxidation unit (Th/Ox) was used to treat vapors and consumed a lot of natural gas.

The Central Groundwater Treatment Plant after optimization: The UV/Ox system was shut down and replaced with carbon filtration. Electricity use went from 7,000 kWh to 60 kWh monthly. The Th/Ox system was mothballed in favor of the solar powered bioreactor, which went from using 5,200 therms per month, to zero.

The West Treatment and Transfer Plant: the plant was shut-down for a rebound study. Although a potentially temporary action, the electrical use went from about 18,000 kWh per month, down to zero.

The South Groundwater Treatment Plant before optimization: over 703 million gallons of water was treated since 1998 and over 380 lbs of contaminant mass was removed. Over 17,000 kWh of electricity per month was consumed to treat the groundwater, and over 23,000 lbs of CO_2 was generated monthly.

The South Groundwater Treatment Plant after optimization: Energy use was reduced by the change in treatment technology from air stripping to granular activated carbon. The same amount of groundwater is treated and the mass removal rate is the same. Energy use has dropped to about 11,000 kWh of electricity consumed and 15,000 lbs of CO_2 being generated monthly.

In conclusion, Travis has made a lot of energy-saving changes including removal of the Th/Ox system, removal of the UV/Ox high energy lamps, removal of the energy intensive air stripper, switching to carbon for treatment at several treatment plants, and using solar panels for energy at many locations.

VI. Regulatory Agency Reports

Mr. Salcedo from the Department of Toxic Substances Control (DTSC) recommended that Travis AFB continue with the good progress and work.

Mr. Friedman from the SF Bay Regional Water Quality Control Board said he applauds Travis for the very aggressive schedule and to continue with the hard work necessary to make RIP in 2012. Travis is making great efforts in reducing energy costs and CO_2 emissions. Mr. Friedman said he has not seen this aggressive of an approach to energy reduction at any other base.

Mr. Foster said he loved The Guardian (Newsletter) and wanted to compliment and thank the authors on the contents of the most recent edition. It is one of the best. He said it is fascinating to see how much work is getting done and how Travis keeps cutting through the red tape to get things accomplished. Mr. Foster also applauds Travis' efforts in all the great cleanup work.

VII. Focus Group Reports

Mr. Smith thanked the Focus Groups for reviewing and providing comments on the following documents:

ST027 Site Characterization Report

Natural Attenuation Assessment Report (NAAR)

SD001/SD033 Remedial Action Report

Phytostabilization Study Report

2009 GWTP RPO Annual Report

VIII. RAB/Public Questions

None.

IX. Set Time and Place for Next RAB meeting

The next RAB meeting is scheduled for **21 April 2011** at the Northern Solano County Association of Realtors in Fairfield.

X. Adjournment

Mr. Smith adjourned the meeting at **9:10 pm**.

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Minutes submitted by: Jeannette Cumberland, CH2M HILL

Minutes approved by: Mark Smith