TRAVIS A · F · B

BACKGROUND SUMMARY, July 1995

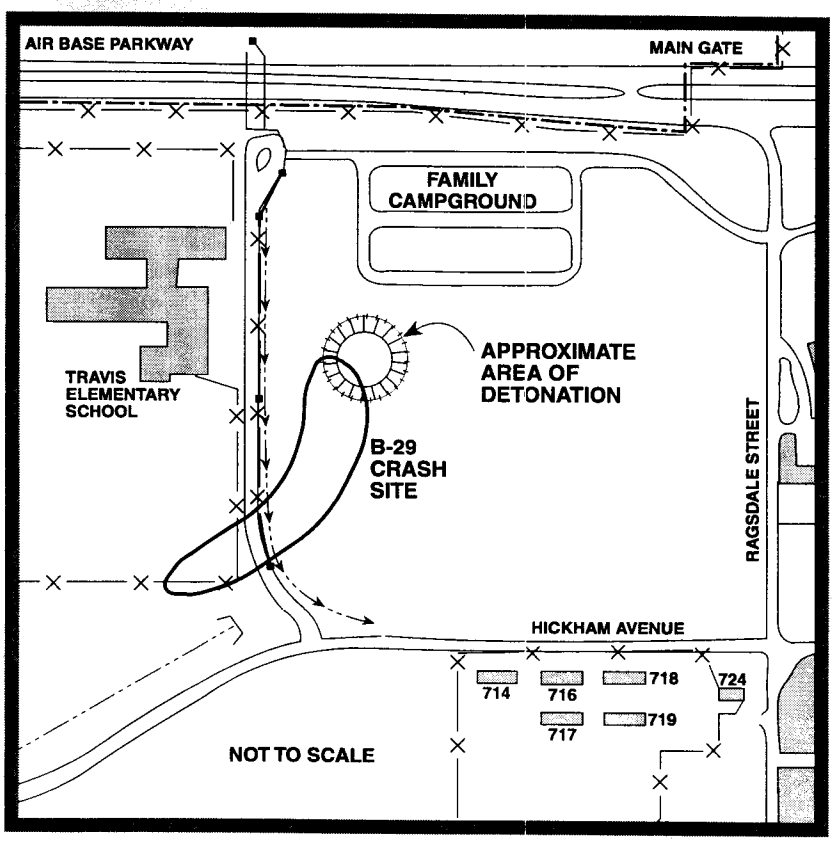
Revised and Updated

Environmental Investigations at the B-29 Crash Site

After extensive research, testing and study, investigators have concluded that the explosion following the B-29 crash in 1950 involved conventional explosives used in nuclear weapons of that era. Although a mildly radioactive substance, depleted uranium, was present, no radioactivity beyond normal background levels has been found in the soil or groundwater. According to procedures of that time, highly radioactive material used in bombs was transported separately in another aircraft. This background summary describes the investigations which led to these conclusions.

How Did it Happen?

Late in the night on August 5, 1950, a B-29 bomber on a secret military mission attempted an emergency landing shortly after takeoff. The aircraft crashed, slid to a stop south of the family campground, and caught fire. Approximately 20 minutes after the crash, the highly explosive component of the weapon (6700 pounds of RDX) detonated. RDX is an abbreviation for Cyclotrimethylenetrinitramine, a high explosive specifically developed for nuclear warheads. The explosion resulted in 19 fatalities, numerous injuries, and extensive damage to private and government properties. Debris was strewn over a 2-square mile area. Eight of the aircrew members, including the pilot, survived. The base commander, Brigadier General Robert Travis, was on board and died from injuries received in the crash. (The base, previously called Fairfield-Suisun Air Force Base, was renamed in his honor.)



Uncovering the History

In 1950, the United States was involved in the Cold War and on the brink of the Korean War. This mission, like all missions of its kind during the time, was classified. Data gathering efforts were complicated due to the passage of time and prior classification of this mission. In 1992, as part of the Installation Restoration Program (IRP) data-gathering work, Travis AFB was successful in declassifying the accident report.

Using the photographs in this report, they were able to identify the areas where the distressed plane hit the ground and where it exploded. Although the photos have a slightly grainy appearance, they clearly show the aircraft's impact point and the skid mark from its controlled crash. It slid in a northeast direction, deflecting slightly to the north due to a small topographic high on the east side of the field.

In March 1993, Travis AFB disaster preparedness staff, trained to interpret the effects of incidents like these, conducted an initial survey of the site. They looked for evidence of radiological contamination using portable field instruments. They did not find radiological readings above ranges that occur naturally in the rocks and soil of the region.

Travis AFB Investigation—Discovering the Facts

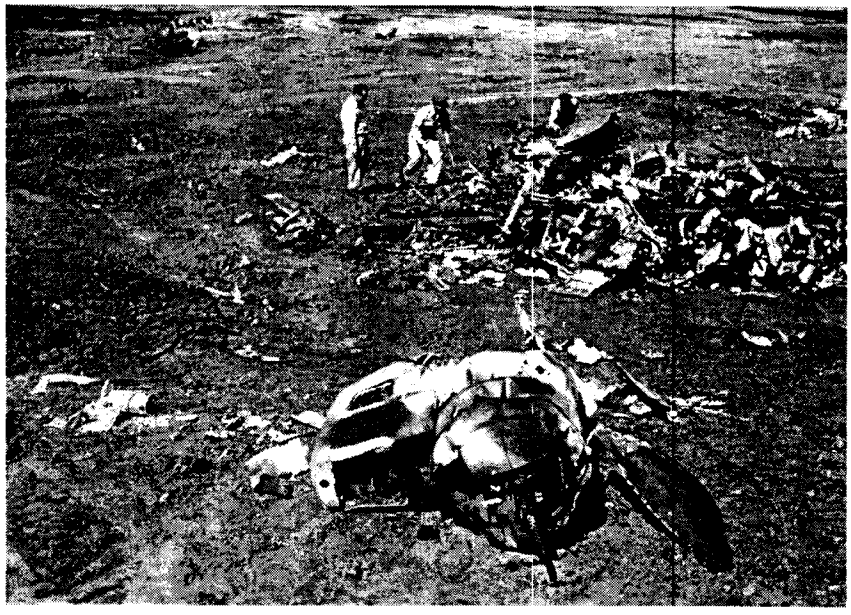
The 1990s brought the end of the Cold War and a renewed focus by the Air Force on environmental restoration and the protection of public health. Since 1992, Travis AFB has researched available information and has concluded the site shows no evidence of nuclear contamination. Had the post-crash explosion been caused by a nuclear reaction, the long-lasting plutonium and uranium isotopes would still be present today and easily detected in soil, on surfaces or in groundwater.

Although the site was cleaned up after the crash and explosion, no written record of an environmental review of the effects of the crash was found. Therefore, Travis AFB commissioned and conducted a thorough investigation, including a review of the post-crash Air Force investigation information, an initial assessment and a sampling and analysis study.

Outlining the Parameters

The site investigation focused on the post-crash explosion of the RDX and the possible distribution of depleted uranium resulting from the explosion. Existing data and background information helped to formulate the parameters of the investigation. They have concluded the explosion following the crash was not nuclear in nature and that no nuclear contamination resulted. This is based on several facts:

- Weapons safety protocol in the 1950s required separate transport of the weapon's nuclear core when flying inside the United States. In other words, to prevent an accidental nuclear detonation, the material capable of producing a nuclear reaction, such as plutonium and uranium-235, was flown in a different aircraft.



Air Force personnel inspect crash debris, August 1950

- Congressional testimony and statements from a surviving aircrew member provided documentation that no plutonium components were present on board the aircraft at the time of the crash.

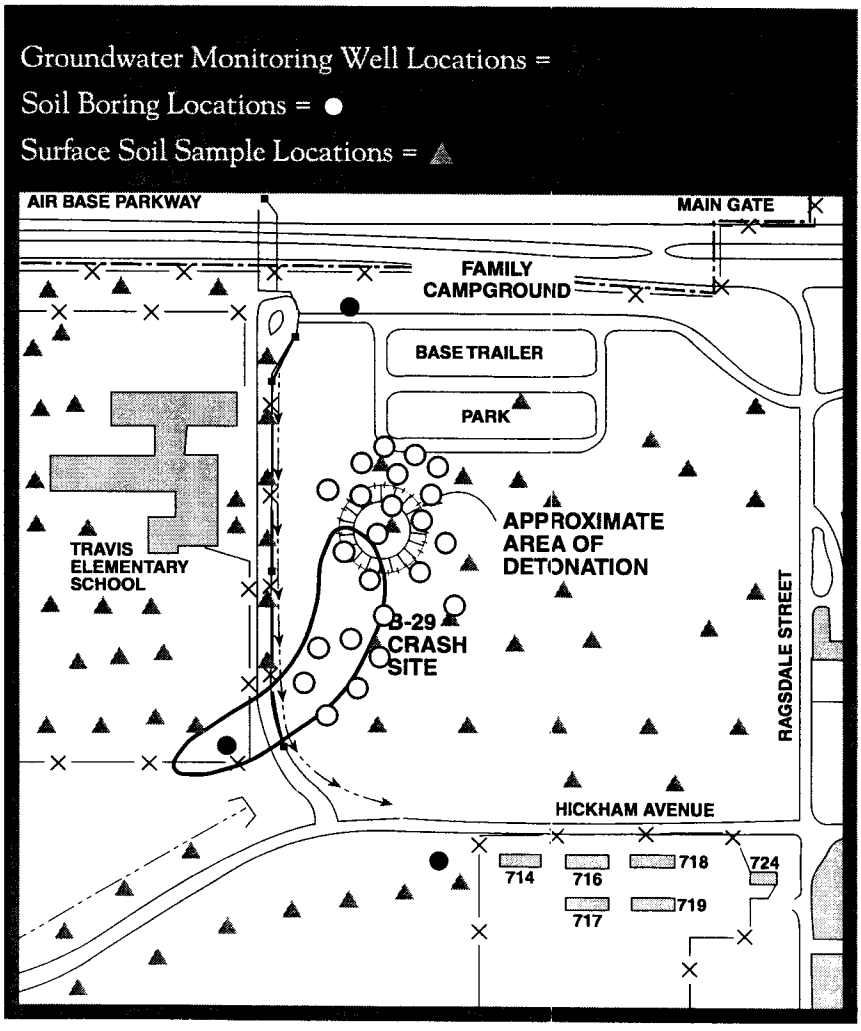
- The results of the site investigations have upheld this testimony. These results have also confirmed the thoroughness of the post-accident cleanup of depleted uranium debris.

Two-Stage Investigation

In March 1994, Travis AFB contracted for a more extensive site investigation of the crash and explosion area. It began with a review of all available and previously identified information in order to identify the site boundaries. In its commitment to be thorough, Travis AFB's investigation targeted specific areas, including the Travis Elementary School property and areas between the school and Air Base Parkway, Parker Road, and Hickham Avenue; the campground and the field east of the school; the field between Hickham Avenue and the railroad tracks; Scandia Elementary School property; and a field in base housing.

Boundaries were extended because, according to the aircraft accident report, the wind at the time of the explosion was coming from the southwest direction at 17 knots (approximately 20 mph), and fine-grained debris would have been deposited in downwind locations. The crash report also indicated that there were no clouds present nor any precipitation on the day of the crash. Historical weather pattern data from the Travis AFB weather office suggest that no rain for the remainder of August and the month of September 1950 could have produced surface runoff. This means it was not possible for fine-grained debris to be carried away from the crash site by surface runoff before completion of the accident investigation and cleanup.

The primary objective was to identify potential radioactive residue from the aircraft fuselage or bomb delivery vehicle on the surface of the targeted areas and to evaluate any resulting human health impacts. The second objective was to look for evidence of the crater that resulted from the detonation of the weapon's high explosives.



Professor Raabe Reviews Data

Professor Emeritus at the University of California at Davis, Dr. Otto G. Raabe served as a third party expert witness to review radiological test results generated by the 1994 studies at Travis AFB. Dr. Raabe has been a professor at U.C. Davis for over 18 years and has published over 300 scientific articles and technical reports. He is a member of numerous professional societies and is an American Board of Health Physics Certified Health Physicist.

Dr. Raabe lives in Davis, California, and is familiar with Travis AFB and the local terrain. As a professional courtesy to Travis AFB, Dr. Raabe reviewed the data collection methods and results from samples taken at the AFB.

Dr. Raabe described to Travis AFB that the samples tested at the base display normal expected statistical variability, and that some measurements are higher and others are lower than the average, but that they all fall within the normal range of radioactivity in typical soil samples in Northern California.

The tests taken at Travis AFB looked for gross alpha radiation emissions, which would indicate a presence of uranium, plutonium, or radium. The results of the tests indicated average values much less than those typically found to be naturally present in soils in the United States. If large amounts of gross alpha emissions were detected, Travis AFB would have conducted tests to quantify the levels of particular elements present.

Dr. Raabe concluded his analysis by informing the AFB that "There is no suggestion in these data of any contamination from plutonium, uranium, radium, or any other radionuclides above normal background levels." Dr. Raabe serves as an expert witness and consultant for radiation protection and radiation sciences for law firms, businesses, and government agencies.

Searching for Potential Radiation

The study began with a radiological survey of the targeted areas using a Field Instrument for the Detection of Low Energy Radiation (FIDLER). FIDLER monitoring is done at 12 inches above ground surface, and the field of view is about 3 feet in radius, so relatively large areas can be surveyed conveniently in less time. The purpose of the survey was to identify specific surface soil locations with elevated radiation levels in order to select and collect surface soil samples for analysis. This screening method precluded the possibility of missing any "hot spots" during a random collection of soil samples.

> " I found no indication of radioactive contamination above the normal range of naturally occurring radioactivity in soil."
>
> Prof. O.G. Raabe

A few elevated readings were noted. Surface soil samples were collected from those locations. Surface soil samples were also randomly collected to verify the FIDLER's accuracy. This also provided additional documentation that plutonium was not present and that depleted uranium components had been thoroughly removed from the site. A total of 80 surface soil samples were collected: 64 in the area around the crash site, 9 on Scandia Elementary School property, and 7 in the base housing field. These samples were analyzed at the Armstrong Laboratory (San Antonio, Texas) using gross alpha/beta and gamma spectroscopy methods.

Finding the Crater

The second objective of this investigation was to collect any physical or chemical evidence that could be used to locate the crater reported to have resulted from the detonation of the weapon's high explosives. These data could provide additional verification of the thoroughness of the original debris cleanup after

the explosion, verify whether petroleum or hydraulic fluid residue remained in the soil, and would be useful in identifying potential ecological impacts.

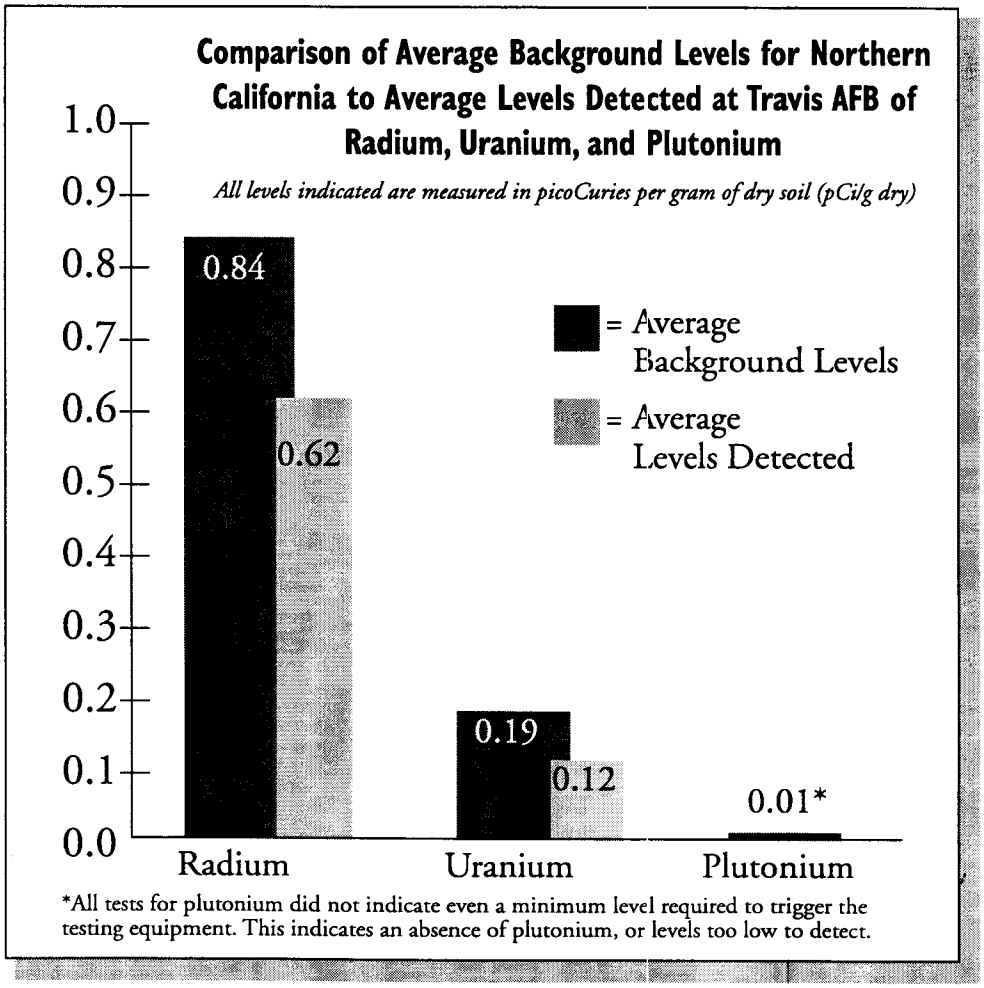
Subsurface sampling points were determined by using two aerial photographs from the accident investigation report and superimposing the impact point and the scrape mark from the aircraft skid on the ground onto several topographic maps of the crash site area. Since the cleanup activities and the backfilling of the crater may have obliterated any signs of the crater that were visible from the air, a sampling pattern was developed to cover the scraped area and the ground north of where the scrape mark ends.

A contractor drilled 23 boreholes at locations along transects starting from the center of the scrape mark. The soil borings were drilled using a patented soil coring method that extracted undisturbed soil cores in 2.5-foot intervals. Upon reaching a consolidated soil unit (rock and soil between 2 and 9 feet below ground surface), the ground penetration of the pneumatically driven core sampler would halt. This coring method was selected expecting that the soil used to backfill the crater would be unconsolidated and that penetration refusal by the core sampler could be an additional indicator for locating the consolidated or hard-packed sides of the reported crater.

After each core was brought to the surface, its alpha, beta, and gamma radiation emissions were checked in the field using portable radiological probes. These readings were made using factory calibrated instruments that were checked daily, and results were recorded in the boring log. None of the cores exhibited elevated radiation readings or signs of petroleum residue, so the collection of samples took place at intervals where extracted cores indicated discontinuities in the soil. To provide a measure of quality assurance for the analytical work to be conducted, 26 subsurface soil samples were split into two sets and sent to separate laboratories for both gamma radiation spectroscopy and gross alpha/beta radiation analysis.

A Third Analysis was Done for Ultimate Assurance

The results of the surface and subsurface soil analysis did not indicate the presence of radioactive contaminants related to the B-29 crash. As further confirmation of the validity of these analytical results,



Chronology of Events at the B-29 Crash Site

August 1950	B-29 Bomber crashed in open field
September 1952	Newly constructed Travis Elementary School opened
April 1992	Testimony before Senate Committee on Governmental Affairs
March 1994	Surface soil and vegetation studies and FIDLER survey done at the site
March 1994	Air Force/IT Corporation subsurface soil investigation
June 1994	Data analyses reported to agencies
August 1994	Second set of analyses completed (Armstrong Laboratory)
November 1994	EPA and DTSC requested groundwater sampling
April 1995	Groundwater sampling conducted

approximately 20 percent of the surface and subsurface soil samples were reanalyzed using alpha radiation spectroscopy to obtain quantitative values for plutonium and uranium. Two samples with the highest readings were selected for isotopic analysis; the remainder were selected randomly. The analytical results indicated no evidence of elevated quantities of uranium, plutonium, or other radionuclides. The concentrations of the samples analyzed were within the range of values expected from typical environmental soil samples.

Conclusions About the B-29 Crash

The aircraft took off with a full load of aviation gasoline. This fuel was incinerated during the fire and explosion, and any residual amounts of petroleum hydrocarbons would have degraded to undetectable levels after 45 years of volatilization and biodegradation. Therefore, petroleum hydrocarbons are not considered candidates for further investigation. Ecological exposure pathways are considered incomplete—in other words, because contaminants are not present, there is no way for them to reach humans or the environment.

The explosion would have scattered the metal from the aircraft and weapon shell throughout the site, however no metal remnants were found, supporting the thoroughness of the post-crash cleanup. While soil that may have been removed from the area has not been specifically identified (excavation of the drainage ditch, for example), if radiation contamination had occurred, evidence would still be detectable at the site. U-238, also referred to as depleted uranium, is a naturally occurring heavy metal that, due to its density, is commonly used as ballast in weapon carrier components. However, no radioactivity beyond usual background levels has been found in several rounds of soil analysis.

Proposed Action—A Health Protective Approach

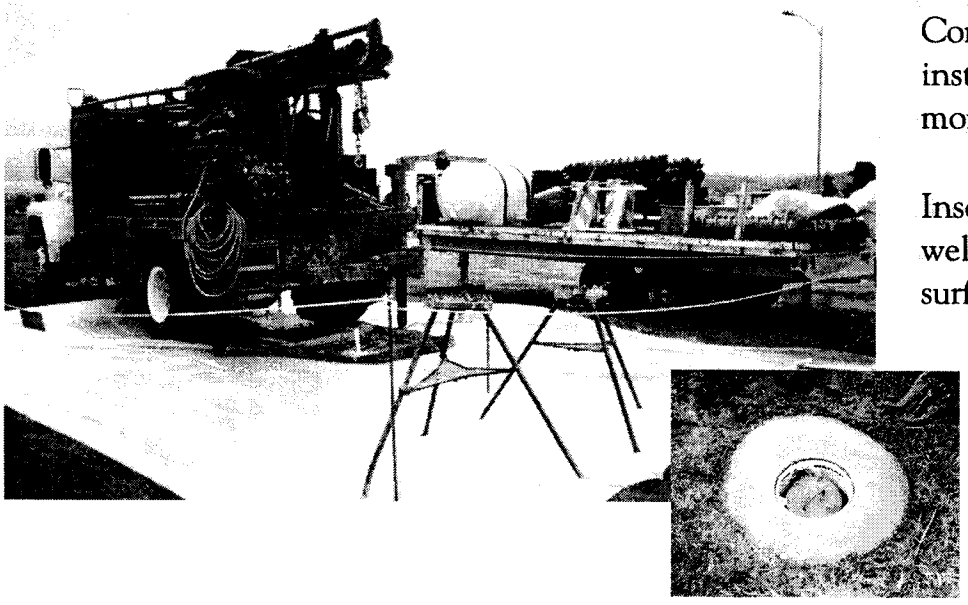
Naturally, community residents and Base families want the cleanest property and the safest environment for a school where children spend a good portion of their days. The Air Force is also concerned with

providing a healthy environment for the community and Travis AFB personnel. In 1993, local newspaper stories and the public raised the concern of possible nuclear contamination. The Base responded quickly, contracting for soil sampling and analysis. The urgency of answering the question of possible nuclear exposure precluded taking time to develop a work plan or follow other steps prescribed by CERCLA and other federal/state regulations.

When laboratory analyses of the soils were returned, the Base showed them to the U.S. Environmental Protection Agency (EPA), the California Department of Toxic Substances Control (DTSC), and the Regional Water Quality Control Board (RWQCB). Although the Base investigations had proceeded outside of the Federal Facilities Agreement (FFA) timeframes, the agencies agreed that the soils data were reliable and that the Base had sampled in the right places. Travis has prepared a work plan that presents these results and conclusions that the agencies have accepted. The agencies have requested and the Base has agreed to groundwater sampling to complete these investigations. Although specific radionuclides had not been detected above natural levels in either surface or subsurface soil samples collected at the crash site and in the surrounding area, Travis AFB preferred to take a conservative approach to closure of this site. Three groundwater monitoring wells have been installed in the area of the B-29 crash site. Groundwater samples have been analyzed for isotopic uranium, gross alpha, gross beta, gamma spectroscopy, and metals. Objectives for this kind of monitoring were to determine whether radioactive contaminants were present in the groundwater. Test results have been received and water sample data do not indicate any evidence of radioactive components dispersed as a result of the crash and fire. This is consistent with findings of past soil investigations.

Public Concerns and Air Force Commitment

Recognizing the importance of community feelings about this property, Travis is making its investigation an open process. This background summary is one way to make the information available to anyone who is interested. Technical documents placed in the Information Repositories located at the Fairfield-Suisun, Vacaville, and Travis libraries are available for community members to read. In keeping with the RI/FS requirements, Travis AFB has established a Restoration Advisory Board (RAB). This panel of community volunteers reviews the technical reports, discusses Base and Agency decisions, and provides input to the Installation Restoration process from the Community. Travis AFB is committed to environmental restoration and to maintaining a mutually beneficial relationship with the local community.



Contractors prepare to install groundwater monitoring wells.

Inset: A completed well as seen at ground surface.

For More Information:

If you have any questions or concerns, please contact:

Dixie Porter
Travis AFB, Public Affairs
707-424-5126

Information Repositories:

You can review documents and reports pertaining to the environmental investigation and cleanup at Travis AFB at the following libraries:

Mitchell Memorial Library
510 Travis Avenue (Building 436)
Travis AFB, California 94535
(707) 424-3279

Hours: Monday–Thursday 10 a.m. to 9 p.m.
Sunday 12 p.m. to 6 p.m.
(Closed Saturday)

Fairfield–Suisun Community Library
1150 Kentucky Street
Fairfield, California 94533
(707) 421-6500

Hours: Monday and Thursday 12 p.m. to 8 p.m.
Tuesday and Wednesday 10 a.m. to 6 p.m.
Saturday 10 a.m. to 5 p.m. (winter only)
Sunday 1 p.m. to 5 p.m. (winter only)
(Closed Friday)

Vacaville Public Library
1020 Ulatis Drive
Vacaville, California 95688
(707) 449-6290

Hours: Monday and Thursday 12 p.m. to 8 p.m.
Tuesday and Wednesday 10 a.m. to 6 p.m.
Saturday 10 a.m. to 5 p.m.
(Closed Friday)

Administrative Record

Environmental Management Office
420 Airmen Drive, Building 121
Travis AFB, California 94535
(707) 424-5126

Hours: Monday 8 a.m. to 4:30 p.m.
Friday Closed
(Closed Saturday)

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