CARSWELL AFB
TEXAS

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 765

Carswell/Plant 4
Restoration Advisory Board Meeting
August 21, 2003
6:00–8:00 pm

Agenda

Welcome/Introductions/Minutes	5 minutes
Westworth Redevelopment Authority Update	10 minutes
Action Items	
Carswell Off-Base/Charles Pringle	
Program Update	
– Nuclear Maintenance Waste Survey (Air Force Institute for Operational Health)	30 minutes
– Sanitary Sewer System Field Work Update	2 minutes
– Permeable Reactive Barrier Near Golf Course Update	2 minutes
– Amend Plant 4 ROD/OPS for Golf Course	2 minutes
Projected Future Land Transfers	
– Off-Site Weapons Storage Area EOD/FOST Update	4 minutes
– Golf Course Parcels/Total Update	5 minutes
Air Force Plant 4/George Walters	15 minutes
Program Update	
– Overview of Nuclear Aerospace Research Facility Closure (decommissioned in 1974)	
Carswell On-Base/Mike Dodyk	15 minutes
Program Update	
Next Meeting Agenda	5 minutes
Open Discussion/Questions	5 minutes

CARSWELL/PLANT 4
RESTORATION ADVISORY BOARD MEETING

DRAFT
Summary Minutes of August 21, 2003
Regular Quarterly Meeting

A regular meeting of the Carswell/Plant 4 Restoration Advisory Board (RAB) was held August 21, 2003 at the Lockheed Martin Recreation Association Ranch House, 3400 Bryant Irvin Road. The RAB meeting began at 6:00 p.m.

AGENDA

Welcome/Introductions/Minutes

Westworth Redevelopment Authority Update

Action Items

Community Co-Chair Nomination and Election

Carswell Off-Base (Charles Pringle)
Program Update
- Nuclear Maintenance Waste Survey (Air Force Institute of Operational Health)
- Sanitary Sewer System Field Work Update
- Permeable Reactive Barrier Near Golf Course Update
- Amend Plant 4 ROD/OPS for Golf Course

Projected Future Land Transfers
- Off-Site Weapons Storage Area EOD/FOST Update
- Golf Course Parcels

Air Force Plant 4 (George Walters)
Program Update
- Overview of Nuclear Aerospace Research Facility Closure (decommissioned in 1974)

Carswell On-Base (Mike Dodyk)
Program Update

Next Meeting Agenda

Open Discussion/Questions

WELCOME AND INTRODUCTION OF ATTENDEES

George Walters called the meeting to order. Mr. Walters informed the meeting participants that Allison Thompson, RAB Community Co-Chair, accepted a new position and that she would no longer be able to be the Community Co-Chair. He asked if anyone would like to fill the position, and if not, the Air Force would rotate chairing the meetings. Seeing no volunteers, Mr. Walters indicated that the Air Force would chair the next meeting. The minutes were approved from the May 8th meeting. No action items remain from the May 8th meeting.

WESTWORTH REDEVELOPMENT AUTHORITY

Leland Clemmons was not present at the meeting, therefore an update was not provided by the Westworth Redevelopment Authority.

CARSWELL OFF-BASE

Charles Pringle introduced himself and indicated that he works for the Air Force Center for Environmental Excellence and also represents the Air Force Real Property Agency. The Air Force Real Property Agency currently owns the land at the former Carswell Air Force Base (AFB). Mr. Pringle is responsible for overseeing the clean up of the BRAC land necessary for property transfer to the Westworth Redevelopment Authority.

Mr. Pringle introduced Dr. Jody Wireman from the Air Force Institute for Operational Health (AFIOH) out of Brooks AFB, which is part of the Air Force Surgeon General. Dr. Wireman's group was contacted by the Air Force Real Property Agency for assistance with radiological issues at the Weapons Storage Area portion of the former Carswell AFB. The Weapons Storage Area is located approximately 5 miles west of the main portion of the base.

Dr. Wireman spoke about the Weapons Storage Area survey that was conducted at Carswell AFB based on findings at other Air Force Bases. When investigating Loring AFB, it was discovered that maintenance workers in the 1950s and 1960s cleaned the interior portion of missiles using rags to wipe uranium oxide (rust) from the casing within the missiles. The oxidation had to be removed so that the missile components could slide together and function properly. As a result of this cleaning, small amounts of residual uranium would become embedded on cleaning rags and gloves which were disposed of in trenches. This same cleaning process was conducted at Carswell's Weapons Storage Area.

Solid Waste Management Unit (SWMU) 60 at the Carswell Weapons Storage Area consisted of three pipes containing disposed radioactive material. The Air Force is searching records to determine if these pipes were the same as the trenches likely used for disposal of the uranium contaminated wipes, rags, and gloves. It is possible that the

maintenance wastes were removed for off-site disposal but additional records search should determine if this was the case.

AFIOH has completed a preliminary assessment survey as of May 27, 2003, and discovered that there currently is no immediate danger of the radioactive material leaking due to the required depths that the trenches were dug. The next step will be to continue the records research to determine if there are other trenches besides those at SWMU 60, and asking retired maintenance personnel to come forward with any information they may have. If at anytime a trench is found that has high concentrations of radioactive materials, funds are already available to begin cleanup activities. The Air Force has contracted with Cabrera Services to investigate and clean up the area as necessary. The Air Force will work closely with the regulators to develop work plans for future investigation and clean up work as necessary. Mr. Pringle commented that they are in the midst of creating a Work Plan for the remediation and will be submitting the plan to the regulators so that in November everything will be in place to begin work.

Mr. Pringle introduced Mr. McShulley from Carbera Services, a radiological remediation specialty company. Mr. McShulley briefed the RAB participants on the type of radiological materials and re-affirmed that generally they are looking for clothing items that may have been buried in the trenches. He is confident that the part of the uranium that was accessed by workers was not at a high level, and would have presented more of a problem if it was ingested or inhaled. Mr. Pringle stated that all of the other weapons materials were taken off base and disposed of accordingly.

Tim Sewell, Texas Commission on Environmental Quality, requested that the information briefing handouts and so forth be submitted to his manager, Mark Reeder, in Austin. Mr. Pringle indicated that this information was provided to Mr. Reeder before the survey was conducted.

Next, Mr. Pringle updated the participants on the Sanitary Sewer System, SWMU 66. There are 12 sites that need remediation along the sanitary sewer once funding is received. Mr. Pringle is hopeful that work can begin this November and by June 2004, the site will be remediated and a report submitted to regulators for closure.

The Permeable Reactive Barrier installed by HydroGeoLogic is performing beyond expectations, for which Mr. Pringle is very pleased. There are several monitoring wells in place that are sampled quarterly to monitor the plume and its degradation.

AIR FORCE PLANT 4

Nuclear Research Facility

Mr. Walters indicated that knowing that the Weapons Storage Area would be discussed, he prepared a briefing on the nuclear aerospace research facility that formerly existed at AFP 4. The nuclear aerospace research facility was located on the very northern end of AFP 4. Mr. Walters showed pictures of the research facility circa 1960s and 1970s. One of the research projects conducted at the facility included a nuclear powered airplane. The

airplane wasn't light enough however, so that project wasn't successful. This area was also used for testing aircraft electronic components by radiating the components in order to monitor the damage suffered under fire. Once something is irradiated, it becomes radioactive and would have to be properly disposed of. When the site was decommissioned in 1974, over 17 millions pounds of debris was hauled away. As a result of the thorough cleanup, the site was given unrestricted use. In the 1980s when the Air Force identified the original Installation Restoration Program sites, this area was one of the 20 IRP sites identified. However, upon ranking the sites based on their potential risk, this site was very low. The top 19 sites scored between 88 and 51. This site scored a 6. The site has been sampled and a no-further-action report issued. Mr. Walters indicated that all the reports for Air Force Plant 4 are available on CD ROM and also are available for review at the White Settlement Library.

Mr. Walters indicated that people get nervous when they hear about radioactivity, but that hopefully the information about the Weapons Storage Area has been explained well enough so that people aren't nervous. He indicated that hopefully everyone here has a radioactive device in their homes—a smoke detector. Smoke detectors have a little bit of Americium-241 in it that ionizes the smoke. Americium-241 is alpha radiation, the kind of radiation blocked by skin. Alpha radiation causes damage when ingested.

Site Conceptual Model

Mr. Walters explained the conceptual site model of the site and showed slides illustrating the model. He indicated that there are many borings and monitoring wells on site that were used to prepare this model. The model maps the bedrock surface and the TCE plume among other characteristics of the sites. The model depicts exactly where in feet below the ground surface, one layer of stratigraphy changes to another. A paleochannel, an old stream bed where gravel has been deposited has been mapped and is depicted in the model. Gravel allows water flow through it much faster than in the bedrock. There are approximately 1,000 monitoring wells at both Carswell and Air Force Plant 4. The Air Force uses a Geographical Information System (GIS) to make sense of all the existing data. Mr. Walters indicated that Air Force Plant 4 was built in the early 1940s, during the war, and was built very quickly. The plant has miles and miles of pipes and unfortunately, a lot of them leak and contributed to groundwater flow. Mr. Walters explained that in localized areas the bedrock that protects the deep groundwater from the contamination in the terrace layers is missing. This means that the groundwater from the top layers can migrate down into the deeper layers. That's why in these areas like the East Parking Lot, the extraction wells keep the contamination from spreading.

This conceptual site model helps EPA and the regulators, as well as all the contractors, agree on what the subsurface conditions look like. Mr. Walters explained that this model is necessary because of the commingled TCE plume. The site conceptual model will be presented in a report due out in a couple of months.

The USGS conducted a survey at SWMU 22 (Landfill 4) at Carswell using new geophysical technology. This new radar can present detailed pictures of subsurface conditions. Mr. Walters' supervisor saw this technology at a conference and wanted to

use it at Air Force Plant 4. Carswell had a good area to test this technology. Mr. Walters explained that the landfill was already closed and had surveys done before. The landfill has also been capped so it is not a risk to anyone. Mr. Walters is hoping to have the results in a couple of months.

CARSWELL ON-BASE

Mike Dodyk, the Air Force's resident engineer at Carswell, began by giving the participants background on the environmental restoration program at Carswell. Carswell AFB officially closed on September 30th, 1993, and the majority of the base was realigned as the Naval Air Station Joint Reserve Base. A small portion of the base has been provided to the Westworth Redevelopment Authority. The Air Force is responsible for clean up of contamination occurring before October 1st, 1993, while Carswell was active.

In compliance with the Resource Conservation and Recovery Act (RCRA) the Air Force was required to conduct a RCRA Facility Assessment (RFA) which was done in 1989. This assessment identified areas of potential releases of contaminants. The RFA identified 87 sites on base that required additional investigation. These sites included landfills, fire training areas, and underground tanks. The RFA identified 68 SWMUs and another 19 Areas of Concern (AOCs), totaling 87 sites basewide. At this time, the Air Force has received closure on 78 of the 87 sites. Of the nine remaining sites, three are planned for closure this year, and another five sites are slated for closure summer of 2004. One site, AOC 1 remains under remediation.

To ensure the complete identification of sources of contamination, the Air Force is currently conducting a historical document review and interviews with former Air Force employees regarding any potential releases on this site. Archival records are being reviewed and interviews with Air Force personnel stationed at Carswell will be conducted. Mr. Dodyk invited people to take a flyer with them with a toll free number to call should they have historical information pertaining to Carswell.

Mr. Dodyk spoke about AOC 1 and the new groundwater treatment system. The system has six extraction wells, each approximately 33 feet deep. He explained how the water is being separated from the gasoline contamination and discharged to the City of Fort Worth sewer system. The treatment system has been in effect for 20 days as of the RAB meeting and has removed 0.67 pounds of benzene and 3.3 pounds of total petroleum hydrocarbons. There will be more monitoring of AOC 1 in the fall.

Mr. Dodyk indicated that that PRB performance monitoring will continue as scheduled, every three months. He explained that samples are collected upgradient of the PRB, within the PRB, and downgradient of the PRB to measure the performance. The PRB is successfully remediating the groundwater. Mr. Dodyk's presentation included an animated model of the PRB performance monitoring showing how the higher concentrations upgradient decreased as groundwater flowed through the PRB.

Upcoming field work includes delineation of soil contamination and related removal actions at SWMU 28, also known as Landfill 1. Soil delineation is also necessary at SWMUs 54 and 55, the Storm Water Interceptors, and East Gate Oil Water Separator, respectively.

Mr. Dodyk explained the details regarding a new demonstration project conducted on base. This project involves injecting vegetable oil into the groundwater to serve as a carbon source for microbes to digest. When the microbes digest the carbon, they also degrade the TCE that is in the groundwater. The vegetable oil injection study was conducted in the northern lobe of the TCE plume.

Currently, the regulators are reviewing the RFI Report for SWMUs 19, 20 and 21 combined together these sites make up the former Fire Training Area No. 2. Regulators are also reviewing the Final Site Investigation Report for Building 1010. Mr. Dodyk indicated that there are Executive Summaries available for these reports for participants to take with them. The Air Force is currently reviewing the RFI report for SWMU 49. Once the review is complete, the final version of this report will be submitted to the regulators for approval. The Air Force is also working closely with the regulators on the final version of the feasibility study for the southern lobe of the TCE plume.

NEXT MEETING

The next RAB meeting is scheduled for November 13, 2003.

OPEN DISCUSSION/QUESTIONS

A meeting participant, John Maddux, asked questions on how to obtain a closure letter stating that he is not liable for the contamination of his property, and that it is currently not contaminated. He was advised by Mr. Pringle to work with the TCEQ and obtain a Certificate of Innocence.

Mr. Walters asked the City of Fort Worth how to obtain information for the RAB participants on the City's sediment sampling program. He was advised that Clarence Reed is in charge of that program, but was asked to check the TCEQ website to gain further information as to who is responsible for the different areas of sampling and remediation.

Mr. Walters again asked if anyone would like the co-chair position. No one volunteered.

The meeting was adjourned.

IN ATTENDANCE

Carswell DERA (On-Base)
Mike Dodyk, AFCEE, Resident Engineer
Miquette Rochford, HydroGeoLogic, Inc.
Mike Hawkins, AFCEE
Audrie Medina, Booz Allen & Hamilton

Carswell AFBCA (Off-Base)
Charles Pringle, HQAFCEE/ERB
Dr. Jody Wireman, Air Force Institution for Operational Health
Steve McShulley, Air Services
Doug Karas, Air Force Real Property Agency

Air Force Plant 4
George Walters, AFP 4 Project Manager, ASC, Wright Patterson Air Force Base
Gregg McGraw, Shaw Group
Randall McDaniel, Shaw Group
Rick Wice, Shaw Group
Karen Katzenback, Public Affairs, Wright Patterson Air Force Base
Dan Schultz, Earth Tech
Dave Parson, Earth Tech

Texas Commission on Environmental Quality
Tim Sewell

U.S. Environmental Protection Agency
Bob Sullivan
Noel Bennett

Lockheed Martin
Elizabeth Rawls
Stacy Getuara

Others (Off-Base)
J'Nell Pate, Community Member
Jim Scanlan, City of Fort Worth Water Department
D.W. Owens, River Oaks
Greg Henderson, River Oaks
John Maddux, Community Member
Bill Olshefski, Retired Air Force
Michael Cook, TX ANG
Chris Breitling, City of Fort Worth Environmental Management Department

Comments regarding the meeting minutes should be sent to:

Ms. Miquette Rochford
HydroGeoLogic, Inc.
1155 Herndon Parkway, Ste. 900
Herndon, VA 20170
Phone: (703) 736-4511
Fax: (703) 471-4180
e-mail: mer@hgl.com

CARSWELL / PLANT 4 RAB Restoration Advisory Board FORT WORTH, TEXAS

Carswell/Plant 4

FINAL RCRA FACILITY INVESTIGATION REPORT SWMUs 19, 20, and 21 / Fire Training Area No. 2

Restoration Advisory Board Executive Summary #40 • August 21, 2003

INTRODUCTION

Naval Air Station Fort Worth Joint Reserve Base (NAS Fort Worth JRB), formerly Carswell Air Force Base, is in the process of planning and conducting activities for the identification, remediation, and closure of contaminated sites at the base through the Installation Restoration Program (IRP). The IRP is the primary mechanism of the Department of Defense for environmental response actions on U.S. Air Force installations. IRP activities are governed by provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and other applicable federal and state regulations. The IRP at NAS Fort Worth JRB is being conducted through the combined efforts of the Air Force Center for Environmental Excellence (AFCEE) and the Air Force Real Property Agency (AFRPA).

PROJECT BACKGROUND

A RCRA Facility Investigation (RFI) was conducted at solid waste management units (SWMU) 19 (former Fire Training Area No. 2), 20 (waste oil storage tank), and 21 (waste fuel storage tank). The locations of SWMUs 19, 20, and 21 are presented in Figure 1. SWMU 19 consisted of a circular fire ring with soil berms around its perimeter. The area within the berms contained steel dumpsters that were arranged in the shape of an aircraft. Periodically, the dumpsters were filled with waste oil and waste fuel and ignited during fire training exercises to simulate aircraft fires. Fire training activities at SWMUs 19, 20, and 21 were conducted from 1963 to 1991. The RFI of SWMUs 19, 20, and 21 was required by the base's RCRA hazardous waste permit (HW-50289).

RCRA FACILITY INVESTIGATION STRATEGY

The purpose of the RFI was to obtain closure of the sites under the TCEQ Risk Reduction Standard (RRS) program. The RFI sampling plan was designed to determine if a release from SWMUs 19, 20, and 21 had occurred. Essential information consisting of soil lithology, the nature of wastes encountered, and an assessment of potential contaminant impacts on the quality of soil and groundwater within and around SWMUs 19, 20, and 21 was obtained to determine if the site presented a threat to human health or the environment.

RFI activities at SWMUs 19, 20, and 21 were initiated in May 2000 and were concluded in January 2003. These activities included 2 geophysical surveys, 4 exploratory excavations, and the installation of 41 soil borings, 7 monitoring wells, and 19 piezometers. A total of 203 soil and 51 groundwater samples were collected for laboratory analysis.

Upon review and evaluation of the data, evidence of a release of metals, volatile organic compounds, and semivolatile organic compounds into soil was found. However, all contaminants of concern for soil were delineated, and concentrations were shown to be protective of human health and the environment.

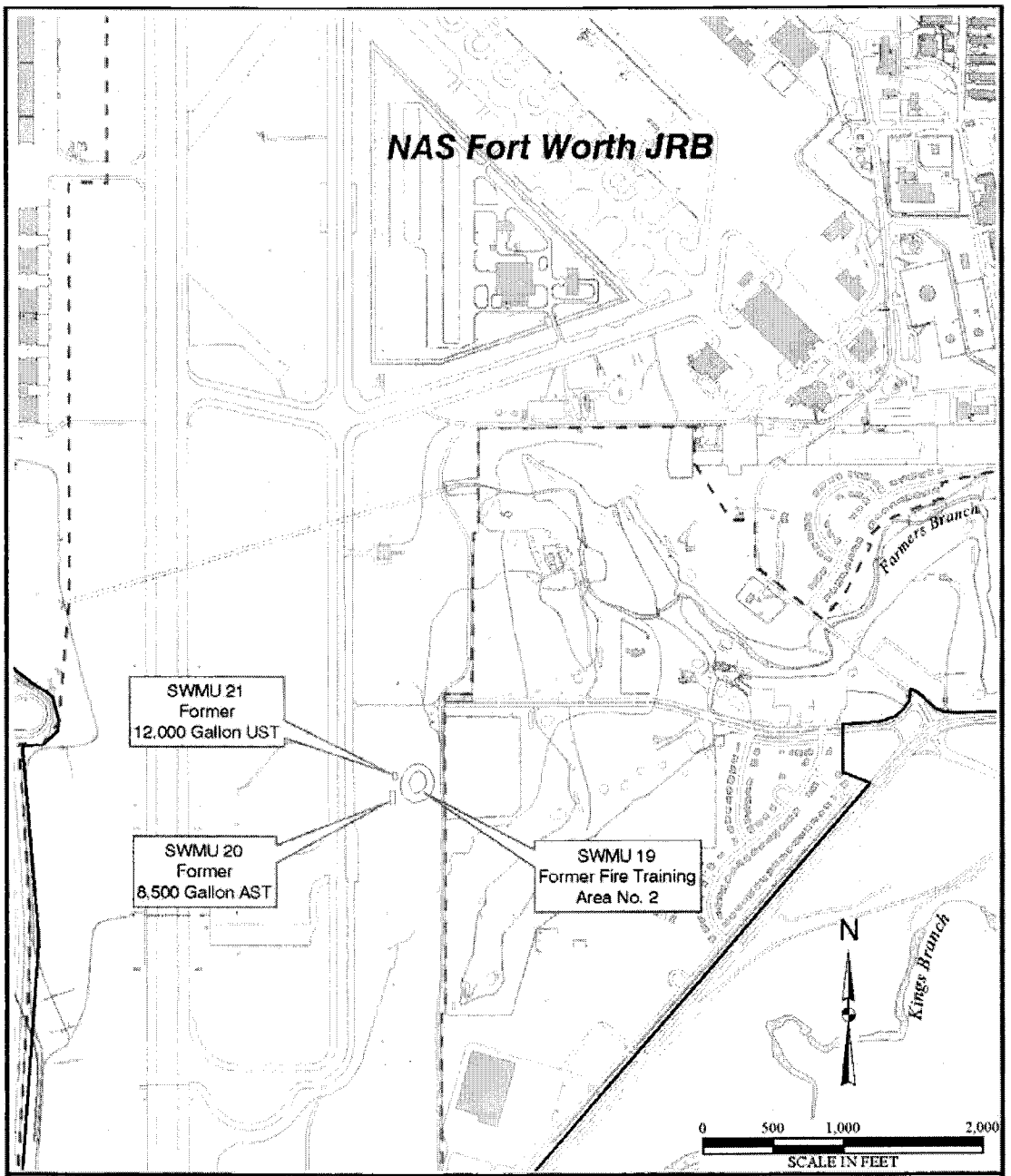
In addition, evidence of a release of petroleum-related compounds into groundwater at SWMU 19 was also identified. Free-phase petroleum product was removed from a monitoring well located in the center of SWMU 19. Other dissolved petroleum-related compounds were delineated in groundwater. The remaining concentrations of petroleum-related compounds in groundwater are at or below RRS 2 concentrations, and these compounds were delineated to RRS 1 levels. Therefore, petroleum-related compounds present in groundwater at SWMU 19 do not appear to pose a threat to human health and the environment.

Analytical results from monitoring well data also suggest that SWMU 21 and possibly SWMU 19 may have been contributing sources of tetrachloroethene (PCE) and trichloroethene (TCE) to the basewide TCE plume, which affects a large area of NAS Fort Worth JRB groundwater. However, as PCE, TCE, and other related chlorinated solvents detected in groundwater at SWMUs 19, 20, and 21 are migrating into the downgradient permeable reactive barrier designed to remediate chlorinated solvents, the potential risk to human health and the environment has been mitigated.

Consequently, the Final RFI Report recommended closure of soil under RRS 2 for SWMUs 19, 20, and 21. The RFI Report was submitted to the TCEQ for review and approval in June 2003.

For More Information:

If you would like more information, please see our website at http://www.afcee.brooks.af.mil/er/carswell/nasfw/ or contact Michael Dodyk, HQ AFCEE, at (817) 782-7169 or via e-mail at Mike.Dodyk@carswell.af.mil.



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Source: HydroGeoLogic, Inc GIS Database

Legend

- NAS Fort Worth JRB Boundary
- Former Carswell AFB Boundary
- Solid Waste Management Units 19, 20, and 21
- AST Aboveground Storage Tank
- UST Underground Storage Tank

Figure 1

Location of SWMUs 19, 20, and 21 NAS Fort Worth JRB, Texas

Carswell/Plant 4

FINAL SITE INVESTIGATION REPORT Building 1010 Jet Engine Test Stand

Restoration Advisory Board Executive Summary #41 • August 21, 2003

INTRODUCTION

Naval Air Station Fort Worth Joint Reserve Base (NAS Fort Worth JRB), formerly Carswell Air Force Base, is in the process of planning and conducting activities for the identification, remediation, and closure of contaminated sites at the base through the Installation Restoration Program (IRP). The IRP is the primary mechanism of the Department of Defense for environmental response actions on U.S. Air Force (USAF) installations. IRP activities are governed by provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and other applicable federal and state regulations. The IRP at NAS Fort Worth JRB is being conducted through the combined efforts of the Air Force Center for Environmental Excellence (AFCEE) and the Air Force Real Property Agency (AFRPA).

PROJECT BACKGROUND

A Site Investigation (SI) was conducted at the former Building 1010 Jet Engine Test Stand, which was located in the southeastern portion of NAS Fort Worth JRB (Figure 1). The SI was conducted based on historical aerial photographic evidence that suggested jet engine testing activities likely occurred at the site. A series of historical aerial photographs from February 1954 through April 1979 identified a V-shaped earthen berm used for testing aircraft engines. The SI was conducted at the request of the United States Environmental Protection Agency (USEPA) Region VI and the Texas Commission on Environmental Quality (TCEQ). It should be noted that the former Building 1010 Jet Engine Test Stand was not included in the NAS Fort Worth JRB RCRA hazardous waste permit (HW-50289). Therefore, this SI was performed as a proactive measure as a voluntary action of the USAF.

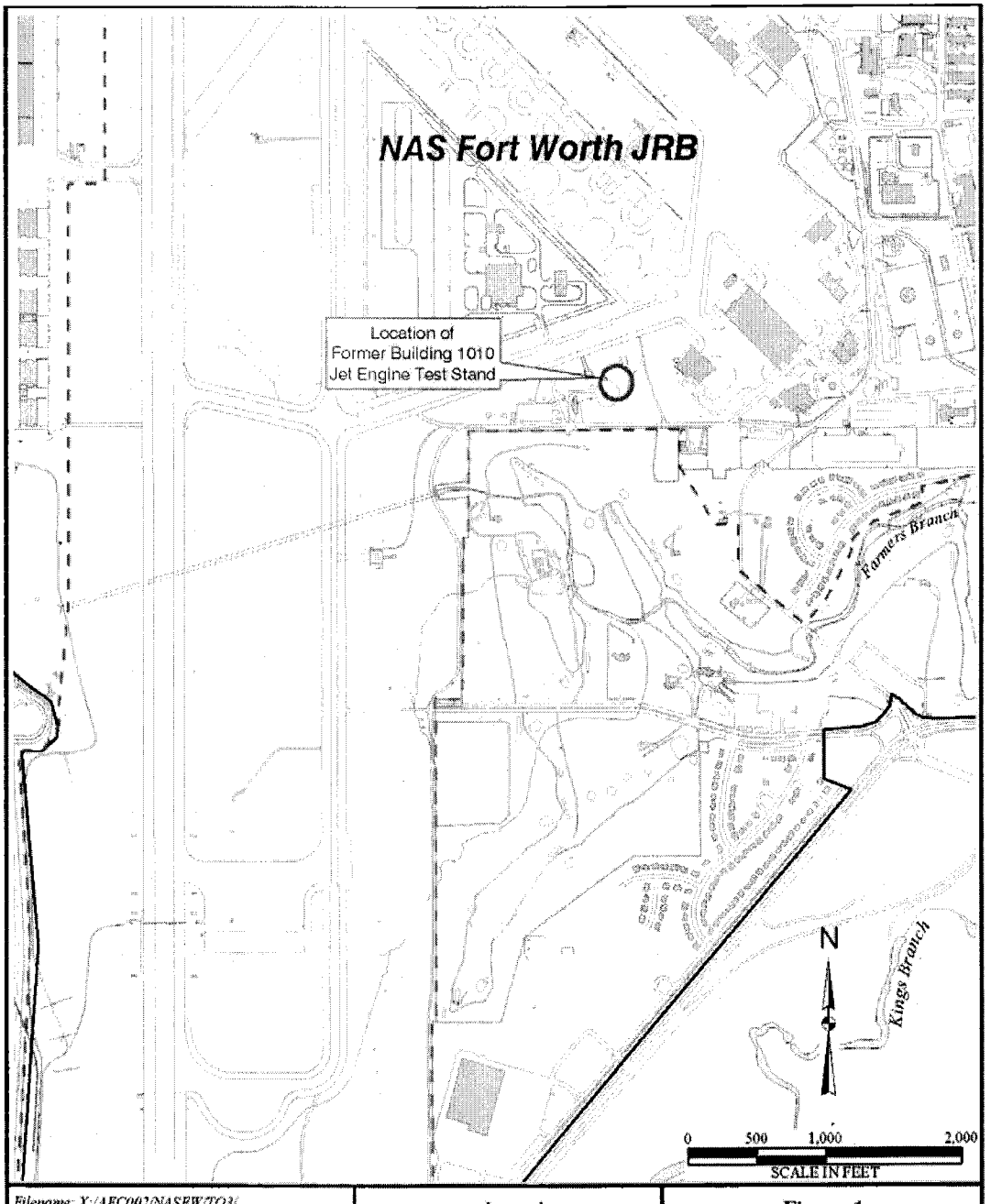
SITE INVESTIGATION STRATEGY

The SI was designed to achieve site closure under the Texas Commission on Environmental Quality Risk Reduction Standard (RRS) program. A SI sampling plan was designed to determine if a release from the Building 1010 Jet Engine Test Stand had occurred. In concurrence with the TCEQ, analytical methods were selected based on likely contaminants of concern resulting from typical activities conducted at jet engine test stands. The selected analytical methods included total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). Essential information consisting of soil lithology and an assessment of potential contaminant impacts on the quality of soil and groundwater within and around the former Building 1010 Jet Engine Test Stand were obtained.

SI activities at the former Building 1010 Jet Engine Test Stand were conducted in January 2003. These activities included the advancement of 2 soil borings, and the collection and analysis of 11 soil samples.

Field observations and analytical results indicate that a release to soils has not occurred at the former Building 1010 Jet Engine Test Stand. In addition, concentrations of TPH, VOCs, and SVOCs associated with jet fuel and lubricants were not detected above RRS 1 concentrations. Therefore, it is unlikely that shallow groundwater was affected. The Final Building 1010 Jet Engine Test Stand SI Report recommending closure under RRS 1 was submitted to the TCEQ in July 2003.

For More Information:
If you would like more information, please see our website at http://www.afcee.brooks.af.mil/er/carswell/nasfw/ or contact Michael Dodyk, HQ AFCEE, at (817) 782-7169 or via e-mail at Mike.Dodyk@carswell.af.mil.



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Source: HydroGeoLogic, Inc GIS Database

Legend

- NAS Fort Worth JRB Boundary
- Former Carswell AFB Boundary

Figure 1

Location of Former Building 1010 Jet Engine Test Stand

Carswell/Plant 4

FINAL
RCRA Facility Investigation Report
SWMU 49 / Former Aircraft Washing Area No. 1

Restoration Advisory Board Executive Summary #42 • November 13, 2003

INTRODUCTION

Naval Air Station Fort Worth Joint Reserve Base (NAS Fort Worth JRB), formerly Carswell Air Force Base, is in the process of planning and conducting activities for the identification, remediation, and closure of contaminated sites at the base through the Installation Restoration Program (IRP). The IRP is the primary mechanism of the Department of Defense for environmental response actions on U.S. Air Force installations. IRP activities are governed by provisions of the Comprehensive Environmental Response, Compensation, and Liability Act, the Resource Conservation and Recovery Act (RCRA), and other applicable federal and state regulations. The IRP at NAS Fort Worth JRB is being conducted through the combined efforts of the Air Force Center for Environmental Excellence and the Air Force Real Property Agency.

PROJECT BACKGROUND

A RCRA Facility Investigation (RFI) was conducted at solid waste management unit (SWMU) 49, also known as the Former Aircraft Washing Area No. 1 (see Figure 1 for SWMU location). This unit served as an aircraft washing area and drain collecting wastewater from cleaning and maintenance activities from military aircraft. SWMU 49 encompassed an area 150 feet wide by 300 feet long. The perimeter was bordered by a 6-inch high concrete berm with openings on either side for aircraft to enter and exit. The area within the berms was paved with asphalt and sloped toward a central drain measuring 2 feet by 2 feet. The drain discharged to an oil water separator where any petroleum products were separated. The remaining discharge was then directed to the West Fork Trinity River. Based on aerial photographs, SWMU 49 was operational from 1955 until the early 1990s. The area was then repaved with reinforced concrete and is currently used for parking military aircraft. The RFI at SWMU 49 is required by the base's RCRA hazardous waste permit (HW-50289) that was issued by the Texas Commission on Environmental Quality (TCEQ).

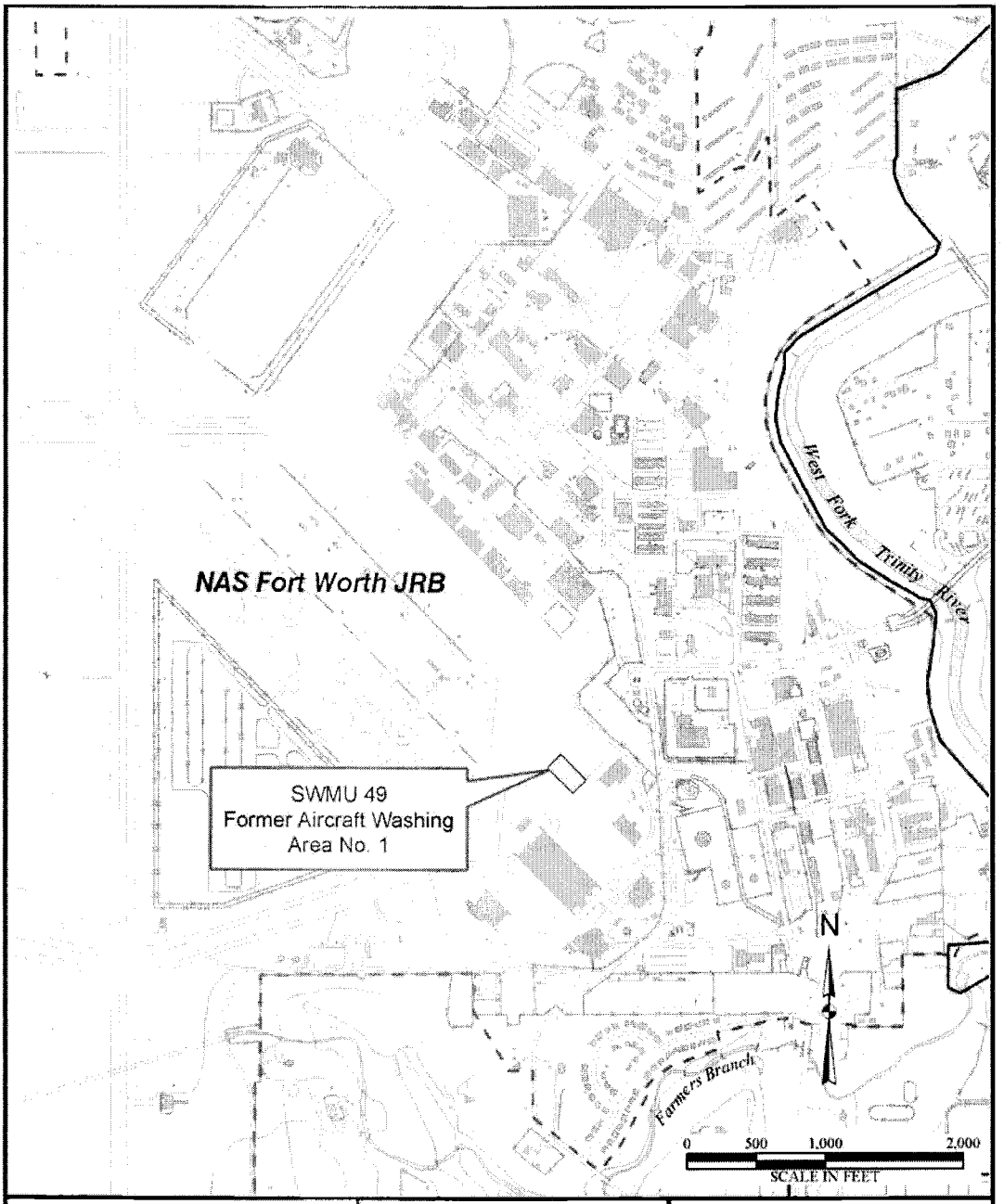
RCRA FACILITY INVESTIGATION STRATEGY

The goal of the RFI was to obtain closure of the site under the TCEQ Risk Reduction Standard (RRS) program. Consequently, an RFI sampling plan was designed to determine if a release from SWMU 49 had occurred and, if contamination was encountered, delineate the nature and extent of the contamination. Essential information consisting of soil lithology and an assessment of potential contaminant impacts on the quality of soil and groundwater within and around SWMU 49 was obtained. RFI activities at SWMU 49 were initiated in January 2002 and concluded in January 2003. These activities included the installation of 7 soil borings and 4 monitoring wells and the analysis of 36 soil samples and 15 groundwater samples.

Analytical results indicate that SWMU 49 may have had an impact on the surrounding soil and groundwater. Therefore, this RFI Report recommended closure under RRS 2 for SWMU 49. Analytes detected in soil and included in the RRS 2 deed certification included ethylbenzene; m,p-xylenes; o-xylene; toluene; fluoranthene; naphthalene; phenanthrene; 1,2,-dichlorobenzene; and 2-methylnaphthalene. Analytes detected in groundwater and included in the RRS 2 deed certification include benzene, ethylbenzene, and o-xylene. The Final SWMU 49 RFI Report recommending closure under RRS 2 was submitted to the TCEQ for review in September 2003.

For More Information:

If you would like more information, please see our website at http://www.afcee.brooks.af.mil/er/carswell/nasfw/ or contact Michael Dodyk, HQ AFCEE, at (817) 782-7169 or via e-mail at Mike.Dodyk@carswell.af.mil.



Map Source: HydroGeoLogic, Inc. GIS Database
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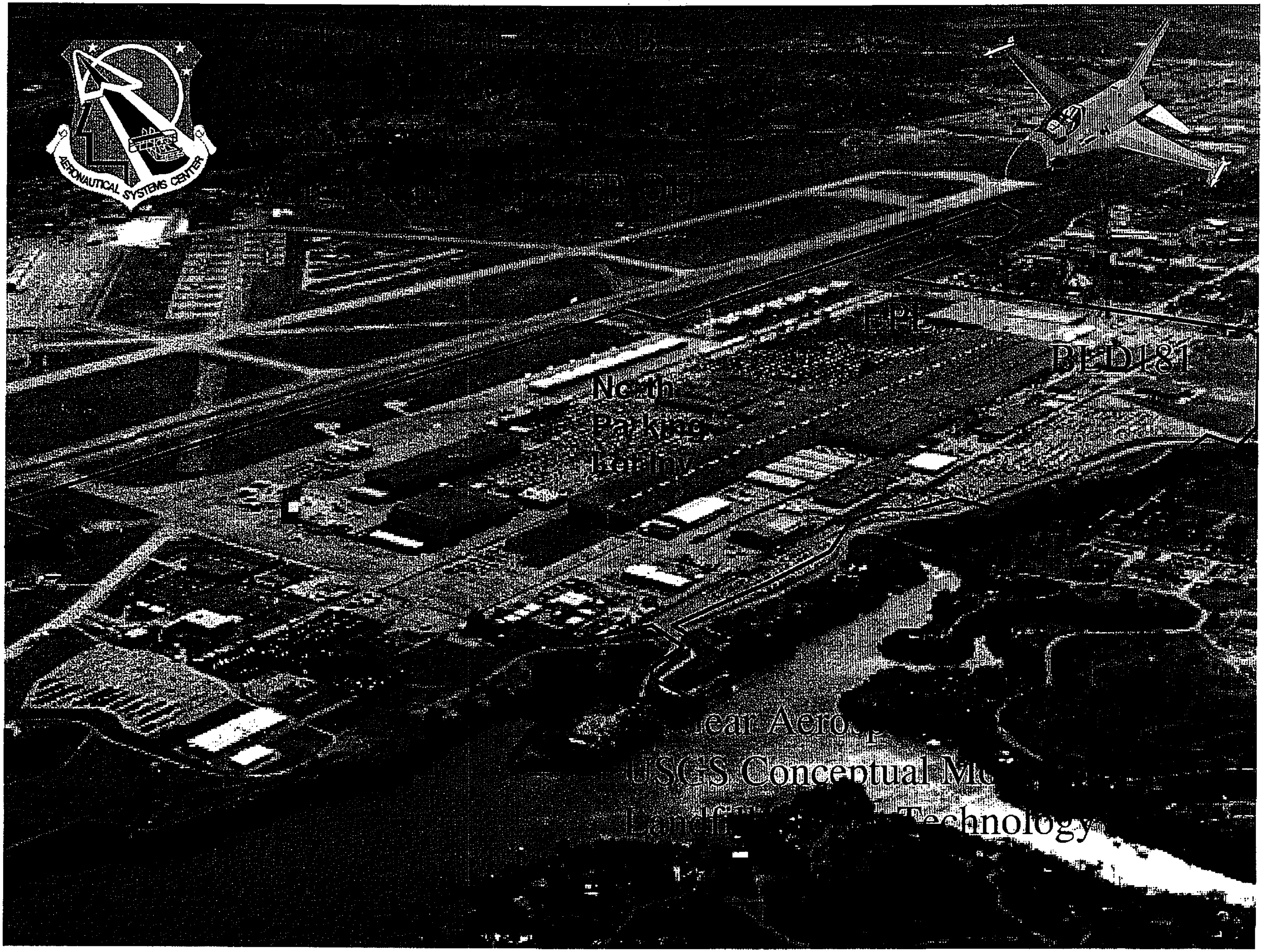
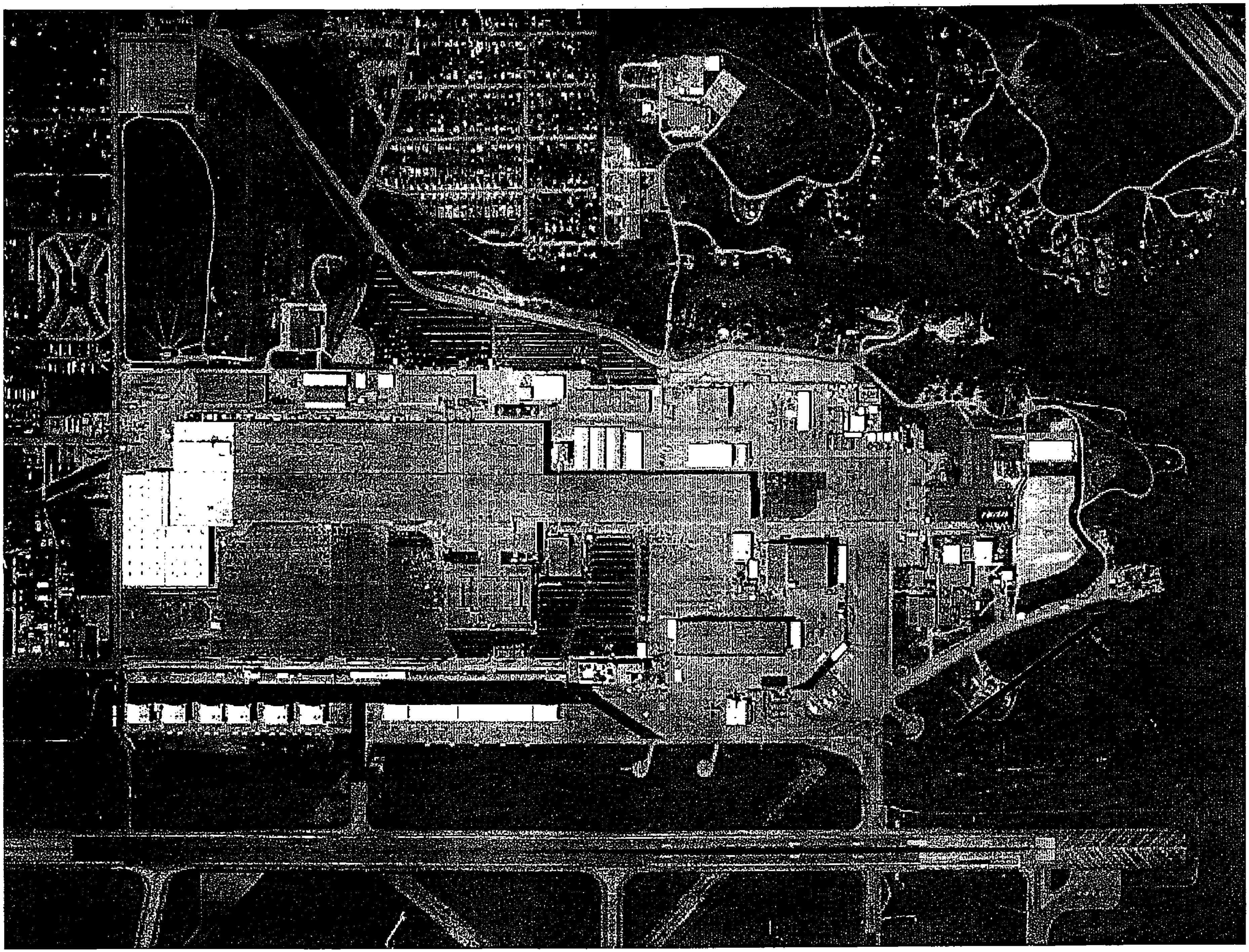
Legend

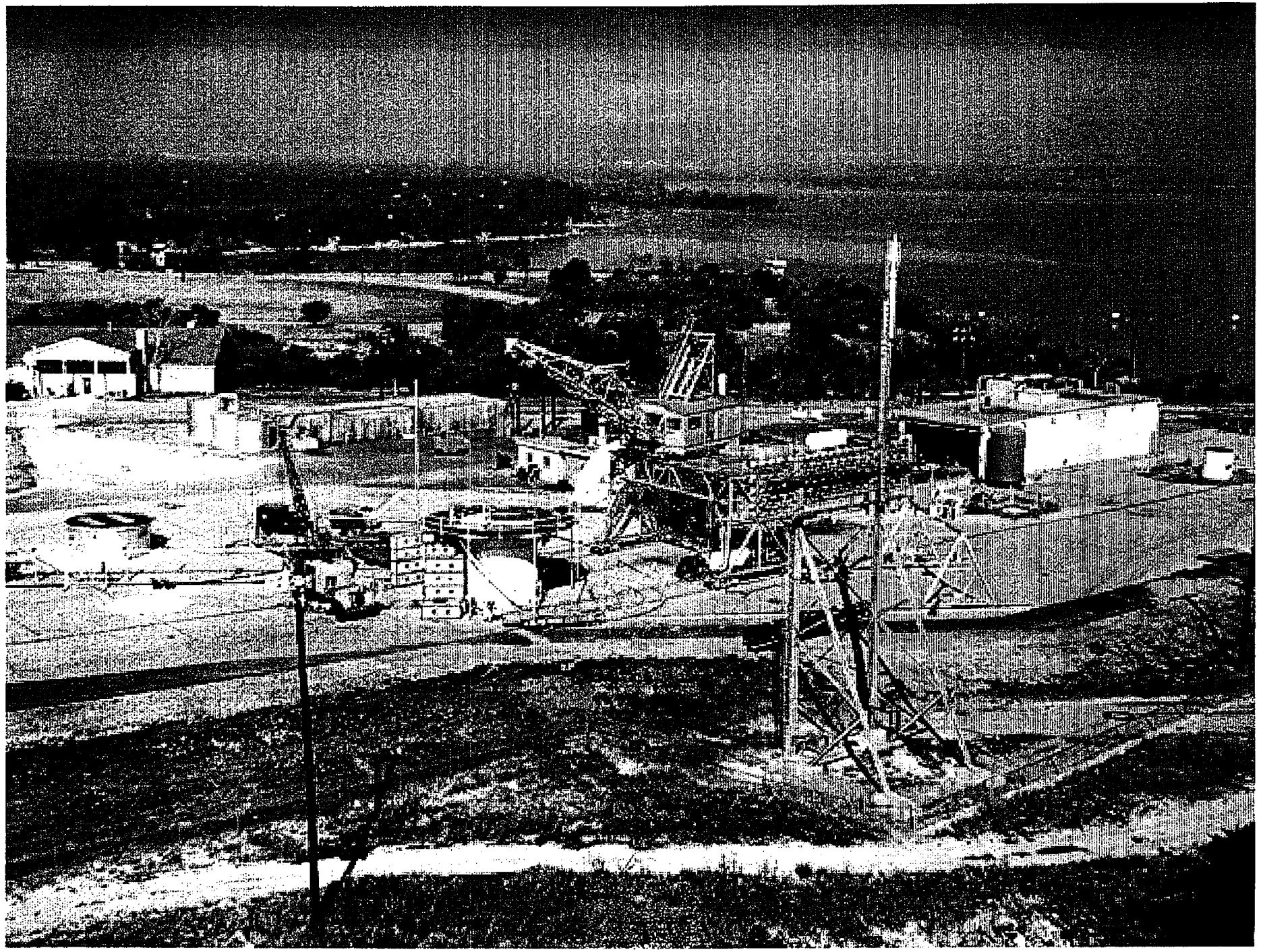
- NAS Fort Worth JRB Boundary
- Former Carswell AFB Boundary
- Solid Waste Management Unit 49

Figure 1

Location of
SWMU 49
NAS Fort Worth JRB, Texas


North
Parking
USGS Conceptual
Technology





Nuclear Aerospace Research Facility (NARF)

NARF site housed several experimental atomic reactors between 1953 and 1974. About 120 acres.

- Various materials were subjected to radiation to determine the affect on physical properties and operability. Also, a nuclear powered aircraft experiment was conducted.

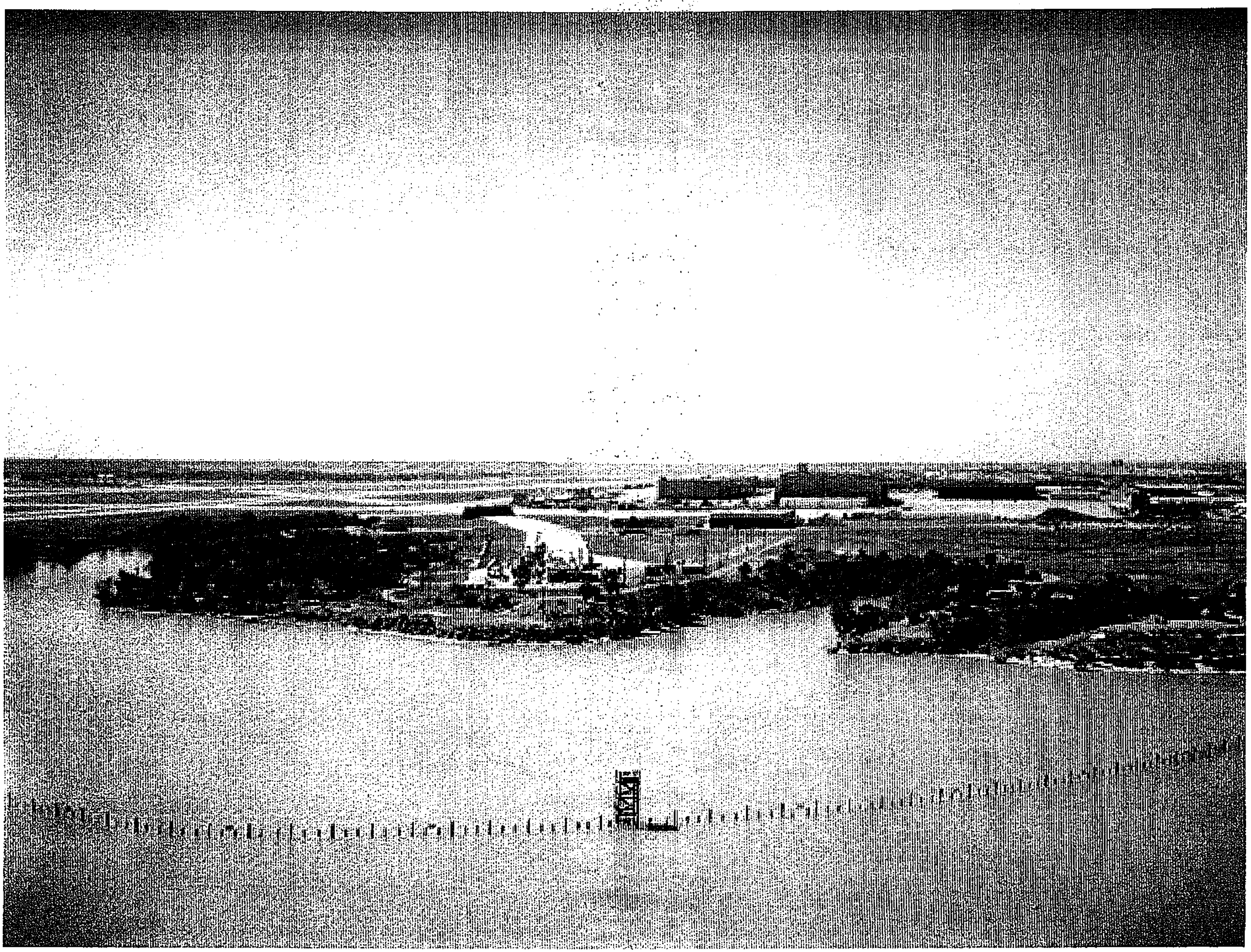
Decommissioned in 1974. Unrestricted use!

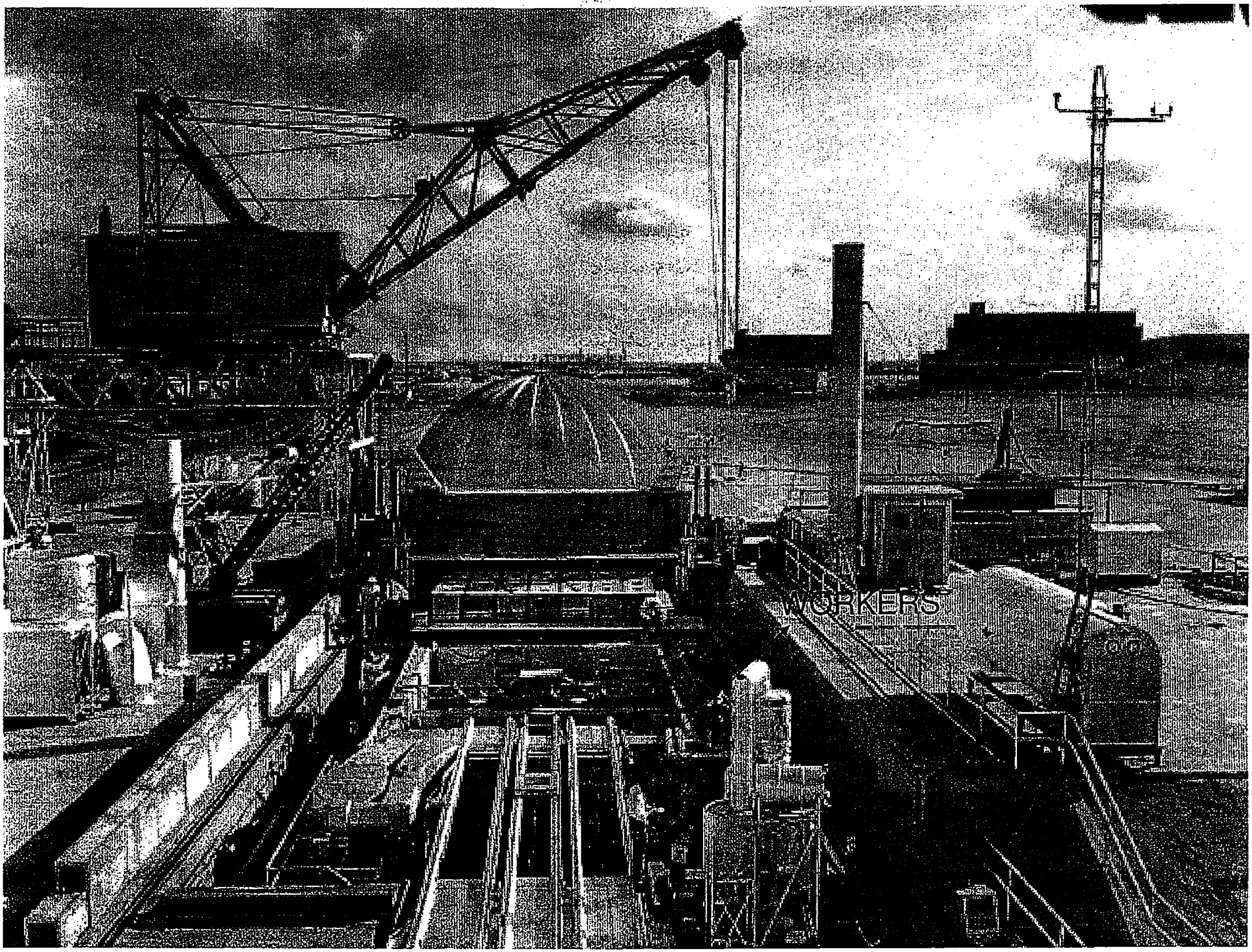
- 2 Million pounds of parts (activation material) and 15 million pounds of concrete rubble were hauled to Barnwell, SC

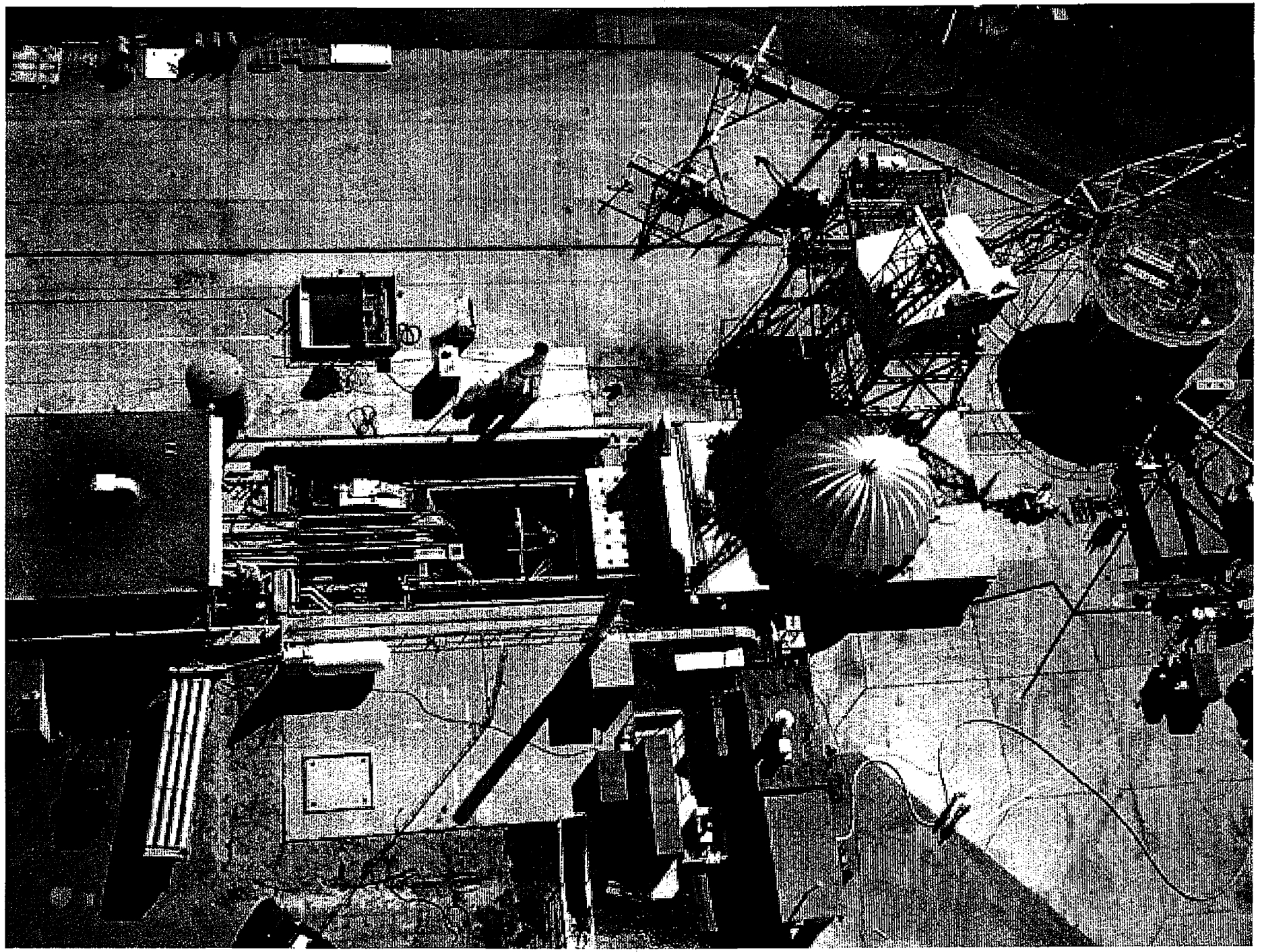
- Post closure inspection revealed no remaining contamination.

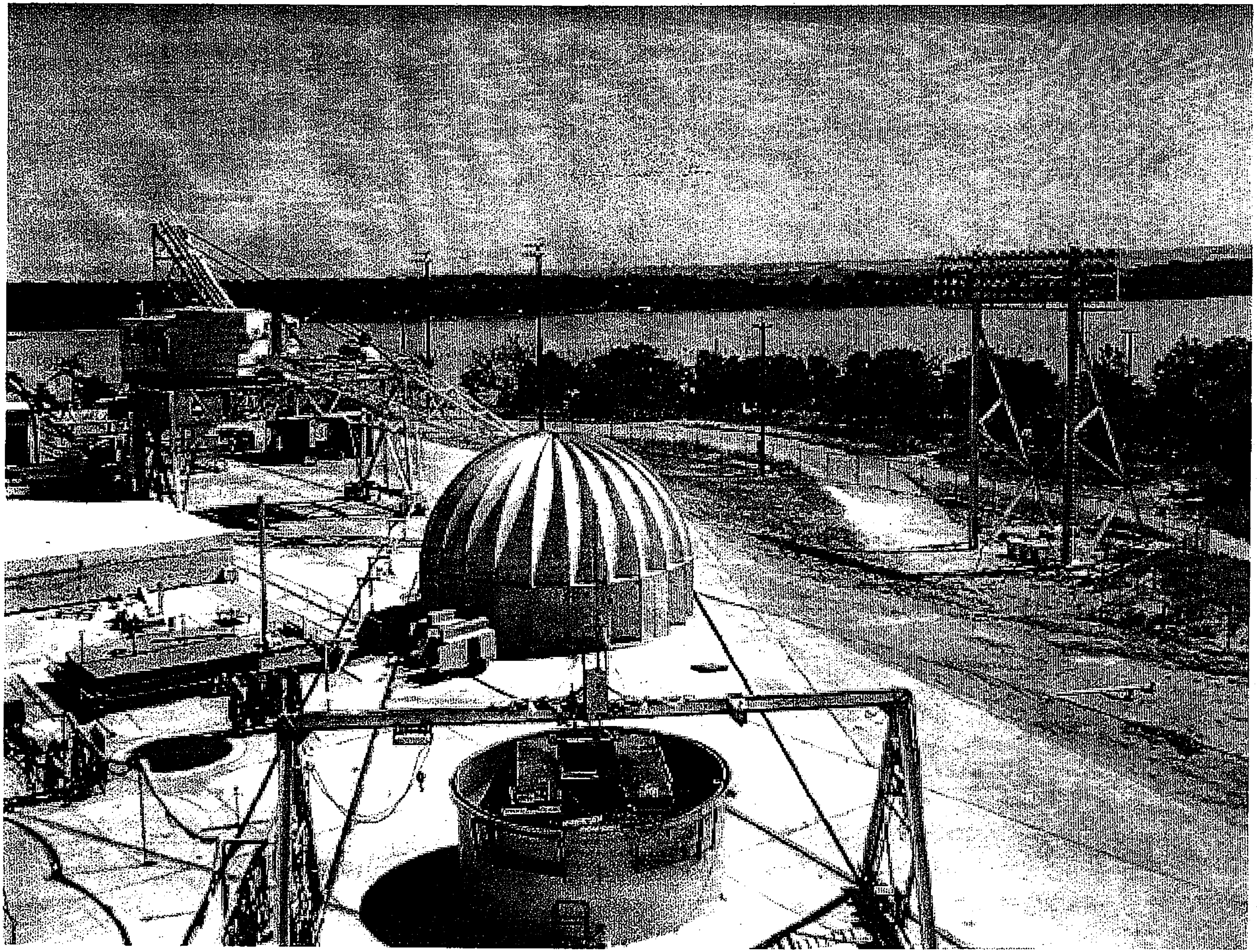
Of 20 original installation restoration sites (Landfills, pits, Fire training areas), the top 19 scored between 88 and 51, the NARF scored a 6.

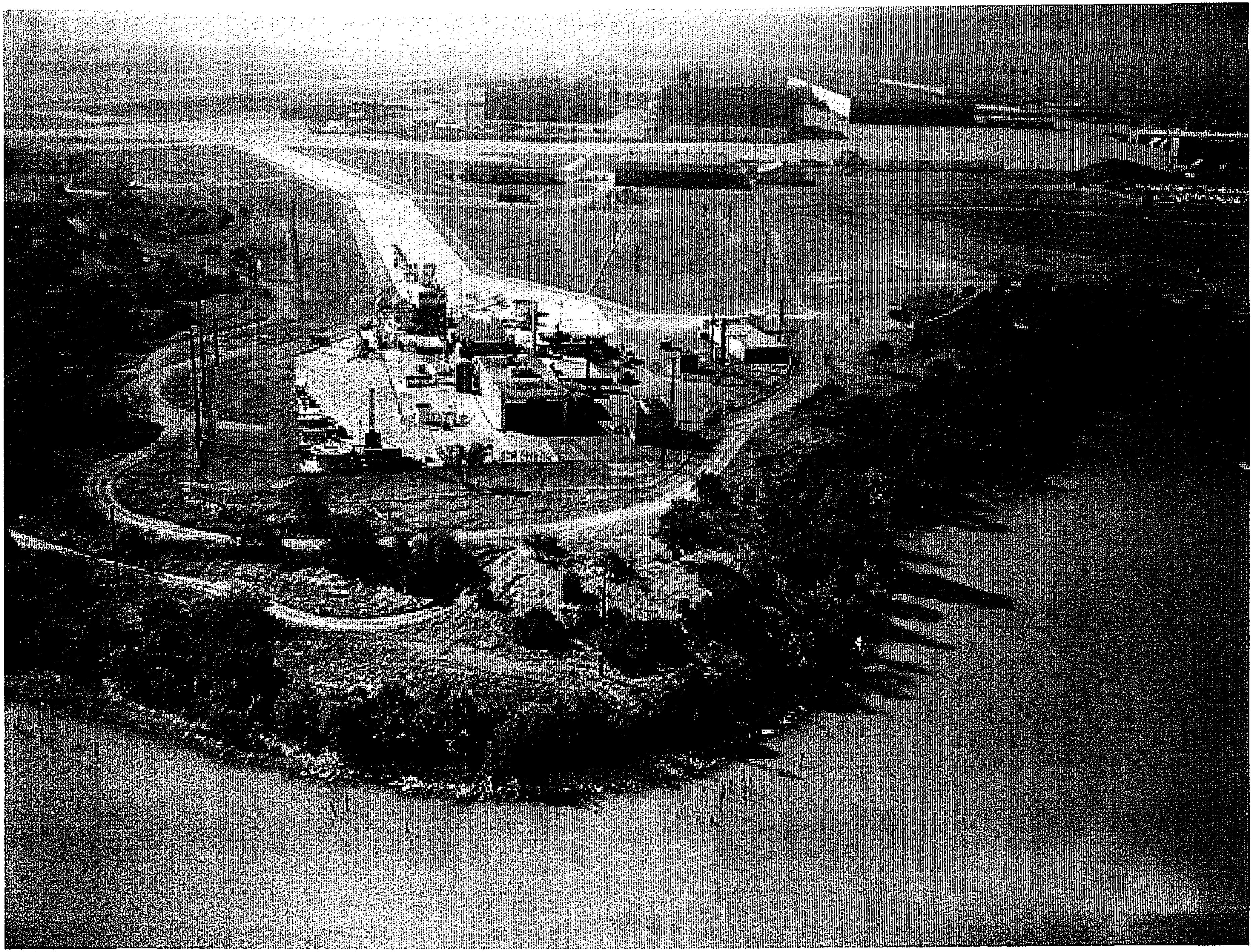
ALL AFP 4 Investigation Reports are on CD-ROMS, White Settlement Library!

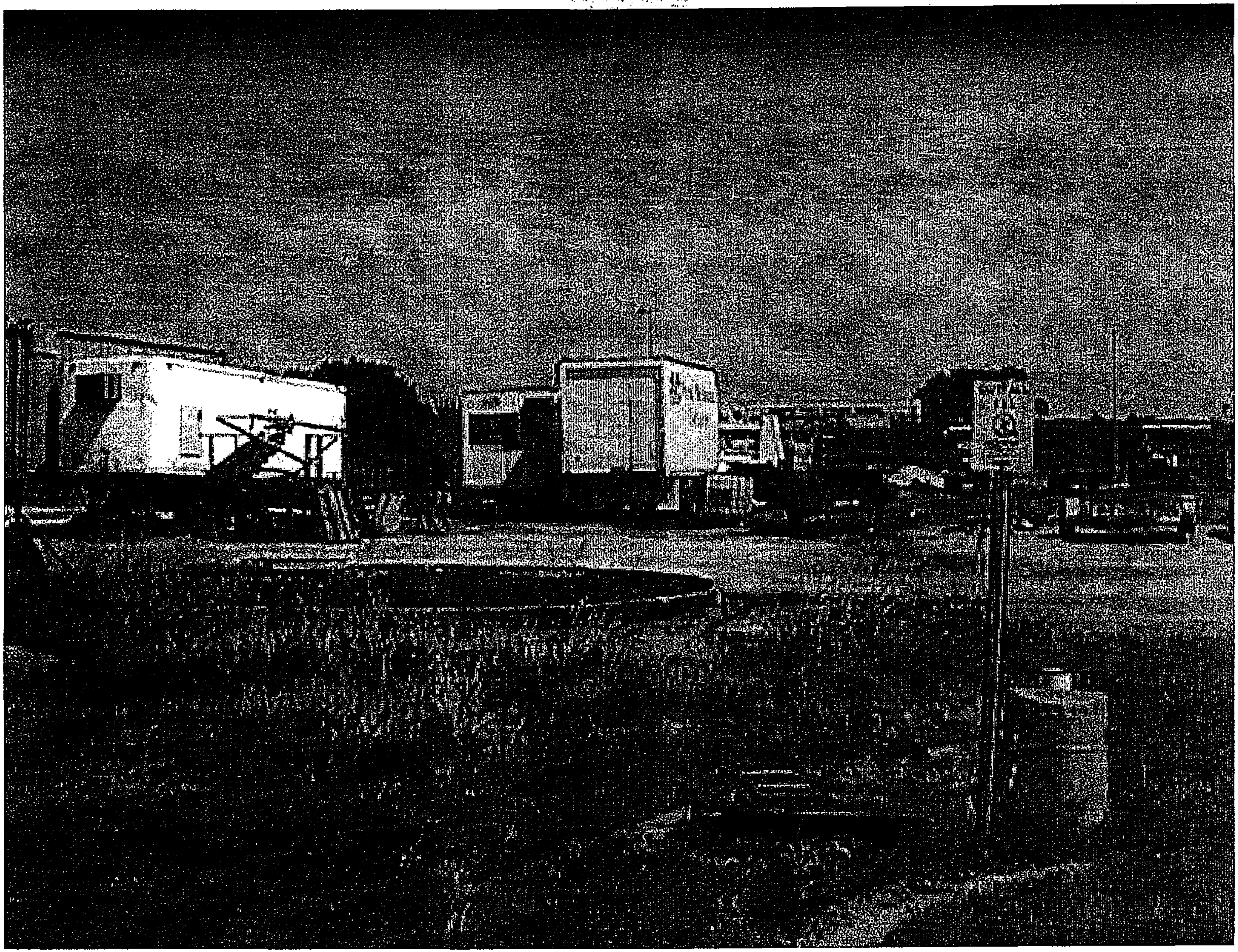



WORKERS









USGS 2001 Conceptual Site Model

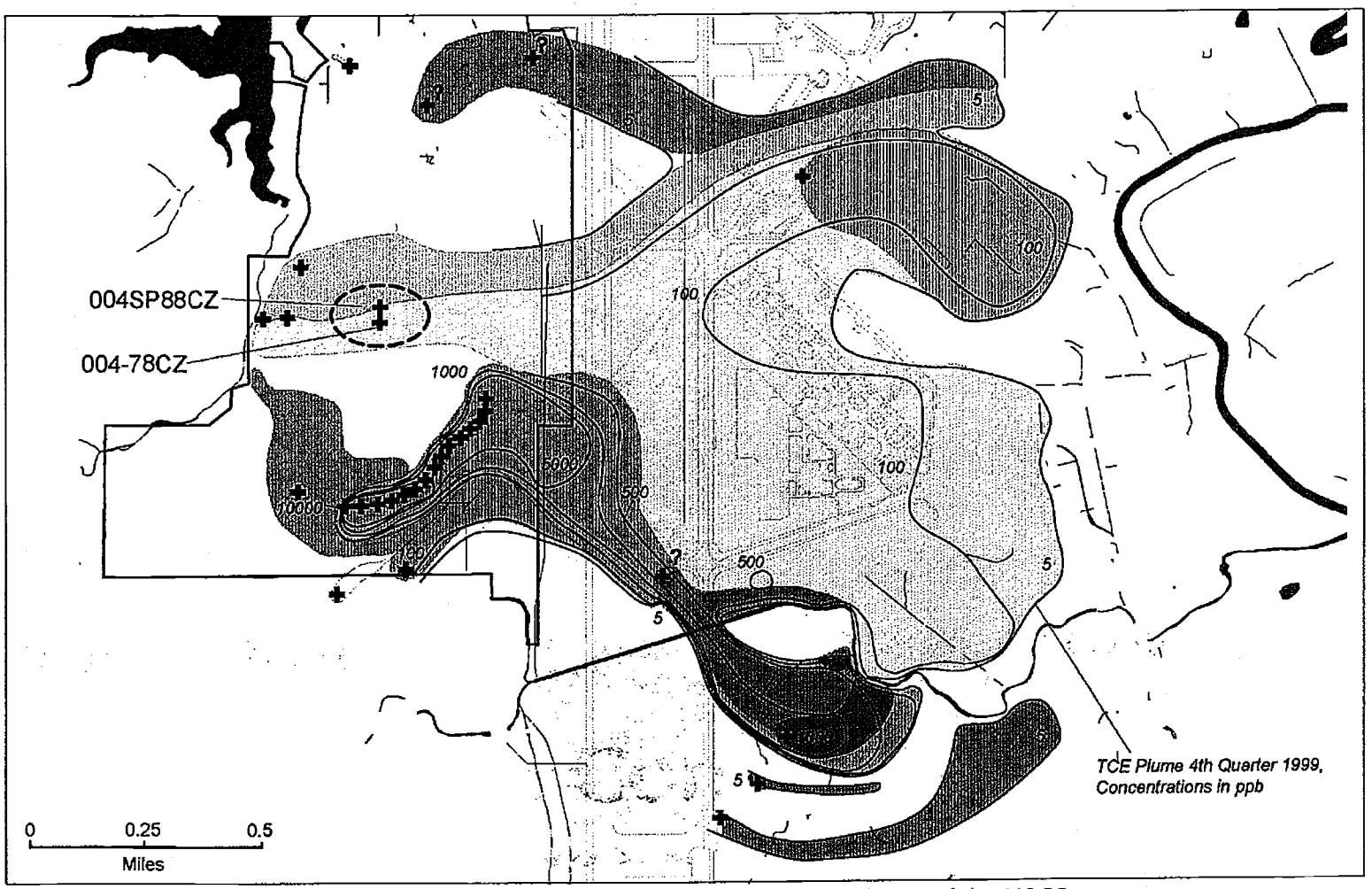
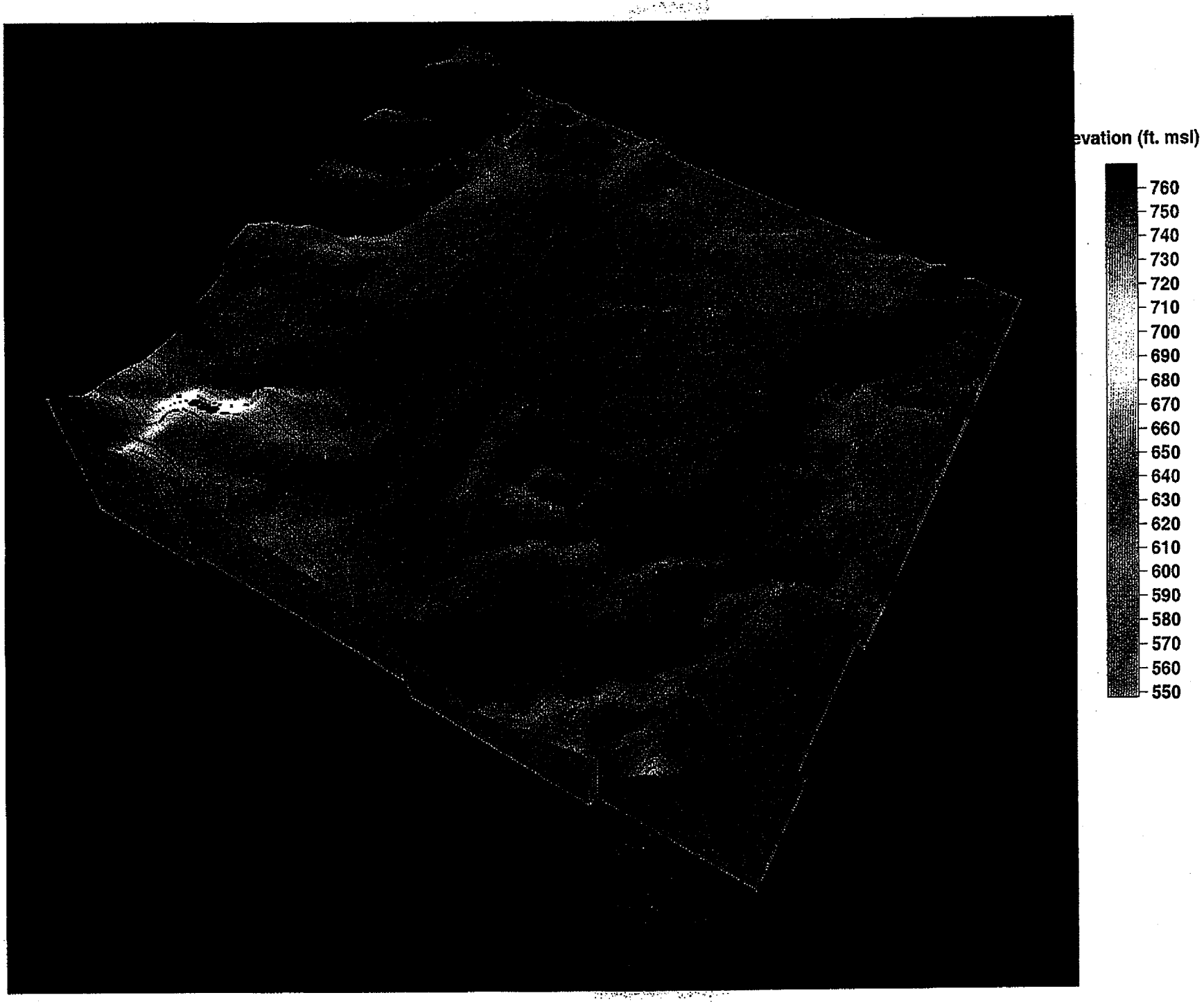


Figure 4. Possible TCE source areas, conceptualized in May 2001 by Sandy Eberts of the USGS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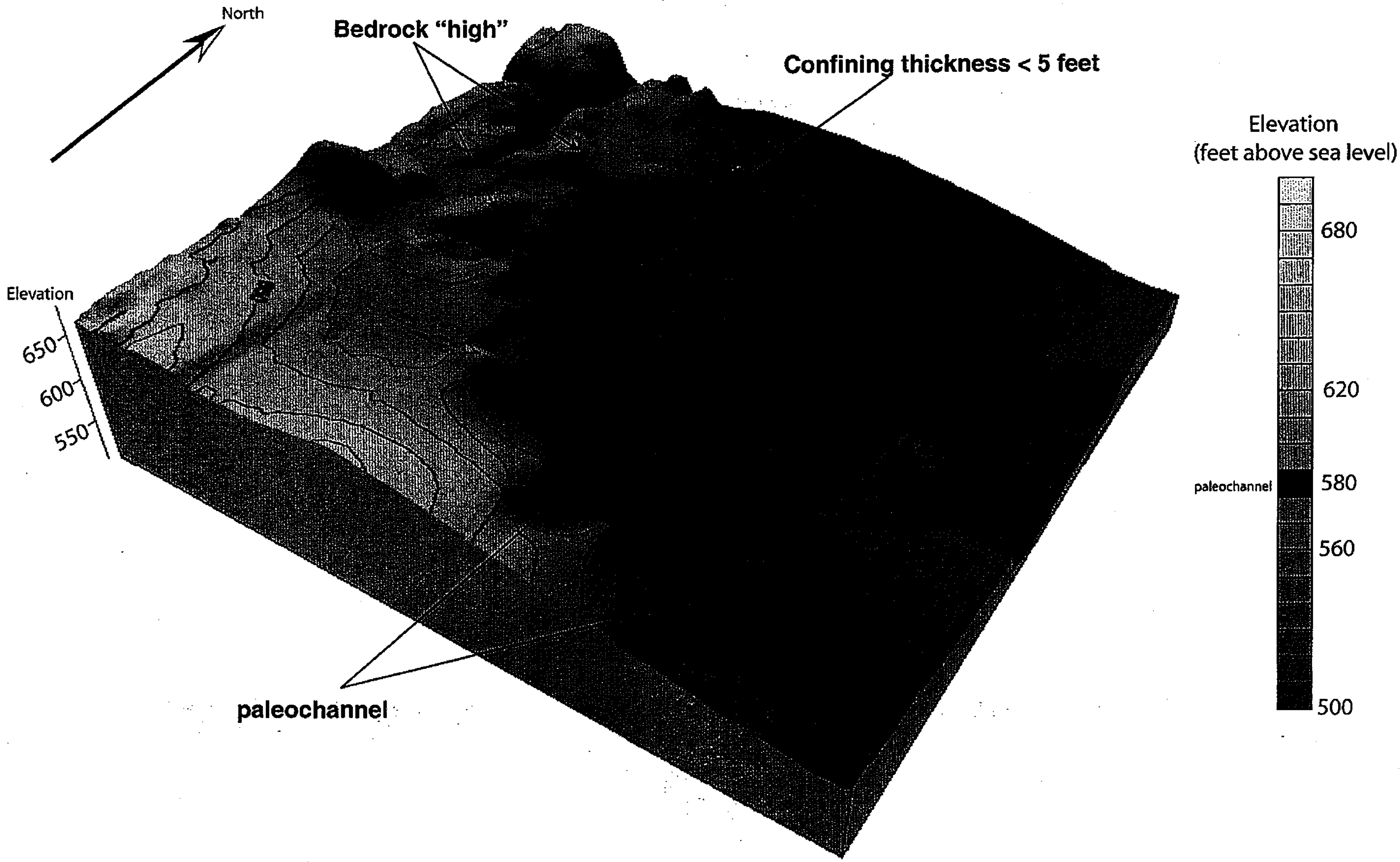
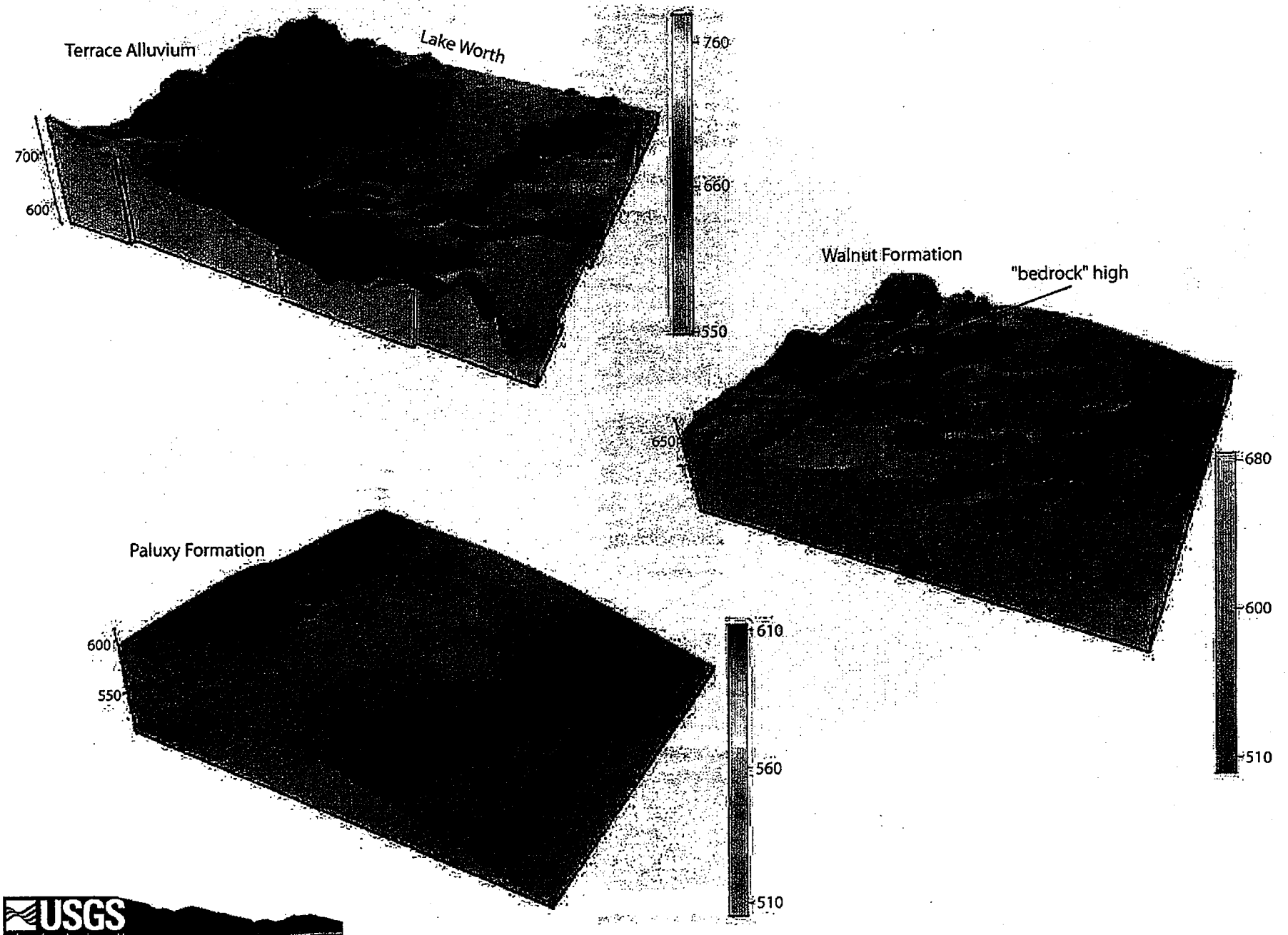
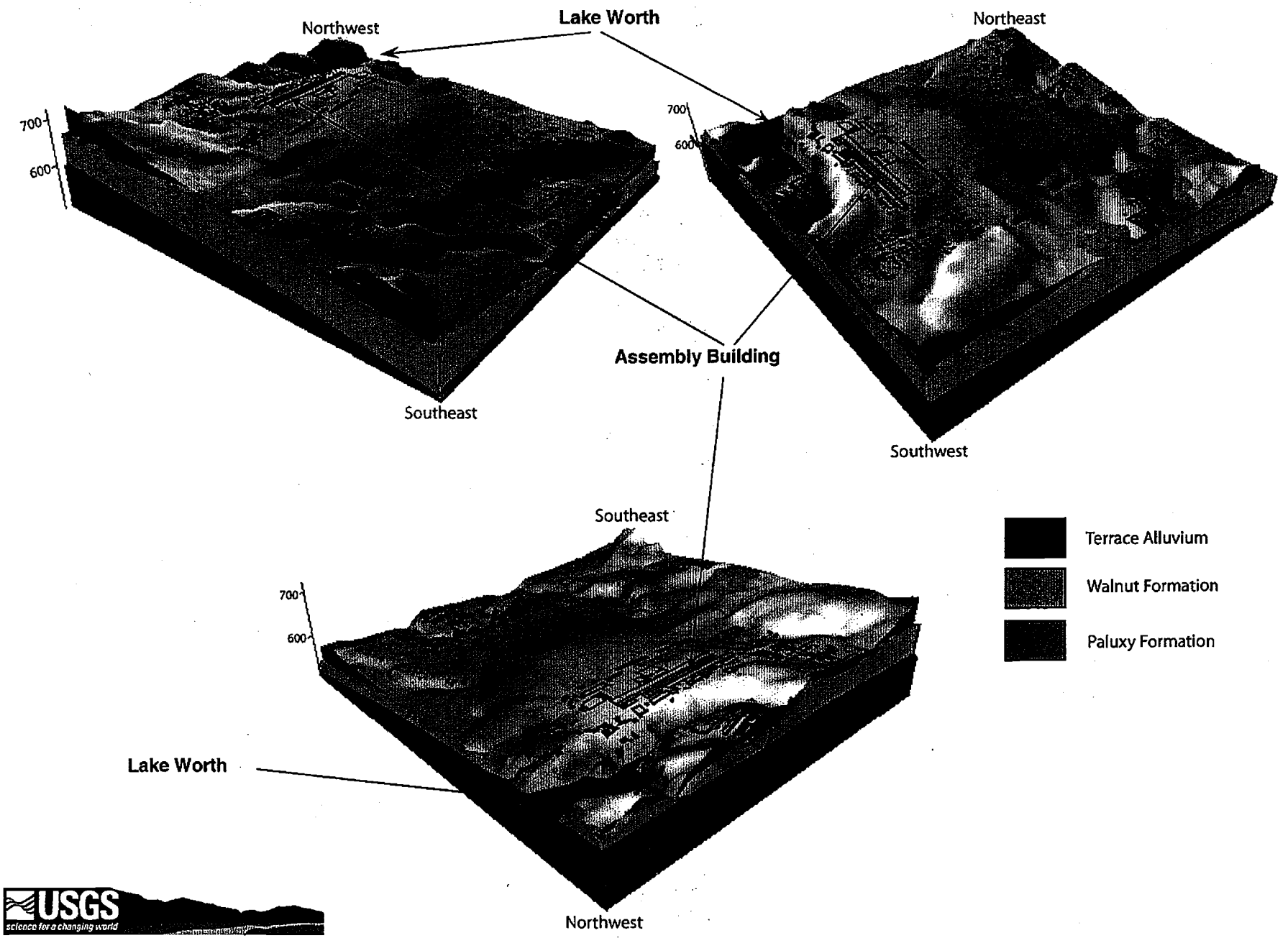


Lithologic surfaces in the vicinity of Air Force Plant 4-NAS Fort Worth, TX



USGS
science for a changing world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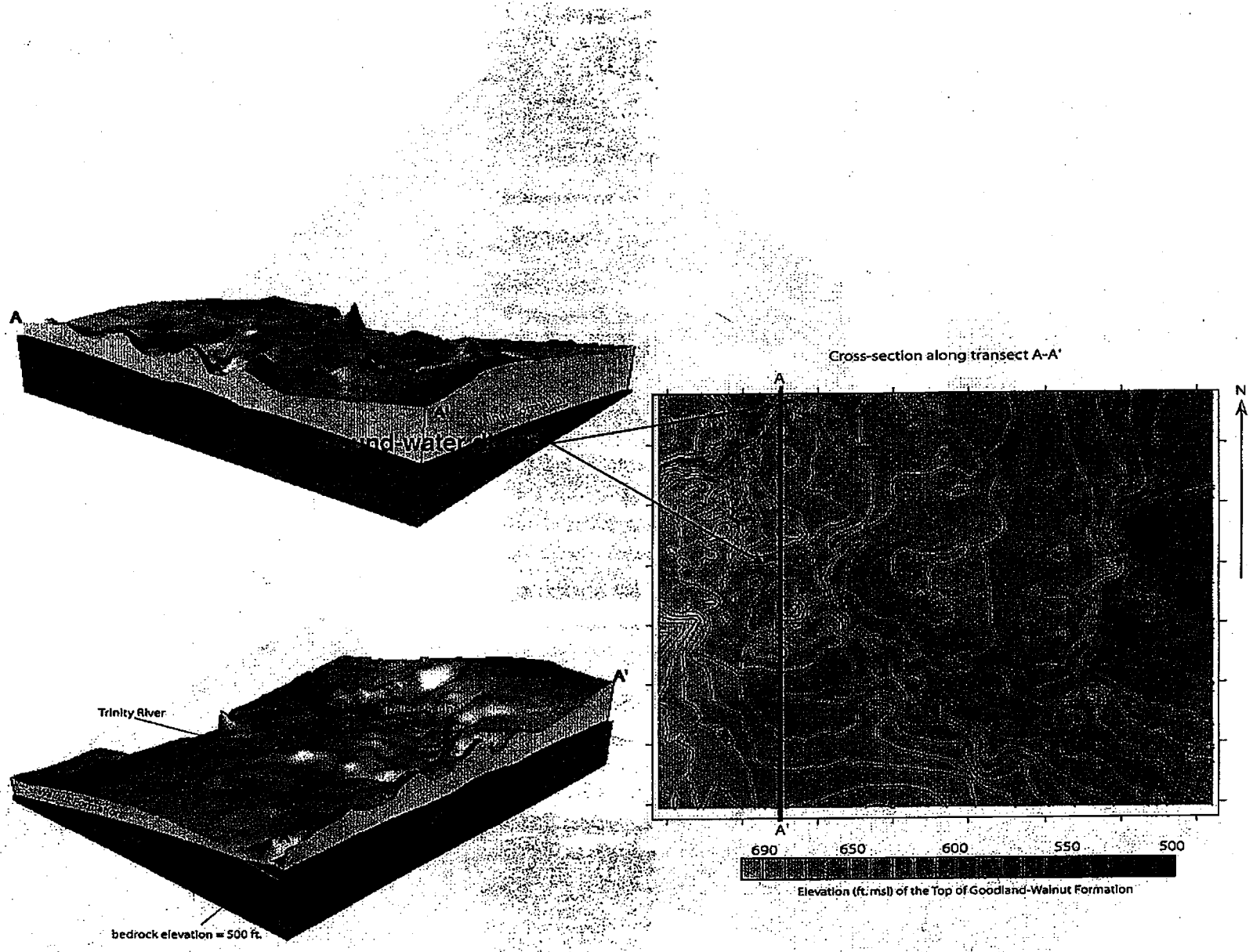
Walnut Formation
Paluxy Formation
USGS
science for a changing world



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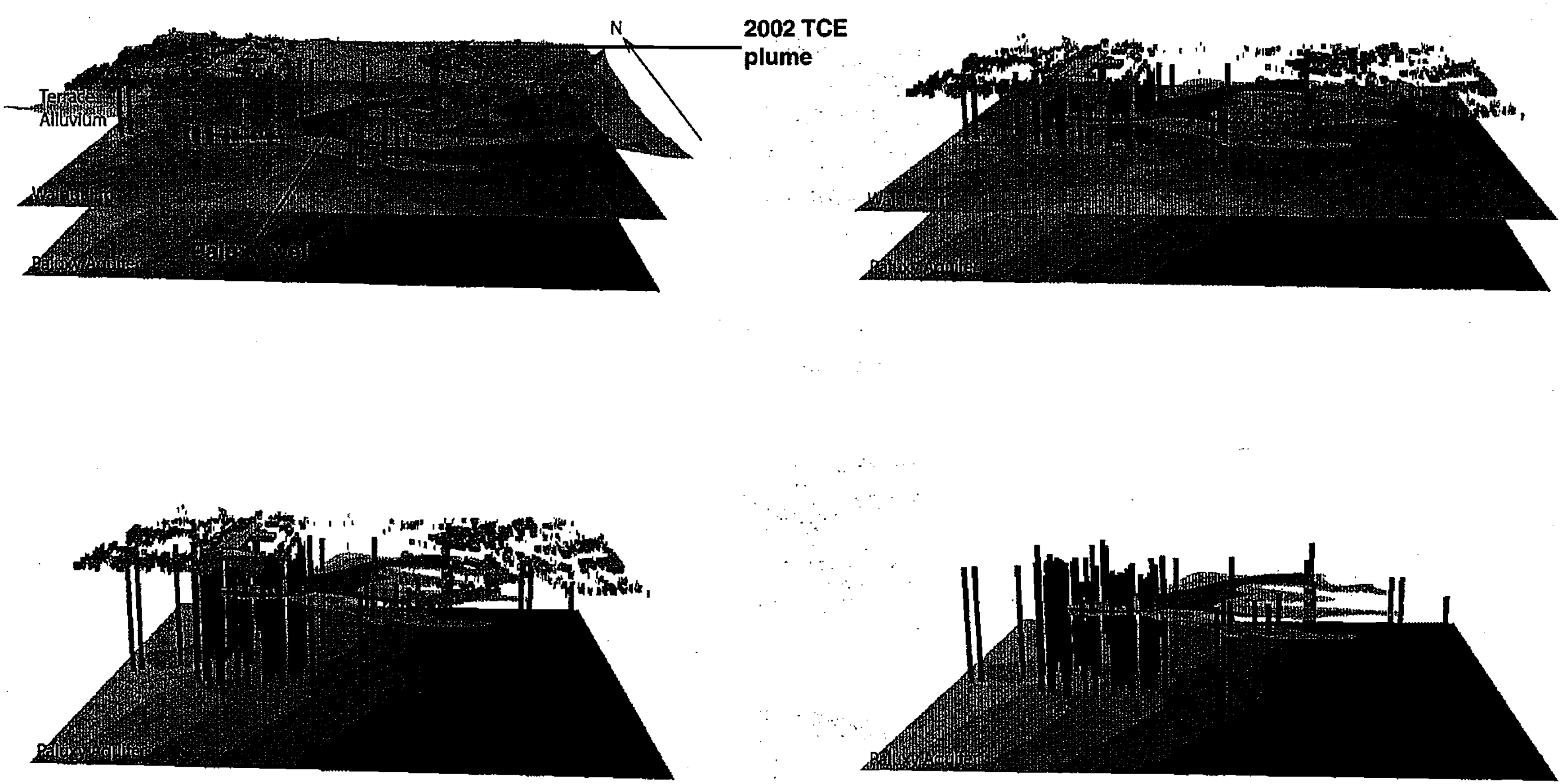
Assembly Building

Air Force Plant 4-NAS Conceptual Model: 3D Diagram of study area (tops of lithologic surfaces with 2002 TCE ground water plume)



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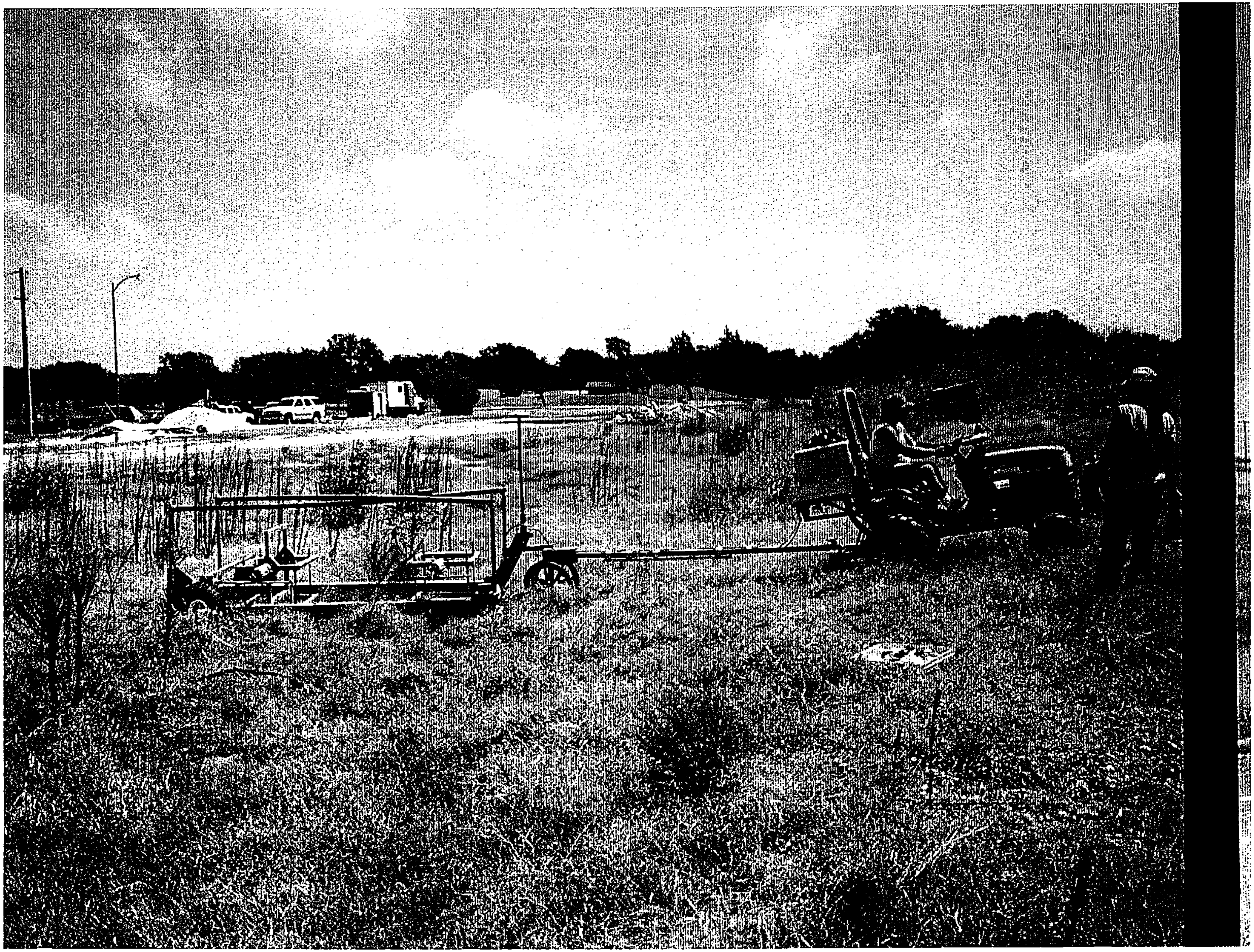
science for a changing world



Air Force Plant 4

Operated by Lockheed Martin Aeronautical Company, Fort Worth, Texas

Fact Sheet

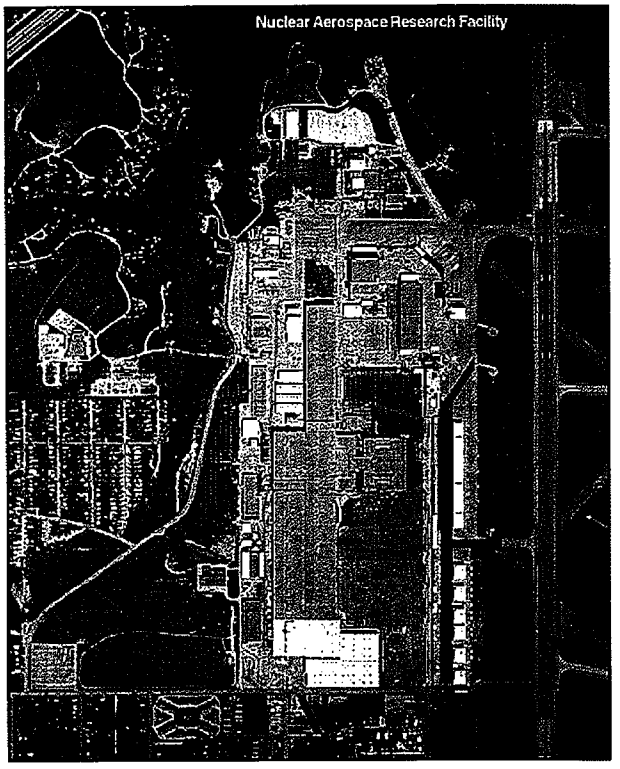
Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio - August 2005 - PAM # 03-113

Nuclear Aerospace Research Facility (NARF)

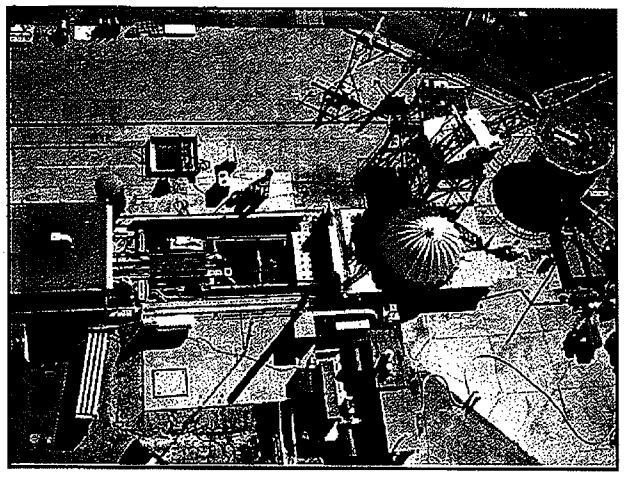
From 1953 until 1974, this 120-acre site at the north end of the plant property contained several experimental nuclear reactors. A portion of the area extended into Lake Worth. Extensive research and development activities were conducted at the site during the 1950s and 1960s, including radiation experiments, decontamination activities and the development of a nuclear-powered aircraft. As part of this research and development effort, various materials were subjected to radiation to determine the affect on physical properties and operability. Some documented contamination occurred, including leaks from irradiated water storage tanks.

As part of the Air Force's cleanup effort after the facility was decommissioned in 1974, 2 million pounds of parts and 15 million pounds of concrete rubble were hauled to a nuclear waste disposal facilility in Barnwell, S.C. The cleanup reduced radiological concentrations at the NARF to levels suitable for unrestricted occupancy. The area is not being used at this time.

Groundwater samples, taken in 1987 and analyzed for various chemicals and radioactive materials, contained no radioactivity above background levels. Soil samples, taken at the same time, contained detectable amounts of alpha and beta radiation; however, the amount of radiation present suggests that no residual radiation is present above background levels at this site. Sediment samples from Lake Worth, taken in 1991, also contained no radioactivity above background levels.



A final radiological survey performed after the 1974 decommissioning found no evidence that overlying soils or groundwater contained contaminants exceeding health-based cleanup standards. The Air Force drafted a No Further Response Action Planned Decision Document in July 1993, and the EPA and Texas state regulators signed a No Further Action Record of Decision in August 1996.



The NARF during its operational years, 1953-1974

The NARF site now.

Contact: Karen Katzenbach, ASC Environmental Public Affairs, 1-800-982-7248, ext. 53593 - karen.katzenbach@wpafb.af.mil

Headquarters U.S. Air Force

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Carswell Off-Base BRAC UPDATE Restoration Advisory Board

U.S. AIR FORCE

Charles C. Pringle, BEC

21 AUG 2003

U.S. AIR FORCE

Carswell Off-Base/Agenda

- **Program Update**
  - **WSA Nuclear Maintenance Waste Survey (30 Mins)**
  - **Sanitary Sewer System Field Work Update (2 Mins)**
  - **Permeable Reactive Barrier near Golf Course Update (2 Mins)**
  - **Amend Plant 4 ROD/OPS for Golf Course Update (2 Mins)**
- **Projected Future Land Transfers**
  - **Off-Site Weapons Storage Area EOD/FOST Update (4 Mins)**
  - **Golf Course Parcels/Total Update (5 Mins)**

NOTE: AFRPA'S Administrative Record Web Site address is:
http://www.adminrec.com/afbcanew.htm

Air Force Center for Environmental Excellence

Promoting Readiness through Environmental Stewardship

NAS Fort Worth JRB Installation Restoration Program Update

Michael R. Dodyk, P.E.
AFCEE
August 21, 2003

Installation Restoration History

Carswell Air Force Base closed September 30, 1993. The majority of the base was realigned as Naval Air Station Joint Reserve Base Fort Worth.

The Air Force is responsible for cleanup of environmental contamination that occurred before October 1, 1993 (while Carswell AFB was active.)

Installation Restoration History

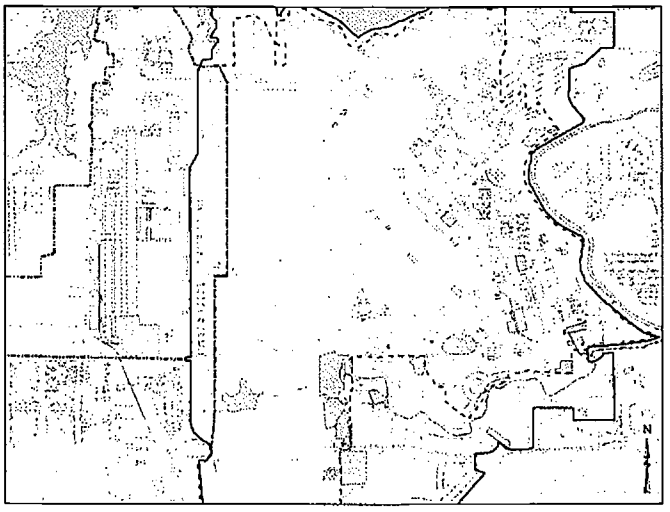
In compliance with the Resource Conservation and Recovery Act (RCRA), a RCRA Facility Assessment (RFA) was completed in 1989.

The RFA identified 87 sites that required investigation and closure.

- **68 Solid Waste Management Units (SWMU)**
- **19 Areas of Concern (AOC)**

Promoting Readiness through Environmental Stewardship 3

SWMUs and AOCs



Promoting Readiness through Environmental Stewardship 4

Site Closure Update

To date, the Air Force has received closure on 78 of the 87 sites (9 sites remaining).

Of these 9 remaining sites:

3 will be closed by 12/31/03 (SWMUs 19, 20, 21)

5 will be closed by 6/30/04 (SWMUs 28, 49, 54, 55, 66)

AOC 1 will be closed by 12/30/05

Basewide Historical Investigation

To ensure complete investigation of possible sources of contamination, the Air Force is conducting historical research consisting of:

- **Records searches of archival documents**
- **Interviews with Air Force personnel stationed at Carswell AFB**
- **Summary of historical aerial photographs**
- **Compilation of historical data in basewide report**

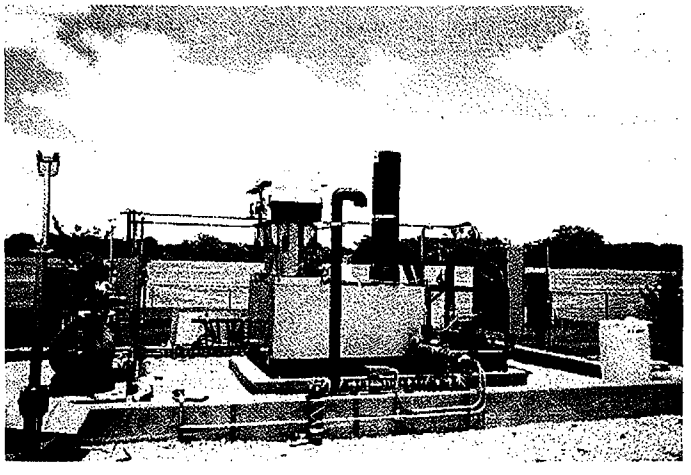
Field Activities

Construction of the groundwater remediation system at the former base gas/service station (AOC 1) was completed in June. The groundwater treatment system began operating June 10, 2003.

Performance monitoring of the PRB was conducted in June.

A demonstration study using vegetable oil injected into the ground to treat TCE contamination in the northern lobe of the plume was completed in July.

AOC 1 Treatment System



AOC 1 Cleanup Information

The system has six groundwater recovery wells, each approximately 33 feet deep. Contaminated groundwater is pumped to the surface and passed through an air stripper to volatilize contaminants.

Within the first 20 days of operation, the system treated 183,704 gallons of contaminated groundwater.

At a pumping rate of 6 gallons per minute, the system removed 0.67 pounds of benzene and 3.3 pounds of total petroleum hydrocarbons.

Permeable Reactive Barrier

The PRB was installed in April/May 2002 to remediate groundwater contaminated with trichloroethene (TCE). Groundwater sampling is conducted every 3 months to monitor performance.

The PRB is successfully remediating groundwater

Upcoming Field Work

Fall 2003:

Performance monitoring of the AOC 1 groundwater treatment system.

Delineation of various compounds and an excavation to remove cadmium-impacted surface soil at Landfill 1.

Delineation of sediment/soil contamination at SWMUs 54 and 55 (Storm water interceptors and the East Gate oil/water separator).

Documents Under Review

Draft Documents Under Review by AFCEE:

RFI of SWMU 49 (Former Aircraft Washing Area).

Documents Under Review by Regulators:

RFI of SWMUs 19, 20, and 21 (Former Fire Training Area No. 2).

Final SI for Building 1010 (former Jet Engine Test Stand).

Documents Under Discussion Between Regulators and AFCEE Prior to Finalization:

Focused Feasibility Study on the Southern Lobe TCE Plume.

Air Force Real Property Agency
Air Force Institute for Operational Health

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Weapons Maintenance Waste Investigation : Carswell AFB TX

Restoration Advisory Board Meeting
21 Aug 03

Presented by Jody Wireman, PhD, MSPH, CIH
Environmental Radiation Branch

U.S. AIR FORCE

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Overview

- How Did We Get Here?
- What We Know
- The Path Forward
- WSA Survey, 27 May 03 – no immediate human or environmental health risk
- Conclusion

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How Did We Get Here

- Late 01-Jan 03: Air Force Safety Center (AFSC), thru VA claims process, IDs unsealed weapons maintenance operation
  - Low-levels of radioactive waste potentially generated
  - Operation occurred during 1950s and early 1960s
  - Previously unidentified installations potentially impacted
  - AFSC performs records search to determine which Air Force BRAC installations potentially impacted
- Jan-Present: AFSC continues investigation
- May-Jul 03:
  - Air Force notifies stakeholders of potential for new waste sites
  - Air Force Institute for Operational Health (AFIOH) creates Environmental Radiation Branch to provide technical and contract support
  - AFIOH performs preliminary site investigations

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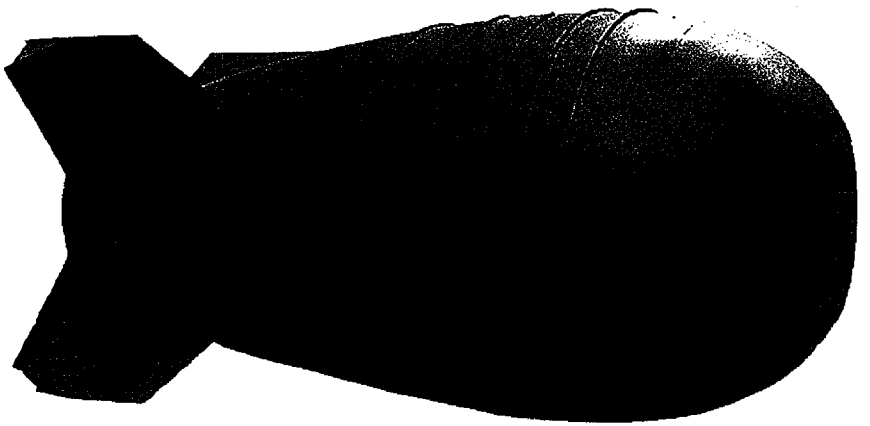
The Weapon Systems



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Carswell AFB – What We Know

- Carswell weapon storage area (WSA)
  - Depleted and/or natural uranium oxidation (rust) was likely removed during cleaning operations in late 50s to early 60s
  - Small amounts of residual uranium deposited on cleaning materials (rags, wipes) and personal protective equipment (gloves, smocks)
- Waste materials typically disposed of within the highly secure WSA
  - Waste may have been shipped off-site (SWMU 60 – Rad removal site; records search ongoing)
- Further investigations and historical records review are ongoing by the Air Force

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Carswell Weapons Storage Area

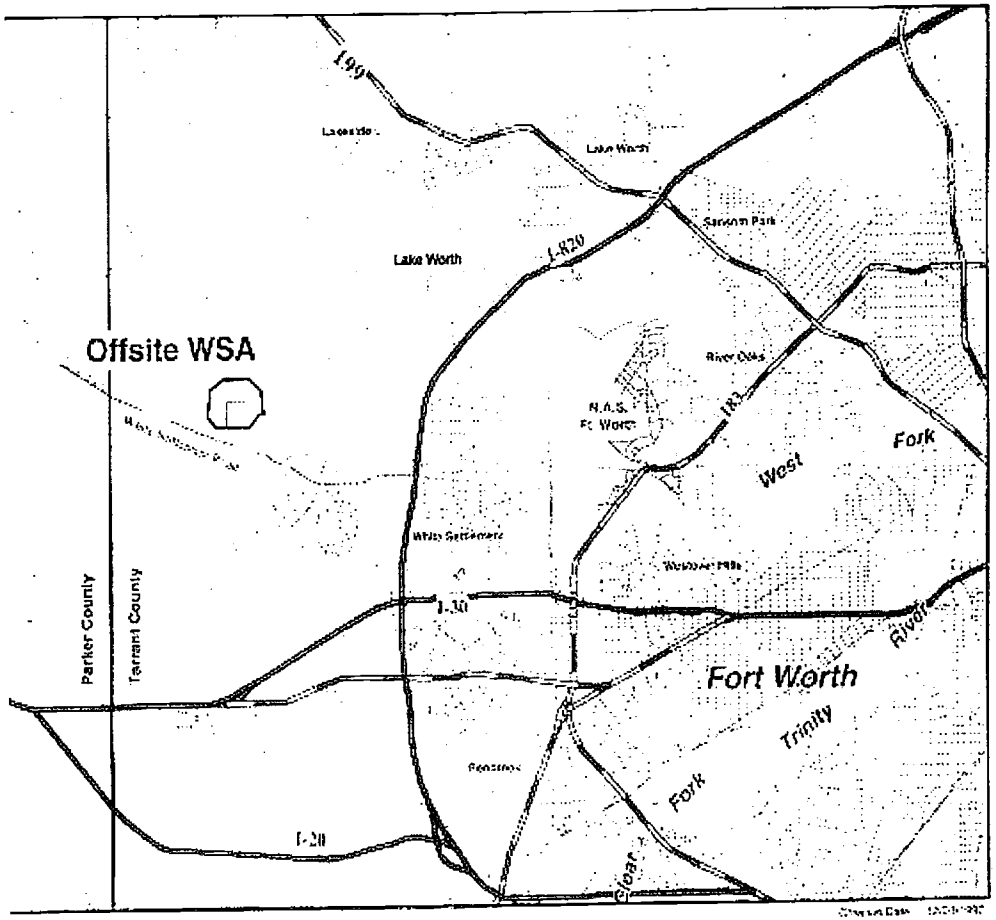

Figure 1-2 – Vicinity Map

WSA Carswell Facilities of Concern

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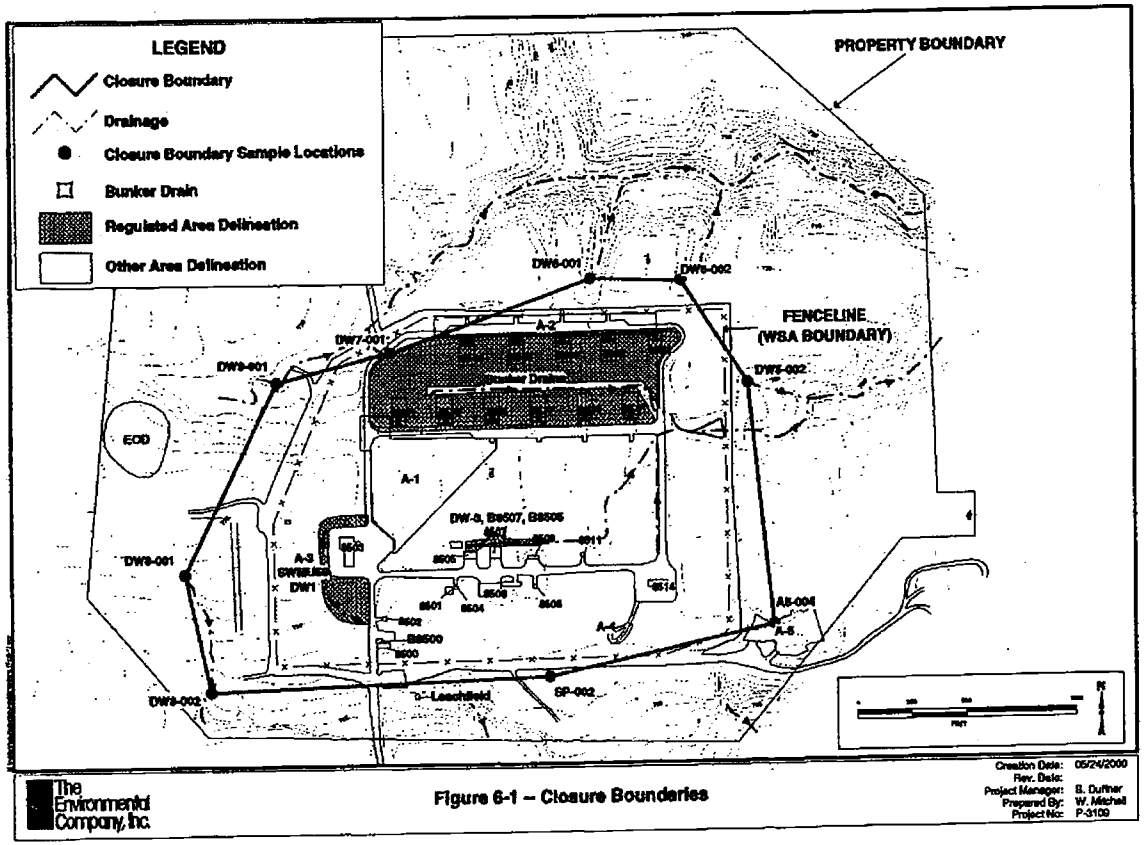
- WSA Igloos 8531 and 8552



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Activities Completed

- 27 May: AFIOH conducts preliminary site investigation
- 30 May 03: Cabrera Services, a company that performs radiation surveys, was placed on contract
- 20 Aug: Carswell AFB work plan initiated
- 21 Aug: Brief BCT and RAB on background, current status, and proposed actions; conduct site visit

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Carswell AFB – What We Know

- Air Force has identified potential burial locations
  - Knowledge obtained from other installations and interviews with former workers
  - Interviews with workers have occurred and are ongoing
  - At other bases where sites have been identified, contamination levels were low and the sites were successfully remediated

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Carswell WSA Survey

- Survey conducted 27 May 03
- Purpose: Conduct preliminary investigation to determine if weapons maintenance waste poses an immediate human health or environmental risk
- Scope:
  - Interior surveys performed in high-interest structures (WSA 8531 and 8552) -
  - Exterior surveys are areas adjacent to the high-interest structures or any excavated areas
- Preliminary Findings:
  - All measurements were within natural background levels, and thus, no burial site or residual radioactive materials were identified
  - If a burial site exists, it does not pose an immediate risk to health or the environment

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Path Forward
The CERCLA Process

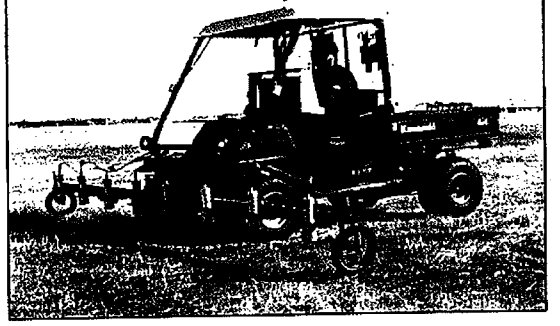
Planning

Stakeholder Notification

Is there an immediate risk?

Site Inspection (non-intrusive scoping surveys)

Non-Intrusive Scoping Survey

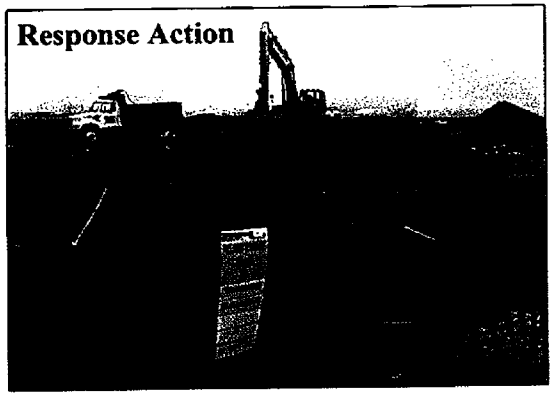


Is intrusive characterization of the burial site and/or cleanup required?

Remedial Investigation (intrusive surveys)

Decision Document

Response Action



What is the appropriate response action?

Response Action

Clearance and Closure Reports

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Path Forward
The Investigation Process

- **The formal process to determine potential waste locations is called a CERCLA Preliminary Assessment / Site Investigation (PA/SI)**
- **This includes:**
  - **Preparing field sampling plan and obtaining regulatory approval**
  - **Conducting non-intrusive scoping surveys using specialized monitoring equipment**
  - **Sample surface soils and accessible water sources**
  - **Prepare PA/SI report**

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Path Forward Immediate Actions

- Complete Investigation (PA/SI)
  - Prepare draft field sampling plan
  - Distribute draft plan for regulatory review and approval
  - Conduct non-intrusive survey of WSA property
- Consult with regulators and other stakeholders on follow-on actions
- Conduct further studies (Remedial Investigation / Feasibility Study) and cleanup (Remedial Design / Removal Action), if necessary

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Conclusion

- We are at the first step of a multi-step process
- A preliminary investigation was conducted: No immediate human health or environmental risk
- The Air Force will fully investigate and cleanup any potential burial sites
- Site investigation plans will be developed
- Full involvement from all involved is the key to success

Investigation of Weapons Maintenance Waste Burial Site

This fact sheet answers questions you may have about the proposed investigation of a potential weapons maintenance waste burial site at this former Air Force installation:

- What is this burial site?
- Is there a risk to the public?
- Why are we just learning about it?
- What are you going to do about it?
- How can I stay informed?

What is this burial site?

The Air Force Real Property Agency (AFRPA) has compiled information that indicates certain weapon maintenance activities conducted at this installation in the 1950s and early 1960s may have resulted in the generation of waste materials containing radioactive contamination. This waste material is suspected of being buried within the former Weapons Storage Area (WSA). The WSA was a highly secure facility consisting of weapons storage, maintenance, and other industrial and administrative buildings. They were surrounded by security fencing and guarded by an armed security force.

The burial of the maintenance waste was a standard practice at the time. The waste material consisted of wipes, gloves, protective clothing, respirator cartridges, butcher paper, and tape used during the maintenance activities. Weapons maintenance waste sites have been identified at other Air Force installations and have been successfully remediated. The maintenance waste was typically buried in a small trench or in a sealed steel pipe.

Is there a risk to the public?

Based on the information available at this time, there is no immediate risk to public health and the environment as long as the burial site is not disturbed. The Air Force is taking steps to ensure that digging is restricted within the former WSA.

Why are we just learning about it?

As part of ongoing restoration activities, we continue to obtain information regarding potential historical contamination sources. When our initial records searches were performed in the early 1980s, this information was not available. As a result of recent information developed by the Air Force Safety Center (AFSC), we performed additional record reviews and conducted interviews with retired Air Force personnel who performed these weapons maintenance activities. This information was used to determine that a burial site could be located within the former WSA.

What are you going to do about it?

The burial site will be investigated as part of AFRPA's ongoing environmental restoration program. With the support of the Air Force Institute for Operational Health (AFIOH), AFRPA will initially determine whether a burial site is present. Based on the results of this site investigation, additional site characterization and/or cleanup actions may be warranted. This process will be implemented consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the regulatory framework used by the Air Force to investigate and cleanup contamination at its installations. In addition, the AFIOH will re-evaluate the radiological decommissioning of buildings within the former WSA's based on information gathered during the site investigation. If a new survey is required, the buildings will be resurveyed using updated techniques and current procedures.

How can I stay informed?

Consistent with our ongoing cleanup program, AFRPA is committed to informing and involving the public in this process. With the help of the local Restoration Advisory Board, if still active, the Air Force will actively communicate findings, plans, and accomplishments to the public. Information will also be made available in information repositories and administrative records maintained by local libraries. If you have additional questions, please contact the local AFRPA Operating Location. 5/23/03

Air Force
Real Property Agency

MARSSIM

Fact Sheet

MARSSIM

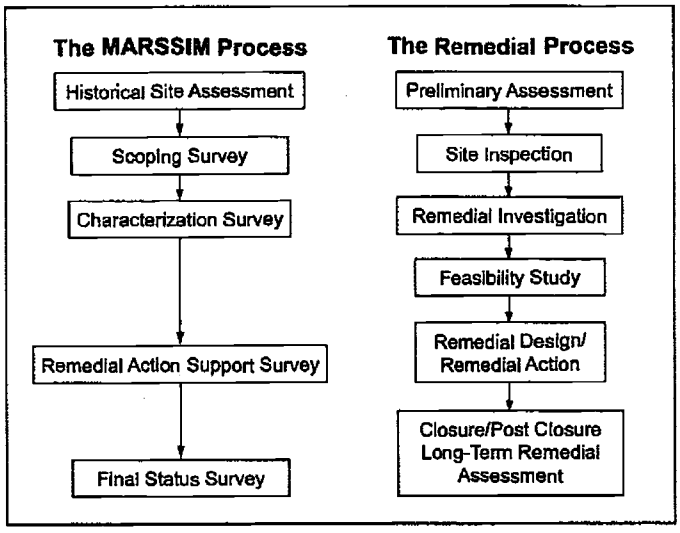
The *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) guides a scientific process used to determine the amount of radioactive materials in soil or on building surfaces and to document the levels of radiation at a site. MARSSIM is a tool to investigate radioactive contaminants in the environment. MARSSIM is the product of a multiagency work group consisting of experts from the U.S. Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), the Department of Energy (DOE), and the Department of Defense (DOD). These four federal agencies share radiation-protection responsibilities and continually seek to offer accurate research tools to measure radioactivity. The EPA, NRC, DOE, and DOD, along with industry and public experts, have intensively reviewed the MARSSIM process and found that it offers the most accurate system to guide decision making where radioactive contamination is a concern.

How Does MARSSIM Work?

In its basic form, the MARSSIM process is consistent with the process set out by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly called the "Superfund" law. CERCLA addresses a broad range of hazardous substances and includes selection and execution of remedial actions, whereas MARSSIM addresses only radioactive contamination and focuses on establishing the need for and success of remedial action. Despite different scopes, MARSSIM activities correspond to parallel steps in, and can be used to meet requirements of, the more familiar CERCLA process.

Initial Step

MARSSIM begins with an Historical Site Assessment (HSA) which is comparable to CERCLA's Preliminary Assessment. Both processes are performed to gather existing information about a site and determine whether a threat from contamination may exist. The data collected helps determine whether further investigation is needed.



Beginning Surveys

The next step in MARSSIM is the Scoping Survey, which correlates to CERCLA's Site Inspection. Both processes include an assessment of hazards at a site and the location of the contamination (radiological hazards in MARSSIM's case, hazardous substances in CERCLA's). The CERCLA process uses a Hazard Ranking System to determine whether the investigation can end or remedial action and further testing are necessary. MARSSIM's Scoping Surveys separate nonimpacted from impacted areas at the site and provide data that can be used in CERCLA's scoring process.

AFIOH
Air Force Institute for Operational Health

Determining Extent

MARSSIM's Characterization Survey parallels CERCLA's Remedial Investigation. At this stage, the nature and extent of contamination are determined. The CERCLA process sets the goals for cleanup levels based on the National Contingency Plan. During this stage, sampling and monitoring surveys are completed to document the levels of contamination. This data is recorded and used again to compare to data collected after remedial activities are completed. In MARSSIM, the radioactive dose and risk to humans are assessed according to regulations set by federal and state agencies. The dose and risk of a specific radioactive contaminant is converted into a concentration level in the MARSSIM process. This level is referred to as the derived concentration guideline level (DCGL). The DCGL is the concentration of a specific radioactive contaminant that would not pose a threat to humans and sets the bar for cleanup effectiveness. Both MARSSIM and CERCLA set the remediation goals that must be met after remediation activities have taken place during this stage.

Determining Remedial Activities

CERCLA includes steps and studies to select and verify the feasibility of remediation methods. MARSSIM does not address method selection; however, the Characterization and Remedial Action Support Surveys in the MARSSIM process may provide data for the Feasibility Study in the CERCLA process. In the CERCLA process, the selected remedial action is developed and the action is executed. MARSSIM does not suggest alternative remedial activities or include surveys that support the work, but, MARSSIM's Remedial Action Support Survey may be used to gauge whether a site has been cleaned up enough for a final survey for release.

Final Step

After remedial activities are completed, the MARSSIM process uses the Final Status Survey (FSS) to determine whether the cleanup activities reduced contamination levels to the DCGLs set earlier. The FSS is similar to CERCLA's Long-Term Remedial Assessment. At this point, a decision is made whether a site has reduced risk levels to the point safe for release.

MARRSIM and CERCLA

The MARSSIM process is not meant to replace CERCLA guidance. It is a tool to provide additional support for specific steps in the CERCLA process. Both processes can be used together to provide accurate data to ensure any residual contamination is too low to threaten human health.

CONTACTS

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Air Force Institute for Operational Health
Toll-Free: 1-888-2332-ESOH (3764)
Radiation Branch: 210-536-1461

EPA Facts About Uranium

July 2002

What is uranium?

Uranium is a radioactive metal that is present in low amounts in rocks, soil, water, plants, and animals. Uranium and its decay products contribute to low levels of natural background radiation in the environment. Significant concentrations of uranium occur naturally in some substances such as phosphate deposits and uranium-enriched ores.

How does uranium change in the environment?

Natural uranium is found in the environment in three forms, called isotopes: uranium-234, uranium-235, and uranium-238. Ninety-nine percent of natural uranium occurring in rock is uranium-238. Uranium-235 accounts for just 0.72 percent of natural uranium, but it is more radioactive than uranium-238. Uranium-234 is the least abundant uranium isotope in rock.

Uranium is not a stable element. As uranium decays, it releases radiation and forms decay products. Uranium-238 decay products include uranium-234, radium-226, and radon-222. See EPA Fact About Radon and Radium for additional information on these radionuclides.

Natural uranium releases alpha particles and low levels of gamma rays. Alpha particles can travel only short distances and cannot penetrate human skin. Gamma radiation, however, can penetrate the body.

The half-life for uranium-238 is about 4.5 billion years, uranium-235 is 710 million years and uranium-234 is 250,000 years. Because of the slow rate of decay, the total amount of natural uranium in the earth stays almost the same, but radionuclides can move from place to place through natural processes or by human activities. Rain can wash soil containing uranium into rivers and lakes. Mining, milling, manufacturing, and other human activities also release uranium to the environment.

What are the uses of uranium?

Uranium-235 is used in nuclear weapons and nuclear reactors. Depleted uranium (natural uranium in which almost all of the uranium-235 has been removed) is used to make ammunition for the military, guidance devices and compasses, radiation shielding material, and X-ray targets. Uranium dioxide is used to extend the lives of incandescent lamps used for photography and motion pictures. Very small amounts of other uranium compounds are used in photography for toning, in the leather and wood industries for stains and dyes, and in the wool industries. Uranium has also been used in the past in ceramics as a coloring agent.

How are people exposed to uranium?

Uranium-238 and members of its decay chain which include uranium-234, radium-226, and radon-220 are present in nature. The members of the decay chain in undisturbed soil are present often at concentrations that approximate that of the parent uranium-238. Uranium ore contains all the daughter elements of uranium-238 and uranium-235, but during uranium processing the uranium-238, uranium-234 and uranium-235 are extracted and chemically separated. This concentrated uranium product which is generated at uranium mill tailing sites and uranium processing facilities is a potential source of exposure to individuals and the environment and is a primary concern for the cleanup of these sites. Potential individual exposure at these sites may be from different pathways, but because of the mobility of uranium the ground water pathway is of particular concern.

How does uranium get into the body?

Uranium can enter the body when it is inhaled or swallowed or through cuts in the skin. About 99 percent of the uranium ingested in food or water will leave a person's body in the feces, and the remainder will enter the blood. Most of this uranium will be removed by the kidneys and excreted in the urine within a few days. A small amount of the uranium in the bloodstream will be deposited in a person's bones, where it will remain for several years.

Alpha particles released by uranium cannot penetrate the skin, so natural uranium that is outside the body is less harmful than that which is inhaled, swallowed or enters through the skin. When uranium gets inside the body, radiation and chemical damage can lead to cancer or other health problems including kidney damage.

Is there a medical test to determine exposure to uranium?

Tests are available to measure the amount of uranium in a urine or stool sample. These tests are useful if a person is exposed to a larger-than-normal amount of uranium, because most uranium leaves the body in the feces within a few days. Uranium can be found in the urine for up to several months after exposure. However, the amount of uranium in the urine and feces does not always accurately show the level of uranium exposure. Since uranium is known to cause kidney damage, urine tests are often used to determine whether kidney damage has occurred.

How can uranium affect people's health?

In addition to the risks of cancer posed by uranium and all other radionuclides, uranium is associated with non-cancer effects and the major target organ of uranium's chemical toxicity is the kidney. Radioactivity is a health risk because the energy emitted by radioactive materials can damage or kill cells. The level of risk is dependent on the level of uranium concentration.

What recommendations has the Environmental Protection Agency made to protect human health?

Please note that the information in this section is limited to recommendations EPA has made to protect human health from exposure to uranium. General recommendations EPA has made to protect human health, which cover all radionuclides including uranium, are summarized in the Introduction section of this booklet.

EPA has established a Maximum Contaminant Level (MCL) of 30 micrograms per liter (ug/liter) for uranium in drinking water. For uranium mill tailing sites, EPA has established 30 picocuries per Liter (pCi/l) for uranium 234 and 238 as standards for protecting groundwater. The EPA OSWER Directive 9283.1-14 "Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites" provides guidance regarding how these two standards should be implemented as an ARAR at Superfund sites.

For uranium mill tailing sites, EPA has established 5 picocuries per gram (pCi/g) of radium as a protective health based level for the cleanup of the top 15 centimeters of soil. If regulations under 40 CFR Part 192.12 are an ARAR for radium in soil at a Superfund site, then NRC regulations for uranium mill tailing sites under 10 CFR Part 40 Appendix A, I, Criterion 6(6) may possibly be an ARAR at the same site, particularly if uranium-234 or uranium-238 is a contaminant at the site. Criterion 6(6) requires that an estimate be made of the level of radiation, called a "benchmark dose," that an individual would receive after that site was cleaned up to the radium soil regulations under 40 CFR Part 192.12. This benchmark dose then becomes the maximum level of radiation that an individual may be exposed to from all radionuclides, except radon, in both the soil and buildings at the site. The EPA OSWER Directive 9200.4-35P, "Remediating Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criterion 10 CFR Part 40 Appendix A, I, Criterion 6(6)" provides guidance regarding how Criterion 6(6) should be implemented as an ARAR at Superfund sites, including using a radium soil cleanup level of 5 pCi/g in both the surface and subsurface when estimating a benchmark dose.

For more information about how EPA addresses uranium at Superfund sites, please contact either:

EPA's Superfund Hotline
1-800-424-9346 or 1-800-535-0202
or EPA's Superfund Radiation Webpage
http://www.epa.gov/superfund/resources/radiation

Ionizing Radiation

As adapted from the EPA Web site

June 2003

What Is Ionizing Radiation?[1]

Ionizing radiation is radiation that has sufficient energy to remove electrons from atoms. In this document, it will be referred to simply as radiation. One source of radiation is the nuclei of unstable atoms. For these radioactive atoms (also referred to as radionuclides or radioisotopes) to become more stable, the nuclei eject or emit subatomic particles and high-energy photons (gamma rays). This process is called radioactive decay. Unstable isotopes of radium, radon, uranium, and thorium, for example, exist naturally. Others are continually being made naturally or by human activities such as the splitting of atoms in a nuclear reactor. Either way, they release ionizing radiation. The major types of radiation emitted as a result of spontaneous decay are alpha and beta particles, and gamma rays. X rays, another major type of radiation, arise from processes outside the nucleus.

Alpha Particles

Alpha particles are energetic, positively charged particles (helium nuclei) that rapidly lose energy when passing through matter. They are commonly emitted in the radioactive decay of the heaviest radioactive elements such as uranium and radium as well as by some manmade elements. Alpha particles lose energy rapidly in matter and do not penetrate very far; alpha particles can be stopped completely by a sheet of paper. However, they can cause damage over their short path through human tissue. These particles are usually completely absorbed by the outer dead layer of the human skin so alpha-emitting radioisotopes are not a hazard outside the body. However, they can be very harmful if they are ingested or inhaled.

Beta Particles

Beta particles are fast-moving, positively or negatively charged electrons emitted from the nucleus during radioactive decay. Humans are exposed to beta particles from manmade and natural sources such as tritium, carbon-14, and strontium-90. Beta particles are more penetrating than alpha particles but are less damaging over equally traveled distances. Some beta particles are capable of penetrating the skin and causing radiation damage; however, as with alpha emitters, beta emitters are generally more hazardous when they are inhaled or ingested. Beta particles travel appreciable distances in air but can be reduced or stopped by a layer of clothing or by a few millimeters of a substance such as aluminum.

Gamma Rays

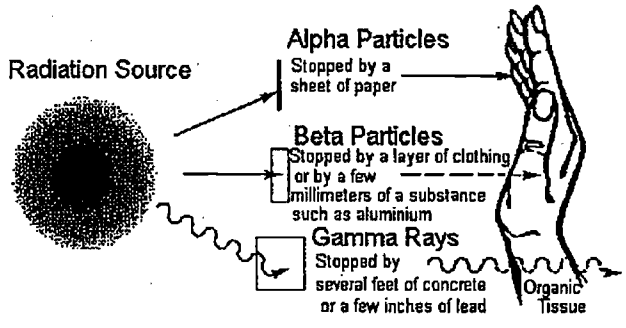
Like visible light and X rays, gamma rays are weightless packets of energy called photons. Gamma rays often accompany the emission of alpha or beta particles from a nucleus. They have neither mass nor a charge and are very penetrating. One source of gamma rays in the environment is naturally occurring potassium-40. Manmade sources include plutonium-239 and cesium-137. Gamma rays can easily pass completely through the human body or be absorbed by tissue, thus constituting a radiation hazard for the entire body. Several feet of concrete or a few inches of lead may be required to stop more energetic gamma rays.

[1] This information is taken from the U.S. EPA web sites: http://www.epa.gov/radiation/docs/ionize/ionize.htm and http://www.epa.gov/radiation/docs/ionize/ionize2.htm

X Rays

X rays are high-energy photons produced by the interaction of charged particles with matter. X rays and gamma rays have essentially the same properties, but differ in origin; i.e., X rays are emitted from processes outside the nucleus, while gamma rays originate inside the nucleus. X rays are generally lower in energy and therefore less penetrating than gamma rays. Literally thousands of x-ray machines are used daily in medicine and industry for examinations, inspections, and process controls. X rays are also used for cancer therapy to destroy malignant cells. Because of their many uses, X rays are the single largest source of manmade radiation exposure. A few millimeters of lead can stop medical X rays.

Penetrating Powers of Alpha and Beta Particles and Gamma Rays



Sources of Radiation

Natural Radiation

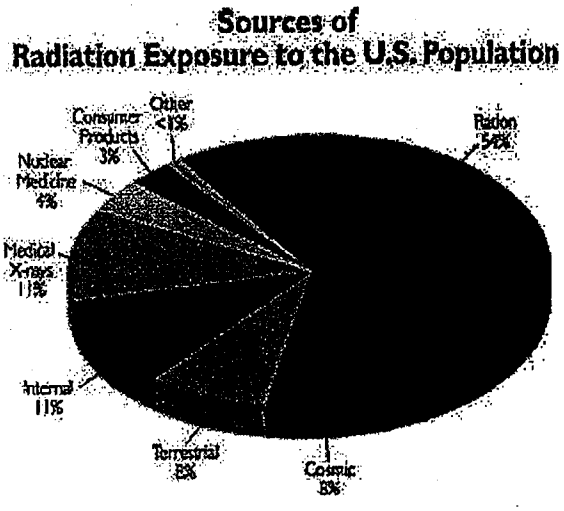
Humans are primarily exposed to natural radiation from the sun, cosmic rays, and naturally occurring radioactive elements found in the earth's crust. Radon, which emanates from the ground, is another important source of natural radiation. Cosmic rays from space include energetic protons, electrons, gamma rays, and X rays. The primary radioactive elements found in the earth's crust are uranium, thorium, and potassium, and their radioactive derivatives. These elements emit alpha and beta particles, or gamma rays.

Manmade Radiation

Radiation is used on an ever increasing scale in medicine, dentistry, and industry. Main users of manmade radiation include: medical facilities such as hospitals and pharmaceutical facilities; research and teaching institutions; nuclear reactors and their supporting facilities such as uranium mills and fuel preparation plants; and Federal facilities involved in nuclear weapons production as part of their normal operation.

Many of these facilities generate some radioactive waste and some release a controlled amount of radiation into the environment. Radioactive materials are also used in common consumer products such as digital and luminous-dial wristwatches, ceramic glazes, artificial teeth, and smoke detectors.

Most of the x-ray exposure people receive is technologically produced. Natural radiation comes from cosmic rays, naturally occurring radioactive elements found in the earth's crust (uranium, thorium, etc.), and radioactive decay products such as radon and its subsequent decay products. The latter group represents the majority of the radiation exposure of the general public.
The following figure shows the percentage contribution that various radiation sources make toward the yearly average effective dose received by the U.S. population (NCRP Report No. 93).
Any release of radioactive material is a potential



source of radiation exposure to the population. In addition to exposure from external sources, radiation exposure can occur internally by ingesting, inhaling, injecting, or absorbing radioactive materials. Both external and internal sources may irradiate the whole body or a portion of the body. The amount of radiation exposure is usually expressed in a unit called millirem (mrem). In the United States, the average person is exposed to an effective dose equivalent of approximately 360 mrem (whole-body exposure) per year from all sources (NCRP Report No. 93).

Health Effects of Radiation Exposure

Depending on the level of exposure, radiation can pose a health risk. Ionizing radiation can cause changes in the chemical balance of cells, some of which can result in cancer. In addition, by damaging the genetic material (DNA) contained in all cells of the body, ionizing radiation can cause harmful genetic mutations that can be passed on to future generations. Exposure to large amounts of radiation, a rare occurrence, can cause sickness in a few hours or days and death within 60 days of exposure. In extreme cases, it can cause death within a few hours of exposure.

With smaller doses, the person or particular irradiated organ(s) may survive, but the cells are damaged, increasing the chance of cancer. The extent of the damage depends upon the total amount of energy absorbed, the time period and dose rate of exposure, and the particular organ(s) exposed. Evidence of injury from low or moderate doses of radiation may not show up for months or even years. For leukemia, the minimum time period between the radiation exposure and the appearance of disease (latency period) is 2 years. For solid tumors, the latency period is more than 5 years. The types of effects and their probability of occurrence can depend on whether the exposure occurs over a large part of a person's lifespan (chronic) or during a very short portion of the lifespan (acute). It should be noted that all of the health effects of exposure to radiation can also occur in unexposed people due to other causes. Also, there is no detectable difference in appearance between radiation-induced cancers and genetic effects and those due to other causes.

Chronic Exposure

Chronic exposure is continuous or intermittent exposure to low levels of radiation over a long period of time. Chronic exposure is considered to produce only effects that can be observed some time following initial exposure. These include genetic effects and other effects such as cancer, precancerous lesions, benign tumors, cataracts, skin changes, and congenital defects.

Acute Exposure

Acute exposure is exposure to a large, single dose of radiation or a series of doses over a short period of time. Large acute doses can result from accidental or emergency exposures or from special medical procedures (radiation therapy). In most cases, a large acute exposure to radiation can cause both immediate and delayed effects. For humans and other mammals, acute exposure, if large enough, can cause rapid development of radiation sickness, evidenced by gastrointestinal disorders, bacterial infections, hemorrhaging, anemia, loss of body fluids, and electrolyte imbalance. Delayed biological effects can include cataracts, temporary sterility, cancer, and genetic effects. Extremely high levels of acute radiation exposure can result in death within a few hours, days, or weeks.

Risks of Health Effects

All people are chronically exposed to background levels of radiation present in the environment. Many people also receive additional chronic exposures and/or relatively small acute exposures. For populations receiving such exposures, the primary concern is that radiation could increase the risk of cancers or harmful genetic effects.

The probability of a radiation-caused cancer or genetic effect is related to the total amount of radiation accumulated by an individual. Based on current scientific evidence, any exposure to radiation can be harmful (or can increase the risk of cancer);

however, at very low exposures, the estimated increases in risk are very small. For this reason, cancer rates in populations receiving very low doses of radiation may not show increases over the rates for unexposed populations.

For information on effects at high levels of exposure, scientists largely depend on epidemiological data on survivors of the Japanese atomic bomb explosions and on people receiving large doses of radiation medically. These data demonstrate a higher incidence of cancer among exposed individuals and a greater probability of cancer as the level of exposure increases. In the absence of more direct information, that data is also used to estimate what the effects could be at lower exposures. Where questions arise, scientists try to extrapolate based on information obtained from laboratory experiments, but these extrapolations are acknowledged to be only estimates. For radon, scientists largely depend on data collected on underground miners.

Professionals in the radiation protection field prudently assume that the chance of a fatal cancer from radiation exposure increases in proportion to the magnitude of the exposure and that the risk is as high for chronic exposure as it is for acute exposure. In other words, it is assumed that no radiation exposure is completely risk free.

Other Sources of Information

World Health Organization
http://www.who.int/ionizing_radiation/en/

U.S. AIR FORCE

Path Forward
Long-Term Response Actions

- If necessary, the Air Force will conduct cleanup activities, following these steps:
  - Prepare *Removal Action Work Plan*
  - Conduct regulatory and community involvement
  - Perform cleanup, such as soil excavation and disposal at an approved disposal facility
  - Prepare *Final Status Survey* report

Former Carswell Air Force Base
Fort Worth, Texas

HydroGeoLogic, Inc., is under contract to the Air Force Center for Environmental Excellence to **research the operational history** of the **former Carswell Air Force Base,** which began serving as a military installation in 1942 and is presently under the U.S. Navy's control. The site is currently known as **Naval Air Station Fort Worth** and was formerly known by the following names:

Tarrant Field Airdrome
Fort Worth Army Airfield
Griffiss Air Base
Fort Worth Air Base
Carswell Air Force Base

We wish to interview individuals knowledgeable about operations at these facilities. If you have any information concerning these operations, please call the toll free number below.

1-800-836-8134

AFC002A_1FAB flyer.cdr

HydroGeoLogic, Inc. ◆ 1155 Herndon Parkway, Suite 900 ◆ Herndon, VA 20170

NAS Fort Worth JRB Installation Restoration Program Update

Michael R. Dodyk, P.E.
AFCEE
August 21, 2003

Installation Restoration History

Carswell Air Force Base closed September 30, 1993. The majority of the base was realigned as Naval Air Station Joint Reserve Base Fort Worth.

The Air Force is responsible for cleanup of environmental contamination that occurred before October 1, 1993 (while Carswell AFB was active.)

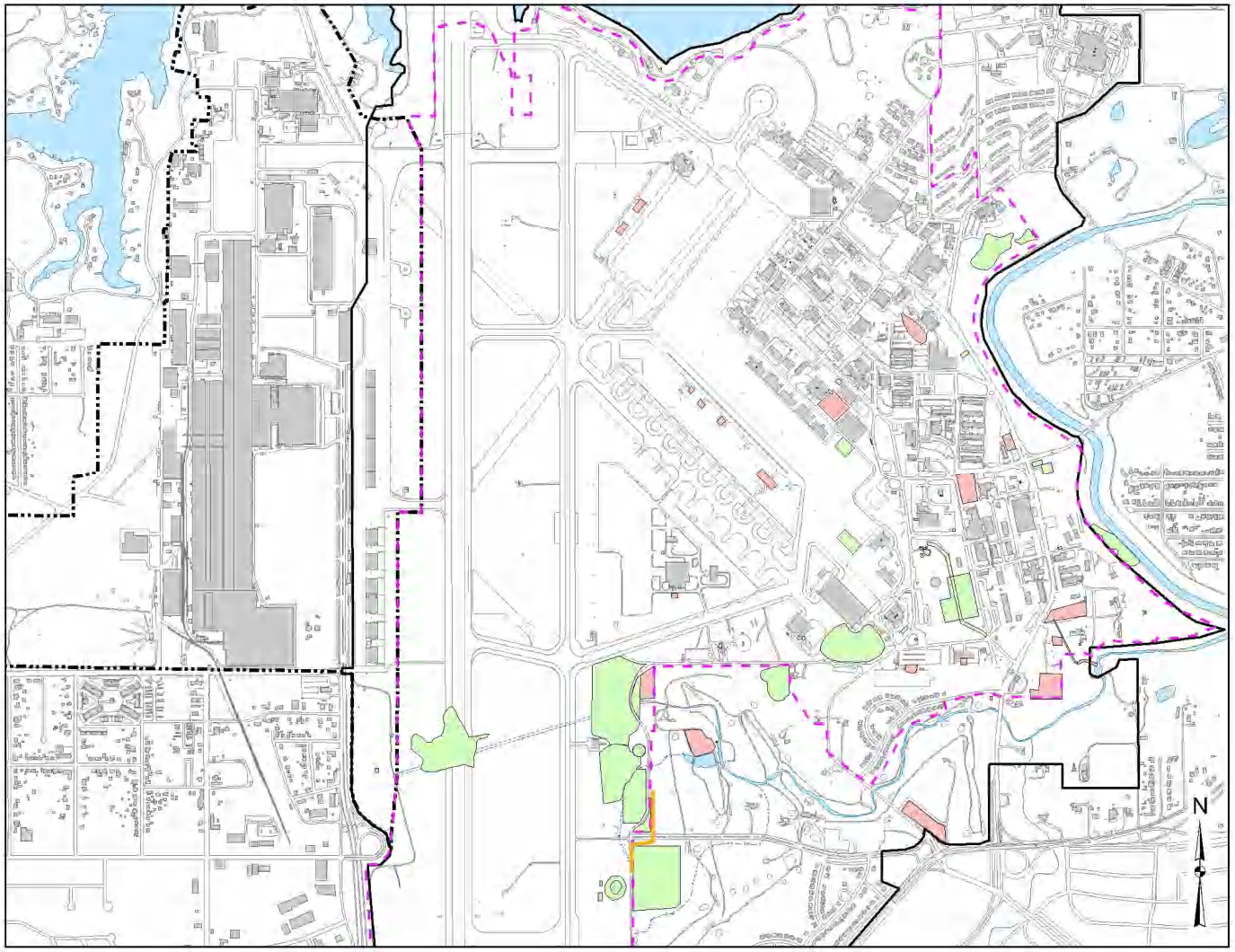
Installation Restoration History

In compliance with the Resource Conservation and Recovery Act (RCRA), a RCRA Facility Assessment (RFA) was completed in 1989.

The RFA identified 87 sites that required investigation and closure.

- **68 Solid Waste Management Units (SWMU)**
- **19 Areas of Concern (AOC)**

SWMUs and AOCs



Site Closure Update

To date, the Air Force has received closure on 78 of the 87 sites (9 sites remaining).

Of these 9 remaining sites:

3 will be closed by 12/31/03 (SWMUs 19, 20, 21)

5 will be closed by 6/30/04 (SWMUs 28, 49, 54, 55, 66)

AOC 1 will be closed by 12/30/05

Basewide Historical Investigation

To ensure complete investigation of possible sources of contamination, the Air Force is conducting historical research consisting of:

- **Records searches of archival documents**
- **Interviews with Air Force personnel stationed at Carswell AFB**
- **Summary of historical aerial photographs**
- **Compilation of historical data in basewide report**

Field Activities

Construction of the groundwater remediation system at the former base gas/service station (AOC 1) was completed in June. The groundwater treatment system began operating June 10, 2003.

Performance monitoring of the PRB was conducted in June.

A demonstration study using vegetable oil injected into the ground to treat TCE contamination in the northern lobe of the plume was completed in July.

AOC 1 Treatment System

AOC 1 Cleanup Information

The system has six groundwater recovery wells, each approximately 33 feet deep. Contaminated groundwater is pumped to the surface and passed through an air stripper to volatilize contaminants.

Within the first 20 days of operation, the system treated 183,704 gallons of contaminated groundwater.

At a pumping rate of 6 gallons per minute, the system removed 0.67 pounds of benzene and 3.3 pounds of total petroleum hydrocarbons.

Permeable Reactive Barrier

The PRB was installed in April/May 2002 to remediate groundwater contaminated with trichloroethene (TCE). Groundwater sampling is conducted every 3 months to monitor performance.

The PRB is successfully remediating groundwater

PRB Animation

Upcoming Field Work

Fall 2003:

Performance monitoring of the AOC 1 groundwater treatment system.

Delineation of various compounds and an excavation to remove cadmium-impacted surface soil at Landfill 1.

Delineation of sediment/soil contamination at SWMUs 54 and 55 (Storm water interceptors and the East Gate oil/water separator).

Documents Under Review

Draft Documents Under Review by AFCEE:

RFI of SWMU 49 (Former Aircraft Washing Area).

Documents Under Review by Regulators:

RFI of SWMUs 19, 20, and 21 (Former Fire Training Area No. 2).

Final SI for Building 1010 (former Jet Engine Test Stand).

Documents Under Discussion Between Regulators and AFCEE Prior to Finalization:

Focused Feasibility Study on the Southern Lobe TCE Plume.


Air Force Plant 4 - RAB
August 21, 2003
George Walters
Wright-Patterson AFB OH
EPL
BLD181
North
Parking
Lot Inv
Nuclear Aerospace Research Facility
USGS Conceptual Model Progress
Landfill Survey Technology Demo

Nuclear Aerospace Research Facility (NARF)

NARF site housed several experimental atomic reactors between 1953 and 1974. About 120 acres.

- Various materials were subjected to radiation to determine the affect on physical properties and operability. Also, a nuclear powered aircraft experiment was conducted.

Decommissioned in 1974. Unrestricted use!

- 2 Million pounds of parts (activation material) and 15 million pounds of concrete rubble were hauled to Barnwell, SC

- Post closure inspection revealed no remaining contamination.

Of 20 original installation restoration sites (Landfills, pits, Fire training areas), the top 19 scored between 88 and 51, the NARF scored a 6.

ALL AFP 4 Investigation Reports are on CD-ROMS, White Settlement Library!


WORKERS

USGS 2001 Conceptual Site Model

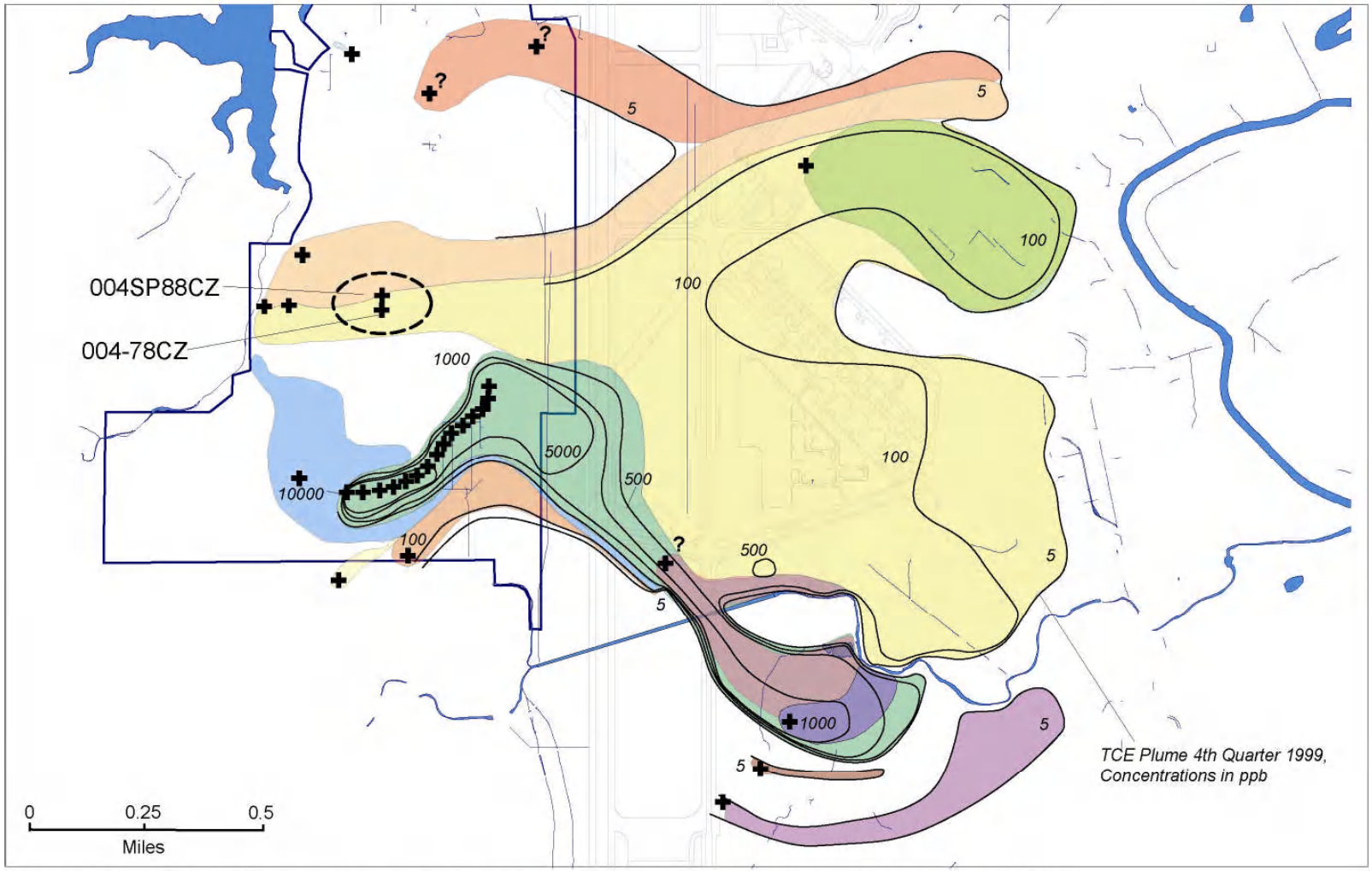
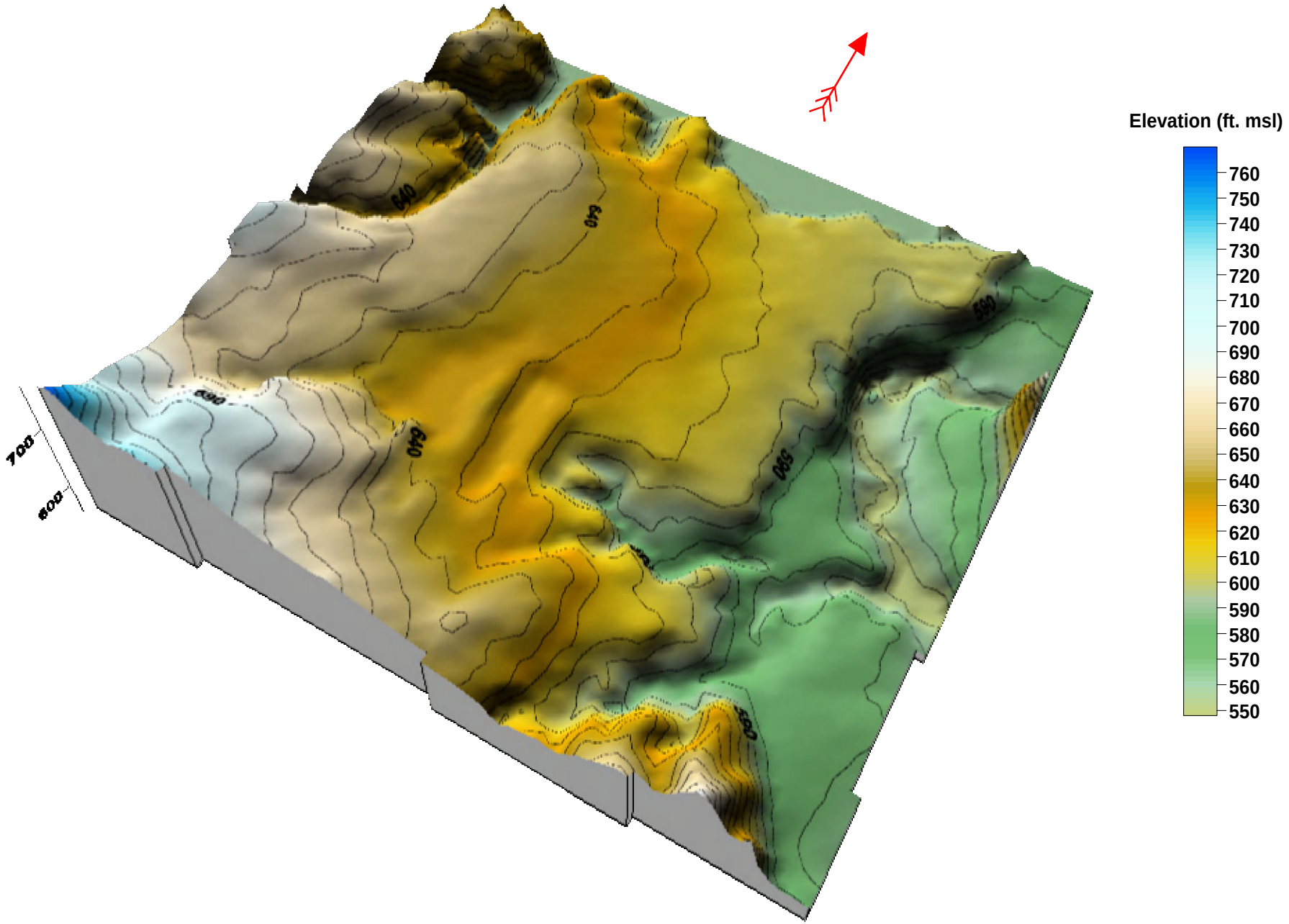
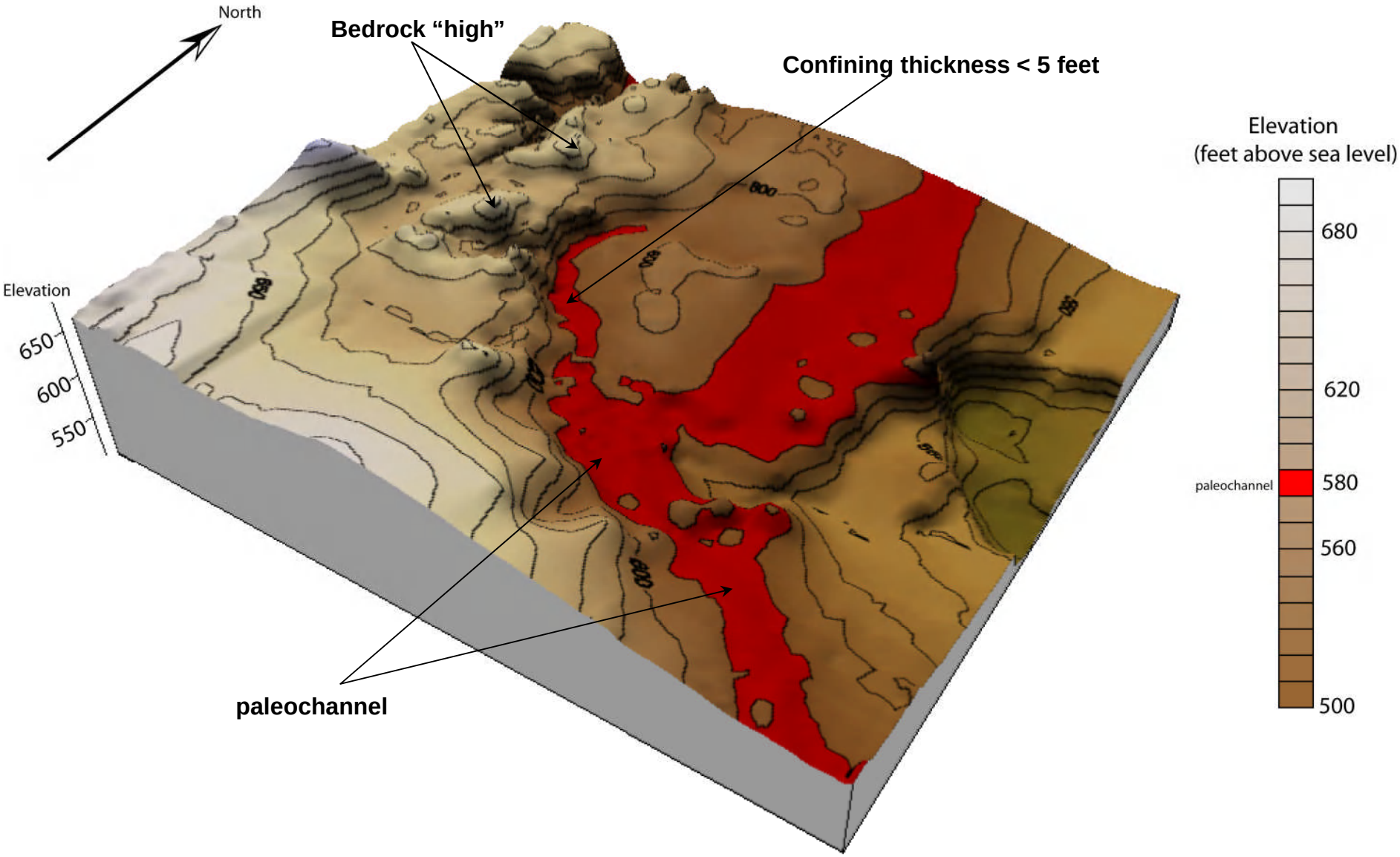


Figure 4. Possible TCE source areas, conceptualized in May 2001 by Sandy Eberts of the USGS

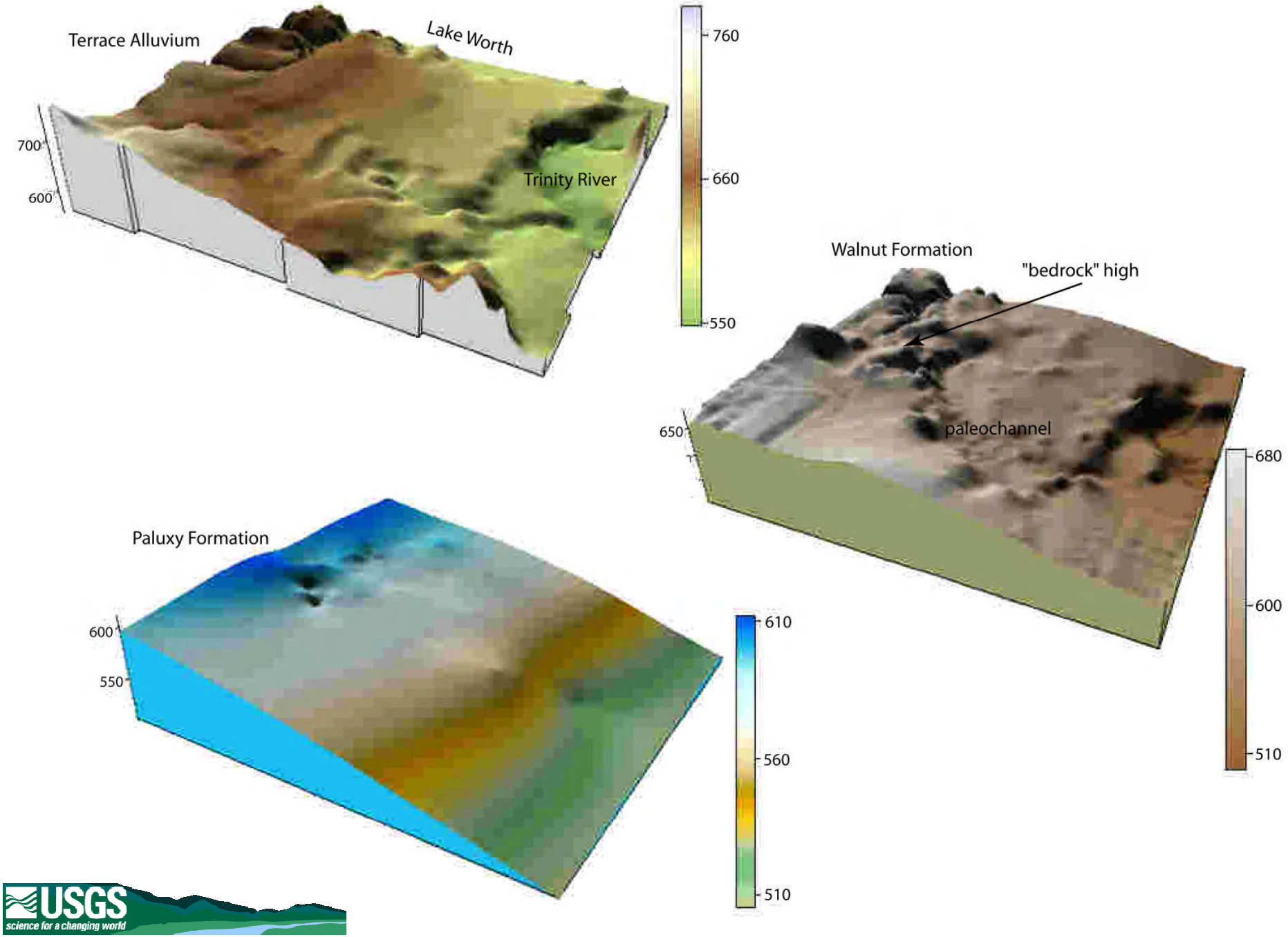


USGS
science for a changing world

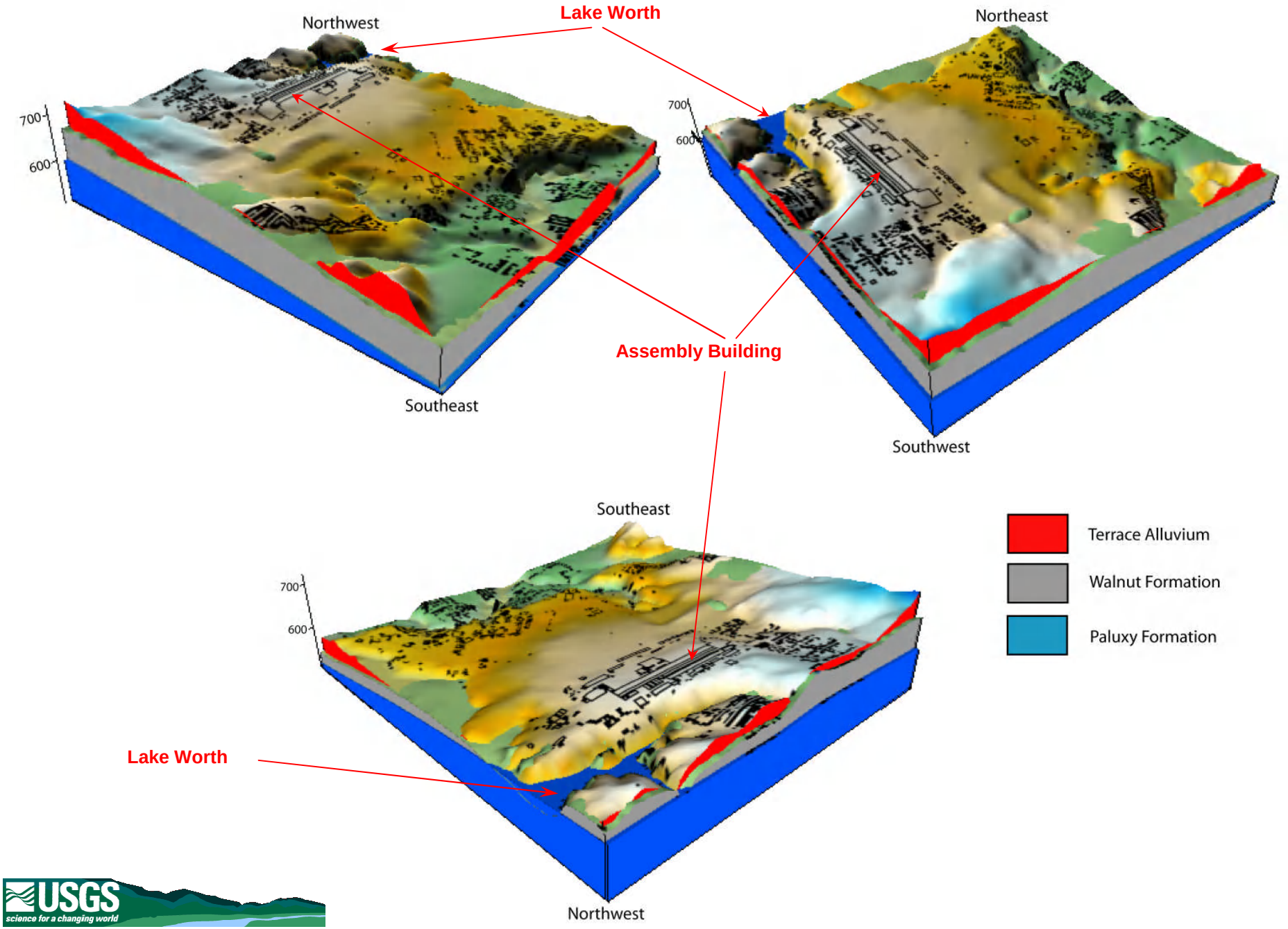


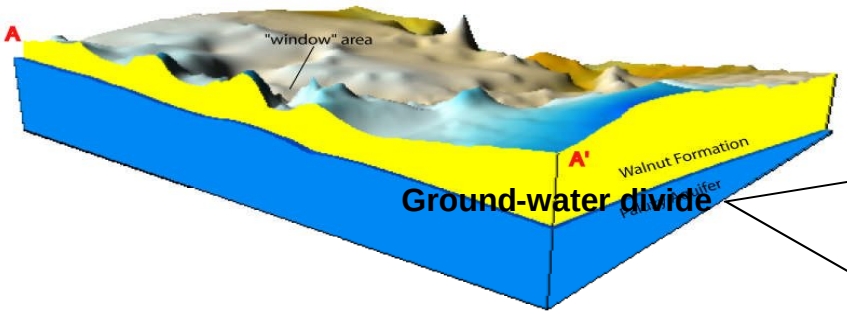
USGS
science for a changing world

Lithologic surfaces in the vicinity of Air Force Plant 4-NAS Fort Worth, TX

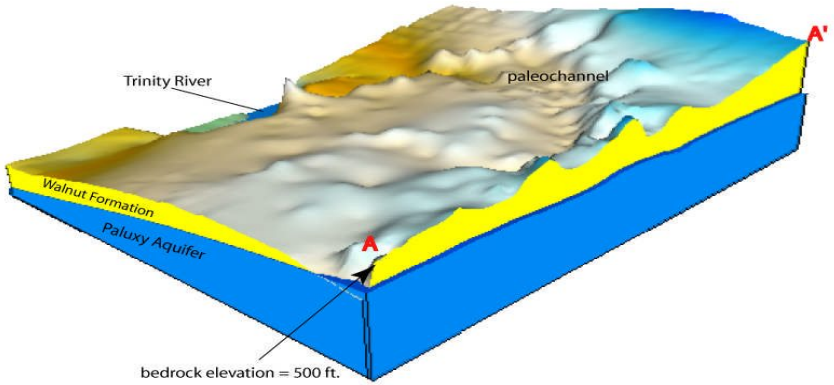


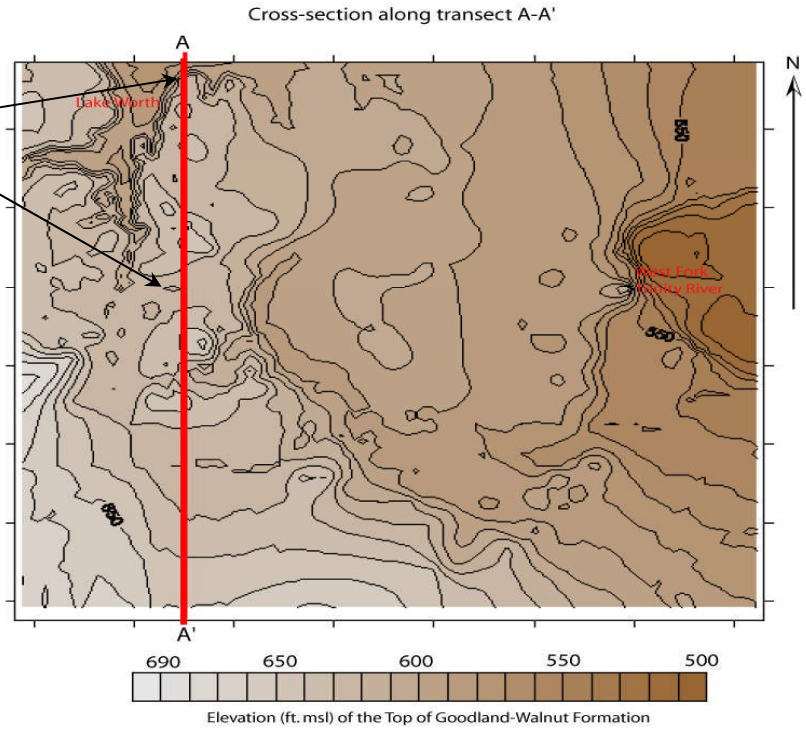
USGS science for a changing world


Lake Worth
Northwest
Southeast
700
600
Northeast
Southwest
Assembly Building
Southeast
Northwest
Lake Worth
Terrace Alluvium
Walnut Formation
Paluxy Formation



Ground-water divide

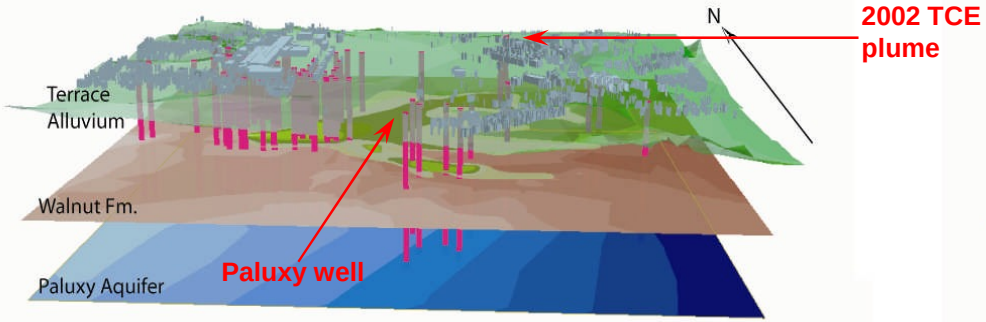


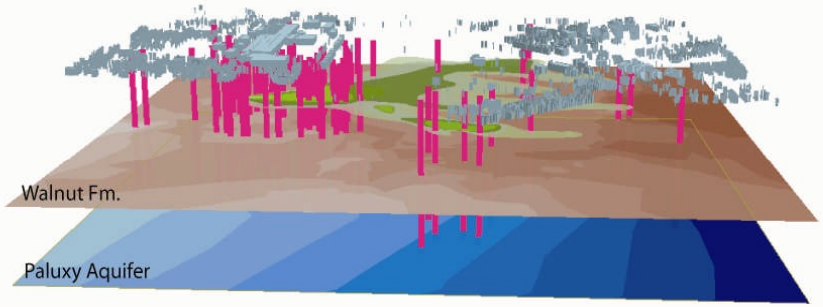


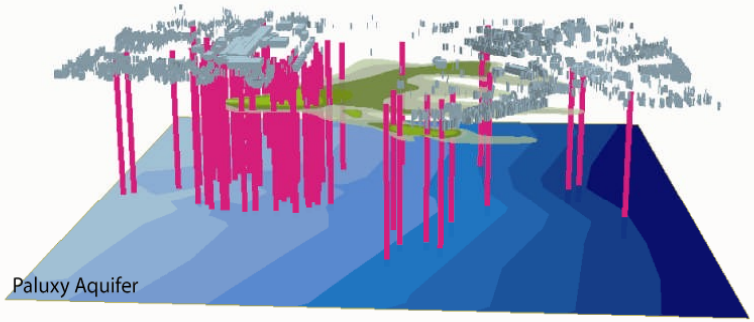
USGS science for a changing world

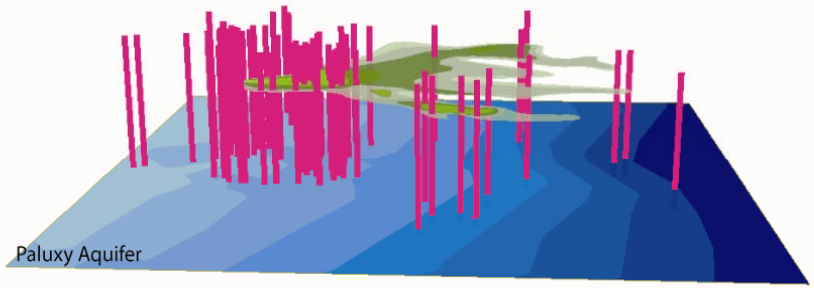
Assembly Building

Air Force Plant 4-NAS Conceptual Model: 3D Diagram of study area (tops of lithologic surfaces with 2002 TCE ground water plume)





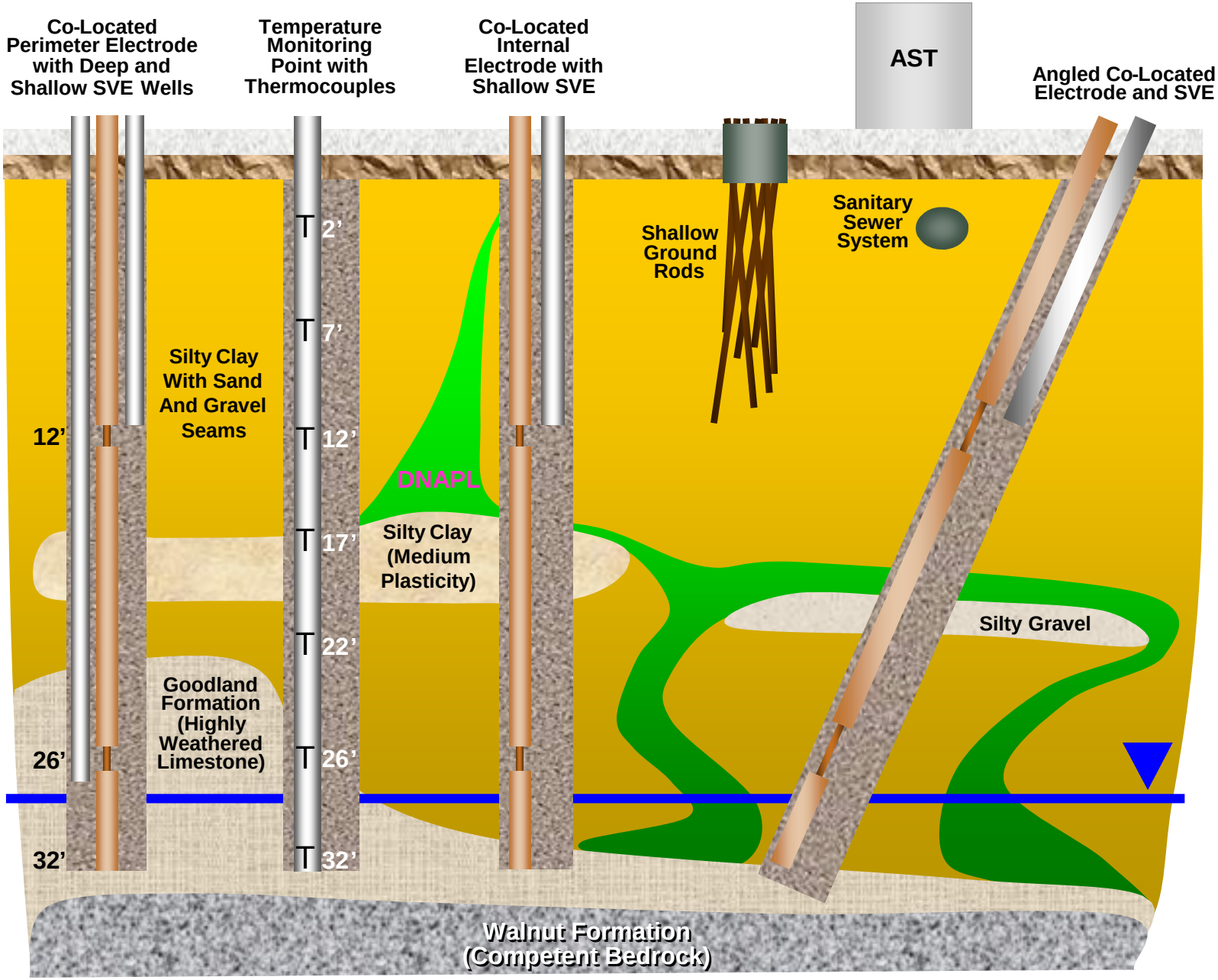


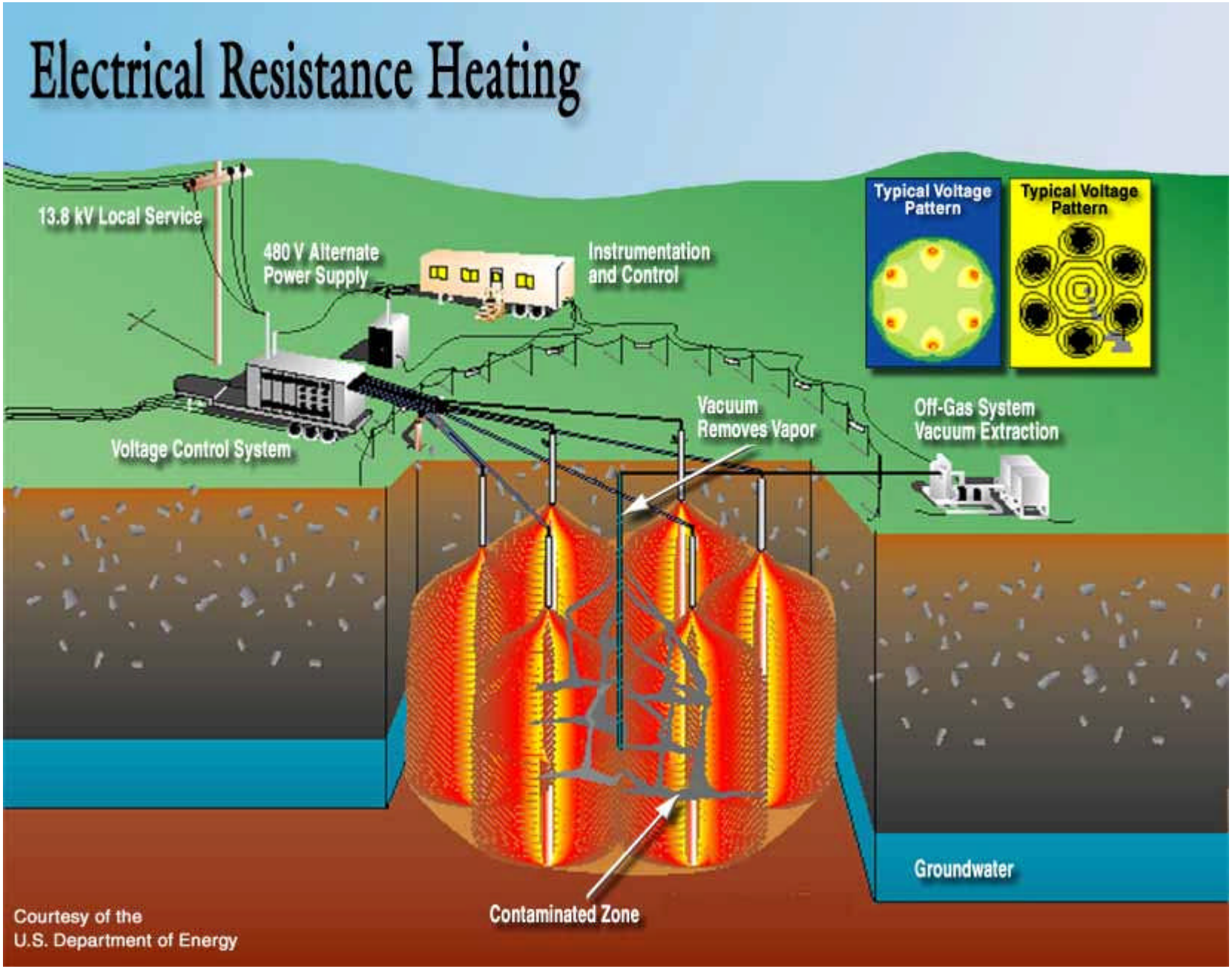


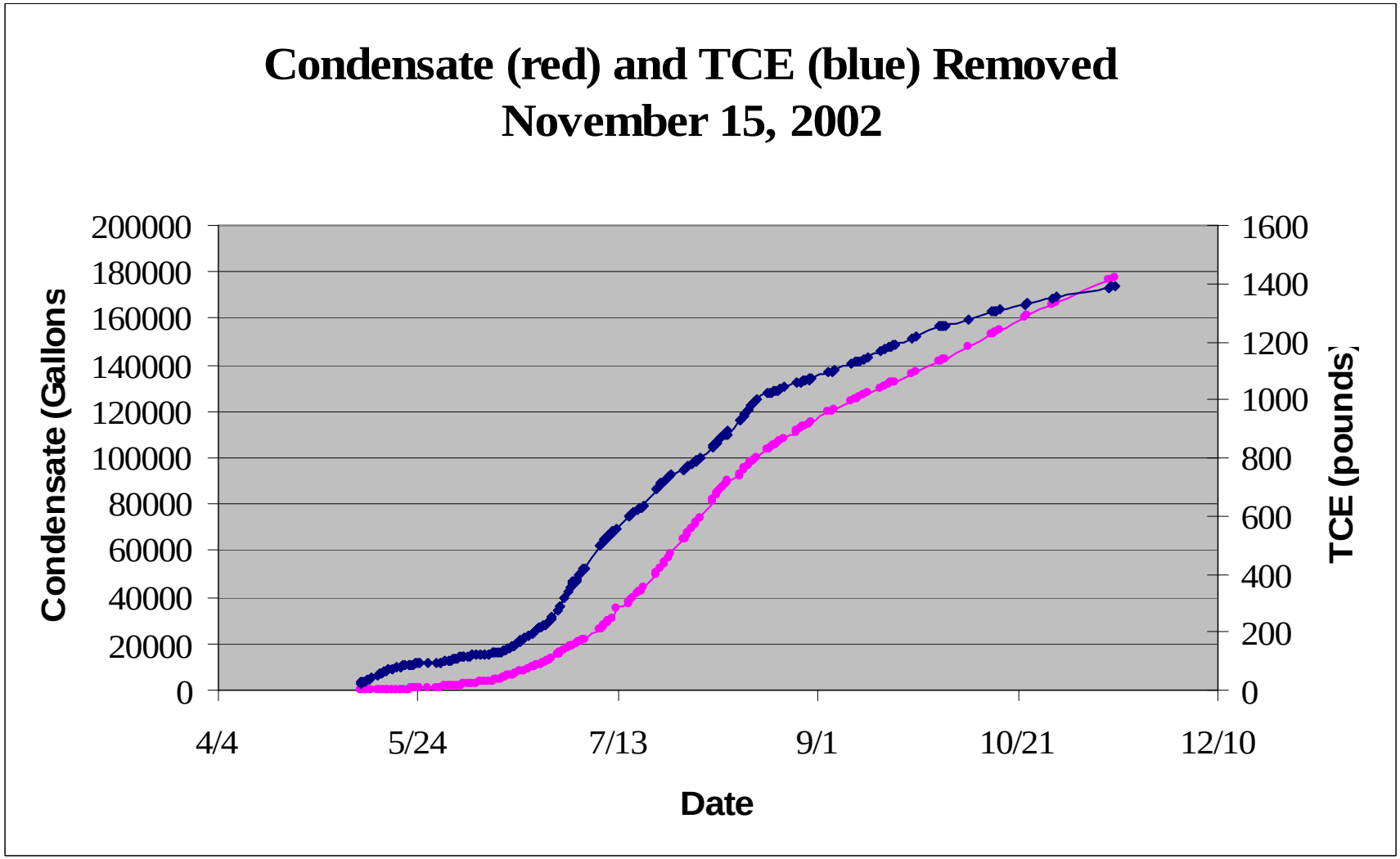
USGS science for a changing world

Much Respect to our Fighting Forces!

ERH Subsurface Cross Section

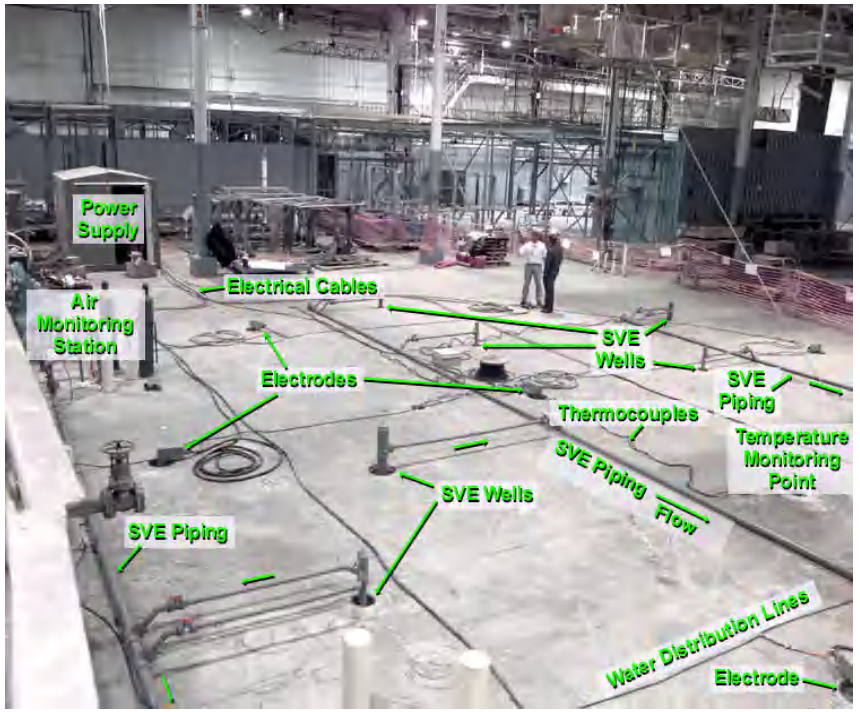


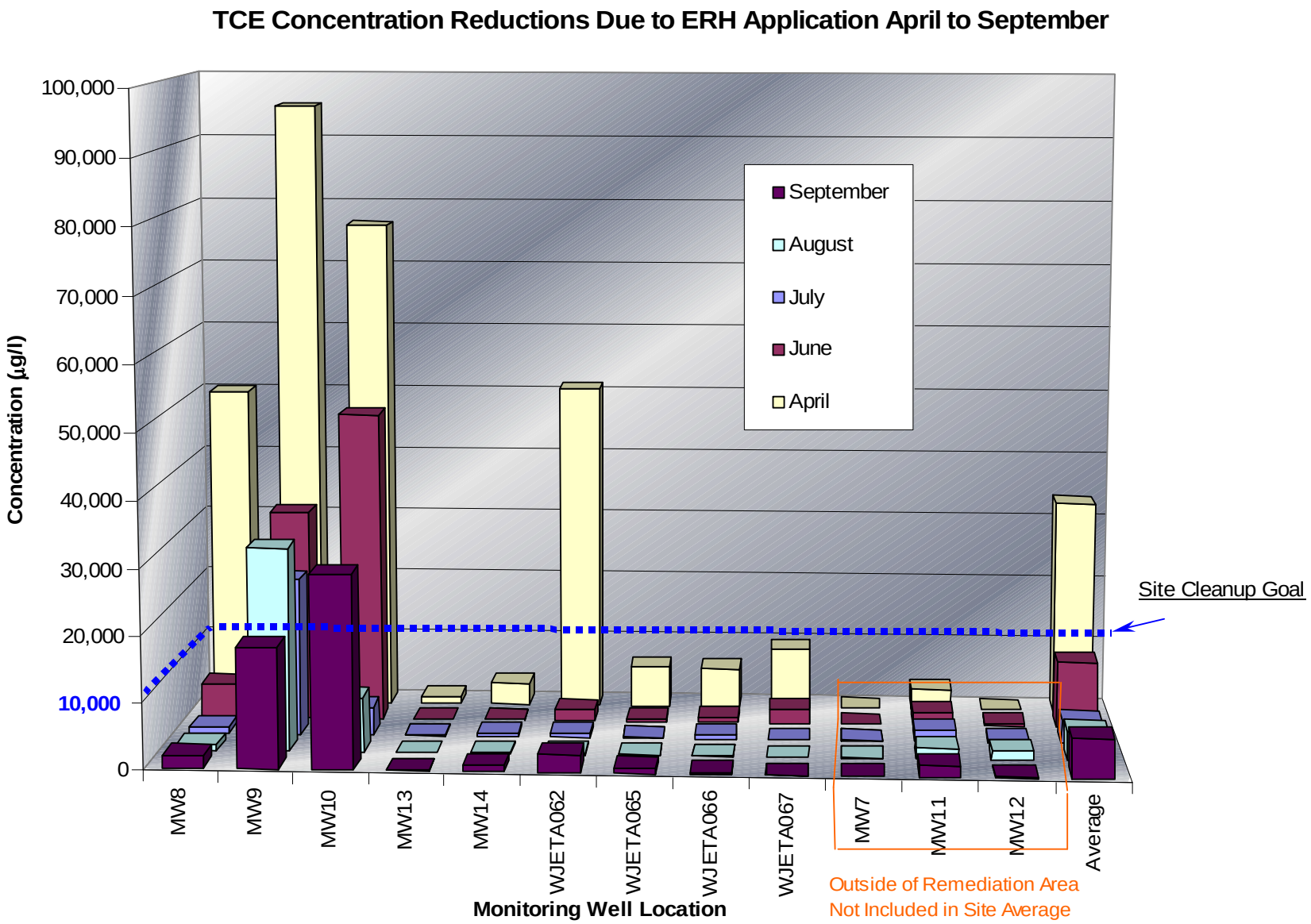

Electrical Resistance Heating
13.8 kV Local Service
480 V Alternate Power Supply
Instrumentation and Control
Typical Voltage Pattern
Typical Voltage Pattern
Voltage Control System
Vacuum Removes Vapor
Off-Gas System Vacuum Extraction
Groundwater
Contaminated Zone
Courtesy of the U.S. Department of Energy


Condensate (red) and TCE (blue) Removed
November 15, 2002
Condensate (Gallons
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1600
1400
1200
1000
800
600
400
200
0
TCE (pounds)
4/4
5/24
7/13
9/1
10/21
12/10
Date

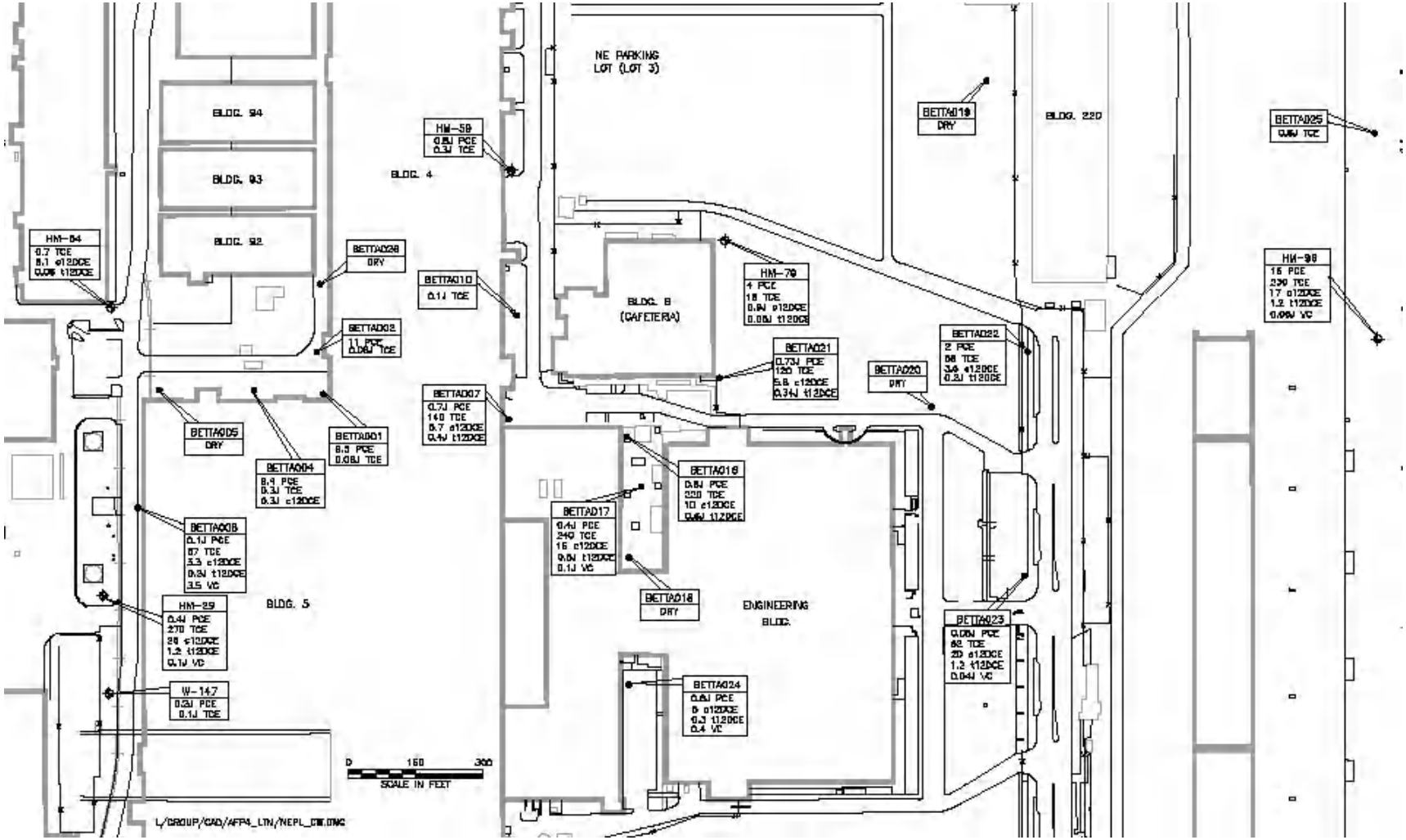
Source Area Remediation Demonstration
Electrical Resistive Heating
AF Plant 4, Fort Worth, TX

- ERH demonstration started 7 May 02 – Ended 18 Dec 02
- Total power input into the subsurface - 1.899 MWh
- Total condensate removed from the subsurface – 177,711 gals
- Total TCE removed from the subsurface – 1391 lbs
- Total soil borings that achieved cleanup goals – 10 of 10
- Total monitoring wells that achieved cleanup goals - 8 of 9

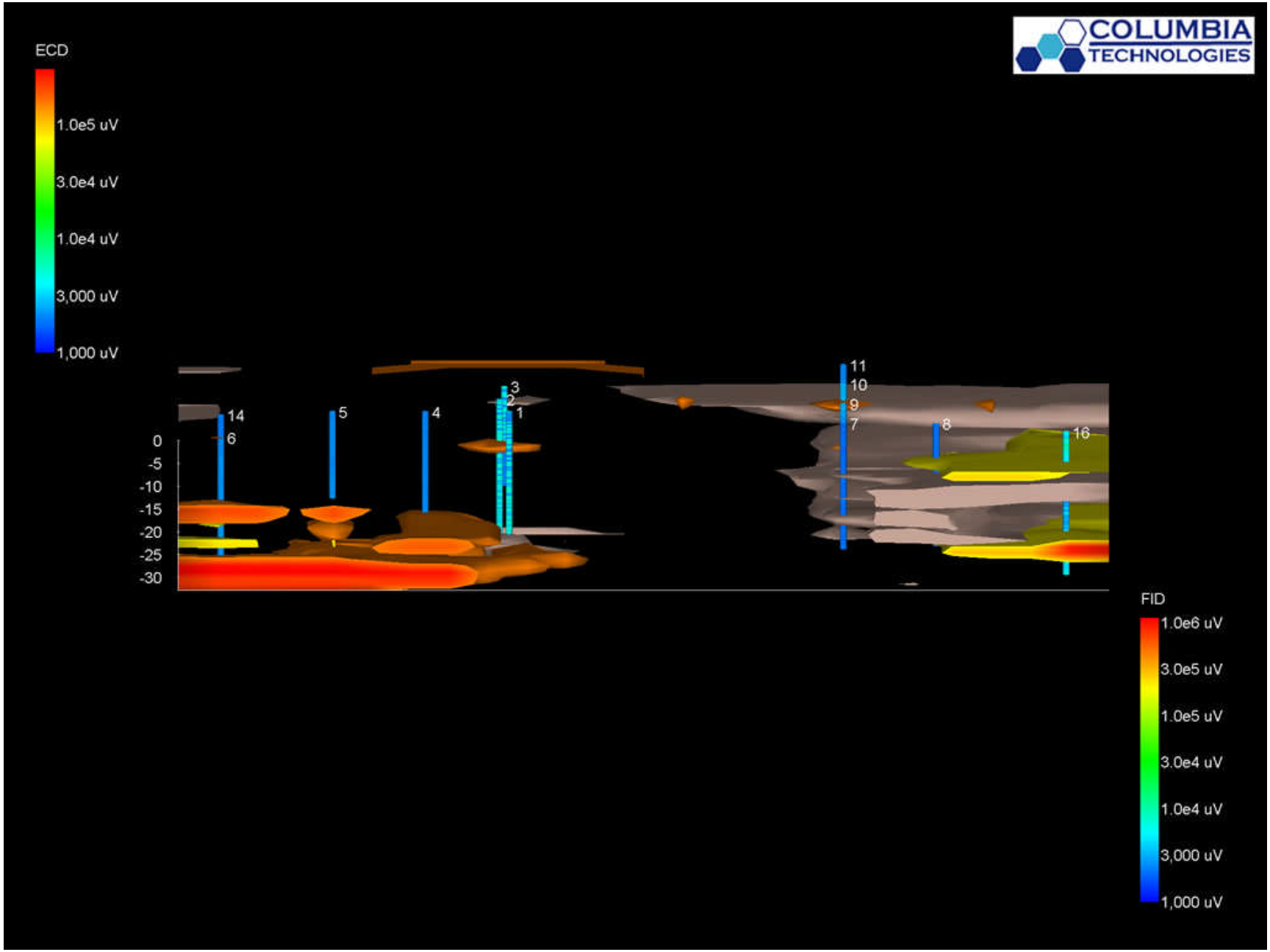



TCE Concentration Reductions Due to ERH Application April to September
Concentration (µg/l)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
September
August
July
June
April
Site Cleanup Goal
MW8
MW9
MW10
MW13
MW14
WJETA062
WJETA065
WJETA066
WJETA067
MW7
MW11
MW12
Average
Monitoring Well Location
Outside of Remediation Area
Not Included in Site Average

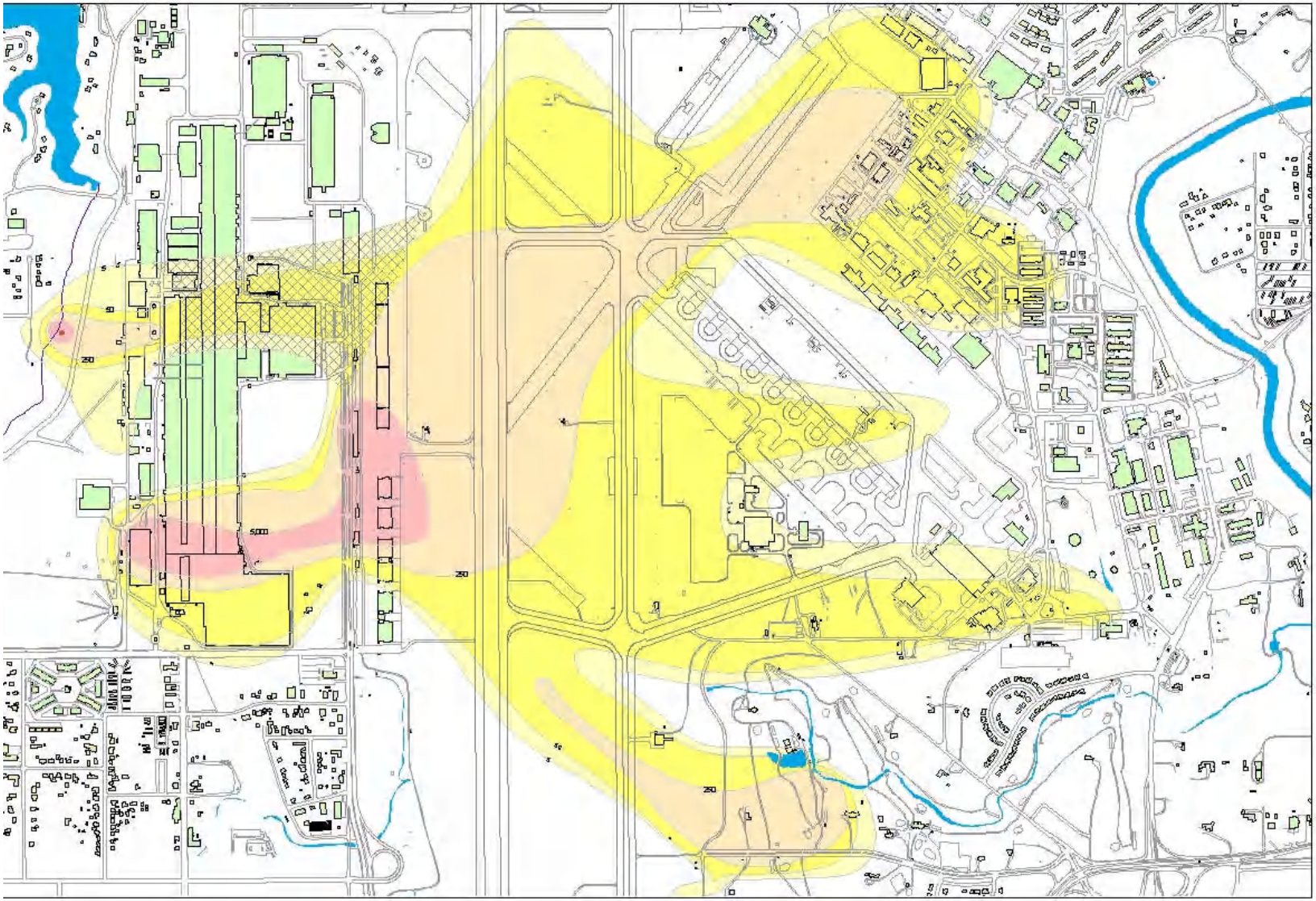
Groundwater Results



MIP Response (Looking North)



TCE Concentrations at AFP4 and NASFW



5 Year ROD Review Report (I can email to you, or at Library)

Long term monitoring in May 2003

Additional investigation on
north side of building.

Equipment removed from
Heating area, soil samples taken.

USGS working on sediment sampling, radioisotope report,
Conceptual modeling.

Budget is very tight the next few years! **https://www.denix.osd.mil/denix/denix.html**

FINAL PAGE

ADMINISTRATIVE RECORD

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