# BUILDING 3001 (NPL SITE)
# RECORD OF DECISON
# TINKER AIR FORCE BASE

## OKLAHOMA CITY, OKLAHOMA

## INSTALLATION RESTORATION PROGRAM
## PROJECT NO. WWYK86-0311
## SITE IDENTIFICATION NO. TINKER-OT01

FINAL
AUGUST 1990

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# BUILDING 3001
# RECORD OF DECISION

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TINKER AIR FORCE BASE
INSTALLATION RESTORATION PROGRAM
PROJECT NO. WWYK86-311
SITE NO. TINKER 01

PREPARED FOR:
ENVIRONMENTAL MANAGEMENT DIRECTORATE
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS OKLAHOMA CITY AIR LOGISTICS CENTER

PREPARED BY:
U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

FINAL

AUGUST 1990

# RECORD OF DECISION

## DECLARATION

### SITE NAME AND LOCATION

Soldier Creek/Building 3001
Tinker Air Force Base (TAFB)
Oklahoma County, Oklahoma

### STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for the Building 3001 Operable Unit of the Tinker Air Force Base(Soldier Creek/ Building 3001), in Oklahoma County, Oklahoma, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

The State of Oklahoma concurs on the selected remedy. A letter of concurrence from the State of Oklahoma is included in Appendix C.

### ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

### DESCRIPTION OF SELECTED REMEDY

This ROD addresses the sources of the contamination and any threat posed by migration of contamination to groundwater beneath the building, the principle threats at the site. A subsequent ROD will address the remainder of the site, potential contamination associated with Soldier Creek.

The proposed remedies address groundwater beneath Building 3001, the Pit Q-51 Operable Unit, and the North Tank Area Operable Unit. The functions of these remedial actions are to remove, treat, and dispose of the contaminated groundwater from beneath Building 3001; remove and dispose of the contaminated pit contents from Pit Q-51; and remove and dispose of the fuel products in the subsurface soils at the North Tank Area.

The remedial actions implemented at the Pit Q-51 and NTA, should eliminate the sources of contamination.

The remedial actions selected in this Record of Decision incorporate the following components:

Building 3001 Groundwater

- Addition of monitoring wells in order to monitor the groundwater contaminant plume.

- Extraction of contaminated groundwater from the perched water zone, top of regional water zone, and regional water zone by exterior and interior extraction wells.

- Treatment of the contaminated groundwater in a treatment facility constructed specifically for the Building 3001 remedial action. The treated water will be reused in TAFB's industrial operations.

- The sludge will be disposed of at an offsite RCRA permitted facility approved to receive CERCLA waste.

Pit Q-51 Operable Unit

- Removal of approximately 45 gallons of liquid, steam cleaning of the pit, analysis of the liquid and washwater, and disposal in a facility that is approved to receive CERCLA waste. The pit will be backfilled with sand and covered with an 8-inch concrete cap to prevent future use.

North Tank Area Operable Unit

- Installation of a floating fuel product removal system to recover fuel product floating above the groundwater table. The recovered fuel will be disposed of at a RCRA approved facility. The groundwater will be treated at the new Building 3001 treatment plant.

- Installation of a vapor extraction system to remove fuel vapors from the subsurface soils which will be destroyed in a thermal combustor.

- Thermal combustion of fuel vapors recovered by the removal systems.

- Removal and disposal of a 750 gallon waste tank and proper closure of a 235,000 gallon fuel oil tank.

STATUTORY DECLARATION

The selected remedies are protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this

remedial action and are cost effective. These remedies utilize permanent solutions and alternative treatment technology to the maximum extent practicable, and satifies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element.

Due to the length of the final remedial action, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Joseph K. Spiers

Joseph K. Spiers, Major General, USAF
Commander, Oklahoma City Air Logistics Center
Department of the Air Force

15 AUG 90
Date

Robert E. Layton Jr., P.E.
Regional Administrator

8-16-90
Date

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## 1.0 SITE LOCATION AND DESCRIPTION

1.1 Location. Tinker AFB (TAFB) is located in central Oklahoma, in the southeast portion of the Oklahoma City metropolitan area, in Oklahoma County. The Base is bounded by Sooner Road to the west, Douglas Boulevard to the east, Interstate 40 to the north, and Southeast 74th Street to the south. Building 3001 (B3001) is located in the northeast portion of the Base, east of the north-south runway. Figure 1-1 shows the location of the Base and Building 3001.

1.2 Site Description. The B3001 site includes the building complex (covering 50 acres), the North Tank Area (NTA), Pit Q-51, and the surrounding areas encompassed by the lateral extent of the groundwater contaminant plume. The site is located near the northeast boundary of the Base and covers an area of approximately 220 acres. A site map is shown in Figure 1-2. The NTA is located immediately north of the building and Pit Q-51 is located inside of the building (see Figure 1-2). The extent of the groundwater contamination is shown in Figure 1-2a. The operable units of B3001 do not lie within the flood plain and are not considered to be a wetland.

a. Building 3001 Complex. The building complex houses an aircraft overhaul and modification complex to support the mission of the Oklahoma City Air Logistics Center. The primary industrial activities conducted in the building (since operations began in the early to mid-1940's) are aircraft and jet engine service, repair, and/or upgrading. Some industrial processes use or generate solutions containing solvents and metals similar to contaminants found in the underlying groundwater. Organic solvents were used for cleaning and degreasing metal engine parts. Trichloroethylene was the predominant solvent used from the 1940's until the 1970's. The degreasing operations were conducted in concrete pits located set below the floor level. In the early 1970's, tetrachloroethylene began to replace trichloroethylene as the predominant degreasing solvent and the pits were replaced with above ground degreasing systems (pit, piping, pumps, etc.). The subsurface pits were emptied and abandoned, typically by backfilling with sand and capping with concrete. The wastewater from the plating shop and paint stripping operations contained high concentrations of solvents and heavy metals, particularly chromium . Waste materials generated from plating, painting, and heat treating activities contain both solvents and metals. Subsurface contamination occurred primarily by leakage from the subsurface pits and trenches, erroneous discharging of solvents or wastewaters into storm drains, accidental spills, and/or improper connections between wastewater and storm drains.

b. North Tank Area. The NTA contains an inactive 235,000 gallon underground fuel oil tank (tank number 3404), an inactive

# LOCATION OF TINKER AIR FORCE BASE WITHIN OKLAHOMA

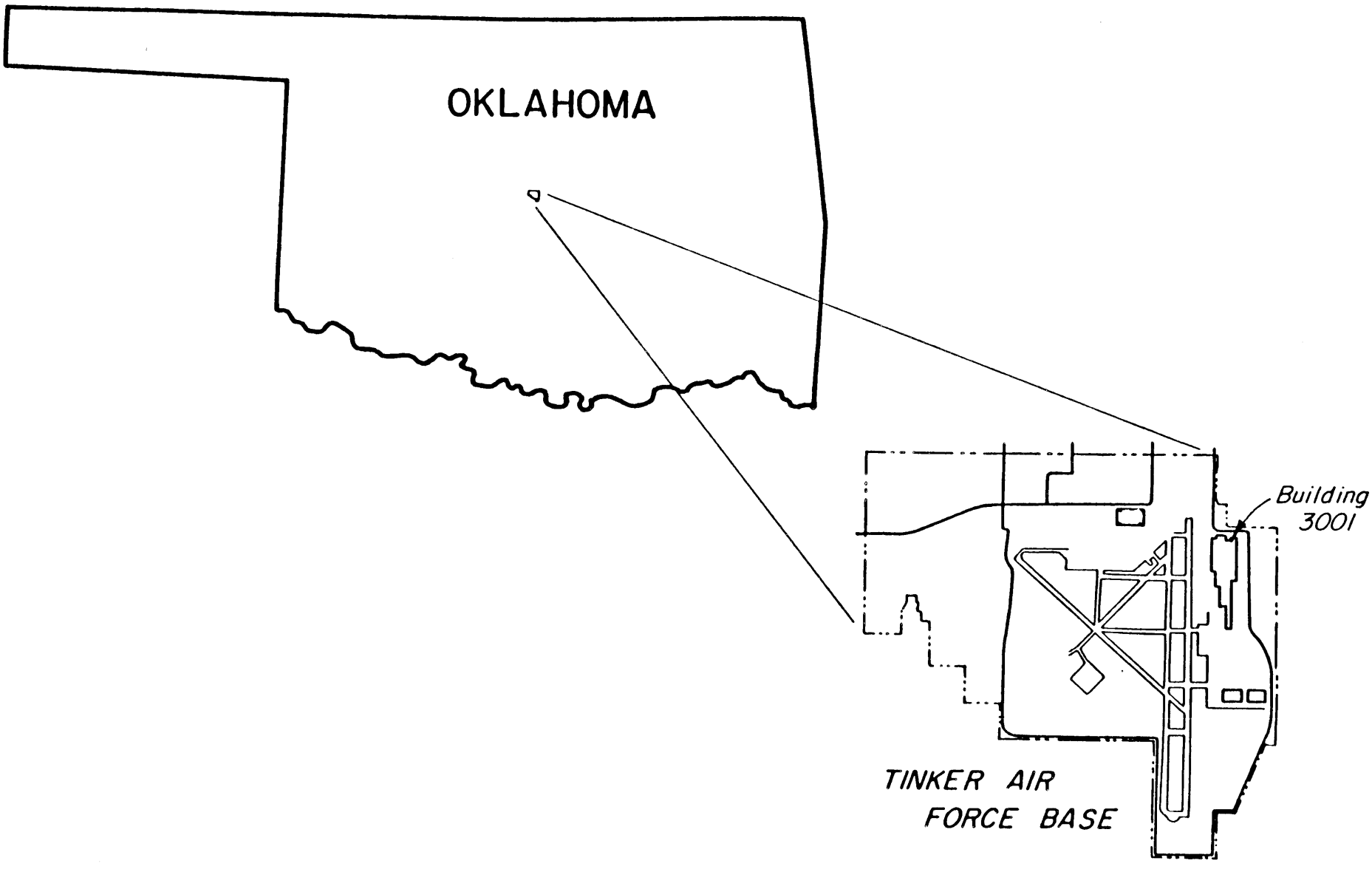



FIGURE 1-1

# OPERABLE UNIT LOCATIONS

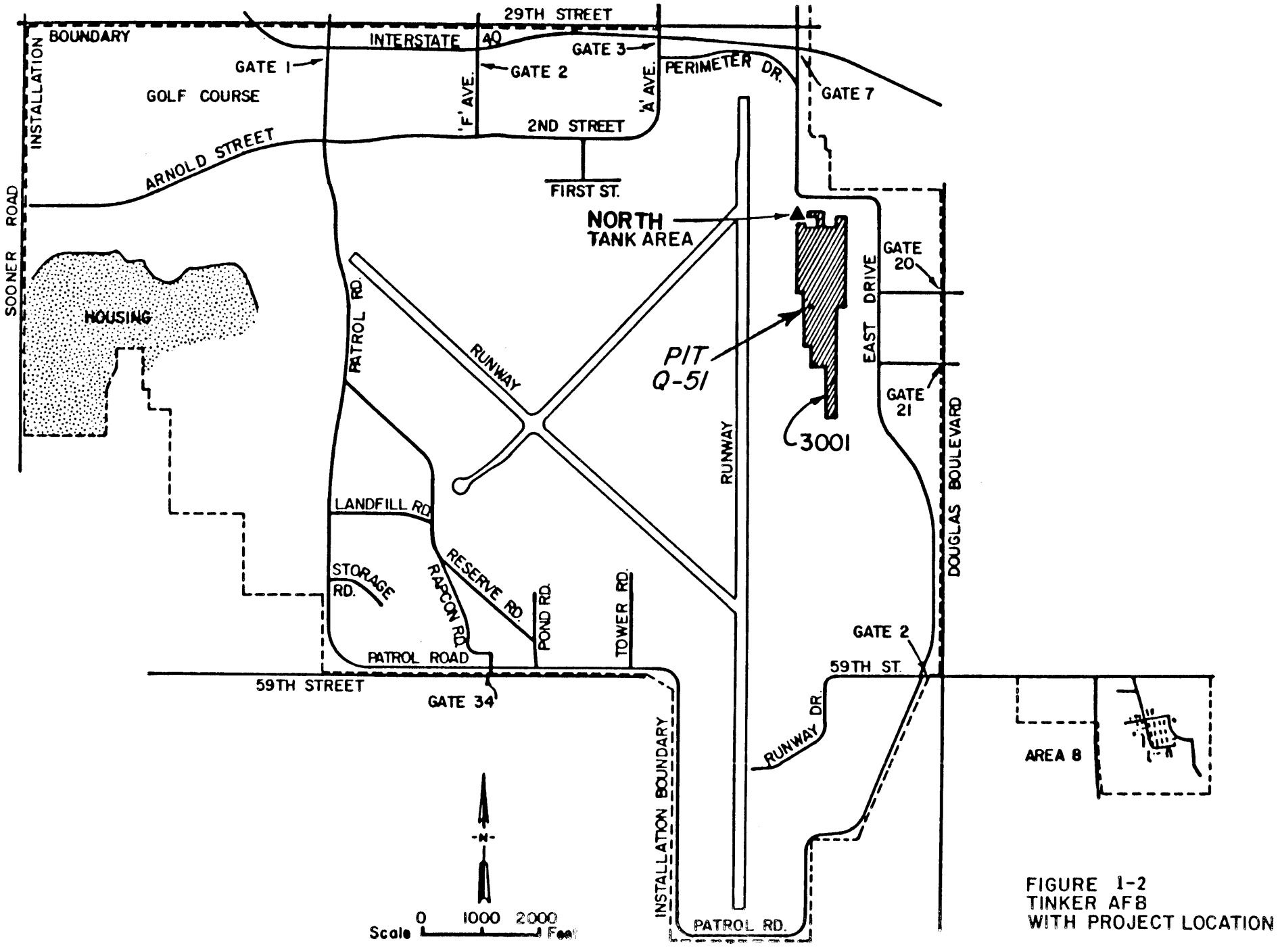



FIGURE 1-2
TINKER AFB
WITH PROJECT LOCATION

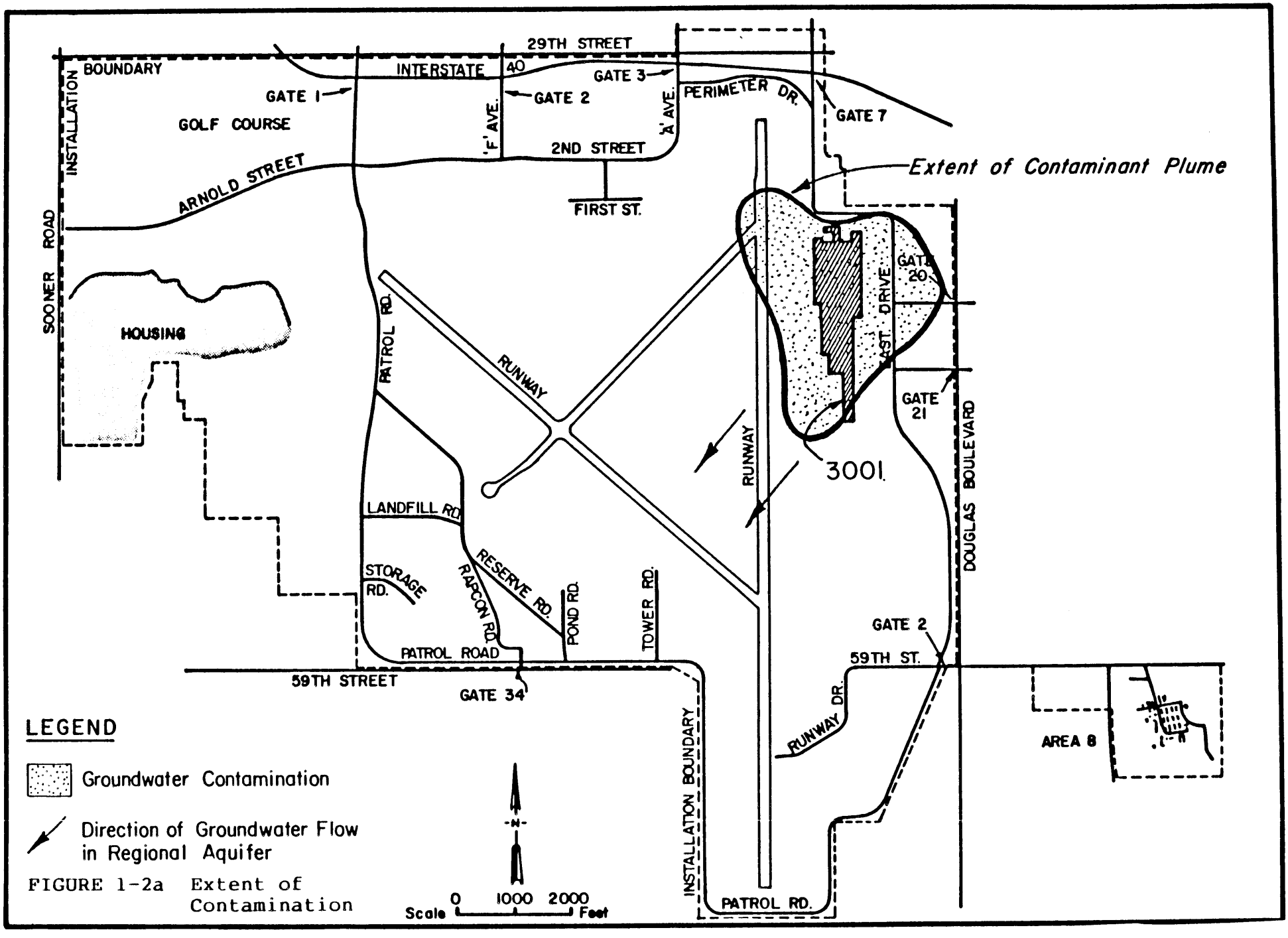



FIGURE 1-2a Extent of Contamination

750 gallon underground waste oil tank, and an active 20,000 gallon diesel tank (tank number 3401). An abandoned 13,000 gallon gasoline tank (tank number 3405) was removed from the site in 1985. The site, as shown in Figure 1-3, is a small grassed area covering approximately 16,400 square feet. The soil and groundwater have become contaminated with fuel product, benzene, toluene, and xylene, due to leaking tanks and/or possible fuel spills. Also, some metals and organic solvents are present in the groundwater, which may be a result of leaking utility lines in the area.

c. Pit Q-51. During remedial investigations to determine the contents of the remaining abandoned pits, conducted in 1986, Pit Q-51 was identified to contain hazardous contaminants (see Appendix D in the Building 3001 Remedial Investigations (RI) Report). The pit is concrete-lined and appears to have not leaked any of its contents into the subsurface. Pit Q-51 is located inside B3001 at column-line Q-51 as shown in Figure 1-2. The pit is 20 feet long, 8 feet wide, and 10 feet in depth. The pit contains a sump area that is 3 feet wide, 3 feet long, and 2 feet in depth. The sump contains approximately 45 gallons of liquid contaminated with trichloroethylene, cadmium, chromium, and lead.

1.3 Demography. B3001 is a large industrial complex which operates 24 hours a day. Approximately 8,000 people are employed at the complex. Approximately 20,000 people work on TAFB. The Base accommodates 530 family housing units and 7 dormitories. Oklahoma County has a population of 628,600, in which the highest population is in the community of Oklahoma City. TAFB is located in the Oklahoma City limits and adjacent to Midwest City and Del City which have populations of 406,800, 58,000 and 33,400, respectively.

1.4 Land Use. B3001 is primarily an industrial site with a mission to support the Air Logistics Center. The Base is bordered on the north and northeast by urban communities. The south boundary area is adjacent to the General Motors Plant, an industrial complex. Lake Stanley Draper is located southeast of the Base. The remaining areas to the south and east are primarily agricultural.

1.5 Climatology. The climate at TAFB is characterized by long hot summers (sometimes droughts of varying duration occur). The average annual temperature is approximately 60-62 degrees F. The maximum precipitation generally occurs in May. Precipitation then decreases in June, setting the stage for hot and dry summers. Fall is the second wettest season but again tapers off with January being a dry month. Average annual precipitation for the area is 32 inches and the average evaporation rate is approximately 50 inches.

NORTH TANK AREA OPERABLE UNIT

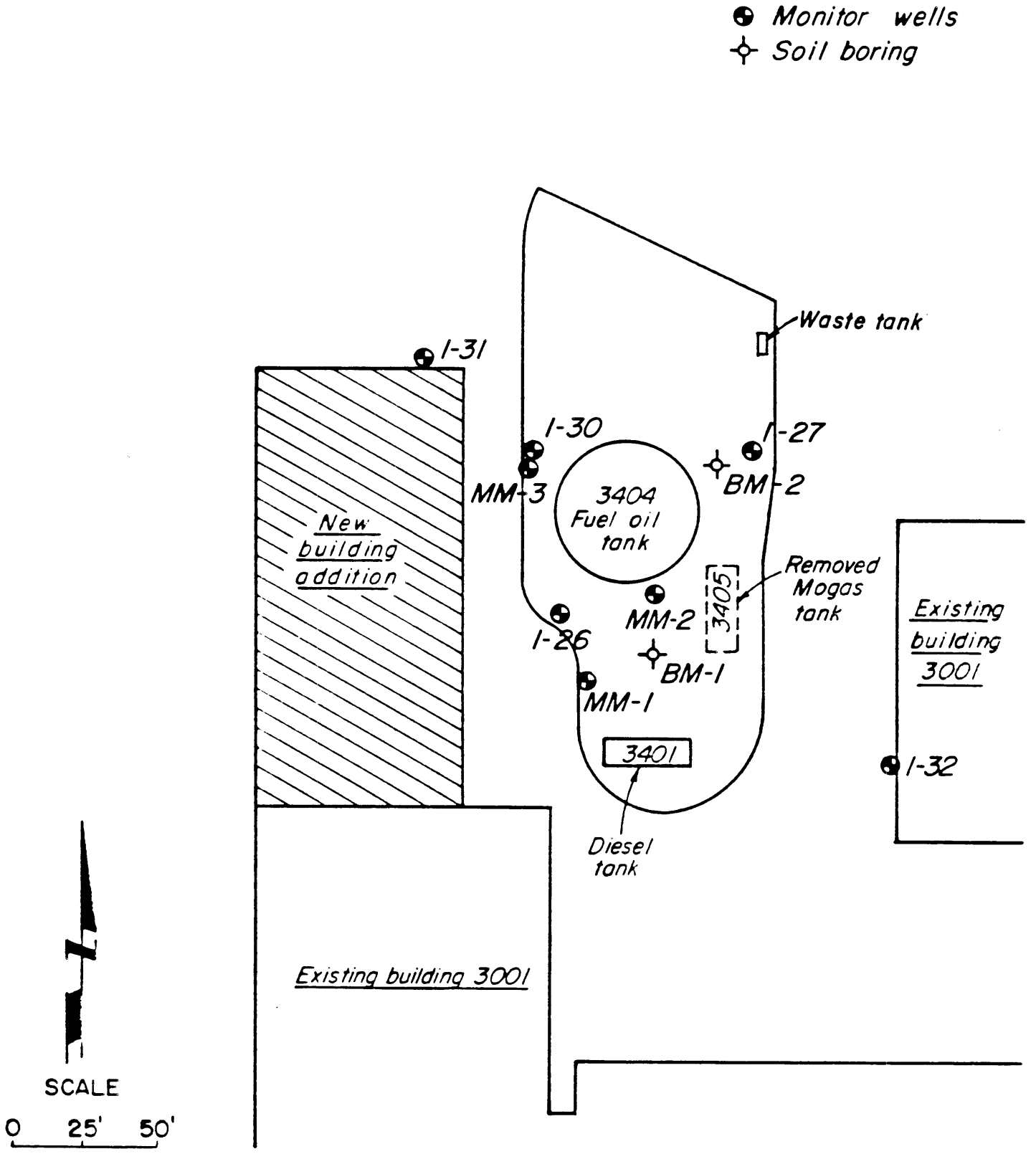



FIGURE 1-3

1.6 General Geohydrology. TAFB is located in the Interior Lowlands physiographic province on gently westward dipping Permian redbeds. The geology, which is shown on Figure 1-4, is discussed below. Figure 1-5 is a geologic section along the east perimeter through B3001. Bedrock units encountered at TAFB include the Garber-Wellington Formation and the overlying Hennessey Formation. These units are discussed below.

a. Garber-Wellington Formation.

1.) Geology. The Garber-Wellington Formation outcrops in Central Oklahoma, as shown on Figures 1-4 and 1-5, and supplies much of the drinking water for residents of Oklahoma and Cleveland counties. The recharge area covers the eastern half of Oklahoma County including TAFB, and the formation dips to the west about 15 feet per mile. The Garber Sandstone and Wellington Formations are hydrologically interconnected formations which are not easily distinguished from each other based on rock type, key beds, fossils, or hydrologic properties. The Garber-Wellington is about 900 feet thick in the TAFB area, and consists of lenticular and interbedded sandstone, shale, and siltstone. Sandstone is orange-red to reddish-brown, fine-grained, and poorly cemented. The grains are sub-angular to sub-rounded and composed of quartz. Shale is reddish-brown and silty. Although present beneath all of TAFB, the Garber-Wellington is overlain by the Hennessey Formation over the southern half of the Base, as shown on the geologic map of the TAFB area on Figure 1-6. Sediments of the Garber-Wellington are overlain by the Hennessey Formation over the southern half of the Base, as shown on Figure 1-6. Sediments of the Garber-Wellington are deltaic in origin. Stream-deposited sands interfinger with marine shales, and individual beds vary from a few feet to about 40 feet in thickness. Sandstone averages about 65% of the formation, as determined from borings drilled at the Base. Because of shifting channels and changing currents during deposition, detailed correlation of lithologic units is only possible over short distances. A north-south geologic section through the eastern portion of TAFB is comprised of borings from B3001, water supply wells, and IRP borings, as shown in Figure 1-7. It shows that the Hennessey does not extend as far north as B3001. It also shows that the major sandstone and shale beds can be correlated over this distance.

The subsurface shale layers have prevented contaminants from migrating into the drinking water zone. The contaminants which have migrated into the upper zones of the Garber-Wellington traveled through possible cracks or discontinuities in the shale layers. Overall, the shale layers are effective in slowing the migration of contaminants into the producing zone.

2.) Groundwater. Groundwater exists in the Garber-Wellington under both water table and confining conditions,

# REGIONAL GEOLOGY OF THE GARBER-WELLINGTON AQUIFER

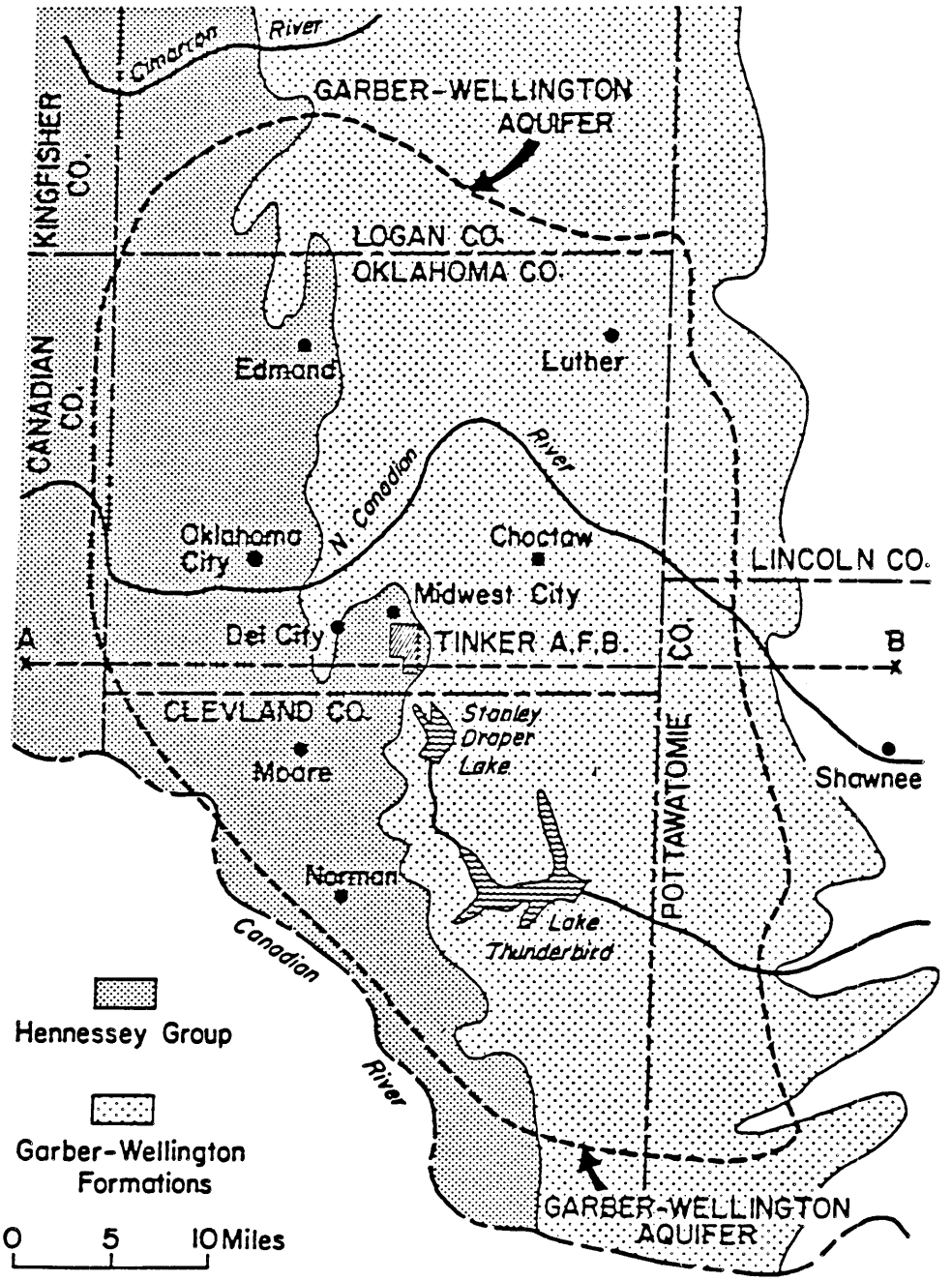



FIGURE 1-4. Generalized geologic map showing the outcrop area of the Garber-Wellington and Hennessey formations. The area inside the dashed line is the area where the Garber-Wellington is a major groundwater resource.

# REGIONAL GEOLOGY

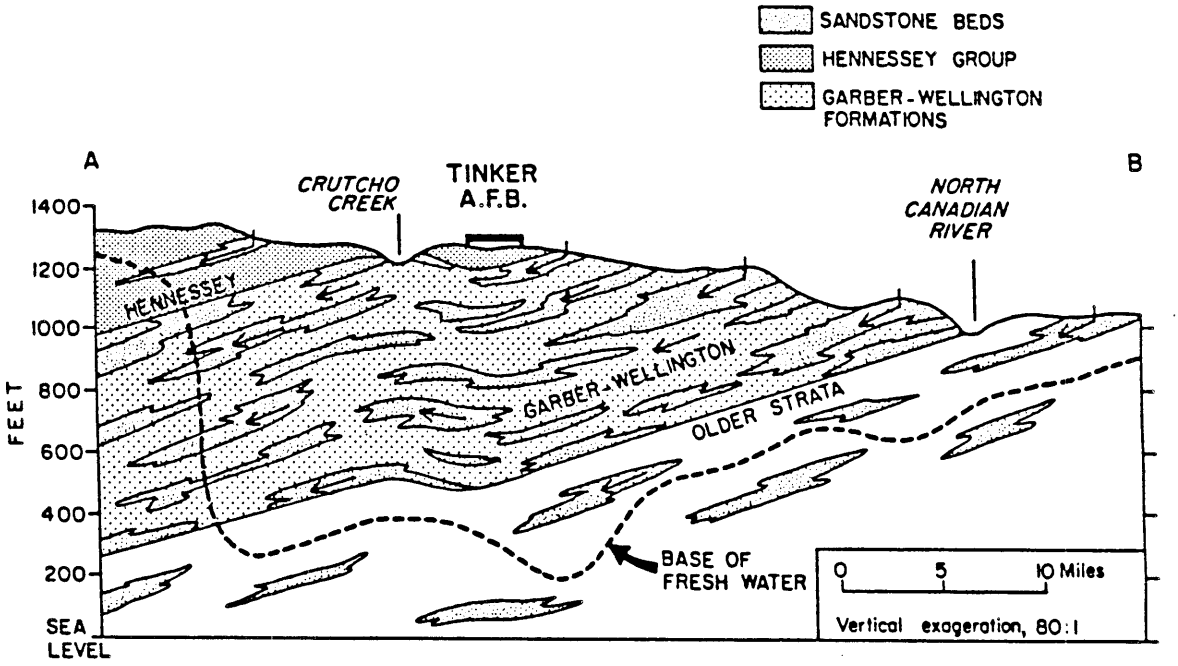



FIGURE 1-5 Generalized geologic section across portions of Canadian, Oklahoma, and Lincoln Counties showing the Garber-Wellington formation.

TINKER AIR FORCE BASE SURFACE GEOLOGY

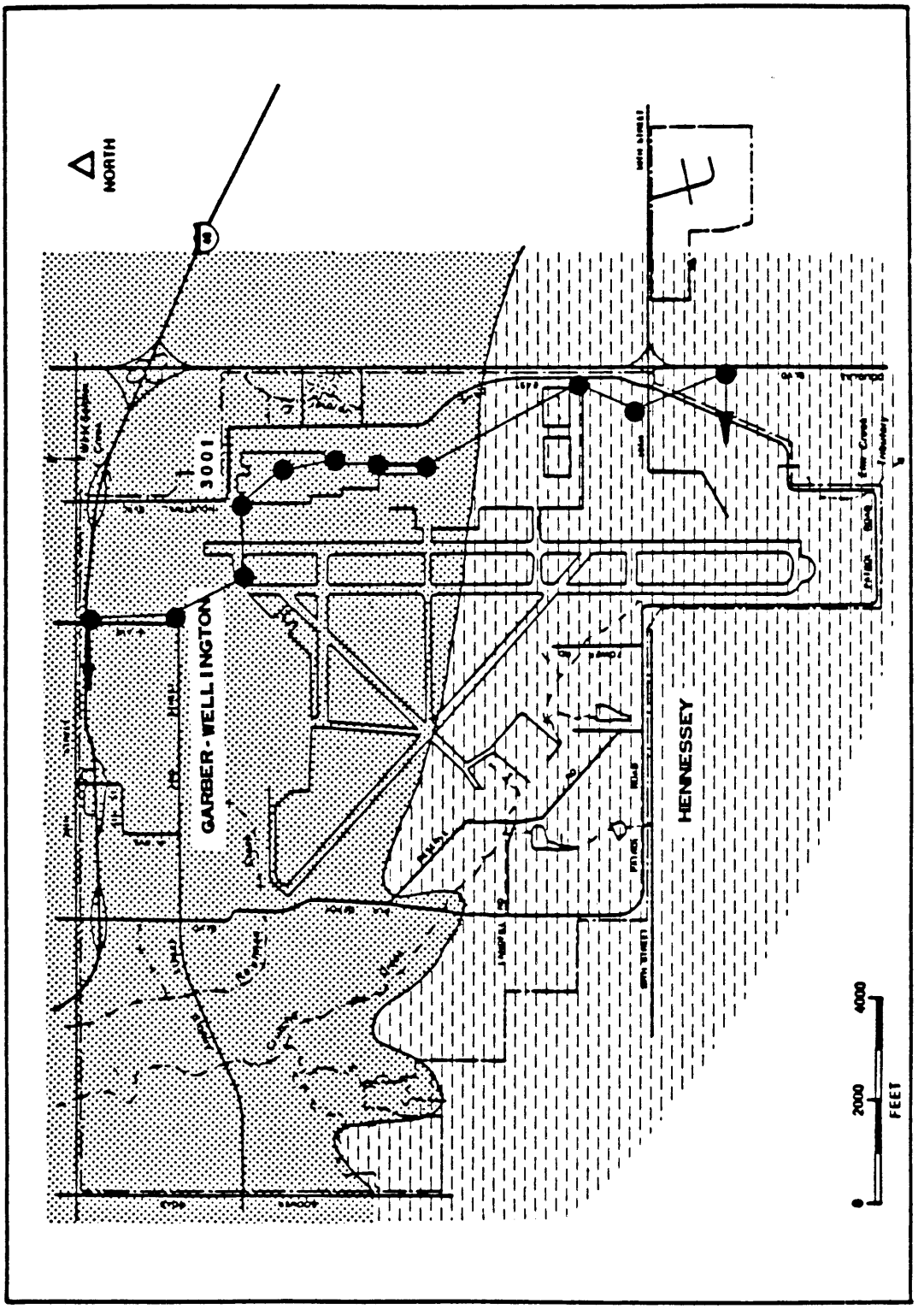



FIGURE I-6 Surface geology at Tinker Air Force Base. Location of North-South geologic section, figure I-7, is shown.

# GEOLOGIC CROSS SECTION

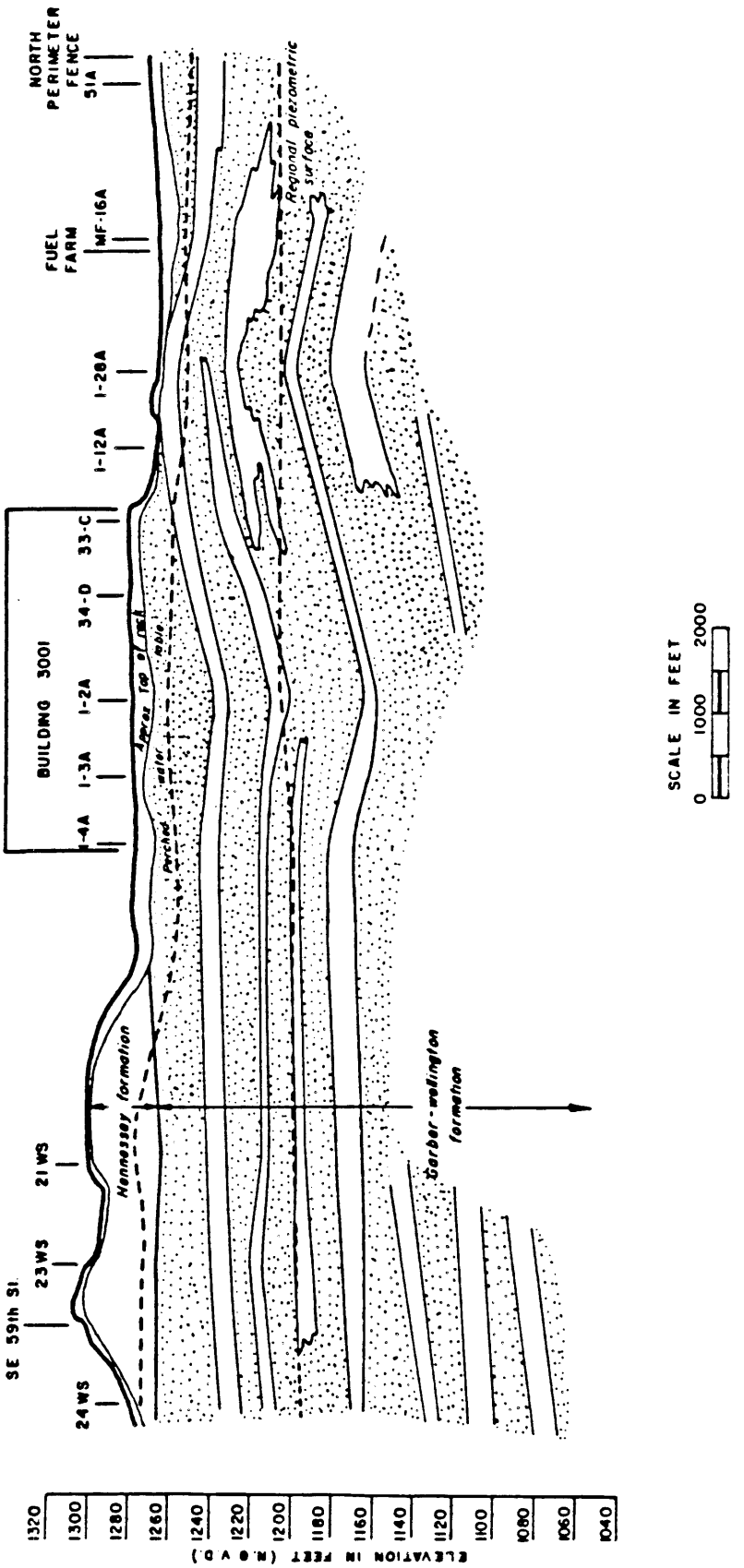



FIGURE I-7 North - South geologic section through eastern portion of TAFB.

depending on the presence of overlying shale beds, and it flows to the southwest. The Garber-Wellington Aquifer is a Class I Aquifer which produces water used for public water supply and cannot be replaced. There are 25 water supply wells located on TAFB. These wells, which were drilled in the 1940's and are shown on Figure 1-8, provide 4 to 6 million gallons per day for use by the Base, making TAFB the greatest user of groundwater in the area. These wells average 217 gallons per minute and consist of multiple screens from a depth of 250 feet to 700 feet. This zone, where most of the water for industrial and commercial use is pumped, is relatively permeable, and pump tests from wells in the towns of Norman and Edmond yield permeabilities about $10^{-3}$ cm/sec. The average depth to water in the producing zone is about 250 feet, which is about 200 feet lower than the regional water table. Thus, a vertical component of groundwater flow also exists. The water becomes salty near the base of the formation, and wells drilled through the fresh water zone have to be partially backfilled to be usable. Background water quality at TAFB is best in the deeper strata. In general, heavy metals such as barium, cadmium, chromium, mercury, and silver are at or below detection limits. Arsenic is about 0.002 ppm, lead about 0.04 ppm, and selenium 0.002 ppm. Overpumpage tends to increase the concentration of some of these metals, especially arsenic, selenium, and chromium. There is no known reason at this time for the increase of metals due to overpumpage, however, this has been researched for the past six years in the Oklahoma City area. Chlorides, sulfates, and conductivities seem to be the lowest in the deeper strata, and highest in groundwater under water table conditions.

b. Hennessey Formation. The Hennessey Formation outcrops over the southern half of TAFB as shown in Figures 1-6 and 1-7. The Hennessey thins to the north and pinches out just south of B3001. It consists of reddish-brown shale with beds of siltstone and silty sandstone. Where present, the Hennessey separates the regional water table in the Garber-wellington from overlying perched water. There are several wells in the area producing minor amounts of water from the Hennessey which are developed from one of the thin sandstone beds or from joints and fractures in the shale.

c. Quaternary Alluvium. Most of the streams at TAFB have some alluvial deposits unless their channels have been modified, such as East Soldier Creek. These deposits consist of unconsolidated sediments of sand, silt, and clay. The thickness of these deposits have not been determined at TAFB. The alluvial deposits are water-bearing and are hydrologically connected to a perched water table which is found over most of the Base.

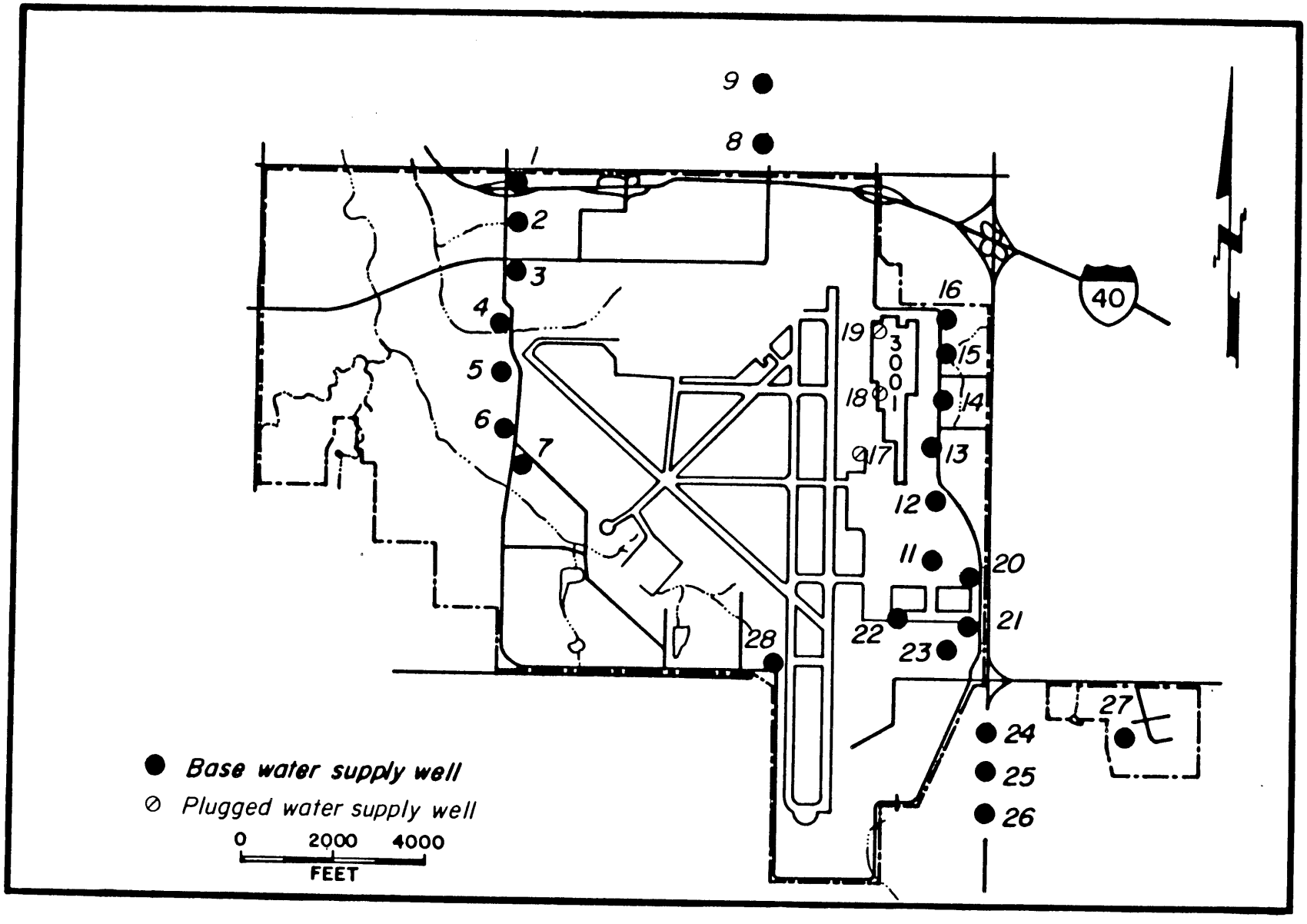



FIGURE I-8. Water supply wells on Tinker Air Force Base.

1.7 Natural Resources. The primary natural resource at the site is groundwater. The underlying Garber-Wellington aquifer is the single most important source of potable groundwater in the Oklahoma City area. Five TAFB water supply wells (well numbers 13 through 17) are located in the vicinity of the site (see Figure 1-8). These wells draw water from the producing zone at depths of approximately 250 to 700 feet.

2.0 SITE HISTORY. The remedial investigations conducted at Tinker Air Force Base are a part of the U.S. Air Force Installation Restoration Program (IRP). The Air Force is the owner of the site and the lead agency for implementing the environmental response actions.

2.1 Previous IRP Investigations. The previous IRP work conducted at the site consisted of a records search, field evaluation, and confirmation/quantification investigations. The Records Search, conducted by Engineering Science in 1982 (ref.5), reviewed current and past waste management practices in an effort to identify areas with a potential for contaminant migration. The Field Evaluation, conducted by Radian Corporation in 1984 (ref.10), investigated the site to determine if contamination had resulted from past waste disposal practices. The Field Evaluation included pumping water supply well 18 (for 16 hours) where volatile organics including trichloroethylene and tetrachloroethylene had previously been found, and periodically collecting samples for volatile organic testing. trichloroethylene concentrations ranged from 1800 to 4600 ppb during the pumping period and tetrachloroethylene remained below detection limits. The Quantification/Confirmation report, prepared by Radian Corporation in 1984 (ref.11), determined that contamination existed at the site and recommended that additional investigations be performed to define the site conditions. Monitoring wells were installed at seven locations around the building during these investigations. Trichloroethylene concentrations of 642 and 102 ppb were found in 19A and 20A, respectively. Other substances were detected in relatively high concentrations at some locations such as chlorobenzene and trans-1,2-dichloroethylene with concentrations of 34.5 ug/l and 33.2 ug/l, respectively. The conclusions drawn from the previous IRP reports were that any abandoned pits and tanks beneath B3001 should be sampled and analyzed for the presence of chlorinated solvents, the area of contamination should be defined, and a remedial action plan should be initiated for the contaminated groundwater.

2.2 Investigations Within Fire-Damaged Area. In November of 1984, the roof of the north portion of B3001, north of column-line 81, was extensively damaged by fire. During May through August 1985, the Tulsa District, Corps of Engineers (COE) conducted IRP investigations within this fire-damaged area during reconstruction. The work consisted of investigating abandoned

pits, conducting groundwater investigations, and installing monitoring wells. Sixty-four pits were located and investigated. One pit (located near column-row E105) contained high concentrations of trichloroethylene (120 ppm) was detected in soil adjacent to the pit). Two other pits (near column-rows V85 an LM107) contained high concentrations of metals. The pit near V85 contained 25,600 ppm of lead and the pit near LM107 contained 106 ppm of lead. The contents of the three pits were removed and disposed of in a hazardous waste landfill. The pits were backfilled and capped with concrete. The groundwater investigations revealed an upper perched aquifer overlying the regional Garber-Wellington aquifer. Trichloroethylene contamination was present in both the perched and top of regional zones. Groundwater monitoring well clusters were installed at four locations within the fire damaged area so that quality monitoring could be continued. Each well cluster consisted of three wells, one located in the perched aquifer, one in the top of regional aquifer, and one approximately 75 feet into the regional aquifer. Appendix B of the B3001 RI Report (COE, 1988) discusses the investigations within the fire damaged area.

2.3 Underground Storage Tank (UST) Investigations. An investigation of abandoned and active underground storage tanks at TAFB was conducted by A.L. Burke Engineers, Inc., in 1985 (ref.1). The investigations included locating underground storage tanks and collecting and analyzing samples of the soil and groundwater from areas adjacent to tanks to determine if subsurface contamination existed from leaking tanks. Two contaminated storage tank areas (NTA and Southwest Tank Area) were identified during the investigations. Three monitoring wells (MM-1, MM-2, and MM-3), were installed adjacent to tanks in the NTA, as shown in Figure 1-3. Free fuel product was observed in two of the wells (MM-1 and MM-3). The Southwest Tank Area contains both fuel tanks and abandoned solvent tanks. The tanks will be investigated as part of TAFB's Underground Storage Tank Program and the contaminated groundwater will be treated with the B3001 contaminated groundwater at the Building 3001 treatment facility.

2.4 Plugging of Wells 18 and 19. In late 1983 routine Air Force testing indicated the presence of both trichloroethylene and tetrachloroethylene in samples taken at the well head from water supply (WS) wells 18 and 19. The wells were taken out of service, and a contract was awarded to Engineering Enterprises (ref.6) in 1984 to conduct a study of the wells. They conducted pump tests, took water samples at the well head, and performed a television log. In 1986, Dansby and Associates (ref.3) cleaned the wells, conducted geophysical logging and televising operations, set packers and took stratified water samples, and conducted an environmental assessment on possible interim actions. The results of these investigations showed that the casings in both wells were highly corroded and that the cement

bond was not very good in WS 18. Channeling and downward movement of water was indicated by noise and spinner logs. Trichloroethylene in WS 18 was as high as 2400 ppb, and in WS 19, it was as high as 9 ppb. These studies concluded that contaminants were entering both wells through corrosive holes in the upper zones, travelling downward through the casing as well as through annular space between casing and the formation. They recommended that the wells be plugged as soon as possible. Both of the wells were plugged in September 1986. A report on the well plugging procedures is given in Appendix C of the B3001 RI Report (COE, 1988). WS 17 was also plugged in 1988.

2.5 Summary of COE Remedial Investigations. The remedial investigations were conducted in order to properly assess the subsurface conditions and implement a remedial action plan. The field and laboratory work required to accomplish this objective included investigating abandoned solvent pits within B3001 (see Appendix D of the B3001 RI Report), investigating the geological site conditions, installing groundwater monitoring wells, sampling water supply wells and monitoring wells, and conducting aquifer tests. All of the field and laboratory work was conducted in accordance with the Quality Assurance/Quality Control Plan (Appendix H in the B3001 RI report). The collected data was analyzed in order to define the contamination problem at the site. A groundwater and contaminant transport model was developed (Appendix K of the B3001 RI report) to simulate the contaminant movements within the aquifer systems.

2.6 Enforcement. B3001 was placed on the National Priorities List (NPL) in July 1987. Since Tinker AFB installation owned by the Air Force, the Air Force is the only Potentially Responsible Party (PRP). The primary contaminants of concern are trichloroethylene and chromium. Between 1986 and 1989, TAFB as the lead agency conducted a Remedial Investigation and Feasibility Study (RI/FS) under the guidance of the Environmental Protection Agency (EPA) and the Oklahoma State Health Department (OSDH). The RI/FS was conducted to define and characterize the extent and magnitude of contamination and to provide a detailed description and evaluation of remediation alternatives for remediating the site. The EPA, OSDH, and the U.S. Air Force signed a Federal Facility Agreement (FFA) under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) in December 1988. The FFA addresses investigation, remediation, and documentation procedures for the remediation of hazardous waste at B3001. It also specifies procedures for the separate operable units that have been identified at the B3001 site. Pit Q-51 and the NTA have been designated as operable units in the FFA.

3.0 COMMUNITY RELATIONS. In May 1989, the RI report was made available to the public and placed in the Administrative Record at the Midwest City, Oklahoma Public Library. The FS report and the Proposed Plan were placed in the Administrative Record in

December 1989 and March 1990, respectively. TAFB solicited input from the community on the clean up methods proposed for this site. TAFB held a public comment period from March 19, 1990 to April 30, 1990 to encourage public participation in the remedial action process. A public meeting consisting of approximately 100 attendees was held in Midwest City on April 5, 1990. During the comment period and public meeting , TAFB presented the RI/FS reports, Proposed Plans, and the NTA Design Summary Report; answered questions; and received both oral and written comments. TAFB provided notice of the public comment period and public meeting through announcements in the newspaper on March 19, 1990 and April 2, 1990. The comments received during the public comment period, including the 28 written comments and those received at the public meeting, are addressed in the Responsiveness Summary in Appendix A.

4.0 SCOPE OF RESPONSE ACTION. The Building 3001 site is divided into operable units. The operable units include the Building 3001 groundwater, Pits Q-51, U-51, MN-36, E-105, V-85, LM-107 and P-75, NTA, and water supply wells 17, 18 and 19. All of the pits with the exception of Pit Q-51 have been remediated. The contents of the pits was removed and the pits were backfilled with sand and capped with concrete. Water supply wells 17, 18 and 19 have been put out of operation and permanently plugged. The Record of Decision will include the Building 3001 groundwater, Pit Q-51 and the NTA.

The response actions at the Building 3001 site, covered in this ROD, will consist of interim and final remedial actions. The interim remedial actions will include the removal of fuels and fuel vapors from the NTA and the cleanup of Pit Q-51 inside of B3001 followed by backfilling with sand and capping the pit with concrete to eliminate any future use of the pit. The final remedial action will be comprised of two stages:

1.) Groundwater Pumping/Collection
2.) Groundwater Treatment/Industrial Reuse

These actions will eliminate the sources of contamination and eliminate the primary pathway for exposure to the public thereby eliminating the principal threat of contaminated drinking water posed by conditions at the site.

The proposed remedy for the contaminated groundwater at B3001 would pump and collect the contaminated groundwater, then treat and dispose of it. The groundwater would be pumped and collected by a network of exterior and interior wells. The groundwater would be treated in a treatment facility specifically constructed for removing contaminants from the groundwater at B3001 and reused in TAFB's industrial operations.

The volatile organic contaminants would be removed by air and/or steam stripping. A metals precipitation process would extract heavy metals and an optional fine filtration process would be used to remove non-volatile organics and the remaining metal concentrations.

The interim remedial actions implemented at the NTA and Pit Q-51 will eliminate the sources of contamination and eliminate the primary pathway for exposure to the public which is groundwater contamination.

The proposed remedy for the floating fuel and fuel vapors at the NTA Operable Unit (OU) would involve collecting the free floating fuel, extracting fuel vapors from the subsurface soils, and tank abandonment. The free floating fuel will be recovered with three recovery wells which will contain a pump that will recover only the floating fuel. A water table depression pump will be installed at such a time when free floating fuel cannot be collected easily. The pump will depress the water table in order to allow fuel product to be collected at the well and extracted from the subsurface. The vapor extraction system will consist of horizontal borings extending radially out of Tank 3404 and connected to a blower to extract the vapors. The vapors will be destroyed by a thermal combustor that will completely burn off the vapors. A small waste oil tank will be removed and disposed of and Tank 3404 will be properly abandoned.

The proposed remedy for the Pit Q-51 OU would consist of removing the pit contents, steam cleaning the pit, sampling the pit contents and washwater, backfilling and capping the pit, and disposing the pit contents and washwater at an offbase facility approved to receive CERCLA waste.

The Pit Q-51 and NTA remedies will remove potential sources of contamination to the groundwater. The B3001 groundwater remedy would stop the spread of contamination in the Garber-Wellington Formation associated with the movement of contaminated groundwater.

## 5.0 SITE CONTAMINATION.

### 5.1 Contamination Sources.

5.1.1 Building 3001. During the period from the 1940's to 1970's, industrial solvents and wastewaters inside B3001 were contained in subsurface pits and trenches (some steel-lined and some concrete-lined). Over a period of time the pits and trenches leaked and allowed percolation and downward subsurface migration. Also, some of the solvents and wastewaters from TAFB's industrial operations were drained into the storm drain system beneath the building. Leakage from storm drain pipes probably occurred, allowing downward migration into the perched aquifer. Some of

the discharge to storm drains occurred from improper tie-in connections between industrial waste lines and storm drains. The storm drains discharged to the east and west sides of the building into tributaries of Soldier Creek, commonly referred to as East and West Soldier Creek.

5.1.2 Pit Q-51. In the early 1970's, solvent pits began to be replaced with above-ground degreasing systems. Most of the subsurface pits were backfilled with sand and covered with a concrete cap. Based on investigations within the building for abandoned pits still containing contamination only seven were found to contain significant contamination. All of these pits have been cleaned up and the waste disposed of with the exception of Pit Q-51.

In June 1986, a sample was taken from the contents in Pit Q-51. Table 5.1 lists the contaminants detected in the sample.

Table 5.1
Contaminants Detected in Pit Q-51 Liquids

| Contaminant | Concentration (ppm*) |
|---|---|
| Trichloroethylene | 42.0 |
| Cadmium | 3.0 |
| Chromium | 0.4 |
| Lead | 22.0 |

*ppm - parts per million

5.1.3 North Tank Area. Underground tanks within the NTA allowed leakage into the soils and groundwater. The OU contains one active diesel tank and two inactive tanks. Fuel product sampled in the soil and groundwater was identified as fuel oil which was contained in Tank 3404. The volatile organics detected in the samples of the drill cuttings from monitoring well 1-30 at the NTA are listed in Table 5.2.

Table 5.2
Volatile Organics Detected in Soil Sample
North Tank Area Well 1-30

| Contaminant | Maximum Concentration(ppm*) |
|---|---|
| Methylene Chloride | 0.330 |
| Acetone | 9.96 |
| Chlorobenzene | 0.015 |
| Ethylbenzene | 10.13 |
| Toluene | 7.73 |
| Xylene | 31.00 |
| Styrene | 27.00 |

*parts per million

5.2 Evaluation of Primary Contaminants. 32 chemical constituents were identified in the groundwater during the remedial investigations. Trichloroethylene and chromium are the primary contaminants of concern at the Building 3001 site because they pose the greatest risk to the public and they had the highest concentrations and frequency in the contaminant plume.

5.2.1 Identification of Exposed Population. The Building 3001 site, located on Tinker AFB has a workforce population of approximately 20,000 and a resident population of 2500.

5.2.2 Contaminant Characteristics. Trichlorethylene is a probable human carcinogen. It is the most significant contaminant identified in the remedial investigation sampling with a high frequency of occurrence in all aquifer layers and the highest concentrations reported in the study. Trichloroethylene is highly mobile in the environment. Chromium exhibits several oxidation states. The most common oxidation states are the trivalent chromium and the hexavalent chromium states. Hexavalent chromium is the greatest health threat. Chromium was selected based on its high frequency of occurrence and concentrations. It had the highest concentration of the inorganic constituents. Chromium is a human carcinogen, highly toxic and extremely mobile.

5.2.3 Potential Pathways of Migration. Based upon a risk assessment conducted at the Building 3001 site, the potential pathways of migration are the perched and top of regional aquifers, the surface water of Soldier Creek and the air. Complete pathways were identified for only the groundwater pathway as drinking water on the Base. Surface water and air pathways are not presently complete and pose no immediate threat to populations along Soldier Creek.

5.3 Soil Contamination. The soil is contaminated in localized areas beneath B3001 and in the NTA. The soils and bedrock (above the perched water table) became contaminated in localized areas beneath B3001 as contaminant migration occurred. Concentrations of trichloroethylene, 1,2-dichloroethylene, tetrachloroethylene, methylene chloride, benzene, ethyl ketone were all detected in these areas beneath the building. Concentration levels are low except in two locations, where high concentrations of trichloroethylene (120 and 11 ppm) are present. Chromium' lead, barium, and cadmium are also present in these areas. Although most of the contamination sources have been eliminated, the soils beneath the building will continue to flush contaminants into the perched aquifer where they will be captured by the groundwater collection system for several years. The upper soils at the NTA are contaminated with fuel products, primarily fuel oil, that have leaked from the underground tanks.

5.4 Perched Aquifer. Perched groundwater exists beneath the site, overlying the regional aquifer. Figure 5-1a shows a cross section of the generalized site geology with the three groundwater zones. The depth from the surface of the perched aquifer is approximately 15 feet. The thickness of the perched aquifer is approximately 23 feet. The highest concentrations of contaminants are contained in this zone. Contamination occurred from the downward movement of liquids contaminated with solvents, metals, and fuel products. Trichloroethylene has spread beneath the site with concentrations ranging from 330,000 ppb beneath the building to less than 5 ppb at the limits of the plume. The trichloroethylene plume, which covers approximately 140 acres, is shown in Figure 5-1. 1,2-dichloroethylene is present with a similar shaped plume and the highest concentrations of 4600 ppb located west of the building. Tetrachloroethylene exists primarily beneath the building with the highest concentration of 260 ppb located beneath the building. Plumes of 1,2-dichloroethylene and tetrachloroethylene cover approximately 78 and 17 acres, respectively. Chromium, lead, and barium, at levels above drinking water standards, are present in the perched zone also. Chromium is present beneath the site with concentrations ranging from 80,000 ppb beneath the building to less the 10 ppb at the edge of the plume. The chromium plume, which covers approximately 220 acres, is shown in Figure 5-2. Lead and barium have similar shaped plumes with the highest concentrations detected as 570 and 28,000 ppb for lead and barium respectively. Toluene, benzene, and xylene are found at the NTA and fuel product (6000-12,000 gallons is estimated) is found floating above the perched groundwater. The maximum concentrations for toluene, benzene, and xylene were 47,000, 1535, and 780 ppb, respectively. Table 5.3 lists the compounds and metals detected in the perched zone at the NTA.

Table 5.3
Contaminants Detected in Perched Zone

| Organic Compounds | Times Found/ Total No. Samples | Concentration Range (ppb*) |
|---|---|---|
| Trichloroethylene | 19/33 | <5 - 330,000 |
| Toluene | 10/39 | <5 - 47,000 |
| 1,2-Dichloroethylene | 10/33 | <5 - 4,600 |
| Acetone | 11/33 | <5 - 1,600 |
| Benzene | 10/39 | <5 - 1,535 |
| Xylene | 6/39 | <5 - 780 |
| Tetrachloroethylene | 6/33 | <5 - 260 |

Table 5.3 (cont.)

| Total Metals | Times Found/ Total No. Samples | Concentration Range (ppm*) |
|---|---|---|
| Chromium | 27/33 | <0.01- 80 |
| Zinc | 33/33 | <0.01 - 1.30 |
| Barium | 29/33 | <0.05 - 28 |
| Nickel | 33/33 | .013 - 1.10 |
| Lead | 33/33 | <0.01 - .57 |
| Cadmium | 9/33 | <.005 - .020 |

*ppb - parts per billion
*ppm - parts per million

5.5 Top of Regional Groundwater Zone. The depth from the surface to the top of regional aquifer is approximately 50 feet. The thickness is approximately 30 feet. Trichloroethylene, 1,2-dichloroethylene, chromium, lead, and barium are all present in the aquifer in concentrations generally lower than in the perched zone. Concentrations of tetrachloroethylene are slightly higher in this zone. Trichloroethylene and chromium, the primary contaminants, were detected in maximum concentrations beneath the building with maximum concentrations of 30,000 ppb for trichloroethylene and 1700 ppb for chromium. The contaminant plumes of trichloroethylene and chromium cover approximately 181 and 153 acres respectively and are shown in Figures 5-3 and 5-4. The highest concentration of 1,2-dichloroethylene was 1400 ppb in an area northeast of the building. The plume shape is similar to the trichloroethylene plume. Tetrachloroethylene is present primarily beneath the building with the highest concentration detected at 1200 ppb. Barium and lead exist in plumes with similar shapes as chromium. The maximum concentrations of barium was 24,000 ppb and of lead was 410 ppb. One area northeast of the building contains higher concentrations of trichloroethylene, 1,2-dichloroethylene, tetrachloroethylene, and chromium and also contains high concentrations of chlorobenzene and vinyl chloride, which were not detected in significant concentrations throughout the rest of the site. This area is upgradient from the site and the contaminants have evidently migrated from a different source. Table 5.4 lists the compounds and metals detected in the top of regional zone.

# GENERALIZED SITE GEOLOGY BELOW BUILDING 3001
# TINKER AIR FORCE BASE

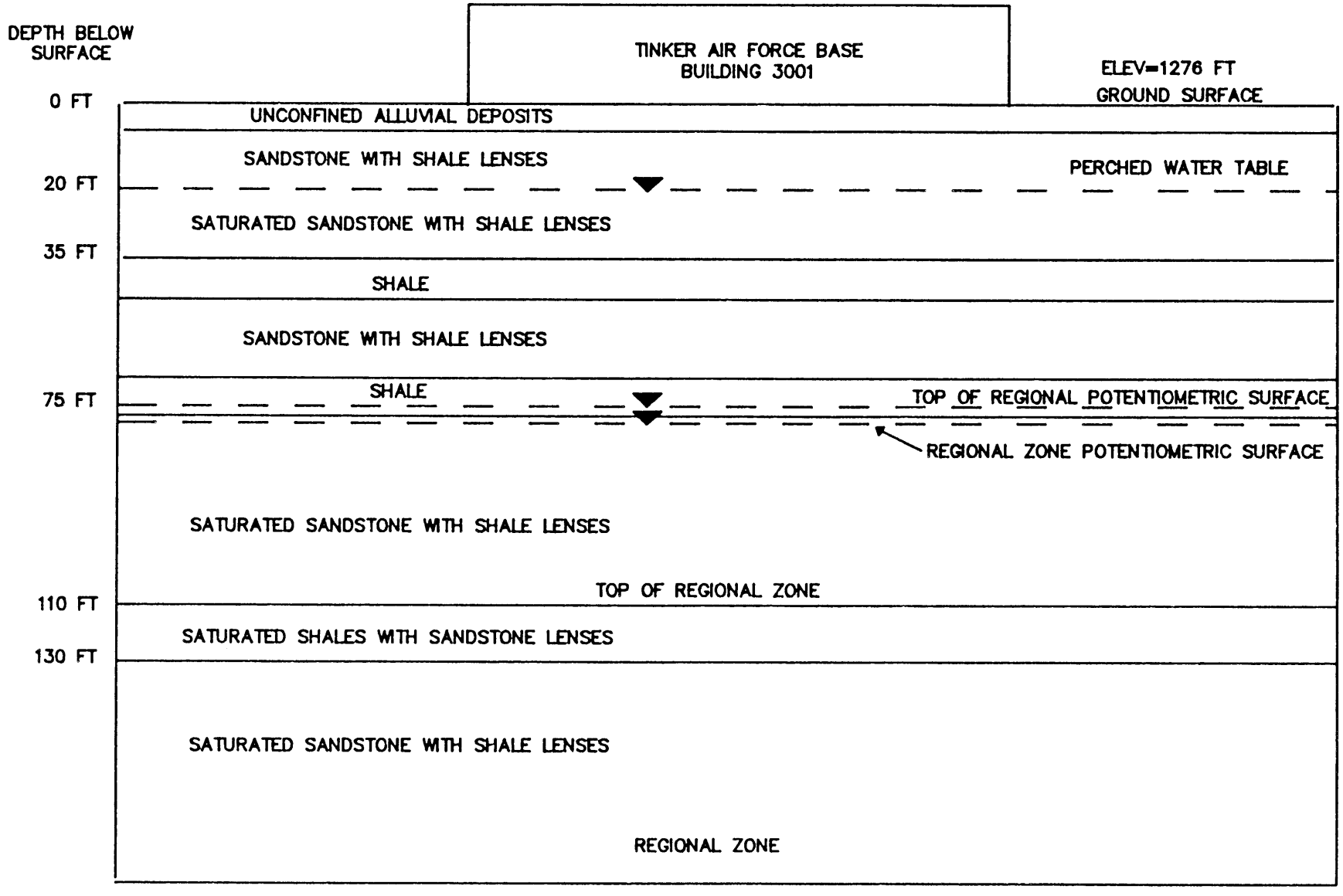
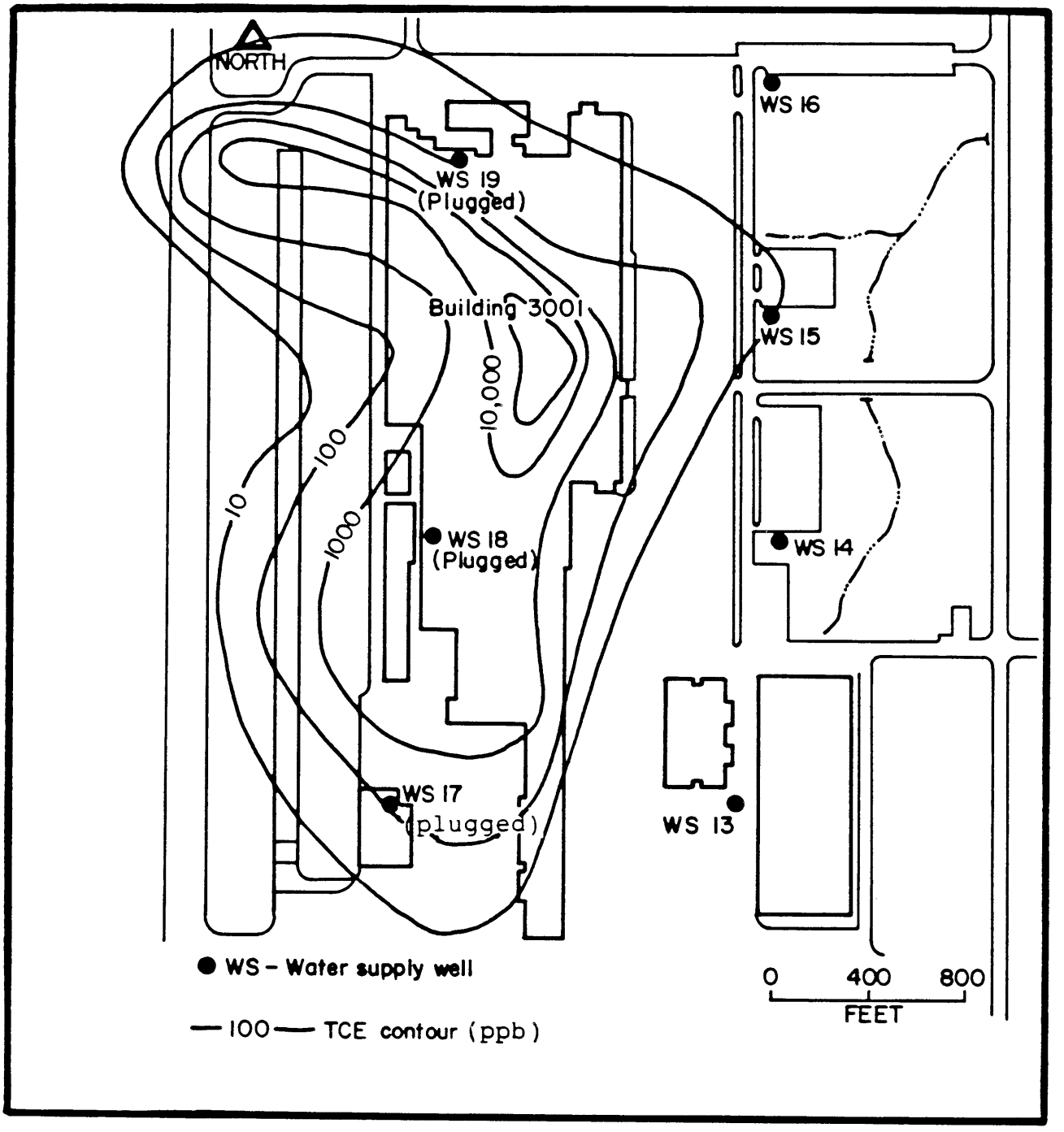
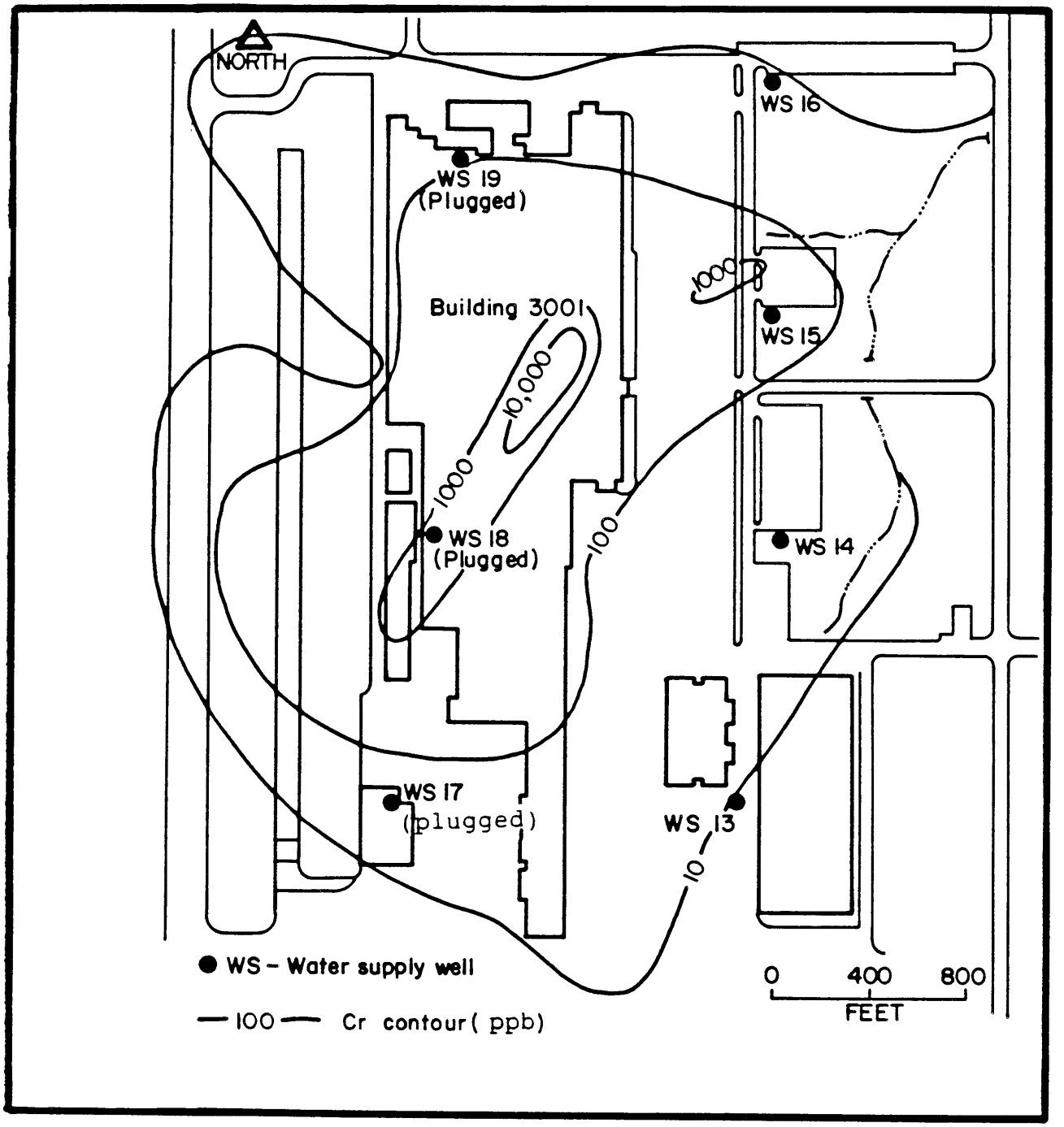



FIGURE 5–1a



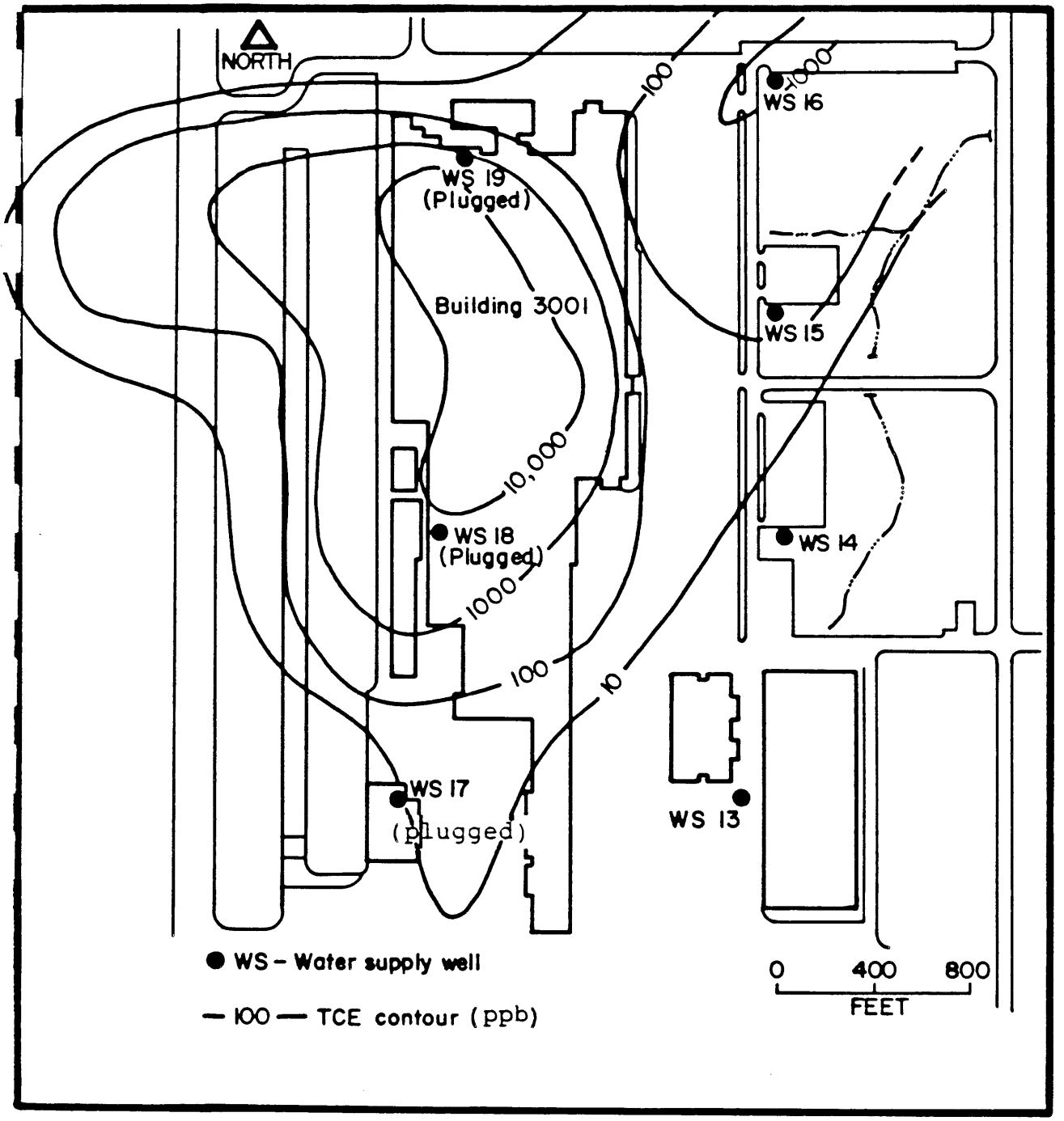

TRICHLOROETHYLENE PLUME IN PERCHED AQUIFER

FIGURE 5-1



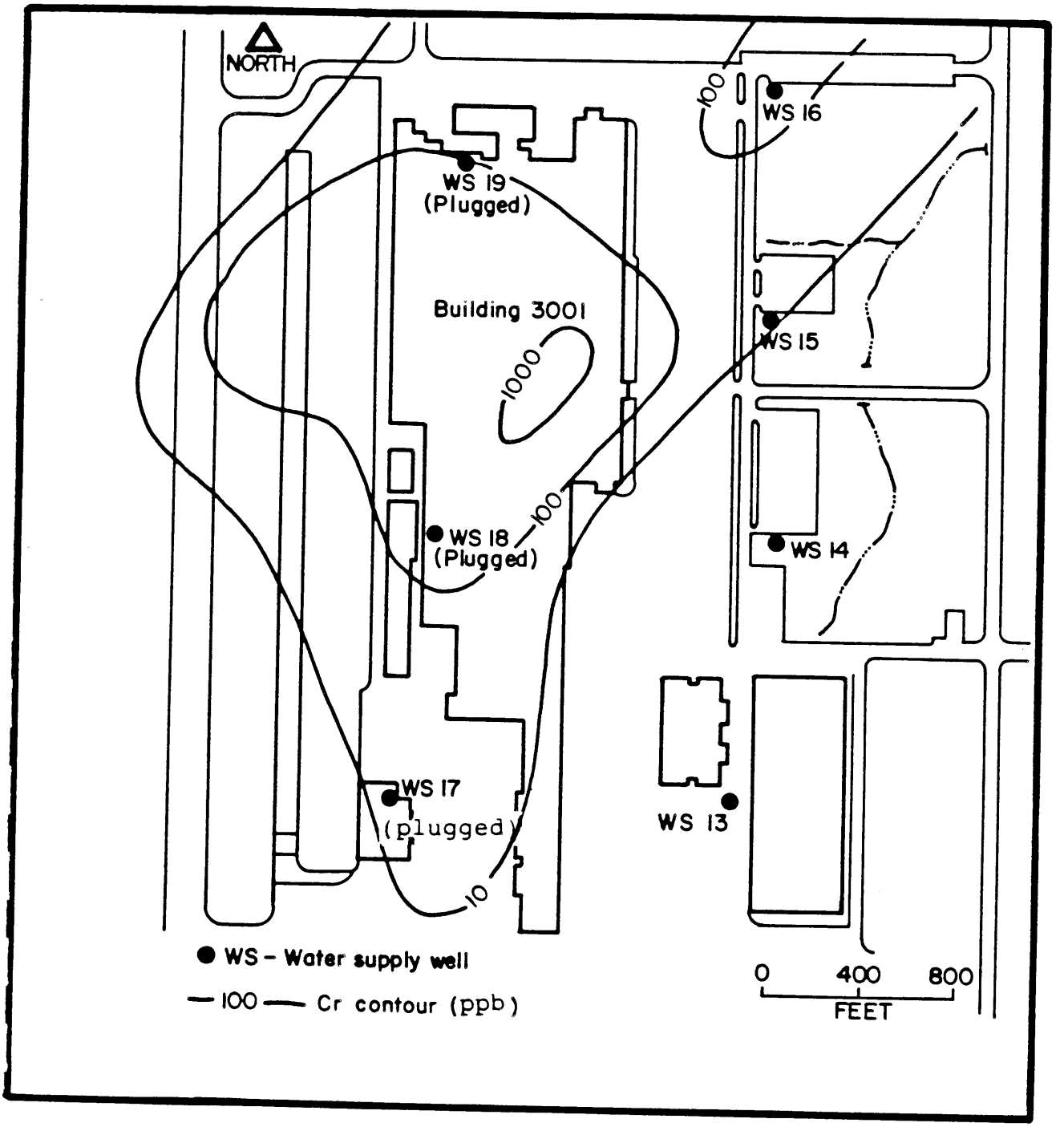

CHROMIUM PLUME IN PERCHED AQUIFER

FIGURE 5-2




TRICHLOROETHYLENE PLUME IN TOP OF REGIONAL ZONE

FIGURE 5-3




## CHROMIUM PLUME IN TOP OF REGIONAL ZONE

FIGURE 5-4

Table 5.4
Contaminants Detected in the Top of Regional Zone

| Organic Compound | Times Found/ Total No. Samples | Concentration Range (ppb*) |
|---|---|---|
| Trichloroethylene | 17/25 | <5 - 30,000 |
| 1,2-dichloroethylene | 14/25 | <5 - 1,400 |
| Tetrachloroethylene | 5/25 | <5 - 1,200 |
| Toluene | 5/25 | <5 - 84 |
| 1,2-Dichloroethane | 5/25 | <5 - 300 |
| Di-n-butyl phthalate | 3/10 | <10 - 300 |
| Phenol | 5/10 | <10 - 86 |
| Bis(2-Ethylhexyl)phthalate | 5/10 | <10 - 42 |
| 1,1 -dichloroethylene | 4/25 | <5 - 12 |
| Chlorobenzene | 3/25 | <5 - 940 |
| Vinyl Chloride | 2/25 | <10 - 530 |
| Acetone | 13/25 | <5 - 1400 |

*ppb - parts per billion

| Total Metals | Times Found/ Total No. Samples | Concentration Range (ppm**) |
|---|---|---|
| Chromium | 27/33 | <.01 - 1.7 |
| Barium | 18/23 | <.50 - 24 |
| Lead | 21/23 | <.01 - .41 |
| Nickel | 23/23 | .03 - .53 |

**ppm - parts per million

5.6 Regional Groundwater Zone. The depth from the surface to the regional zone is approximately 110 feet. The approximate thickness is 65 feet. The significant organic compounds found in this zone are trichloroethylene and 1,2-dichloroethylene, with concentrations much lower than in the top of regional zone. The maximum concentrations of trichloroethylene and 1,2-dichloroethylene were 1000 and 46 ppb, respectively. The extent to which contaminants have migrated in the regional zone is significantly less than in the top of regional zone. Contaminants are concentrated primarily beneath the building. The trichloroethylene plume covers approximately 78 acres. Chromium is also present with a maximum concentration of 1200 ppb beneath the building. The chromium plume covers approximately 145 acres. The regional zone is not used as a water supply source on Base. The producing zone begins at approximately 100 feet below the bottom of this layer. Table 5.5 list the contaminants detected in the regional zone.

Table 5.5
Contaminants Detected in the Regional Zone

| Organic Compounds | Times Found/ Total No. Samples | Concentration Range (ppb*) |
|---|---|---|
| Trichloroethylene | 7/11 | <5 - 1000 |
| 1,2-dichloroethylene | 4/11 | <5 - 46 |
| Tetrachloroethylene | 2/11 | <5 - 28 |
| Methylene Chloride | 2/11 | <5 - 15 |
| Benzene | 1/11 | <5 - 430 |
| 1,2-dichloroethane | 1/11 | <5 - 7 |
| Toluene | 3/11 | <5 -13,000 |
| Xylene | 2/11 | <5 - 7 |
| Acetone | 3/11 | <10 - 100 |

*ppb - parts per billion

| Total Metals | Times Found/ Total No. Samples | Concentration Range (ppm*) |
|---|---|---|
| Chromium | 8/11 | 1.2 |
| Barium | 8/11 | 27 |
| Lead | 11/11 | .40 |
| Cadmium | 8/11 | .013 |
| Nickel | 11/11 | 1.9 |

*ppm - parts per million

5.7 Producing Groundwater Zone. The producing zone is below the regional zone at a depth of 250 feet to 700 feet below the surface. There are 25 existing water supply wells on-Base which pump groundwater from this zone. Seven water supply wells were located in the vicinity of B3001 (WS 13-19). Wells 18 and 19 were sampled at the well head and found to contain trichloroethylene and tetrachloroethylene. The two wells were taken out of operation in 1984. WS 15 and 16 contain trace levels of trichloroethylene and WS 16 contains trace levels of 1,2-dichloroethylene and tetrachloroethylene. Both wells were sampled at the well head. WS 17, which is near the southwest corner of the building, has been permanently plugged due to its proximity to the contaminant plume. The well was sampled before plugging and was not contaminated.

## 6.0 SUMMARY OF SITE RISK.

A Risk Assessment of the B3001 site was performed in August 1988. The primary contaminants are trichloroethylene and chromium based on their high frequency of occurrence and concentrations in each aquifer zone. Tables 5.3 thru 5.5 lists the concentration of trichlorethylene and chromium in each aquifer zone. From the 32 chemicals identified in the remedial investigation (24 organic and 8 inorganic), seven indicator chemicals were selected based

on toxicity, mobility, frequency of occurrence, and concentrations. The indicator chemical selection process is described in the B3001 Risk Assessment (COE 1988). The assessment was conducted under the assumption that the site would not be remediated. Table 6.1 lists the indicator chemicals and the accompanying longterm exposure concentrations. The longterm exposure concentration is the estimated concentration of the contaminant at the exposure points due to movement of the contaminant along potential contaminant flow pathways.

Table 6.1
Indicator Chemicals and Longterm Exposure Concentrations

| Chemical | MCL (ppb*) | Concentration (ppb*) |
|---|---|---|
| Benzene | 5.0 | 0.8 |
| Trichloroethene | 5.0 | 16.7 |
| Tetrachloroethene | ** | 3.5 |
| Nickel | ** | 47.0 |
| Hexavalent Chromium | 50.0 | 16.0 |
| Lead | 50.0 | 2.7 |
| Barium | 1000.0 | 700.0 |

*ppb - parts per billion
** MCL has not been established by the EPA

The three primary pathways in which humans can be exposed to the contamination at the B3001 site are through the groundwater beneath the site, surface water in Soldier Creek and the air. The only complete pathway identified was the groundwater pathway used as drinking water supply on the Base. Surface water and air pathways are not presently complete and pose no immediate threat to populations along Soldier Creek. The surface waters of Soldier Creek are not used as a drinking water source. Therefore consumption of the surface water is not considered a significant route of exposure. The chaotic movement of the creek's surface water will sufficiently volatilize (evaporate) the organics that may flow into the creek from the perched aquifer. The subsurface soils beneath the B3001 site were identified in the B3001 RI Report as the source of contamination. Since the contaminated soils are beneath B3001, the soils are separated from the surface and direct human contact.

Unless remedial action is taken, the contamination in the perched zone and upper zone of the regional aquifer would eventually migrate into the lower zones and contaminate the Base's water supply. Routes of exposure from contaminated drinking water in the producing zone could be ingestion (drinking or cooking with contaminated groundwater), dermal contact (skin contact with contaminated water), and inhalation (breathing of contaminated vapors) from showers and industrial processes.

Without remedial action, the perched aquifer directly below the contaminated subsurface soils would continue to receive contaminants from the soils and transport them to the surface waters of Soldier Creek through seepage up through the stream.

The risk characterization of the site indicates a potential for carcinogenic and non-carcinogenic health effects as a result of no remedial action at the site. The carcinogenic risk is calculated based on the intake of 2 liters of contaminated water per day by a 70-kg adult over a 70-year exposure period. Acceptable risk are $10^{-4}$ to $10^{-6}$ or one additional incidence of cancer per 10,000 people to one additional incidence of cancer per 1,000,000 people. The potential for carcinogenic effects from long-term consumption of drinking water at TAFB was characterized by the upperbound risk of $1.2x10^{-5}$ or one additional case of cancer per 83,000 people which is in the cceptable risk range. The potential for carcinogenic effects from long-term consumption of fish from Soldier Creek was indicated by the upper bound risk of $6.9x10^{-6}$ or one additional case of cancer per 145,000 people. Based upon the conservative risk assessment, the carcinogenic risk is considered low.

6.1 Contaminant Characteristics. Trichlorethylene is a probable human carcinogen. It is the most significant contaminant identified in the remedial investigation sampling with a high frequency of occurrence in all aquifer layers and the highest concentrations reported in the study. Trichloroethylene is highly mobile in the environment. Chromium exhibits several oxidation states. The most common oxidation states are the trivalent chromium and the hexavalent chromium states. Hexavalent chromium is the greatest health threat. Chromium was selected based on its high frequency of occurrence and concentrations. It had the highest concentration of the inorganic constituents. Chromium is a human carcinogen, highly toxic and extremely mobile.

6.2 Environmental Impact. The remediation of the contaminated groundwater will reduce the potential for adverse environmental impacts. Organic contaminants released to the atmosphere will be below the existing air quality standards. Construction activities associated with the treatment facility will impose short-term impacts on low quality habitat at the site. Wildlife in this area will experience no longterm impacts as a result of the response actions. The proposed remedial action will minimize the release of contaminants to East Soldier Creek and will reduce the extent of groundwater contamination. The OU's do not contain endangered species or any critical habitats.

6.3 Identification of Exposed Population. Tinker AFB has a workforce population of approximately 20,000 and a resident population of 2500. The workforce and resident population

represent the potentially exposed population. The potentially exposed population increases if the surface water of Soldier Creek becomes contaminated. The population would then expand to include the residential and business communities along Soldier Creek. The Building 3001 site is bordered to the north by Midwest City and to the northwest by Del City, with populations of 58,000 and 33,400 (1980 census), respectively. Although these cities border the contamination site and use the regional aquifer for water supply, the potentially exposed population is assumed to be that portion of Midwest City adjacent to Soldier Creek. This assumption is based on the fact that only the surface water and air pathways potentially affect that population. Since the contaminated groundwater plume is contained within the base boundary and the horizontal migration is to the southwest away from the water supply wells of these communities, a groundwater pathway to these communities does not exist at this time.

## 7.0 DESCRIPTION OF THE ALTERNATIVES FOR CONTAMINATED GROUNDWATER.

Several alternatives were considered for the remediation of the contaminated groundwater at the site during the Feasibility Study.

Table 10.1 in Section 10 lists the maximum contaminant levels that the remedial actions must achieve. The response action was divided into two stages. They were:

1) Groundwater Pumping/Collection, and
2) Groundwater Treatment and Disposal.

The alternatives considered for the first stage consisted of

1) Alternative 1-1: No Action
2) Alternative 1-2: Groundwater Removal by Exterior Wells
3) Alternative 1-3: Groundwater Removal by Exterior and Interior Wells.

The alternatives evaluated for Groundwater Removal and Disposal were:

1) Alternative 2-1: Modified Industrial Waste Treatment Plant (IWTP)/Industrial Reuse
2) Alternative 2-2: Modified IWTP/Surface Water Discharge
3) Alternative 2-3: Treatment/Industrial Reuse
4) Alternative 2-4: Treatment/Surface Water Discharge

### 7.1 Groundwater Pumping/Collection.

7.1.1 Alternative 1-1: No Action. This alternative, required by CERCLA and the NCP, was used to compare the effectiveness of the other alternatives. The no action alternative does not involve any pumping from the contaminated

aquifers but does include monitoring of the groundwater contaminant plume and surface water monitoring at East Soldier Creek. This alternative would not achieve maximum contaminant levels.

7.1.2 Alternative 1-2: Groundwater Removal from Exterior Wells. This alternative includes pumping groundwater from approximately 111 exterior wells located around the exterior of B3001 at a combined rate of 71,820 gallons per day. Pumping at this rate will prevent further migration of the contaminants. An estimated 786,000,000 gallons of contaminated groundwater will be collected and treated. Alternative 1-2 is expected to reduce contaminant concentration below maximum concentration levels by 75 percent at the regional aquifer and 97 percent in the overlying aquifers within the first 30 years of operation. A groundwater monitoring network would be installed to monitor the groundwater. The areas of highest contaminant concentrations, directly under B3001, would not be directly pumped by this alternative.

7.1.3 Alternative 1-3: Exterior and Interior Groundwater Removal. Alternative 1-3 is similar to Alternative 1-2 with the addition of approximately 18 interior wells. The well network would pump at a rate of approximately 88,180 gallons per day. Pumping at this rate will prevent further migration of the contaminants. An estimated 964,000,000 gallons of contaminated groundwater will be collected and treated. This alternative is expected to reduce contaminant concentrations below maximum concentration levels by 93 percent at the regional aquifer and 97 percent in the overlying aquifers within the first 30 years of operation. Since all the groundwater contamination will be below Maximum Contaminant Levels, no area of attainment will be established. The groundwater monitoring would be identical to Alternative 1-2 monitoring. Although this alternative would be more disruptive to the operations in the building during the installation of recovery wells within B3001, it would include groundwater collection from areas of the plume with the highest contaminant concentrations.

7.2 Groundwater Treatment and Disposal.

7.2.1 Alternative 2-1: Modified IWTP/Industrial Reuse. Alternative 2-1 consists of routing contaminated groundwater recovered from three aquifer zones to an air stripper, using the air stripper to remove volatile organic compounds, pumping the air stripper effluent to a storage tank, treating for inorganics and nonvolatile organics at the existing Industrial Waste Treatment Plant (IWTP), and reusing the treated groundwater in TAFB's industrial operations. Existing treatment processes at the IWTP include oil/water separation, flow equalization, metals reduction/precipitation by sulfide precipitation, biological treatment by activated sludge, oxidation/disinfection by

chlorination, and pressure filtration. The sludge is thickened and dewatered onsite and disposed of at an offsite RCRA permitted facility.

7.2.2 Alternative 2-2:Modified IWTP/Surface Water Discharge. Alternative 2-2 differs from Alternative 2-1 only by the effluent discharge destination. Instead of industrial reuse of the Modified IWTP effluent, the effluent will be discharged to East Soldier Creek.

7.2.3 Alternative 2-3: Treatment/Industrial Reuse. A new treatment facility would be constructed specifically for the Building 3001 site. The primary features of this alternative consist of air stripping for organic removal, a precipitation process for metals removal, and a fine filtration process for removing the remaining organics and metals. The air emissions from the air stripper would be below the Maximum Acceptance Ambient Concentration. Air emissions would not affect the health of Tinker personnel or the surrounding population. The effluent from the treatment process will be reused in TAFB industrial operations. Sludge will be produced in the treatment process in the removal of inorganic contaminants. The sludge will be disposed of at an offsite RCRA permitted facility approved to receive CERCLA waste.

7.2.4 Alternative 2-4:Treatment/Industrial Reuse. Alternative 2-4 differs from 2-3 only by the effluent discharge destination. The effluent will be discharged into East Soldier Creek.

Section 10.1 discusses the anticipated percentage of reduction of contaminants by treatment. Table 10.1 lists the maximum contaminant levels to be achieved by treating the contaminated groundwater.

A Treatability Study will be conducted to determine the best technology to clean up the contaminated groundwater. A treatability study consists of two phases. The first study involves a bench scale test. If the desired results are not obtained during this phase then the study will be scaled up to a pilot study. The treatability study will test the metals precipitation and water polishing processes.

The primary Applicable or Relevant and Appropriate Requirements (ARARs) that the listed treatment alternatives would have to comply with the Solid Waste Disposal Act, Safe Drinking Water Act, Clean Air Act, Oklahoma Controlled Industrial Waste Disposal Act and the Oklahoma Water Quality Standards for Discharge to a Surface Stream. RCRA Land Ban will not apply to the onsite remedial activities. Materials sent offsite will be transported to an offsite RCRA permitted facility approved to receive CERCLA waste that will comply with the Land Disposal Requirements. A

sludge will be produced when removing organic compounds. The spent carbon absorption units will be regenerated.

## 8.0 DESCRIPTION OF ALTERNATIVES FOR PIT Q-51.

The alternatives considered for Pit Q-51 remediation are:

1) Alternative 1: No action
2) Alternative 2: Removal of Pit Contents/Onbase Treatment
3) Alternative 3: Removal of Pit Contents/Offbase Treatment.

8.1 Alternative 1: No Action. This alternative is required by the CERCLA and the NCP to compare the effectiveness of the other alternatives. The No action alternative would require no action to be taken at the site.

8.2 Alternative 2: Removal of Pit Contents/Onbase Treatment. Alternative 2 consists of removing approximately 45 gallons of liquid from the pit. The pit would be steam-cleaned and the washwater placed in 55 gallon drums. One sample each would be taken from the hazardous material from the pit and the washwater from the final rinse. If the results from the wash water are not below acceptable levels, the pit will be rinsed again and the washwater will be resampled. The drums would be transported to an approved temporary storage area for no more than 90 days. After the sample is analyzed and acceptable levels are obtained, the hazardous material would be transported to the IWTP for treatment with other TAFB industrial waste. The used drums would be disposed of at a facility approved to receive CERCLA waste. The pit would be backfilled with sand and covered with concrete cap.

8.3 Alternative 3: Removal of Pit Contents/Offbase Treatment. Alternative 3 is identical to Alternative 2 with the exception of the method of disposal. This alternative requires that the hazardous material, washwater, and drums be transported offsite to a facility that is approved to receive CERCLA waste.

## 9.0 DESCRIPTION OF ALTERNATIVES FOR THE NTA OU.

Several alternatives for remediation at the NTA OU have been considered. These alternatives are:

1) Alternative 1: Free Floating Fuel Removal
2) Alternative 2: Fuel Vapor Removal
3) Alternative 3: Capping of the Area
4) Alternative 4: Removing the Fuel Contaminated Soil
5) Alternative 5: Collecting and Treating the Contaminated Water
6) Alternative 6: Tank Abandonment

These alternatives are described in more detail in the North Tank

Area Design Summary Report (ref. 17) and the Groundwater Technology reports (ref. 6,7,8). The remedy selection was well advanced at the time of the FFA approval for which this document was developed. The selected interim actions are consistent with the final remedial action for B3001 as described below.

9.1 Alternative 1: Free Floating Fuel Removal. Alternative 1 consists of the removal of floating phase separated hydrocarbons from the perched groundwater. This would be accomplished with three hydrocarbon-only pumps in conjunction with groundwater table depression pumps when necessary. This alternative would remove an estimated 10,000 gallons of fuel product from the perched aquifer. The fuel would be disposed of at a RCRA approved disposal facility.

9.2 Alternative 2: Fuel Vapor Removal. Alternative 2 consists of extracting fuel vapors from the subsurface soils above the perched groundwater surface using horizontal extraction wells which will be destroyed in a thermal combustor. The goal of the final remedial action will be to obtain a 99 % reduction of the original concentration. Realizing that the goal may not be technically feasible, the situation may occur where no significant progress in contaminant reduction occurs so remediation will be ended.

9.3 Alternative 3: Capping of North Tank Area. Alternative 3 would consist of capping the site. The action would reduce the amount of rainwater that could percolate into the site. However, since the near surface soil currently has a 2 to 3 feet layer of relatively low permeable clay, it would not be cost effective to place another low permeable barrier over the site. The alternative would not be permanent since it would not remove the fuel product therefore, allowing the contamination to spread.

9.4 Alternative 4: Removal of Fuel Contaminated Soil. Alternative 4 would consist of excavating approximately 58,800 cubic yards of contaminated soil and disposing of it in an approved facility. This alternative could pose a short term risk to the workers and would not be cost effective since disposal of the material would have to meet Land Disposal Requirements.

9.5 Alternative 5: Collecting and Treating of the Contaminated Groundwater. Alternative 5 would remove and treat the contaminated groundwater. This action will be conducted as part of the B3001 final remedial action, therefore, a separate action is not necessary.

9.6 Alternative 6: Tank Closure. Alternative 6 would consist of cleaning, demolishing and backfilling Tank 3404; and removing and properly disposing of the small waste oil tank.

The interim remedial action will consist of Alternatives 1, 2, and 6.

## 10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES.

The remedial alternatives have been assessed using the Nine Point criteria developed to address CERCLA requirements. The Nine criteria are:

- Overall protection of human health and the environment,
- Compliance with Applicable or Relevant and Appropriate Requirements (ARAR's),
- Long term effectiveness and permanence,
- Reduction of toxicity, mobility, or volume,
- Short term effectiveness,
- Implementability,
- Cost,
- State Acceptance, and
- Community Acceptance.

### 10.1 Overall Protection of Human Health and the Environment.

This criteria addresses whether or not the alternative provides adequate protection to human health and the environment.

a. Building 3001 Groundwater. Alternative 1-1 would not provide adequate protection of human health and the environment. It would allow the contaminant plume to migrate further down into the lower aquifer zones. Alternative 1-2 would be protective of human health and the environment by removing approximately 75% of the contamination in the regional aquifer and 97% in the overlying aquifers within 30 years. Alternative 1-3 would be more protective of human health and the environment by extracting more of the contaminated groundwater at a more rapid rate. The extraction rate of the contaminated groundwater would be increased by the addition of recovery wells in the highly contaminated area under B3001. Alternative 1-2 would only extract contaminanted groundwater from the below the exterior of B3001.Alternative 1-3 would remove 93% of the contaminants in the regional aquifer and 97% in the overlying aquifers within 30 years. All of the alternatives (2-1 thru 2-4) for treatment and disposal will protect human health and the environment. However, Alternative 2-3 would reuse the treated groundwater in TAFB's industrial operations instead of discharging it into Soldier Creek.

b. Pit Q-51. Alternative 1 would not remediate the site and therefore, would not be protective of human health and the environment. Alternatives 2 and 3 would adequately protect human health and the environment by removing all the contents of the pit, steam cleaning the pit, removing the washwater, backfilling the pit with sand, and capping the pit with an 8-inch concrete cap.

c.North Tank Area. Alternatives 1, 2, and 6 would be protective of human health and the environment by removing the fuel and fuel vapors from the site.

10.2 Compliance with ARAR's. Section 121 of CERCLA provides that, except under certain narrow exemptions, remedial actions shall comply with Federal and State laws that are applicable or relevant and appropriate to the contaminants and circumstances of the site. The process by which potential ARAR's are identified, screened, and analyzed to determine if they actually are ARAR's is described in "CERCLA Compliance with Other Laws Manual" (EPA 1988a).

ARAR's may be identified in three general classes:

1. chemical specific - for example, a drinking water "MCL" defines a maximum acceptable concentration for drinking water;

2. action specific - for example, a landfill built to accept hazardous waste would have to meet RCRA 264, Subpart N regulations and associated requirements on design of the landfill;

3. location specific - for example, a hazardous waste landfill could not be built on a flood plain.

The key ARAR's are the chemical specific drinking water requirements or Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act (SDWA), the requirements under the Clean Air Act which relate to the emission standards for ambient air quality and the Oklahoma Water Resources Board Rules, Regulatory and Modes of Procedure 1985. Table 10.1 gives the chemical specific MCLs that apply to the seven indicator chemicals that have already migrated into the Garber-Wellington Formation.

a.Building 3001 Groundwater. Alternative 1-1 does not meet all of the ARAR's. It would not prevent the contaminants from further migration and would not protect human health and the environment. Alternative 1-3 will remediate the perched aquifer faster and remove a greater amount of contamination from the regional zone than Alternative 1-2. Alternative 1-3 would restore contaminated groundwater to drinking water standards faster than Alternative 1-2. Alternative 1-3 would reduce the likelihood of present or future threat of human exposure through the water supply or Soldier Creek by extracting the groundwater from the upper aquifer zones of the Garber-Wellington Formation, treating it and reusing it in TAFB's industrial operations.

Alternatives 2-1 thru 2-4 would be in compliance with the ARAR's

for treatment and disposal of contaminated groundwater. These alternatives would treat the contaminated groundwater to levels below discharge effluent levels.

Table 10.1
MCLs for Indicator Chemicals

| Chemical | MCL (ppb*) |
|---|---|
| Benzene | 5 |
| Trichloroethene | 5 |
| Tetrachloroethene | 5 |
| Barium | 1000 |
| Chromium | 50 |
| Lead | 50 |
| Nickel | - |

Table 10.2
Air Standards

| Contaminant | Air Standard (ppm*) |
|---|---|
| Trichloroethylene | 0.5 |
| 1,2-dichloroethylene | 1.0 |
| Tetrachloroethylene | 0.5 |
| Toluene | 10.0 |
| Benzene | 0.1 |
| Xylene | 10.0 |
| Acetone | 1.0 |

*ppb - parts per billion
*ppm - parts per million

b. Pit Q-51. Alternative 3 is the only alternative that would meet all of the ARAR's of Federal and State laws. Alternative 2 would introduce CERCLA waste into a facility that is permitted to receive RCRA waste, thus creating commingling of waste. Commingling of waste would not be in compliance with environmental regulations.

c. North Tank Area. The alternatives selected will meet the ARAR's by removing the contamination and treating the contaminated groundwater to meet MCL's. Tank abandonment will be completed in compliance with the appropriate state and federal Underground Storage Tank (UST) requirements.

10.3 Long-term Effectiveness and Permanence. This criteria addresses the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

a. Building 3001 Groundwater. Long-term effectiveness is dependent upon the performance of the alternatives over time. Alternatives 1-3 and 2-3 would effectively remove and treat more

of the contaminated groundwater than the other alternatives. In the first 5 years, approximately 72% and 77% of the trichloroethylene and chromium, respectively would be removed. The remedies would permanently remove approximately 85% of the contaminants in all three zones within 20 years. Within 30 years, approximately 93% and 94% of the trichloroethylene and chromium, respectively, would be recovered. The residual contaminants in the groundwater will be below the maximum contaminant levels. By allowing the contaminants to remain for a longer period, the other alternatives are less effective. If the magnitude of the migrating contaminants is reduced, the risk of exposure to the lower aquifer zones is reduced.

b.Pit Q-51. Alternative 1 would not meet the criteria for long-term effectiveness because it will allow migration of the contaminants into the soil and groundwater below B3001. Alternative 2 and 3 would permanently remove the contents of Pit Q-51 and prevent any migration of the contaminants. Alternative 3 would be more effective over a longer period of time since the waste material would be permanently disposed of offsite. Alternative 2 could create more waste that would eventually have to be disposed of offsite.

c.North Tank Area. The selected alternatives would meet the longterm effectiveness criteria. The interim remedial action will be permanent once the floating fuel is recovered and reused and/or disposed and fuel vapors are removed and destroyed; and the tanks are properly removed and disposed of or abandoned.

10.4 Reduction of Toxicity, Mobility, and Volume. This criteria anticipates the performance of the treatment technologies. CERCLA states, in Section 121 (a)(1), a clear preference for remedies which reduce the volume, toxicity, and mobility of the waste.

a.Building 3001 Groundwater. The no action alternative would not reduce the toxicity, mobility, or volume of the contaminants in the groundwater. Alternative 1-3 would reduce the mobility and volume of the contaminated groundwater in the perched aquifer more rapidly than Alternative 1-2, therefore reducing the migration of the contaminants into the lower portion of the regional aquifer and eliminating the risk of exposure to the producing zone. Based upon the Feasibility Study it was determined that the preferred alternative, Alternative 2-3, would vastly reduce the volume of contaminated material by removing approximately 93% and 94% of trichloroethylene and chromium from the groundwater respectively over an estimated 30 year time period. The treatment process will vastly reduce the volume of groundwater contaminated above the maximum contaminant levels.

All the alternatives for treatment and disposal (2-1 thru 2-4) would treat the contaminants in the groundwater. All of the

alternatives would remove volatile organics, heavy metals, and nonvolatile organics. Alternative 2-3 would reduce the contaminant concentration levels below the regulated concentration levels and treated water would be reused instead of being immediately discharged into Soldier Creek.

b.Pit Q-51. The no action alternative would not reduce the toxicity or volume of the contaminants in the pit material or reduce the threat of migration into the groundwater. Alternatives 2 and 3 would reduce the mobility, toxicity, and volume of the hazardous material by removing all of the hazardous material from the site thus eliminating any risk to the public or Tinker AFB personnel. Proper abandonment of the pit would prevent any migration of contaminants into the groundwater.

c.North Tank Area. The selected alternatives will reduce the mobility and volume of the hazardous material by free floating fuel removal and fuel vapor removal. Alternatives 4 and 5 would aid in meeting this criteria but are not necessary if alternatives 1, 2 and 6 are implemented. The destruction of fuel vapors from the soil vapor extraction system will result in permanent mobility, toxicity and volume reduction.

10.5 Short-term Effectiveness. This criteria involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

a.Building 3001 Groundwater. The short-term effectiveness for Alternative 1-1 would be higher than Alternatives 1-2 and 1-3 since this alternative would not remediate the site. However, a small short term risk exists for Alternatives 1-2 and 1-3. Both alternatives would require the use of personal protective equipment while installing the extraction wells. Air monitoring would be required to monitor any vapors which may escape from the subsurface. The remedy will comply with State and local air emission standards.

The risks associated with the treatment alternatives have been evaluated. The alternatives would not expose workers , Tinker personnel, or the surrounding community to hazardous materials during construction or modification of the treatment facilities. Air emission from the air stripping tower would have low contaminant concentrations, therefore neither TAFB personnel or the surrounding community would be adversely affected. The treated groundwater would be below water quality standards, thus posing no risk to TAFB personnel that may contact the reused water in TAFB industrial operations.

Exposure of site workers to hazardous materials and situations during implementation of Alternatives 1-3 and 2-3 would be minimized or prevented with well planned and implemented personal training programs, the supply and utilization of appropriate safety and personal protective equipment and the development and use of an effective safety plan.

b. Pit Q-51. Alternative 1 could pose a risk to the public and Tinker AFB personnel through dermal contact or inhalation. Remediation of the site by Alternative 2 or 3 would pose no short-term effect to TAFB personnel or the environment. Direct contact would be prevented through the use of personal protective equipment.

c. North Tank Area. The selected alternatives would not pose longterm risks to human health or the environment. However, a short-term risk from volatilization of contaminants exists during the installation of the fuel vapor extraction system. Air monitoring equipment will used to monitor the releases of vapors from the subsurface soils. Direct contact would be prevented through the use of personal protective equipment.

10.6 Implementability. Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

a. Building 3001 Groundwater. Alternative 1-1 presents the fewest obstacles to fast and complete implementation. Alternative 1-3 would be difficult to construct due to site restrictions. Removal of contaminated groundwater through pumping is a common technology and has been proven successful at other NPL sites. Operation and Maintenance will be required to keep the collection wells operating efficiently. The interior collection wells would be located in either high bay areas or near aisleways to facilitate construction and minimize disturbance of normal operations. Administrative activities could also delay implementation. There would be no adverse site conditions to affect the construction of any of the groundwater treatment and disposal alternatives. Alternative 2-3 would require the greatest amount of time needed to be implemented. All of the alternatives would require about the same amount of time to achieve the expected results.
Alternative 2-3 is a proven and reliable technology in removing organics and metals from the groundwater. The technologies are currently being demonstrated and are included in the EPA Superfund Innovative Technology Evaluation program. They are effective for the types of contaminants in the groundwater.

b. Pit Q-51. The no action alternative requires no implementation. Alternative 2 and 3 would not present adverse

site conditions to affect the removal of the pit material or construction of the concrete cap. There are no site restrictions that would hinder equipment from reaching the site. This technology is used frequently and is readily available.

c.North Tank Area. There would be no site restrictions to hinder the construction of the NTA remedial action. Soil vapor extraction has been approved by the EPA and is a common technology used in Underground Storage Tank cleanups. While horizontal drilling is has never been implemented at an EPA Superfund site, it is commonly used in construction practices and is a developed technology.

10.7 Costs. This criteria includes capital, operation and maintenance, and present worth costs.

a.Building 3001 Groundwater. Alternative 1-3 is the most expensive of the pumping/collection alternatives, however it removes the greatest amount of contaminated groundwater from the site. Among the treatment alternatives, Alternatives 2-1 and 2-2 are less expensive. However, Alternative 2-3 utilizes the best technologies for obtaining the desired results. The cost for each alternative includes capital cost, operation and maintenance and present worth. The estimated cost for each alternative is:

| | |
|---|---|
| Alternative 1-1: | $ 679,800 |
| Alternative 1-2: | $6,871,079 |
| Alternative 1-3: | $8,437,008 |
| Alternative 2-1: | $1,930,500 |
| Alternative 2-2: | $1,930,500 |
| Alternative 2-3 | $4,286,100 |
| Alternative 2-4: | $4,286,100. |

b.Pit Q-51. The estimated cost for each alternative is:

| | |
|---|---|
| Alternative 1: | $ 0 |
| Alternative 2: | $ 3662 |
| Alternative 3: | $ 5200. |

c.North Tank Area. The cost for Alternatives 1, 2, and 6 is approximately $ 470,000.

10.8 State Acceptance. This criteria indicates whether, based on its review of the RI/FS and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative. The State of Oklahoma has concurred on the selected alternatives for remediation of the groundwater at the B3001 site, Pit Q-51, and the NTA.

10.9 Community Acceptance. This criteria indicates whether the public concurs with, opposes or has no comment on the preferred alternative. During the public meeting and comment period, the

main concerns of the public were the existence of offbase contamination from TAFB and inadequate sampling in the areas of contamination near the Base boundaries. The public expressed concerns on the treatment of the contaminants in the preferred alternatives but were not opposed to the preferred alternatives. Appendix A contains the Responsiveness Summary from the public comment period and public meeting. Base perimeter wells, monitoring wells located at Soldier Creek and the Industrial Waste Treatment Plant and other wells of interest are sampled bi-annually in order to monitor the groundwater at the Base boundary.

## 11.0 SELECTED REMEDIES.

11.1 Building 3001 Groundwater. Alternatives 1-3 and 2-3 are the selected remedies for the contaminated groundwater at Building 3001. The groundwater would be collected by a network of interior and exterior wells and treated in a treatment facility specifically constructed for treatment of the B3001 contaminated groundwater.

The collection system could consist of approximately 111 collection wells surrounding B3001, and approximately 18 collection wells in the interior of the building. The collection wells include approximately 50 wells in the perched aquifer and approximately 79 in the upper portions of the Garber Wellington Aquifer. The final number of wells to be installed will be established during the remedial design. These wells will have a flow rate of approximately 88,180 gallons per day. It is estimated that the collection system will remove 45% of the trichloroethylene and 49% of the chromium in the perched aquifer within 2 years. It will also remove 93% of the trichloroethylene and 94% of the chromium in the regional zone within 30 years. Eighteen monitoring wells would also be installed. Nine 3-well clusters would be installed to monitor the three groundwater zones. The wells would be dedicated stainless steel with teflon purge and sample pumps.

The goal of the remediation will be to reduce contamination to maximum contaminant levels in the groundwater beneath the Building 3001 site. Therefore, no point of compliance will be specified. Table 10.1 lists the maximum contaminant levels. The treatment and disposal alternative would consist of the construction of a new treatment plant and industrial reuse of the treated water. The treatment would consist of air stripping for organics removal, a precipitation process for metals removal, and a fine filtration process for the remaining organics and metals. The treatment would provide 99.9% removal of organic compounds and reduce the chromium concentration to 20-50 ppb. The carcinogenic risk level is $1.2 \times 10^{-7}$, this final remedial action will prevent any increase in the risk due to further migration to Soldier Creek and the producing zone in the groundwater.

11.2 Pit Q-51. Alternative 3 is the selected remedy for Pit Q-51. The contents of the pit would be removed and disposed of offbase. The remedy would consist of removing the pit contents and placing it in a 55-gallon drum. The pit would be steam-cleaned until the washwater contamination is below detection limits and the washwater placed in 55-gallon drums and temporarily stored for no longer than 90-days. One sample would be taken from both the pit contents and the washwater. The samples would be analyzed and the drums would be transported offsite to a facility approved to receive CERCLA waste.

11.3 North Tank Area. The goal of the free floating fuel recovery system is to remove free floating fuel from the groundwater surface. The remedy would include free floating fuel recovery, vapor extraction, and tank abandonment. The groundwater at the site will be remediated as a part of the Building 3001 cleanup.

Tank abandonment would consist of removal and proper disposal of a small waste tank, and proper abandonment, demolition, and backfilling of Tank 3404. Before abandoning Tank 3404, it would be utilized in the vapor extraction system.

A dual fluid production system will be used to remove the 6000-12,000 gallons of floating fuel product. A hydrocarbon-only pump will be used to recover the floating fuel product. A water table depression pump would be installed at such a time when static recovery of the phase separated hydrocarbons no longer creates a sufficient cone of depression to drive hydrocarbons to the recovery wells. The fuel would be pumped to a holding tank and disposed of properly. The groundwater produced would be treated in the Building 3001 treatment plant.

The vapor extraction system would consist of a horizontal well network connected to a blower to extract the vapors from the subsurface soils with a goal of 99 % removal of the contaminants. The vapors would be destroyed by passing through a thermal combustor.

## 12.0 STATUTORY DETERMINATIONS.

Under its legal authorities, TAFB's primary responsibility at this NPL site is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action must comply with ARAR's unless a statutory waiver is justified. The selected remedies must also be cost effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the

statute expresses a preference for remedies which significantly reduce the volume, toxicity, or mobility of hazardous waste. The following sections discuss how the selected remedies meet these statutory requirements. The selected alternatives will satisfy all the statutory requirements without the need to compromise any criteria.

12.1 Protection of Human Health and the Environment. The remedial actions would remove contaminated groundwater from the upper regions of the Garber-Wellington aquifer and treat it to acceptable levels for reuse in TAFB's industrial operations. By removing and treating the contaminated groundwater, destruction of the mobile contaminants including most of the known and suspected carcinogens will be achieved.

The EPA reported acceptable carcinogenic risks fall within the range of $1.0x10^{-4}$ to $1.0x10^{-6}$. The carcinogenic risk for the site if no action were taken is 1.2x10-5. This number will be further reduced when the proposed remedial action is implemented. Therefore, no unacceptable short-term risks would result from implementation of the remedial alternative.

The final remedial action would prevent the contaminants from migrating further horizontally and vertically within the aquifer thus reducing the risk of exposure to the drinking water zone in the lower aquifer. Unacceptable short-term risk or cross media impacts wil not be caused by implementation of the selected remedial alternatives. The remedial action will be permanent and will adequately protect human health and the environment.

12.2 Compliance with ARAR's. The elements of the selected remedies would all comply with the ARAR's established for this site. The list of ARAR's is contained in Appendix B. Key among these ARAR's are the Safe Drinking Water Act chemical specific MCLs and the requirements under the Clean Air Act which relate to the emission standards for ambient air quality. The ARAR's include:

1. National Pollutant Discharge Elimination System (NPDES), 40 CFR Parts 122 and 125.

2. National Primary and Secondary Ambient Air Quality Standards, 40 CFR Part 50.

3. RCRA requirements for the management of hazardous waste for owners and operators of facilities which treat, store, or dispose of hazardous waste, 40 CFR Part 264.

4. Oklahoma Controlled Industrial Waste Disposal Act, 63 OS 1981.

5. Oklahoma Water Quality Standards for discharge to a surface stream.

6. The Oklahoma Clean Air Act

The selected remedial actions will restore the groundwater within the site to the MCLs based on engineering estimates of recovery rates and desorption of contaminants from the aquifer soils. The system will be evaluated during its use and changes may be made in the pump and treat system to optimize its effectiveness. The selected remedies would treat more of the contamination more rapidly than the other alternatives.

12.3 Cost Effectiveness. The selected remedy for B3001 is cost effective and would cost an estimated $12.3 million. The cost includes Alternative 1-3, pumping and collecting the contaminated groundwater by interior and exterior wells, and Alternative 2-3, construction of a new treatment facility to specifically treat the B3001 contaminated groundwater. Alternatives 2-1 and 2-2 would not be cost effective. These alternatives would introduce a CERCLA waste into a facility that is permitted to receive RCRA waste, thus creating commingling of the wastes. Over the longterm, all of the waste at the facility would have to be disposed of in a facility approved to receive RCRA waste. This would drastically increase the cost of disposal. Even though the initial costs for the selected alternatives is more expensive than the other alternatives, the cost is reasonable considering the long-term protection of human health and the environment and the rapid reduction of the contaminant plume.

12.4 Utilization of Permanent Solutions and Alternative Treatment Technologies. The selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost effective manner. The emphasis in the selected remedies is on the recovery and permanent destruction of the contaminants in the groundwater and disposal of hazardous materials and fuel products at Pit Q-51 and NTA. The remedy also includes soil vapor extraction at the NTA.

Another aspect of permanence is the reduction of the mobility, toxicity, or volume of the wastes. The selected alternative will achieve these goals. The contents of Pit Q-51 and the fuel product at the NTA will be permanently removed from the B3001 site by disposing of the material at a facility approved to receive the waste material. The remedial action for the B3001 site will permanently collect and treat the contaminated groundwater. The groundwater collection system would drastically reduce the mobility of the contaminants and prevent further migration of the contaminants.

12.5 Preference for Treatment as a Principal Element. Treatment of the contaminated groundwater is the key to remediating the site. It will remediate the principle threat which is exposure through the use of contaminated groundwater. Contaminated sludges will be disposed of at an approved facility to receive CERCLA waste. The goal of the remedial action is to pump and treat 85% of the contaminant plume in the first 5 years of operation. The remaining 15% will be removed during the next 25 years. The site will be considered remediated upon approval from the Environmental Protection Agency and the Oklahoma State Health Department.

13.0 Documentation of Significant Changes. There were no significant changes from the proposed plan.

## REFERENCES

1. Burke Engineers, Inc., A.L., "Investigation of Underground Storage Tanks", Tinker Air Force Base, Oklahoma, (Report prepared for Department of the Air Force, Air Logistics Center, Tinker AFB, Contract No. F34650-85-C-0238), July 1986.

2. Dansby and Associates, Inc., "Report of Plugging Procedures for Water Wells 18 and 19", report prepared for Department of the Air Force Directorate of Contracting and Manufacturing, Oklahoma Air Logistics Center/PM, Tinker AFB, OK, Contract No. F34650-85-C-0404.

3. Dansby and Associates, Inc.. "Investigation and Modification of Water Wells 18 and 19", report prepared for Department of the Air Force Directorate of Contracting and Manufacturing, Oklahoma Air Logistics Center/PM, Tinker AFB, OK, Contract No. F34650-85-C-0404.

4. Engineering Science, "Installation Restoration Program, Phase I; Records Search, Tinker Air Force Base, Oklahoma", report prepared for United Air Force, AFESC/DEV, Tyndall AFB, FL., Contract No. F08637-80-G-0009, April 1982.

5. Engineering Enterprises, Inc., "Investigation of Water Wells 18 and 19", report prepared for Tinker AFB, OK, Project No. SC-84-308, August 1984.

6. Groundwater Technology, Inc., "Hydrocarbon Abatement Proposal, North Fuel Area", Tinker Air Force Base, Oklahoma, (Report prepared for Department of Army, Corps of Engineers, Tulsa District), June 1988.

7. Groundwater Technology, Inc., "Soil Vent Test, North Tank Area"' Tinker Air Force Base, Oklahoma, (Report prepared for Triax, Inc.), August 1989.

8. Groundwater Technology, Inc., "Absorbed Phase, Remedial Design, North Tank Farm", Tinker Air Force Base, Oklahoma, (Report prepared for Triax, Inc., submitted to Department of the Army, Corps of Engineers, Tulsa District), September 1989.

9. Radian Corporation, "Installation Restoration Program, Phase II, Stage 1, Field Evaluation", Tinker AFB, OK, prepared for U.S. Air Force Occupational and Environmental Health Laboratory (OE) Brooks AFB, Texas, Draft Final Report, November 1984.

10. Radian Corporation, "Installation Restoration Program, Phase II, Stage 2, Confirmation/Quantification", report prepared for U.S. Air Force OEHL, Brooks AFB, Texas, Contract No. F33615-83-D-4001, Draft Report, Dec. 1984.

11. U.S. Army Corps of Engineers, Tulsa District, "Building 3001 Remedial Investigations", Tinker AFB, OK, January 1988.

12. U.S. Army Corps of Engineers, Tulsa District, "Building 3001 Risk Assessment", Tinker AFB, OK, August 1988.

13. U.S. Army Corps of Engineers, Tulsa District, "Building 3001 Feasibility Study", Tinker AFB, OK, August 1989.

14. U.S. Army Corps of Engineers, Tulsa District, "Pit Q-51 Focused Feasibility Study", Tinker AFB, OK, March 1990.

15. U.S. Army Corps of Engineers, Tulsa District, "Building 3001 Proposed Plan", Tinker AFB, OK, March 1990.

16. U.S. Army Corps of Engineers, Tulsa District, "Pit Q-51 Proposed Plan", Tinker AFB, OK, March 1990.

17. U.S. Army Corps of Engineers, Tulsa District, "North Tank Area Design Summary Report", Tinker AFB, OK, March 1990.

# APPENDIX A
# RESPONSIVENESS SUMMARY

RESPONSE TO SPECIFIC QUESTIONS AND COMMENTS:

COMMENT 1: A citizen asked if there were more than two (Chromium VI, Trichloroethylene) toxins of concern. One of the moderators answered that the only others were the fuel oils located at the Pit Q-51 site. In fact, in the Health Assessment document, 32 chemical constituents were identified in the groundwater below Building 3001. Please explain this discrepancy.

RESPONSE: It should be noted that the fuel oils are located at the North Tank Area Operable Unit. Although 32 organic and inorganic contaminants were identified in the groundwater during the remedial investigation (USACE, 1987), the primary contaminants, based on concentration and magnitude, were identified as trichloroethylene and chromium. As stated in the Building 3001 Feasibility Study report, the proposed remedial action will adequately treat all of the chemicals. The hydrocarbons at the North Tank Area will be remediated by pumping the free floating fuel product and disposing of it and remediating the fuel vapors through a soil vapor recovery system. The Building 3001 Feasibility Study, Proposed Plan and North Tank Area Design Summary Report describe this in more detail.

COMMENT 2: Please describe how each of these 32 chemicals will be treated under the proposed plan.

RESPONSE: All of the 32 chemicals will be treated and removed by the air or steam stripping process and the metals precipitation process. Only the remaining trace level metals will be removed by a fine filtration process.

COMMENT 3: The handout provided at the meeting proposes that the remaining pollutants would be treated "by a final filtration step." Please describe how this procedure will be conducted, particularly how volatile hydrocarbons will be filtered. There several methods that could be utilized in the fine filtration process. They include:

Reverse Osmosis
Ion Exchange
Ultrafiltration

Micellar Enhanced Ultrafiltration (MEUF)
Resinous Absorption System
Polymer Enhanced Cross Flow Sand Filtration

REVERSE OSMOSIS: Reverse osmosis involves passing a pressured feed stream across a semipermeable membrane. Water passes through the membrane, and metal salts and organic brighteners remain in the feed, becoming concentrated. The purified water, called the permeate, can be returned to the rinse tank. The concentrate, containing plating bath chemicals, can be returned to the plating process. A reverse osmosis system is capable of recovering 90-95 percent of the rinse water, the remainder forming the concentrate solution.

ION EXCHANGE: Process water is passed through a filter bed of exchange material. Ions in the insoluble exchange material are displaced by ions in the water. When the exchange material is spent, it is regenerated with acid or other salt solutions.

ULTRAFILTRATION: Ultrafiltration is a membrane filtration process which separates particles of about 10 to 100 A (Angstrom) from their surrounding medium [Orr, 1980]. In this size range, particles can be solutes in liquid solution.

MICELLAR ENHANCED ULTRAFILTRATION (MEUF):

MEUF is used to remove dissolved multivalent ions from water. Surfactant of opposite change to that of the pollutant ions is added to the aqueous streams. The micellar have a high electric potential, causing the multivalent ions to bind or absorb on the micellar due to electrostatic attraction. The stream can be treated by ultrafiltration and the micellar rejected by large-pore membranes.

RESINOUS ADSORPTION SYSTEM:

Resinous adsorbents are similar in structure and appearance to ion exchange resins. They are hard, insoluble copolymer beads with high porosity and surface area. Unlike ion exchange resins, the polymeric adsorbents have no functional exchange sites. Instead, the adsorption occurs via forces such as dipole - dipole interactions, hydrophobic or hydrophilic bonds or Van Der Waals

attractions. The binding energies of these forces are low, therefore, adsorbates can be easily recovered during regeneration.

POLYMER ENHANCED CROSS FLOW SAND FILTRATION:

This process consists of a continuous, backwash, upflow, deep and granular media filter. The filter media is continuously cleaned by recycling the sand internally through an airlift pipe and sandwasher. The regenerated sand is redistributed on top of the sand bed allowing for a continuous, uninterrupted flow of filtrate and reject water.
A more detailed description of this process can be found in Reference 4 of the Record of Decision/Responsiveness Summary.

COMMENT 4:

One of the last citizens to speak stated that his well had been sampled and found to be polluted. Thus, evidence of off-base pollution does exist. Tinker AFB has acknowledged the pollution and has run a water line to the property. Please present a plan for determining the source of this contamination. It cannot be assumed to be from another source.

RESPONSE:

The well of consideration is located directly north of Landfill 6. Landfill 6 is a separate site which is currently being investigated under the Air Force Installation Restoration Program. This well is approximately one mile southeast of Building 3001. The Building 3001 RI Report defines the extent of the contaminant plume. Based upon extensive investigations the plume from Building 3001 has not migrated off-base.

COMMENT 5:

Since evidence of off-base pollution has been presented and acknowledged, please present a plan for sampling all existing off-base water source wells and a sufficient number of monitoring wells to ensure that contaminants, irrespective of source, have not left the EPA site. If an off-site monitoring plan is not developed, please explain this difference between that decision and the promised action to monitor if any evidence of off-site pollution were to be known.

RESPONSE:

No evidence of offbase pollution from Building 3001 exists. Eight off-base wells

will be sampled during the Remedial Investigations of Soldier Creek. Monitoring wells have been installed around the perimeter of Tinker AFB in order to insure that no contamination has migrated off-base. These wells are sampled bi-annually. None of these wells have identified any contamination migrating off-base. The contaminant plume from the EPA site (Building 3001) has been defined in the Building 3001 RI Report.

COMMENT 6: The handout provided at the meeting contains a diagram of the Garber-Wellington formation. The aquifer is indicated to be continuous beds. The geological history of the formation would indicate the beds to be not continuous but rather an interfingering of sands and shales reflecting the deltaic origin of deposition. Also the noncontinuous character of the formation under Building 3001 is described in the Ginia Wickersham study (Hydrologic Investigations Publication 86, 1979, Oklahoma Water Resources Board of the Garber- Wellington Groundwater Basin). The assumption of continuity may have been made to facilitate modeling of groundwater movement. Please explain the difference between expectations based on geological history, other studies, and your assumption.

RESPONSE: The diagram in the handout was used only to aid in differentiating between the groundwater zones. The geology in the area is not continuous but is characterized by the interfingering of sand and shales. Several simplifying assumptions were made to allow the use of a computer model. The subsurface was simulated by dividing it into four zones, the perched aquifer, the top of regional aquifer, the regional zone, and the producing zone. The objective of the model was to estimate the trends of the contamination movement and the rate of movement. The model was calibrated with actual data obtained during investigations of the site and met the objectives for its use. This method of modeling is an acceptable practice. A more detailed description of the groundwater model is contained in Appendix K of the Building 3001 RI Report. The documents are contained in the Midwest City Library in Midwest City, Oklahoma.

COMMENT 7: Release the modelling study so that

interested parties may examine the assumptions used and results.

RESPONSE:

The modeling study is contained in Appendix K of the Building 3001 RI Report (COE 1988). The appendix describes the model, and the parameters used. The RI report contains the modeling results. These documents are contained in the Administrative Record.

COMMENT 8:

Provide the following detailed information to enable evaluation of the ultimate disposition:

1. Current amount of water being used at Tinker AFB.
2. Current amount of water being pumped by Tinker AFB.
3. Current volume being treated at the existing waste treatment plant.
4. Maximum continuous capacity of the existing waste treatment plant.
5. Proposed maximum volume to be pumped from all wells once the treatment plant is in full operation.

All data should be segregated by month (12 months) and use, i.e., industrial, public etc.

RESPONSE:

1. 80-120 million gallons of water is used at Tinker AFB each month. Its primary function is for industrial use.
2. The 25 water supply wells average 217 gallons per minute. The Base pumps approximately 120 million gallons of water each month.
3. The waste treatment plant of concern is the Industrial Waste Treatment Plant. This plant treats only industrial waste associated with Tinker AFB. The volume treated is near 36 million gallons each month.
4. The plant could treat approximately 50 million gallons each month if operated continuously.
5. Once the groundwater removal wells and the new treatment plant are in operation, the volume of groundwater pumped will increase approximately 2 million gallons each month. This will increase the overall Base volume to approximately 82 - 122 million gallons each month.

COMMENT 9:

Provide the "after treatment" maximum concentration proposed for each chemical

constituent identified in the Health Assessment document (32 chemicals).

RESPONSE:

The 32 chemical constituents identified in the Risk Assessment are organic compounds and heavy metals. Using the treatment process described in the B3001 Proposed Plan (COE 1990), the organic compound concentrations will be reduced to approximately 1 ppb and the heavy metals to approximately 20 ppb which is below the maximum contaminant levels, and Oklahoma Water Resources Board Rules, Regulatory and Modes of Procedure 1985.

COMMENT 10:

If drinking water standards are not achieved through treatment please provide information concerning plans for protecting the workers exposed to the effluent.

RESPONSE:

The effluent water will meet the standards for industrial reuse and the standards set by Oklahoma Water Resources Board for all the contaminants. A sampling port will be provided at the industrial reuse tie-in point for easy sampling and testing of the water quality. Exposure of site workers to hazardous materials would be minimized or prevented with well planned and implemented personal training programs, the supply and utilization of appropriate safety and personal protective equipment and the development and use of an effective safety plan.

COMMENT 11:

Provide information about how the presenters of future meetings will be trained and sensitized to the need for openness and complete disclosures.

RESPONSE:

The public meeting regarding the Building 3001 site, North Tank Fuel Area, and Pit Q-51 within Building 3001, held on April 5, 1990, was site specific. It was repeated many times during the public meeting that the subject of the public meeting was Building 3001.

In regard to training presenters for future meetings, Tinker's personnel spent hours training and preparing for the public comment meeting in order to anticipate all possible concerns citizens might have. The meeting was held with the intent of openness and

complete disclosure in mind, as will all future meetings.

COMMENT 12: The current response period of less than thirty days does not allow adequate time to review the presentations in depth. Thus it is requested that all response periods be at least 45 days in extent.

RESPONSE: The National Contingency Plan as mandated by the Comprehensive Environmental Response Compensation and Liability Act requires that the public comment period be held no less than 30 days.

The original public comment period was from March 19, 1990 to April 18, 1990. In order to insure that the public had opportunity to review the documents, it was extended an additional 12 days. The ending date was on April 30, 1990. The RI report was placed in the administrative record in May 1989 and the FS report was placed in December 1989.

COMMENT 13: At which level have Building 3001 workers been drinking for the past 25 years? 100, 200 or deeper?

RESPONSE: The water supply wells on Base produce from zones of approximately 250 feet to 700 feet.

COMMENT 14: Were any of these drinking wells contaminated, and if so, by what chemicals?

RESPONSE: Yes. The contaminants consisted of trichloroethylene, tetrachloroethylene , heavy metals, and total organic carbon. The Building 3001 RI gives more details of the wells.

COMMENT 15: Were some drinking wells (past few years) sealed off because of contamination?

RESPONSE: Yes, water supply wells 17, 18 and 19. Appendix C of the Building 3001 RI described the plugging procedures.

COMMENT 16: Are Building 3001 workers still drinking from Tinker AFB wells? If so, which wells are these?

RESPONSE: Yes, water supply wells 13, 14, and 15 supplies drinking water to Building 3001. This water is collected and sent through a

distribution system before use.

COMMENT 17: Are Building 3001 workers now drinking city supplied water? If so, when did the conversion take place? What is the source of the city water?

RESPONSE: Yes, Building 3001 receives approximately 20 million gallons of drinking water per month from Oklahoma City. The primary source of the city water is Stanley Draper Lake, Lake Overholser and some groundwater wells. A tie into the city distribution system was constructed in 1968 at Gate 34. In 1988, another tie in was constructed on the east side of the Base on Douglas Boulevard.

COMMENT 18: The Tinker Take Off article ("Tinker Experts Say Come On In, The Water's Fine"), appears to conflict with the Risk Assessment (COE, 1988) which says "The RI indicates that health and safety effects may result from long-term ingestion of Tinker AFB drinking water," and the RI report (COE, 1988) which says "Wells 15 and 16 contain low levels of trichloroethylene and well 16 also contains low levels of dichloroethylene and PCT." Several wells have been plugged (#18 and #19) and wells 15 and 16 have trace levels of organic compounds. Please explain which is correct.

RESPONSE: None of the statements are incorrect. The Risk Assessment was performed under the assumption that no action would be taken. Since the remedial action will extract the contaminated groundwater from the upper regions of the Garber-Wellington, this will prevent the contamination from moving downward. The water supply wells on Base are monitored bi-annually in order to insure that the water is safe for human consumption. Trace levels of dichloroethylene and tetrachloroethylene were detected in samples taken from the well head. The groundwater from the water supply wells is passed through a distribution system. The water is sampled periodically. No contamination has been detected. The water is safe for human consumption. A future risk will exist if the site is not remediated.

COMMENT 19: Are other wells in the area of the Building 3001 plume in a planning closure stage such

as the well just east of Building 3001.

RESPONSE: Water supply well 17 was put out of operation and plugged in 1988. Water supply well 16 was put of operation in 1990. The Base water supply wells are sampled bi-annually. If contamination is detected, immediate action will be taken.

COMMENT 20: Although the April 5, 1990 Public Meeting addressed the pollution under Building 3001, it appears that the long-term pollution over the past 40 years may have seriously damaged East and West Solider Creeks and possibly the Garber-Wellington aquifer. I would propose that the government sample private wells within a two mile radius of the Building 3001 site. All wells would not have to be tested. A sampling of one will in a general area would reveal the state of most wells in that area. At the public meeting several well owners made this same request but to no avail.

RESPONSE: Remedial investigations are ongoing at the Soldier Creek site. The investigations will be conducted in two phases. Phase I will include sampling of eight off-base ground water wells within the vicinity of Soldier Creek near the Base. The Final Remedial Investigations Report will be available in mid-1991. If sampling results identify any contamination off-base as a result of Soldier Creek the appropriate actions will be taken and, additional off-base wells will be sampled during the Phase II investigations. A public comment period and public meeting will held in order to allow the public to participate in the remedial selection process.

COMMENT 21: The Risk Assessment also indicates that fish taken from Soldier Creek were a health risk. Since I see children playing and sometimes fishing in Soldier Creek, I request that the general public be warned about this danger through signs and public notices.

RESPONSE: The risk assessment conducted at the site indicated that a risk exists if contaminated groundwater and fish were consumed over a long period of time. Presently, Soldier Creek is undergoing remedial investigations. If the investigations indicate any off-base

contamination that would pose a health risk, the appropriate actions will be taken and public signs will be posted. At this point, there is no known contamination offbase.

COMMENT 22: Explain statement "Pollution exists immediately beneath the building" (3001); noting outline of NPL sites is far beyond Building 3001.

RESPONSE: In the public meeting handout the statement goes on to say "...and all the chemicals are contained within Air Force property." The outline of the plume is within this area.

COMMENT 23: Why were groundwater tests not made in the north corner of TAFB. Why were groundwater tests not made in the civilian housing area N and W of the shown Tinker NPL site. Without tests above no basis for indicating "all chemicals are contained within Air Force property."

RESPONSE: The northeast (N.E.) corner of the base is being investigated as a part of the Industrial Waste Treatment Plant (IWTP) site. The monitoring wells in the N.E. corner of the base have been sampled and they are sampled bi-annually. The results will be available in the Final Groundwater Assessment Report in November 1991. If investigations determine that additional offbase sampling is necessary, the appropriate actions will be taken. In addition, Base perimeter wells are sampled bi-annually to monitor possible movement of offbase contamination. All of the chemicals associated with the Building 3001 site are contained within Base boundaries.

COMMENT 24: Pollution has been determined to extend to the 200 foot level that is contained in the entire "Regional Producing Zone." This alone means the plume extent is clearly past groundwater, perched, regional top levels and is accessible to the production zone levels deeper than 700 feet.

RESPONSE:

The groundwater zones and depth should be noted as shown below:

| Zone | Depth ft. |
|---|---|
| Perched water table | 15-30 |
| Top of regional | 50-80 |
| Regional | 110-175 |
| Producing zone | 250-700 |

At 225 feet the concentration is present but in very low concentrations. Tricholorethylene was detected at 7 ppb and chromium was detected at 1.7 ppb. If the proposed remedial action is not implemented, the contamination could eventually reach the producing zone. The remedial action would prevent any contamination from migrating further.

COMMENT 25:

Stated projection due to rainfall beneath Building 3001 and also moving the contaminants 20 feet per year to the west are totally false - diagram indicates a 1500 foot movement from the building to the west on a 75 year (20' to 1500' = 75) occurrence, and ignores the simple fact that rain water does not occur beneath Building 3001.

RESPONSE:

Rainwater can reach the perched aquifer through the storm drainage system. The mounded groundwater beneath Building 3001 appears to be affected by leaking storm drains. The building does not cover the entire area of the plume. Therefore, it must be taken into consideration how rain might impact the contaminant plume beyond the building. Even though the rates of migration vary due to the difference in hydraulic gradient, the rate seems to be approximately 20 feet per year.

COMMENT 26:

Recovery of an oil slick from underground water strata is beyond current technology. Removal of all water in the perched strata would be required.

RESPONSE:

This technology is frequently used to recover floating fuels. There is a layer of fuel floating on top of the groundwater at the North Tank Area (NTA) site. The proposed remedial action for the NTA will pump the floating fuel without pumping groundwater. When the fuel reaches a level where it can't

be pumped, a depression pump will be used to depress the water table thus causing the fuel to accumulate so that it can be pumped. Any contaminated groundwater that is removed along with the fuel will be treated at the Building 3001 treatment facility. The NTA Design Summary Report (COE, 1990) explains the remedial action in more detail.

COMMENT 27: Can this ( the groundwater collection system) mean 111 additional exterior wells and 18 inside 3001. At present over 175 wells exist in this area including 2 in the Building 3001 that were sealed off (H63 and B-111). No depth is indicated for theses extraction wells - do they match the 200 ft. depth pollution is stated to occupy?

RESPONSE: The groundwater pumping collection network will consist of approximately 111 additional exterior and 18 interior wells. The exact number of wells will be determined during the design of the remedial action. These wells will be installed in three aquifer zones as described in Response 23 and will be screened across the water bearing layer. Appendix A of the Building 3001 FS Report describes the proposed locations and screen depths of the wells.

COMMENT 28: If the water is treated (fixed) why can it not be discharged into E. Soldier Creek. Also, if no piping to return water its cost could be gained.

RESPONSE: The water would be treated to levels below EPA and Site permitted levels for discharging treated water to Soldier Creek; however, it would be more advantageous for Tinker to reuse this water in industrial operations.

COMMENT 29: Paying (over $1500) to dispose of polluted material does not resolve the pollution - only moves it - also alternative 3-2 indicates the Tinker AFB IWTP has capability to treat this material - clearly a preferred choice.

RESPONSE: The polluted material in Pit Q-51 will be disposed of in a facility that is approved to receive CERCLA waste. Treatment at the IWTP was considered as an option in the Pit Q-51 FS. However, introducing this waste into a treatment plant that has been permitted for

another type of waste would violate Federal regulations. This issue is discussed in the Pit Q-51 FS report located a the Midwest City Library.

COMMENT 30: Test samples are not of an area nor quantity for this study.

RESPONSE: The contaminated plume for this site has been adequately defined to the extent that remedial actions can be initiated. The progress of the remedial action will be continually monitored. Contamination at other sites is presently in investigations under the Air Force Installation Restoration Program.

COMMENT 31: Are the cost in excess of $7,000,000 for five years?

RESPONSE: The cost breakdown can be found in the Building 3001 FS (COE, 1989) and the Pit Q-51 FS (COE, 1990).

The costs for each site are:

| | |
|---|---|
| B3001 Construction costs: (includes groundwater collection and treatment) | $4,939,700 |
| B3001 O&M costs | $ 246,500 |
| NTA Construction costs | $ 397,568 |
| NTA O&M costs | $ 25,000 |
| Pit Q-51 construction costs | $ 5,200 |
| Pit Q-51 O&M costs: | $ 0 |

COMMENT 32: Pumping night and day for 5 years still only accommodates 85% of the shown problem. Remaining 15% would extend this function to approximately 25 years.

RESPONSE: This statement is correct. The Building 3001 FS (COE, 1989) describes the alternatives in detail. The remedial action will not be terminated until the EPA and OSDH has determined that the site would not present any long term risk to human health and the environment.

COMMENT 33: No consideration for use of existing wells is being considered.

RESPONSE: The existing wells are utilized to monitor the quality of the groundwater. A separate network of wells will be installed to

specifically remediate the Building 3001 site.

COMMENT 34: What was it (groundwater flow direction) 20 years ago or 30 years ago when this occurred? You don't know. We've had a higher water table and it could have been flowing the other way. You could have been recharging the area locally. Who knows?

RESPONSE: Extensive groundwater investigations have been performed showing the regional flow direction to be to the southwest.The conclusions that are made are based upon the available data.

COMMENT 35: What do you analyze the water supply wells for?

RESPONSE: The water supply wells are analyzed for volatile organics (which includes trichloroethylene), semi-volatile organics, total metals (which includes chromium), chloride, sulfate, total organic carbon, and total dissolved solids.

COMMENT 36: What kind of hydraulic conductivity are you using for that soil where you only have 10,000 gallons product and yet you've got a column that's 15 feet thick?

RESPONSE: The hydraulic conductivity in the area is approximately 10 centimeters per second. The wells in this area (North Tank Area) have been sampled several times. The depth of floating fuel product in the wells is known. One well was found to have 15 feet of floating fuel. An estimation is based on thickening of fuel in the well. Past experience has shown that fuel in the aquifer is 4 times less than the thickness measured in the well. The approximation of product floating above the groundwater is based upon this assumption. The floating fuel plume and further details can be found in the North Tank Area Design Summary Report (COE 1990).

COMMENT 37: You think that you can fit 10,000 gallons to give you that kind of a problem over that area, the area you've shown on the map.

RESPONSE: Yes, this is the apparent thickness, the actual thickness could be less.

COMMENT 38: What happens to the fumes from the Treatment Plant for people that have illnesses that live in that area when you process the chemicals?

RESPONSE: The treatment facility will be designed to meet the standards for Air emission.

COMMENT 39: There will be no emissions?

RESPONSE: The air emissions will meet the State and Federal Air Quality Standards. The maximum yearly production of trichloroethylene is approximately 855 lbs. per year which is below the regulated emissions standard of 1200 lbs.

COMMENT 40: What kind of overflow protection are we going to get from Soldier Creek from your plant - which has overflow problems now -- the old plant.

RESPONSE: A 300,000 gallon effluent tank will be included in the design that could hold approximately two days effluent. A line will also be incorporated which will allow discharge into Soldier Creek if necessary. An inlet system will include an equalization tank to provide constant flow throughout the treatment process. The design will also include a secondary containment system in case of spillage or overflow. Curbs will be placed around the tanks to contain any spills.

COMMENT 41: There is one tributary of Soldier Creek that goes straight north just east of Gate 7?

RESPONSE: Tinker AFB is aware of this tributary. It will be included in the remedial investigations of Soldier Creek.

COMMENT 42: Now, if you remove the dirt from the creek in the Base, how about cleaning mine out?

RESPONSE: Soldier Creek is being investigated separately from the Building 3001 site. If the remedial investigation detects offbase contamination, the appropriate actions will be taken. A public comment period and public meeting will be held in order to allow the public the opportunity to participate in the remedial selection process.

COMMENT 43: I have a question regarding the removal of the contents from Pit Q-51. Does the cost include the removal of the contaminants and the disposal of them?

RESPONSE: Yes.

COMMENT 44: The other question that I had was the length of time that it would take to accomplish the pumping operation to accommodate the standard level for the contaminants that are now in place -- how many years it would take to complete this?

RESPONSE: 85 % of the contamination will be removed in 5 years. The remaining 15 % will take 20 or more years to remove. Tinker AFB will continue to search for new technologies that will remediate the site in a more timely manner. Once the migration of contaminants is controlled, the risk of exposure will decrease.

COMMENT 45: We know that that can be accomplished in five years and if we have a standard that 100 is what we're at now and 0 is what we desire and we know we can do 85 % in five years - this other 15 % that may take 20 years that we've indicated, what is the real danger - how much of that have we eliminated.

RESPONSE: Once the migration of the contaminants is controlled through the groundwater collection system there will be minimal risk to public health and the environment.The risks at the site are long term risks associated with drinking groundwater that will become contaminated. Once, contaminated groundwater removal has begun the risk will drop excessively. Pumping the contaminated groundwater from the aquifer will prevent further migration.

COMMENT 46: I was interested first in what the deepest aquifer that's been affected from the Building 3001?

RESPONSE: It reaches the upper portion of the regional aquifer, approximately 200 - 225 feet.

COMMENT 47: My question is in regard to the pumping of the wells to lower the groundwater level in

the vicinity of the extraction wells. Will this result in some area residential wells running low on water?

RESPONSE: We do not believe it will. There is not a large amount of influence that will occur because of the slow withdrawal. It will be mainly localized under the Building itself. We do not think it is going to have effect on the water supply.

COMMENT 48: Will the shallower wells be more affected than the deeper wells?

RESPONSE: Yes, the ones in the vicinity of Building 3001. However, it will not impact any water supply wells.

COMMENT 49: I understand there were two wells that were shut down and capped - drinking wells, in 1983. Is there any health risks to people that had drank the water in 1983 and before?

RESPONSE: No. The drinking water is passed through a distribution system that is sampled periodically. During a sampling round, a trace of contamination was discovered. The source of the contamination was traced back to water supply wells 18 and 19, The wells were shutdown and permanently put out of operation. The health risk is based upon human consumption over a seventy year period. Since action was taken immediately after the contamination was discovered, there was no health risk to those who drank the water in 1983 and prior.

# APPENDIX B
# FEDERAL AND STATE ARAR'S

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| Safe Drinking Water Act (SDMA) | | (42 USC 300) | | | |
| National Primary Drinking Water Standards | Public Water System | 40 CFR 141 | Establishes health-based standards for public water systems (maximum contaminant levels (NLs) | Yes/-- | Organic and Inorganic contaminants have been detected at the study area. |
| National Secondary Drinking Water Standards | Public Water Systems | 40 CFR 143 | Establishes standards for the aesthetic qualities of public water systems (secondary MCLs (SMCLs)). | No/Yes | SMCLs are not federally enforceable but are not intended as guidelines for the states. |
| Maximum Contaminant Level Goals | Public Water System | Public Law No. 99-339 100 Stat. 642 (1986) | Establishes maximum contaminant level goals (MCLGs) of no known or anticipated adverse health effects. | No/No | MCLGs are non enforceable requirements |
| Clean Water Act (CWA) | Waters of the United | 33 USC 1251-1376 | Objectives are to restore and maintain the chemical, physical, and biological integrity of the nation's waters. | Yes/ | Specific requirements are listed under discharge requirements |
| Water Quality Criteria | | 40 CFR 131 | | | |
| Clean Air Act (CAA) | | | | | |
| National Primary and secondary Ambient Air Quality Standards | Contamination of air affecting public health and welfare | 40 CFR 50 (42 USC 7401-7642 | Establishes standards for ambient air quality to protect public health and welfare (including standards particular matter and lead). | No/Yes | Air effluent from the treatment systems must meet these standards. |

Note: -- If a requirement is applicable, it cannot also be relevant and appropriate.

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| National Archaeological and Historical Act | Alternation of terrain that threatens significant scientific, prehistorical, historical, or archaeological data. | (16 USC Section 469) 36 CFR 65 | Must take action to recover and preserve artifacts. | No/No | There are no known scientific, prehistoric, historic, or Preservation archaeological artifacts on-site. |
| Fish and Wildlife Coordination Act | Diversion channeling or other activity that modifies a stream or river and affects fish or wildlife. | (16 USC 661 et. seq.) 36 CFR 65 | Must take action to protect fish or wildlife. | No/No | There will be no discharge to Soldier Creek. |
| Scenic Rivers Act | Activities that affect or may affect any of the rivers specified in Section 1276(a) | (16 USC 661 et. seq. Section 7(a)) 40 CFR 6.302(a) | Must avoid taking or assisting in action that will have direct adverse affect on scenic river. | No/No | No action planned at the site will direct adverse affect on a scenic river. |
| Coastal Zone Management Act | Activities affecting the coastal zone including lands thereunder & adjacent shorelands. | (16 USC Section 145) et. seq.) | Must conduct activities in a manner consistent with approved state management programs. | No/No | The study area is an inland site with no direct access to coastal lands. |
| Clean Water Act (CWA) Section 404 | Oceans and waters of the United States | 40 CFR, Subpart N | Action to dispose of dredge material into ocean waters is prohibited without a permit. | No/No | No action dredge material is proposed at the site. |
| Marine Protection Resources and Sanctuary Act, Section 103 | Oceans and waters of the United States | (33 USC 1251-1376) 40 CFR 230, 231 | Action to dispose of dredge material into ocean waters is prohibited without a permit. | No/No | No action dredge material is proposed at the site. |
| Historic Sites, Buildings, and Antiquities Act | Existence of natural landmarks | (16 USC 461-467) | Must avoid undesirable impacts upon landmarks. | No/No | There are no landmarks on the National Register of Natural Landmarks on the site. |

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| National Historic Preservation Act, Section 106 | Property included in or eligible for the National Register for Historic Places. | (16 USC 470 et. seq) 36 CFR 800 | Must take action to preserve historic properties owned or controlled by federal agency. Must plan action to minimize harm to National Historic landmarks. | No/No | The site is not included in or eligible for the National Register of Historic Places. |
| Endangered Species Act of 1973 | Critical habitat upon which endangered species or threatened species depends. | (16 USC 1531 et. seq.) 50 CFR 200, 50 CFR 402 | Must take action to conserve endangered species or threatened species. | No/No | The site is not a critical habitat upon which endangered species or threatened species depend. |
| Executive Order on Protection of Wetlands | Wetland as defined by Executive Order 11990, Section 7 | Executive Order 11990 40 CFR Appendix 6 | Must take action to minimize the destruction, loss, or degradation of wetlands. | No/No | The site is not a wetland as defined by Executive Order 11990, Section 7. |
| Wilderness Act | Federally owned area described as a wilderness area. | 50 CFR 35.1 et. seq. | Area must be administered in such a manner that will leave it unimpaired as wilderness and to preserve its wilderness character. | No/No | The site is not a federally owned area described as a wilderness area. |
| National Wildlife Refuge System | Area designated as part of the National Wildlife Refuge System | 50 CFR Part 27, (16 USC 668 d.d. et. seq) | Only actions that are allowed under the provisions of 16 USC, Section dd(c) may be undertaken in areas that are part of the National Wildlife Refuge System. | No/No | The site is not designated as part of the National Wildlife Refuge System. |

Note: -- If a requirement is applicable, it cannot also be relevant and appropriate.

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| Solid Waste Disposal Act | | (42 USC 6901-6967) | | | |
| Criteria for Classification of Solid Waste Disposal Facilities and Practices | Disposal of solid waste | 40 CFR 257 | Establishes criteria for for use in determining which solid waste disposal facilities and practices post a reasonable probability of adverse effects on health or the environment and, thereby, constitute prohibited open dumps. | No/Yes | However, the more stringent provisions of 40 CFR 260 Supercede these criteria. |
| Resource Conservation and Recovery Act (RCRA) | Uppermost aquifer underlying a waste management unit beyond the point of compliance. | 40 CFR 264 | Establishes minimum national standards which define the acceptable management of hazardous waste for owner's and operators of facilities which treat, store, or dispose of hazardous waste. | Yes/-- | The specific properties of the site may be similar enough to these requirements to render them relevant and appropriate. |
| Hazardous Waste Management System: General | RCRA hazardous waste | 40 CFR 260 | Establishes procedures and criteria for modification or revocation of any provision is 40 CFR 260-265, 268 and 270 and 271 and notification requirements of RCRA Section 3010. | No/Yes | No modifications or revocations are needed; existing regulations will be used. |
| Identification and Listing of Hazardous Waste | Solid waste | 40 CFR 261 | Defines those solid wastes wastes that are subject to regulation as hazardous wastes under 40 CFR 262-265, and 124, 270 and 271. | No/Yes | Are relevant and appropriate if any solid waste residues are generated as a result of treatment. |
| Standards Applicable to Generators of Hazardous Waste | Generation of RCRA hazardous waste | 40 CFR 262 | Establishes standards for generators of hazardous waste. | No/Yes | Are relevant and appropriate if there is hazardous solid or liquid residues from treatment plant. |
| Standards Applicable | Generation of RCRA | 40 CFR 263 | Establishes standards that | Yes/-- | Applicable to off-site transport of |

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| Standards Applicable to Owners/Operators of Hazardous Waste Treatment, Storage and Disposal Facilities | RCRA hazardous waste | 40 FR 264 | Establishes minimum national standards that define the acceptable management of hazardous waste for owners and operators of facilities that treat, store, or dispose of hazardous waste. | Yes/-- | Applicable to treatment facility. |
| * General Facility Standards Standards | Treatment, storage, or disposal of RCRA hazardous waste on-site. | Subpart B | N/A | No/Yes | Are relevant and appropriate for on-site treatment facility. |
| * Preparedness and Prevention | Generation or treatment, storage, or disposal of RCRA hazardous waste on-site | Subpart C | N/A | No/Yes | Treatment facility needs a properly developed and implemented plan for worker safety. |
| * Contingency Plan and Emergency Procedures | Generation or treatment, storage, or disposal of RCRA hazardous waste on-site | Subpart D | N/A | No/Yes | Establishes normal safety plans and procedures. |
| * Manifest System Recordkeeping and Reporting | Generation or treatment storage, or disposal of RCRA hazardous waste on-site | Subpart E | N/A | Yes/-- | Are applicable if hazardous solid and liquid residues from treatment plant must be transported off-site. |
| * Releases from Solid Waste Management Units | Generation or treatment storage, or disposal of RCRA hazardous waste on-site | Subpart F | N/A | No/Yes | Groundwater monitoring provisions are relevant and appropriate. |
| * Closure and Post-Closure | Generation or treatment storage, or disposal of RCRA hazardous waste on-site | Subpart G | N/A | Yes/-- | Portions of Subpart G that deal with post-closure activities are applicable. |

Note: -- If a requirement is applicable, it cannot also be relevant and appropriate.

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| * Financial Requirements | Generation or treatment storage, or disposal of RCRA hazardous waste on-site | Subpart H | N/A | Yes/-- | |
| * Use and Management of Containers | Management of RCRA hazardous waste in containers | Subpart I | N/A | Yes/-- | Applicable for any containerized waste generated as a result of remedial construction |
| * Tanks | Management of RCRA hazardous waste in containers | Subpart J | N/A | Yes/-- | Same as Subpart I. |
| * Surface Impoundments | Management of RCRA hazardous waste in surface impoundments on-site. | Subpart K | N/A | Yes/-- | Applicable to surface impoundments constructed to hold hazardous waste. |
| * Waste Piles | Management of RCRA hazardous waste in waste piles on-site. | Subpart L | N/A | No/No | Waste piles are not being used at this site. |
| * Land Treatment | Land treatment of RCRA hazardous waste on-site | Subpart M | N/A | No/No | Land treatment is not being proposed for use at this site. |
| * Landfills | Landfilling of RCRA hazardous waste on-site | Subpart N Part 264.310 | Establishes standards for hazardous waste landfills (including cap requirement) | No/No | Closure of landfill |
| * Incinerators | Incineration of RCRA hazardous waste on-site | Subpart O | N/A | No/No | The specific properties of the site may be similar enough to these requirements to render them relevant and appropriate. |
| * Miscellaneous Units | Treatment, storage, or disposal of miscellaneous units. | Subpart X | | No/No | None are identified at this site. |

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities | | 40 CFR 265 | Establishes minimum national standards that define the acceptable management of hazardous waste during the period of interim status and until certification of final closure or, if the facility is subject to postclosure requirements until postclosure requirements are fulfilled. | Yes/-- | This is an interim-status facility. |
| Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Mgmt Facilities | Recyclable materials that are reclaimed to recover precious metals. | 40 CFR 266, Subpart F | Establishes requirements that apply to recyclable materials that are reclaimed to recover economically significant amounts of precious metals. | No/No | This is not a recycling facility to recover precious metals. |
| Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities | New RCRA hazardous waste land disposal facility. | 40 CFR 267 | Establishes minimum national standards that define acceptable management of hazardous waste for new land disposal facilities. Also establishes standards for underground injection of hazardous wastes. | No/No | A new hazardous waste land disposal facility is not being proposed. Underground injection of hazardous wastes is not contemplated. |
| Land Disposal Restrictions | Land disposal of RCRA hazardous waste on-site or off-site. | 40 CFR 268 | Prohibits land disposal of specified untreated hazardous wastes and provides special requirements for handling such wastes. | No/No | No untreated wastes are contemplated for disposal. |

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| Hazardous Waste Permit Program | RCRA hazardous waste treatment, storage, and disposal onsite | 40 CFR 270 | Establishes provisions covering basic EPA permitting requirements | No/No | Permits are not required for on-site activities at Superfund sites. |
| Underground Storage Tanks (UST) | Underground Storage Tank | 40 CFR 280 | Establishes regulations related to underground storage tanks | Yes/-- | Two underground storage tanks at the NTA will be addressed. |
| Proposed Regulation for Control of emissions of volatile organics | Volatile organics | 52 FR 3748 | Proposed standard would require 95% reduction of volatile organic emissions from Produce Accumulator Vessel. | Yes/-- | If a treatment plant is a product accumulator vessel. |
| Safe Drinking Water Act (SDWA) | | (42 USC 300g) | | | |
| Underground Injection Control Regulations (UTC) | Underground injection of substances | 40 CFR 144-147 | Provides for protection of underground sources of drinking water. | No/No | No injection of liquids is planned at the site. |
| Clean Water Act (CWA) | | 33 USC 1251-1376 | | | |
| National Pollutant Discharge Elimination System | Discharge of pollutants from any point source into waters of the United States | 40 CFR 122,125 | Requires permits for the discharge of pollutants from any point source into waters of the United States. Permits based on ambient water quality criteria. will be determined by EPA on a site-specific basis. | Yes/-- | Technology-based treatment requirements that are equivalent to best conventional control technology (NCT) or best available technology economically available (MAT) |
| Effluent Limitations | Point source discharge into the Ore Mining and Dressing Source category. | 40 CFR 440 | Sets technology-based effluent limitations for point source discharges in | No/No | No ore sources have been identified at the site. |

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| National Pretreatment Standards | Pollutants that pass through or interface with treatment processes in POTWs or that may contaminate sewage sludge. | 40 CFR 403 | Sets standards to control pollutants that pass through or interface with treatment processes in POTWs or that may contaminate sewage sludge. | No/No | No discharge to a Public Sewage Treatment Plan is planned at the site. |
| Toxic Pollutant Effluent Standards | Aldrin/dieldrin, DDT, endrin, toxaphene, benzidine, PCRs | 40 CFR 129 | Establishes effluent standards or prohibitions for certain toxic pollutants | No/-- | These contaminants do not exist within the study area. |
| Marine Protection Research and Sanctuaries Act | Ocean Dumping | (13 USC 1401-1445) | Regulates ocean dumping | No/No | Ocean dumping not part of any proposed alternatives. |
| Toxic Substances Control Act (TSCA) | PCBs | (15 USC 2601-2629)<br>40 CFR 761 | Establishes storage and disposal requirements for PCBs | No/-- | Material to be disposed of off-ba do not contain PCBs. |
| Surface Mining Control and Reclamation Act (SMCRA) | Mining Operations | (30 USC 1201-1328) | Establishes provisions designed to protect the environment from the effects of surface coal mining operations, and to a lesser extent, noncoal mining. | No/No | Study are is not a mining-related site. |
| Clean Air Act (CAA) | | (42 USC 7401-7642 | | | |
| National Emission Standard for Hazardous Air Pollutants | Hazardous air pollutants | 40 CFR 61 | Sets emission standards for designated hazardous pollutants, including mercury, beryllium, and inorganic arsenic. | No/Yes | Some portions of 40 CFR 61 would relevant and appropriate to off-g emissions from the treatment systems. |

Initial Screening of Potential Federal Chemical-Specific ARAR's

| Requirement | Prerequisites | Citation | Description | Applicable/Relevant and Appropriate | Comments |
|---|---|---|---|---|---|
| National Ambient Air Quality Criteria | Various air contaminants | | Sets emission standards for designated air contaminants to protect the public health and welfare. | Yes/-- | All proposed alternatives need to provide adequate level of workers protection during remediation. |
| New Source Performance Standards | New stationary source | | Sets emission standards for certain classes of new stationary sources of air pollution. | Yes/-- | If a certain class of new source is proposed as part of treatment plant. |
| Occupational Safety and Health Act (OSHA) | Remedial action workers | (29 USC 651-678) | Regulates worker health and safety | Yes/-- | Applicable to worker health and safety. |
| Federal Mine Safety and Health Act | Work in underground mines | 30 USC 801-962 | Regulates working conditions in underground mines to assure safety and health of workers. | No/No | Study area is not a mining-related site. |
| Hazardous Materials Transportation Act | | (44 USC 1801-1813) | | | |
| Hazardous Materials Transportation Regulations | Transportation of hazardous materials | 40 CFR 107, 171-177 | Regulates transportation of hazardous materials. | Yes/-- | If any alternative requires the offsite transportation of hazardous materials. |

Note: -- If a requirement is applicable, it cannot also be relevant and appropriate.

## STATE ARARS

| STANDARD, REQUIREMENT CRITERIA, or LIMITATION | CITATION | DESCRIPTION | APPLICABLE/ RELEVANT and APPROPRIATE | COMMENT |
|---|---|---|---|---|
| Oklahoma Controlled Industrial Waste Disposal Act | 63 OS 1981 | | | |
| Rules, Regulations, and Minimum Standards | 63 OS 1981 Section 1-2005 | Establishes rules, regulations, and minimum standards for the listing and characterization of controlled industrial waste, for the treatment, disposal, transportation, storage and recycling of controlled industrial waste and recyclable materials in Oklahoma. | Yes/ | For treatment and disposal of waste material. |
| Construction permit application- Review of county road classification plans - Requirements for issuance of permit - Notice proposed site and review - Court review | 63 OS 1981 Section 1-2005.3 | Establishes guidelines for the Board of County Commissions review of the county road classification plan in order to ensure that county roads and bridges to be used from industrial waste facilities, may be used without any substantial detriment. | No/ | Applies to off-site transportation of waste from the industrial waste treatment facility. |
| Definitions - Permits - Hearings - Notice - Review | 63 OS 1981 Section 1-2006 | Establishes requirements for issuance of a construction permit. The permit shall be issued only upon proper application, hearing, if requested, and determination by the Department of Health that the proposed site and facility are physically and technically suitable. Also requires applicant to give notice, by newspapers and radio stations, of opportunity to oppose the granting of such permit by requesting an information public meeting. | Yes/ | Action requires construction of new treatment facility. Construction will remain on site. The state permit standards will be met. But, a permit is not required. |

STATE ARARS
continued

| TANDARD, REQUIREMENT RITERIA, or LIMITATION | CITATION | DESCRIPTION | APPLICABLE/ RELEVANT and APPROPRIATE | COMMENT |
|---|---|---|---|---|
| riteria for controlled ndustrial waste facility | 63 GS 1981 Section 1-2007 | Provides criteria, including testing methods and minimum or maximum standards, before construction of a controlled industrial waste facility shall proceed. | Yes/ | |
| ermits - Application - iability Insurance - Bond - inancial Responsibility - peration of Facility - nsolvency - Liability of uarantors | 63 OS 1981 Section 1-2008 | Establishes the standards and requirements for applicants seeking permits for the operation of controlled industrial waste facilities from the State Department of Health. | Yes/ | Federal Facilities have sovereign immunity. |
| anifest provided to driver | 63 OS 1981 Section 1-2010 | Persons generating controlled industrial waste materials shall provide the operator of any mode of any offsite transportation carrying controlled industrial waste a manifest indicating waste characteristics and destination of the waste. | Yes/ | Disposal of material from Pit Q-51 |
| rohibited disposal - ontrolled industrial facility for onsite or offsite treatment, storage or isposal | 63 OS 1981 Section 1-2014 | Establishes guidelines for site selection of a controlled industrial facility. | Yes/ | |

STATE ARARS
continued

| STANDARD, REQUIREMENT CRITERIA, or LIMITATION | CITATION | DESCRIPTION | APPLICABLE/ RELEVANT and APPROPRIATE | COMMENT |
|---|---|---|---|---|
| Oklahoma Water Resources Board Rules, Regulations, and Modes of Procedure 1985 | Authority by Title 82 0.5, 1981, Section 1085.2 | | | |
| Water Quality Certification | Sec 1015.1 (a) | Permits issued by EPA under the NPDES program will not violate current Oklahoma Water Quality Standards. | Yes/ | Effluent must comply with discharge requirements. |
| Direct Discharges of Industrial Effluents | Sec 1025.10 | Lists the requirements of applicants who wish to receive a permit for discharge of treated and non-treated wastewater to surface water. | Yes/ | |
| Plans to be submitted prior to beginning construction | Sec 1025-14 | Requires plans to be submitted prior to initiating onsite construction of any new wastewater disposal system or addition to any existing wastewater disposal system. | Yes/ | |
| Treatment of Industrial Wastewater | Sec 1045.3 | Due to the diverse nature of industrial wastewater, each proposed installation must be considered on its own merit. Conferences with the Board's staff are highly desirable during the planning and design phases of waste disposal systems. | Yes/ | New facility to be constructed for remediation of B3001 groundwater. |

STATE ARARS
continued

| STANDARD, REQUIREMENT CRITERIA, or LIMITATION | CITATION | DESCRIPTION | APPLICABLE/ RELEVANT and APPROPRIATE | COMMENT |
|---|---|---|---|---|
| Effluent Limitation Guidelines | Sec 1070.1 | Effluent limitation guidelines promulgated pursuant to the Federal Water Pollution Control Act (P.L. 92-500) as amended by the Clean Water Act 1977 (P.L> 95-217) for point sources are hereby adapted. | Yes/ | |
| Guidelines for Wastewater Discharges into Intermittent | Sec 1070.2 | Provides a partial list of maximum effluent concentrations for Streams and Storm Sewers various constituents. Treatment technology data, wasteload allocation studies, the Oklahoma Water Quality Standards, ad other pertinent information will also be utilized in determining constituent limitations for waste disposal limits. | Yes/ | |
| Water Quality Criteria | Sec 1070.3 | Provisions of "Quality Criteria for Water, 1986" US EPA, 440/5-86-001, as amended, are incorporated herein by reference and will be utilized where appropriate to establish waste disposal permit limitations to protect the waters of the state. | Yes/ | |
| Oklahoma Air Pollution Control Regulations | Air Pollution Control Regulations and Guidelines; Oklahoma State Dept. of Health, Air Quality Service; Dec. 28, 1968, as amended. | | | |

**STATE ARARS**
continued

| TANDARD, REQUIREMENT RITERIA, or LIMITATION | CITATION | DESCRIPTION | APPLICABLE/ RELEVANT and APPROPRIATE | COMMENT |
|---|---|---|---|---|
| Permits | Regulation 1.4 | Lists the requirements for sources which emit or may emit a toxic air contaminant. | Yes/ | |
| Control of Emission of Hazardous and Toxic Air Contaminants | Regulation 3.8 | Establishes standards to control the routine emission of hazardous and toxic air contaminants from stationary sources. | Yes/ | |

# APPENDIX C
# STATE OF OKLAHOMA
# LETTER OF CONCURRENCE

**Joan K. Leavitt, M.D.**
Commissioner

**OKLAHOMA STATE DEPARTMENT OF HEALTH**

**P.O. BOX 53551**
**1000 NE TENTH**
**OKLAHOMA CITY, OK 73152**

**Board of Health**
Walter Scott Mason, III, President
Ernest D. Martin, R.Ph., Vice President
Wallace Byrd, M.D., Secretary-Treasurer
John B. Carmichael, D.D.S.
Jodie L. Edge, M.D.
Don H. Fieker, D.O.
Burdge F. Green, M.D.
Linda M. Johnson, M.D.
Lee W. Peden

AN EQUAL OPPORTUNITY EMPLOYER

July 19, 1990

Robert E. Layton Jr. (6A)
Regional Administrator
EPA Region VI
1445 Ross Ave.
Dallas, Texas 75202

Dear Mr. Layton:

The Oklahoma State Department of Health (OSDH) concurs with the *Record of Decision (ROD) for the Tinker Air Force Base Building 3001 and the North Tank Area and Pit Q-51 Operable Units.* Tinker Air Force Base, working in concert with OSDH and EPA through the vehicle of the Technical Review Committee, has formulated a plan to solve the problems of the ground water contamination that is environmentally sound, technically appropriate, and fiscally responsible. This ROD is a major milestone in the efforts to clean up one of Oklahoma's most important environmental concerns and reflects favorably on the cooperative spirit and effort of all those involved.

If you have any questions or comments regarding this matter please call me at 271-8056.

Sincerely yours

Mark S. Coleman, Deputy Commissioner
for Environmental Health Services

# APPENDIX D
# ADMINISTRATIVE RECORD
# FILE STRUCTURE

ADMINISTRATIVE RECORD
TINKER AFB
FILE STRUCTURE

1.0 SITE IDENTIFICATION
- 1.1 Notification/Site Inspection Report
- 1.2 Federal Register (22 Jul 87)
- 1.3 Preliminary Assessment (PA) Report
- 1.4 Site Investigation (SI) Report

2.0 INTERAGENCY AGREEMENT (IAG)
- 2.1 IAG
- 2.2 Admendments to the IAG
- 2.3 Public Comments
- 2.4 Regulatory Correspondence

3.0 REMEDIAL INVESTIGATION (RI)
- 3.1 Sampling & Analysis Plans
- 3.2 Sampling & Analysis Data/Chain of Custody Forms
- 3.3 Work Plan
- 3.4 Action Memorandum
- 3.5 Amendments to Action Memorandum
- 3.6 RI Reports

4.0 HEALTH ASSESSMENTS
- 4.1 ATSDR Health Assessments
- 4.2 Toxicological Profiles
- 4.3 Risk Assessments

5.0 FEASIBILITY STUDY (FS)
- 5.1 ARAR Determinations
- 5.2 FS Reports
- 5.3 Proposed Plans

6.0 RECORD OF DECISION (ROD)
- 6.1 ROD
- 6.2 Public Comments

7.0 PUBLIC PARTICIPATION
- 7.1 Public Notices
- 7.2 Public Comments & Responses
- 7.3 Public Correspondence (General)
- 7.4 Public Meeting Transcriptions
- 7.5 Fact Sheets and Press Releases
- 7.6 Responsiveness Summary
- 7.7 Tinker AFB Technical Review Committee

8.0 TECHNICAL SOURCES & GUIDANCE DOCUMENTS
- 8.1 EPA HQ Guidance
- 8.2 EPA Regional Guidance
- 8.3 State Guidance (Oklahoma State Dept. of Health OSDH)
- 8.4 Technical Sources (General)

# APPENDIX E
# ADMINISTRATIVE RECORD
# INDEX #1
# BUILDING 3001

ADMINISTRATIVE RECORD
BUILDING 3001
INDEX #1

Document Number: 083082002 Date: Aug 82

Title: VOC Contamination in well 16 & 7

Type: Correspondence
Category: 2.4
Author: Mr. Edgar Jeffrey (EPA)
Recipient: Capt. Escoriaza (TAFB)

---

Document Number: 093082002 Date: Sep 82

Title: Tinker Halogenated compound Contamination

Type: Correspondence
Category: 2.4
Author: Maj. David McElway (TAFB)
Recipient: Mr. Edgar Jeffrey (EPA)

---

Document Number: 092484001 Date: Sep 84

Title: State Inspection Report

Type: Correspondence
Category: 2.4
Author: Mr. Ron Jarman (OWRB)
Recipient: Mr. Edgar Jeffrey (EPA)

---

Document Number: 110684431 Date: Nov 84

Title: Bldg 3001 & Soldier Creek Drainage Area, Tinker Air Force Base...NPL scoring package.

Type: Final EPA NPL Scoring
Category: 1.1
Author: EPA
Recipient: EPA/Tinker AFB

---

Document Number: 121284001 Date: Dec 84

Title: Proposed establishment of the Technical Review Committee (TRC)

Type: Correspondence
Category: 7.7
Author: Col. Danny Rivera (TAFB)
Recipient: MR. William Hathaway (EPA)

---

Document Number: 011585004 Date: Jan 85

Title: Minutes of Preliminary Technical Review Committee (TRC) Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 012385001 Date: Jan 85

Title: Jenkins Dunbar appointed OSDH rep. to TRC

Type: Correspondence
Category: 7.7
Author: Mr. Don Hensch (OSDH)
Recipient: Mr. Helmberger (TAFB)

---

Document Number: 020185001 Date: Feb 85

Title: Tinker nominated as NPL candidate

Type: Memo
Category: 2.4
Author: Mr. Dick Whittington (EPA)
Recipient: Mr. Jack McGray (EPA)

---

Document Number: 020685002 Date: Feb 85

Title: Establishment of the TRC

Type: Correspondence
Category: 7.7
Author: Maj. Gen. Burpee (TAFB)
Recipient: Mr. Dick Whittington (EPA)

---

Document Number: 031285001 Date: Mar 85

Title: Publication of Tinker ARB on the NPL

Type: Correspondence
Category: 2.4
Author: Mr. Sam Nott (EPA)
Resicpient: H.A. Caves

---

Document Number: 032285001 Date: Mar 85

Title: Appointment of Drew Puffer as TRC rep. for EPA

Type: Correspondence
Category: 7.7
Author: Mr. Dick Whittington (EPA)
Recipient: Maj. Gen. Burpee (TAFB)

---

Document Number: 042285002 Date: Apr 85

Title: Minutes of TRC meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 043085002 Date: Apr 85

Title: Appointment of Mark Coleman as OSDH rep To TRC

Type: Correspondence
Category: 7.7
Author: Gov. George Nigh (OK)
Recipient: Maj. Gen. Burpee (TAFB)

---

Document Number: 080285001 Date: Aug 85

Title: Additional Monitoring within Bldg 3001

Type: Correspondence
Category: 2.4
Author: Col. Gerald Blackburn (TAFB)
Recipient: Mr. Sam Nott (EPA)

---

Document Number: 082085005 Date: Aug 85

Title: Minutes of TRC meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Auothor: TAFB
Recipient: TRC members

---

Document Number: 101585275 Date: Oct 85

Title: Phase II - Confirmation/Quantification Stage 2, Vol 1

Type: Final (IRP) Report
Category: 1.4
Author: Radian Corporation
Recipient: TAFB

---

Document Number: 101585619M Date: Oct 85

Title: Phase II - Confirmation/Quantification Stage 2, Vol 2 (Appendices)

Type: Final (IRP) Report
Category: 1.4
Author: Radian Corporation
Recipient: TAFB

---

Document Number: 111985003 Date: Nov 85

Title: Minutes of TRC meeitng, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

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Document Number: 021886003 Date: Feb 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

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Document Number: 052086004 Date: May 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 081886003 Date: Aug 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 012687004 Date: Jan 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 041687001 Date: Apr 87 (Received)

Title: Implemeting SARA with TAFB's IRP work

Type: EPA Correspondence
Category: 2.4
Author: Mr. Robert Hannessclager (EPA Region VI)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 300987178 Date: Sep 87

Title: Tinker AFB Groundwater Assessment

Type: Final (IRP) Report
Category: 8.4
Author: COE (Tulsa)
Recipient: TAFB

---

Document Number: 032787003 Date: Mar 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 051987003 Date: May 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 08258700 Date: Aug 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 111887003 Date: Nov 87

Title: Invitation Ltr for EPA visit for Health Assessment Team

Type: TAFB correspondence
Category: 2.4
Author: Maj. J. Jorgensen (TAFB)
Recipient: 1 Ltr to ea. EPA, OSDH, COE

---

Document Number: 111987004 Date: Nov 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 011588151 Date: Jan 88

Title: Building 3001 Remedial Investigation Vol 1 Report

Type: Final (IRP) Report
Category: 3.7
Author: COE
Recipient: TAFB

---

Document Number: 011588693Q Date: Jan 88

Title: Building 3001 Remedial Investigation Vol 2 Appendices

Type: Final (IRP) Report
Category: 3.7
Author: COE
Recipient: TAFB

---

Document Number: 021688004 Date: Feb 88

Title: Minutes of TRC Meetings, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 031588119 Date: Mar 88

Title: Sampling and Analysis Plan Revision 1

Type: Final (IRP) Report
Category: 3.2
Author: COE
Recipient: TAFB

---

Document Number: 05138865 Date: May 88

Title: Selection of Remedial Control Measures & Technology IRP Building 3001

Type: Final (IRP) Report
Category: 3.9
Author: PELA
Recipient: TAFB

---

Document Number: 051788004 Date: May 88

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 051988002 Date: May 88

Title: Comments on Tinker AFB Health Assessment

Type: Memo
Category: 2.4
Author: Mr. Sven Rodenbeck
Recipient: Carl Hickham (ATSDR)

---

Document Number: 052088019 Date: May 88

Title: Health Assessment for Tinker AFB NPL Site
Oklahoma City, Oklahoma County, Oklahoma

Type: Final (IRP) Report
Category: 4.1
Author: Agency for Toxic Substances & Disease Registry
U.S. Public Health Service (ATSDR)
Recipient: Tinker AFB / EPA

---

Document Number: 062488001 Date: Jun 88

Title: Schedule for FFA (IAG) Negotiations

Type: Table memo
Category: 2.4
Author: Ms. S. Turner (EPA)
Recipient: File (EPA)

---

Document Number: 071588161 Date: Aug 88

Title: Risk Assessment of the Building 3001 Site, TAFB

Type: Final (IRP) Report
Category: 4.3
Author: COE
Recipient: TAFB

---

Document Number: 102488005 Date: Aug 88

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 092388004 Date: Sep 88

Title: Disposal of pit P-75 and MN-36 contents w/anal.

Type: Correspondence
Category: 2.4
Author: Maj. William Fodor (TAFB)
Recipient: Ms. Marsha Myers (OSDH)

---

Document Number: 100388001 Date: Oct 88

Title: Delegation of CERCLA authority on Tinker AFB to EPA Region VI

Type: Memo
Category: 2.4
Author: Mr. Winston Porter (EPA)
Recipient: Mr. Robert Layton (EPA Region 6)

---

Document Number: 102588004 Date: Oct 88

Title: Ltr requesting discussion of the TRC Charter in the next TRC meeting

Type : Correspondence
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 111588006 Date: Nov 88

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Rcipient: TRC memebers

---

Document Number: 120988064 Date: Dec 88

Title: Federal Facility Agreement Under CERCLA Section 120 (Admin. Docket # NPL-U3-2-27)

Type: Final - Tinker FFA
Category: 2.2
Author: DOD/EPA
Recipient: EPA/OSDH/Tinker AFB / Public

---

Document Number: 121688001 Date: Dec 88

Title: FFA is signed by Tinker AFB, EPA & OSDH

Type: Newspaper Clipping
Category: 7.5
Author: Tinker Take Off
Recipient: Public

---

Document Number: 122288002 Date: Dec 88

Title: Pit U-51 closure

Type: Correspondence
Category: 2.4
Author: Col. Eusebio Paguyo (TAFB)
Recipient: Mr. Mark Coleman (OSDH)

---

Document Number: 121588154 Date: Dec 88

Title: Safety and Occupational Health Plan for COE Personnel Revision 1

Type: Final (IRP) Report
Category: 4.1
Author: COE
Recipient: TAFB

---

Document Number: 122288001 Date: Dec 88

Title: Ltr requesting Mr. Peter G. Prince III to join The TRC as a public member.

Type: Correspondence
Category: 7.7
Author: Col. Ray Reaves (TAFB)
Recipient: Mr. Peter G. Prince III

---

Document Number: 010589001 Date: Jan 89

Title: Mr. Prince III accepts the invitation to join the TRC.

Type: Coreespondence
Category: 7.7
Author: Mr. Peter G. Prince III
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 011889001 Date: Jan 89

Title: OSDH Identifies Project Coordinator and Alternate

Type: Correspondence
Category: 2.4
Author: Mr. M. Coleman (OSDH)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 012089001 Date: Jan 89

Title: FFA public comment period notice

Type: Newspaper Clipping
Category: 7.1
Author: Tinker AFB
Recipient: Public

---

Document Number: 020689001 Date: Feb 89

Title: Ltr Thanking Mr. Prince III in agreeing to join Tinker's TRC.

Type: Correspondence
Category: 7.7
Author: Maj. d. Cornell (TAFB)
Recipient: Mr. Peter G. Prince III

---

Document Number: 020689002 Date: Feb 89

Title: Pit U-51 unauthorized cleanup

Type: Correspondence
Category: 2.4
Author: Mr. Mark Coleman (OSDH)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 022189005 Date: Feb 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 022389003 Date: Feb 89

Title: Signed TRC Charter

Type: Charter document
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 022889005 Date: Feb 89

Title: Corps of Engineers (Tulsa) comments on FFA

Type: Correspondence
Category: 2.3
Author: Mr. F. Parker (COE)
Recipient: Mr. T. Underwood (EPA)

---

Document Number: 043089009 Date: Apr 89

Title: Response to Public Comments Tinker AFB Federal Facility Agreement Under CERCLA Section 120 Administrative Docket Number NPL-U3-2-27

Type: Comment Response (Final)
Category: 7.2
Author: COE/TAFB
Recipient: EPA / Public

---

Document Number: 052289006 Date: May 89

Title: EPA FFA (IAG) effective date

Type: Correspondence
Category: 2.4
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 052389003 Date: May 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 052489001 Date: May 89

Title: EPA exercises option for additional time to review draft 3001 FS

Type: Correspondence
Category: 2.4
Author: Mr. Sam Becker (EPA)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 060289001 Date: Jun 89

Title: EPA Public Notice on availability to the TAG

Type: Newspaper Clipping
Category: 7.1
Author: EPA
Recipient: Public

---

Document Number: 062689001 Date: Jun 89

Title: TAFB announces new EM Director, Proj Coordinator and Project alternate

Type: Correspondence
Category: 2.4
Author: Maj. D. Cornell (TAFB)
Recipient: EPA (OSDH)

---

Document Number: 071789001 Date: Jul 89

Title: Tinker request to delay submittal of Bldg 3001 Final FS report

Type: Correspondence
Category: 2.4
Author: Mr. A. Lawrence (TAFB)
Recipient: Mr. H. Frey (EPA)

---

Document Number: 082289004 Date: Aug 89

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 082589248 Date: Aug 89

Title: Building 3001 Feasibility Study Volume 1-Report

Type: Final (IRP) Report
Category: 3.9
Author: COE
Recipient: TAFB

---

Document Number: 082589044 Date: Aug 89

Title: Building 3001 Feasibility Study Volume 2 - Environmental Assessment

Type: Final (IRP) Report
Category: 39
Author: COE
Recipient: TAFB

---

Document Number: 092189001 Date: Sep 89

Title: EPA Announces new Superfund Enforcement Branch Chief

Type: Correspondence
Category: 2.3
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 300989479 Date: Sep 89

Title: Tinker AFB Groundwater Assessment Update

Type: Final (IRP) Update Report
Category: 8.4
Author: COE (Tulsa)
Recipient: TAFB

---

Document Number: 10028902 Date: Oct 89

Title: EPA Approves Deadline Schedule

Type: Correspondence
Category: 2.4
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 112889004 Date: Nov 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 021390003 Date: Feb 90

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 022890020 Date: Feb 90

Title: AquaDetox information

Type: Correspondence
Category: 2.4
Author: Ms. C. Taylor (TAFB)
Recipient: Mr. T. Underwoord (EPA)

---

Document Number: 030790028 Date: Mar 90

Title: Building 3001 (NPL Site) Proposed Plan

Type: Final (IRP) Report
Category: 3.10
Author: COE
Recipient: TAFB

---

Document Number: 031590019 Date: Mar 90

Title: Tinker AFB AquaDetox Description / AquaDetox Stripping Sys for Groundwater Remediation / Chromium Removal Process Description

Type: Information Package
Category: 8.4
Author: TAFB/Dow Chemical Company
Recipient: TAFB

---

Document Number: 031990001 Date: Mar 90

Title: TAFB Public Notice for B3001 Proposed Plan (Public Comment Period / Public Meeting Notice)

Type: Newspaper Clipping
Category: 7.1
Author: Tinker AFB Public Affairs Office
Recipient: The Daily Oklahoman (Public)

---

Document Number: 040590042 Date: Apr 90

Title: Building 3001 (NPL Site) Cleanup Plans April 1990, Tinker Air Force Base

Type: Public Meeting Handout
Category: 7.5
Author: Tinker AFB Environmental Management Directorate
Recipient: Public

Note: Handout is located at end of Public Meeting Transcript (see Below).

---

Document Number: 040590042 Date: Apr 90

Title: Transcript...Public Meeting...Building 3001 NPL Proposed Plan

Type: Final Transcript
Category: 7.4
Author: Tinker AFB Judge Advocate Office
Recipient: Public

---

Document Number: 043090006 Date: Undated (Apr 90)

Title: Public Comment on Proposed Plan...Bldg 3001 (Letter from Mr. J.R. Reid)

Type: Public Correspondence
Category: 6.2
Author: Mr J.R. Reid
Recipient: TAFB via EPA

---

Document Number: 041890010 Date: Apr 90

Title: Public Comment on Proposed Plan...Bldg 3001

Type: Public Correspondence (via EPA)
Category: 6.2
Author: Fred Jones
Recipient: TAFB via EPA

---

Document Number: 042790004 Date: Apr 90

Title: Public Comment on Proposed Plan...Bldg 3001

Type: Public Correspondence
Category: 6.2
Author: Kent Engineering (Kent Myers)
Recipient: TAFB via EPA

---

Document Number: 051590003 Date: May 90

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 053190001 Date: May 90

Title: Ltr. From Environmental Pullution Health Concerns Coalition requesting to join Tinker's TRC & TWG.

Type: Correspondence
Category: 7.7
Author: Mr. John Bowman (Chairman)
Recipient: TAFB (Environmental office - Maj Cornell)

---

Document Number: 062590001 Date: Jun 90

Title: Response Ltr. to Mr Bowman's request to join Tinker's TRC & TWG.

Type: Correspondence
Category: 7.7
Author: TAFB
Recipient: Mr. John Bowman, Chairman
Environmental Pollution Health
Concerns Coalition

---

Document Number: 071990001 Date: Jul 90

Title: OSDH (the state) concurs with B3001, N. Tank Area, Pit Q-51 Record of Decision (ROD)

Type: Correspondence
Category: 2.4
Author: Mr. Mark Coleman (OSDH)
Recipient: Mr. Robert Layton (EPA Region VI)

---

Document Number: 07319046 Date: Jul 90

Title: Tinker AFB Installation Restoration Program
Community Relation Plan, Jul 90 version

Type: ComRel Plan
Category: 7.0
Author: TAFB
Recipient: Public

---

Document Number: 800001004 Date: Undated

Title: EPA Region 6 Index of various EPA technical
& guidence documents

Type: References Index
Category: 8.2
Author: EPA Staff Consultants
Recipient: U.S. EPA Region 6 Site Files

---

Document Number: 080190094 Date: Aug 90

Title: Building 3001 (NPL Site) Record of Decision
Tinker Air Force Base, Oklahoma City, Oklahoma

Type: ROD for B3001, N. Tank Area, Pit Q51
Category: 6.1
Author: COE Tulsa
Recipient: TAFB, EPA, OSDH, Public

---

Document Number: 080190094 Date: Aug 90

Title: ROD B3001, Appendix A...Responsiveness Summary

Type: Final response to public period comments
Category: 7.6
Author: COE Tulsa/TAFB
Recipient: Public, TAFB, EPA, OSDH

---

APPENDIX F
ADMINISTRATIVE RECORD
INDEX #2
PIT Q-51

ADMINISTRATIVE RECORD
PIT Q-51 OPERABLE UNIT
(Inside Building 3001)
INDEX #2

Document Number: 092484001 Date: Sep 84

Title: State Inspection Report

Type: Correspondence
Category: 2.4
Author: Mr. Ron Jarman (OWRB)
Recipient: Mr. Edgar Jeffrey (EPA)

---

Document Number: 110684431 Date: Nov 84

Title: Bldg 3001 & Soldier Creek Drainage Area, Tinker Air Force Base...NPL scoring package.

Type: Final EPA NPL Scoring
Category: 1.1
Author: EPA
Recipient: EPA/Tinker AFB

---

Document Number: 121284001 Date: Dec 84

Title: Proposed establishment of the Technical Review Committee (TRC)

Type: Correspondence
Category: 7.7
Author: Col. Danny Rivera (TAFB)
Recipient: MR. William Hathaway (EPA)

---

Document Number: 011585004 Date: Jan 85

Title: Minutes of Preliminary Technical Review Committee (TRC) Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 012385001 Date: Jan 85

Title: Jenkins Dunbar appointed OSDH rep. to TRC

Type: Correspondence
Category: 7.7
Author: Mr. Don Hensch (OSDH)
Recipient: Mr. Helmberger (TAFB)

---

Document Number: 020185001 Date: Feb 85

Title: Tinker nominated as NPL candidate

Type: Memo
Category: 2.4
Author: Mr. Dick Whittington (EPA)
Recipient: Mr. Jack McGray (EPA)

---

Document Number: 020685002 Date: Feb 85

Title: Establishment of the TRC

Type: Correspondence
Category: 7.7
Author: Maj. Gen. Burpee (TAFB)
Recipient: Mr. Dick Whittington (EPA)

---

Document Number: 031285001 Date: Mar 85

Title: Publication of Tinker ARB on the NPL

Type: Correspondence
Category: 2.4
Author: Mr. Sam Nott (EPA)
Resicpient: H.A. Caves

---

Document Number: 032285001 Date: Mar 85

Title: Appointment of Drew Puffer as TRC rep. for EPA

Type: Correspondence
Category: 7.7
Author: Mr. Dick Whittington (EPA)
Recipient: Maj. Gen. Burpee (TAFB)

---

Document Number: 042285002 Date: Apr 85

Title: Minutes of TRC meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 043085002 Date: Apr 85

Title: Appointment of Mark Coleman as OSDH rep To TRC

Type: Correspondence
Category: 7.7
Author: Gov. George Nigh (OK)
Recipient: Maj. Gen. Burpee (TAFB)

---

Document Number: 082085005 Date: Aug 85

Title: Minutes of TRC meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Auothor: TAFB
Recipient: TRC members

---

Document Number: 101585275 Date: Oct 85

Title: Phase II - Confirmation/Quantification Stage 2, Vol 1

Type: Final (IRP) Report
Category: 1.4
Author: Radian Corporation
Recipient: TAFB

---

Document Number: 101585619M Date: Oct 85

Title: Phase II - Confirmation/Quantification Stage 2, Vol 2 (Appendices)

Type: Final (IRP) Report
Category: 1.4
Author: Radian Corporation
Recipient: TAFB

---

Document Number: 111985003 Date: Nov 85

Title: Minutes of TRC meeitng, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 021886003 Date: Feb 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 052086004 Date: May 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 081886003 Date: Aug 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 012687004 Date: Jan 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 041687001 Date: Apr 87 (Received)

Title: Implemeting SARA with TAFB's IRP work

Type: EPA Correspondence
Category: 2.4
Author: Mr. Robert Hannessclager (EPA Region VI)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 032787003 Date: Mar 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 051987003 Date: May 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 072287015 Date: Jul 87

Title: Federal Register, Part III, EPA (40CFR Part 300)

Type: EPA Document
Category: 1.2
Author: EPA
Recipient: Public

---

Document Number: 08258700 Date: Aug 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 111887003 Date: Nov 87

Title: Invitation Ltr for EPA visit for Health Assessment Team

Type: TAFB correspondence
Category: 2.4
Author: Maj. J. Jorgensen (TAFB)
Recipient: 1 Ltr to ea. EPA, OSDH, COE

---

Document Number: 111987004 Date: Nov 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 011588151 Date: Jan 88

Title: Building 3001 Remedial Investigation Vol 1 Report

Type: Final (IRP) Report
Category: 3.7
Author: COE
Recipient: TAFB

---

Document Number: 011588693Q Date: Jan 88

Title: Building 3001 Remedial Investigation Vol 2 Appendices

Type: Final (IRP) Report
Category: 3.7
Author: COE
Recipient: TAFB

---

Document Number: 021688004 Date: Feb 88

Title: Minutes of TRC Meetings, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 031588119 Date: Mar 88

Title: Sampling and Analysis Plan Revision 1

Type: Final (IRP) Report
Category: 3.2
Author: COE
Recipient: TAFB

---

Document Number: 05138865 Date: May 88

Title: Selection of Remedial Control Measures & Technology IRP Building 3001

Type: Final (IRP) Report
Category: 3.9
Author: PELA
Recipient: TAFB

---

Document Number: 051788004 Date: May 88

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 051988002 Date: May 88

Title: Comments on Tinker AFB Health Assessment

Type: Memo
Category: 2.4
Author: Mr. Sven Rodenbeck
Recipient: Carl Hickham (ATSDR)

---

Document Number: 052088019 Date: May 88

Title: Health Assessment for Tinker AFB NPL Site Oklahoma City, Oklahoma County, Oklahoma

Type: Final (IRP) Report
Category: 4.1
Author: Agency for Toxic Substances & Disease Registry U.S. Public Health Service (ATSDR)
Recipient: Tinker AFB / EPA

---

Document Number: 062488001 Date: Jun 88

Title: Schedule for FFA (IAG) Negotiations

Type: Table memo
Category: 2.4
Author: Ms. S. Turner (EPA)
Recipient: File (EPA)

---

Document Number: 071588161 Date: Aug 88

Title: Risk Assessment of the Building 3001 Site, TAFB

Type: Final (IRP) Report
Category: 4.3
Author: COE
Recipient: TAFB

---

Document Number: 102488005 Date: Aug 88

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 100388001 Date: Oct 88

Title: Delegation of CERCLA authority on Tinker AFB to EPA Region VI

Type: Memo
Category: 2.4
Author: Mr. Winston Porter (EPA)
Recipient: Mr. Robert Layton (EPA Region 6)

---

Document Number: 102588004 Date: Oct 88

Title: Ltr requesting discussion of the TRC Charter in the next TRC meeting

Type : Correspondence
Category: 7.7
Author: TAFB
Recipient: TRC members

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Document Number: 111588006 Date: Nov 88

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Rcipient: TRC memebers

---

Document Number: 120988064 Date: Dec 88

Title: Federal Facility Agreement Under CERCLA Section 120 (Admin. Docket # NPL-U3-2-27)

Type: Final - Tinker FFA
Category: 2.2
Author: DOD/EPA
Recipient: EPA/OSDH/Tinker AFB / Public

---

Document Number: 121688001 Date: Dec 88

Title: FFA is signed by Tinker AFB, EPA & OSDH

Type: Newspaper Clipping
Category: 7.5
Author: Tinker Take Off
Recipient: Public

---

Document Number: 121588154 Date: Dec 88

Title: Safety and Occupational Health Plan for COE Personnel Revision 1

Type: Final (IRP) Report
Category: 4.1
Author: COE
Recipient: TAFB

---

Document Number: 122288001 Date: Dec 88

Title: Ltr requesting Mr. Peter G. Prince III to join The TRC as a public member.

Type: Correspondence
Category: 7.7
Author: Col. Ray Reaves (TAFB)
Recipient: Mr. Peter G. Prince III

---

Document Number: 010589001 Date: Jan 89

Title: Mr. Prince III accepts the invitation to join the TRC.

Type: Coreespondence
Category: 7.7
Author: Mr. Peter G. Prince III
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 011889001 Date: Jan 89

Title: OSDH Identifies Project Coordinator and Alternate

Type: Correspondence
Category: 2.4
Author: Mr. M. Coleman (OSDH)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 012089001 Date: Jan 89

Title: FFA public comment period notice

Type: Newspaper Clipping
Category: 7.1
Author: Tinker AFB
Recipient: Public

---

Document Number: 020689001 Date: Feb 89

Title: Ltr Thanking Mr. Prince III in agreeing to join Tinker's TRC.

Type: Correspondence
Category: 7.7
Author: Maj. d. Cornell (TAFB)
Recipient: Mr. Peter G. Prince III

---

Document Number: 020689002 Date: Feb 89

Title: Pit U-51 unauthorized cleanup/Future Pit cleanup

Type: Correspondence
Category: 2.4
Author: Mr. Mark Coleman (OSDH)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 022189005 Date: Feb 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 022389003 Date: Feb 89

Title: Signed TRC Charter

Type: Charter document
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 022889005 Date: Feb 89

Title: Corps of Engineers (Tulsa) comments on FFA

Type: Correspondence
Category: 2.3
Author: Mr. F. Parker (COE)
Recipient: Mr. T. Underwood (EPA)

---

Document Number: 043089009 Date: Apr 89

Title: Response to Public Comments Tinker AFB Federal Facility Agreement Under CERCLA Section 120 Administrative Docket Number NPL-U3-2-27

Type: Comment Response (Final)
Category: 7.2
Author: COE/TAFB
Recipient: EPA / Public

---

Document Number: 052289006 Date: May 89

Title: EPA FFA (IAG) effective date

Type: Correspondence
Category: 2.4
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 052389003 Date: May 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 060289001 Date: Jun 89

Title: EPA Public Notice on availability to the TAG

Type: Newspaper Clipping
Category: 7.1
Author: EPA
Recipient: Public

---

Document Number: 062689001 Date: Jun 89

Title: TAFB announces new EM Director, Proj Coordinator and Project alternate

Type: Correspondence
Category: 2.4
Author: Maj. D. Cornell (TAFB)
Recipient: EPA (OSDH)

---

Document Number: 082289004 Date: Aug 89

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 092189001 Date: Sep 89

Title: EPA Announces new Superfund Enforcement Branch Chief

Type: Correspondence
Category: 2.3
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 10028902 Date: Oct 89

Title: EPA Approves Deadline Schedule

Type: Correspondence
Category: 2.4
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 112889004 Date: Nov 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 021390003 Date: Feb 90

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 0213900030 Date: Mar 90

Title: Pit Q-51 (NPL Site) Operable Unit to B3001
Focused Feasibility Study

Type: Final (IRP) Report
Category: 3.9
Author: COE (Tulsa)
Recipient: TAFB

---

Document Number: 030790022 Date: Mar 90

Title: Pit Q-51 (NPL Site) Operable Unit Bldg 3001
Proposed Plan

Type: Final (IRP) Report
Category: 3.10
Author: COE
Recipient: TAFB

---

Document Number: 031990001 Date: Mar 90

Title: TAFB Public Notice for Pit Q-51 Proposed Plan
(Public Comment Period / Public Meeting Notice)

Type: Newspaper Clipping
Category: 7.1
Author: Tinker AFB Public Affairs Office
Recipient: The Daily Oklahoman (Public)

---

Document Number: 040590042 Date: Apr 90

Title: Building 3001 (NPL Site) Cleanup Plans April 1990, Tinker Air Force Base [incl. Pit Q-51]

Type: Public Meeting Handout
Category: 7.5
Author: Tinker AFB Environmental Management Directorate
Recipient: Public

Note: Handout is located at end of Public Meeting Transcript (see Below).

---

Document Number: 040590042 Date: Apr 90

Title: Transcript...Public Meeting...Building 3001 NPL Proposed Plan [incl. Pit Q-51 Proposed Plan]

Type: Final Transcript
Category: 7.4
Author: Tinker AFB Judge Advocate Office
Recipient: Public

---

Document Number: 043090006 Date: Undated (Apr 90)

Title: Public Comment on Proposed Plan...Pit Q-51

Type: Public Correspondence
Category: 6.2
Author: Mr J.R. Reid
Recipient: TAFB via EPA

---

Document Number: 041890010 Date: Apr 90

Title: Public Comment on Proposed Plan...Pit Q-51

Type: Public Correspondence (via EPA)
Category: 6.2
Author: Fred Jones
Recipient: TAFB via EPA

---

Document Number: 042790004 Date: Apr 90

Title: Public Comment on Proposed Plan...Pit Q-51

Type: Public Correspondence
Category: 6.2
Author: Kent Engineering (Kent Myers)
Recipient: TAFB via EPA

---

Document Number: 051590003 Date: May 90

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 053190001 Date: May 90

Title: Ltr. From Environmental Pullution Health Concerns Coalition requesting to join Tinker's TRC & TWG.

Type: Correspondence
Category: 7.7
Author: Mr. John Bowman (Chairman)
Recipient: TAFB (Environmental office - Maj Cornell)

---

Document Number: 062590001 Date: Jun 90

Title: Response Ltr. to Mr Bowman's request to join Tinker's TRC & TWG.

Type: Correspondence
Category: 7.7
Author: TAFB
Recipient: Mr. John Bowman, Chairman
Environmental Pollution Health
Concerns Coalition

---

Document Number: 071990001 Date: Jul 90

Title: OSDH (the state) concurs with B3001, N. Tank Area, Pit Q-51 Record of Decision (ROD)

Type: Correspondence
Category: 2.4
Author: Mr. Mark Coleman (OSDH)
Recipient: Mr. Robert Layton (EPA Region VI)

---

Document Number: 07319046 Date: Jul 90

Title: Tinker AFB Installation Restoration Program Community Relation Plan, Jul 90 version

Type: ComRel Plan
Category: 7.0
Author: TAFB
Recipient: Public

---

Document Number: 800001004 Date: Undated

Title: EPA Region 6 Index of various EPA technical & guidence documents

Type: References Index
Category: 8.2
Author: EPA Staff Consultants
Recipient: U.S. EPA Region 6 Site Files

---

Document Number: 081590094 Date: Aug 90

Title: Building 3001 (NPL Site) Record of Decision Tinker Air Force Base, Oklahoma City, Oklahoma

Type: ROD for B3001, N. Tank Area, Pit Q51
Category: 6.1
Author: COE Tulsa
Recipient: TAFB, EPA, OSDH, Public

---

Document Number: 081590094 Date: Aug 90

Title: ROD B3001, Appendix A...Responsiveness Summary

Type: Final response to public period comments
Category: 7.6
Author: COE Tulsa/TAFB
Recipient: Public, TAFB, EPA, OSDH

---

APPENDIX G
ADMINISTRATIVE RECORD
INDEX #3
NORTH TANK AREA

ADMINISTRATIVE RECORD
NORTH TANK AREA OPERABLE UNIT
(Building 3001)
INDEX #3

Document Number: 092484001 Date: Sep 84

Title: State Inspection Report

Type: Correspondence
Category: 2.4
Author: Mr. Ron Jarman (OWRB)
Recipient: Mr. Edgar Jeffrey (EPA)

---

Document Number: 110684431 Date: Nov 84

Title: Bldg 3001 & Soldier Creek Drainage Area, Tinker Air Force Base...NPL scoring package.

Type: Final EPA NPL Scoring
Category: 1.1
Author: EPA
Recipient: EPA/Tinker AFB

---

Document Number: 121284001 Date: Dec 84

Title: Proposed establishment of the Technical Review Committee (TRC)

Type: Correspondence
Category: 7.7
Author: Col. Danny Rivera (TAFB)
Recipient: MR. William Hathaway (EPA)

---

Document Number: 011585004 Date: Jan 85

Title: Minutes of Preliminary Technical Review Committee (TRC) Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 012385001 Date: Jan 85

Title: Jenkins Dunbar appointed OSDH rep. to TRC

Type: Correspondence
Category: 7.7
Author: Mr. Don Hensch (OSDH)
Recipient: Mr. Helmberger (TAFB)

---

Document Number: 020185001 Date: Feb 85

Title: Tinker nominated as NPL candidate

Type: Memo
Category: 2.4
Author: Mr. Dick Whittington (EPA)
Recipient: Mr. Jack McGray (EPA)

---

Document Number: 020685002 Date: Feb 85

Title: Establishment of the TRC

Type: Correspondence
Category: 7.7
Author: Maj. Gen. Burpee (TAFB)
Recipient: Mr. Dick Whittington (EPA)

---

Document Number: 031285001 Date: Mar 85

Title: Publication of Tinker ARB on the NPL

Type: Correspondence
Category: 2.4
Author: Mr. Sam Nott (EPA)
Resicpient: H.A. Caves

---

Document Number: 032285001 Date: Mar 85

Title: Appointment of Drew Puffer as TRC rep. for EPA

Type: Correspondence
Category: 7.7
Author: Mr. Dick Whittington (EPA)
Recipient: Maj. Gen. Burpee (TAFB)

---

Document Number: 042285002 Date: Apr 85

Title: Minutes of TRC meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 043085002 Date: Apr 85

Title: Appointment of Mark Coleman as OSDH rep To TRC

Type: Correspondence
Category: 7.7
Author: Gov. George Nigh (OK)
Recipient: Maj. Gen. Burpee (TAFB)

---

Document Number: 082085005 Date: Aug 85

Title: Minutes of TRC meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Auothor: TAFB
Recipient: TRC members

---

Document Number: 101585275 Date: Oct 85

Title: Phase II - Confirmation/Quantification Stage 2, Vol 1

Type: Final (IRP) Report
Category: 1.4
Author: Radian Corporation
Recipient: TAFB

---

Document Number: 101585619M Date: Oct 85

Title: Phase II - Confirmation/Quantification Stage 2, Vol 2 (Appendices)

Type: Final (IRP) Report
Category: 1.4
Author: Radian Corporation
Recipient: TAFB

---

Document Number: 111985003 Date: Nov 85

Title: Minutes of TRC meeitng, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 021886003 Date: Feb 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 052086004 Date: May 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 081886003 Date: Aug 86

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 012687004 Date: Jan 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 041687001 Date: Apr 87 (Received)

Title: Implemeting SARA with TAFB's IRP work

Type: EPA Correspondence
Category: 2.4
Author: Mr. Robert Hannessclager (EPA Region VI)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 032787003 Date: Mar 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 051987003 Date: May 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 072287015 Date: Jul 87

Title: Federal Register, Part III, EPA (40CFR Part 300)

Type: EPA Document
Category: 1.2
Author: EPA
Recipient: Public

---

Document Number: 08258700 Date: Aug 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 111887003 Date: Nov 87

Title: Invitation Ltr for EPA visit for Health
Assessment Team

Type: TAFB correspondence
Category: 2.4
Author: Maj. J. Jorgensen (TAFB)
Recipient: 1 Ltr to ea. EPA, OSDH, COE

---

Document Number: 111987004 Date: Nov 87

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 011588151 Date: Jan 88

Title: Building 3001 Remedial Investigation Vol 1 Report

Type: Final (IRP) Report
Category: 3.7
Author: COE
Recipient: TAFB

---

Document Number: 011588693Q Date: Jan 88

Title: Building 3001 Remedial Investigation Vol 2 Appendices

Type: Final (IRP) Report
Category: 3.7
Author: COE
Recipient: TAFB

---

Document Number: 021688004 Date: Feb 88

Title: Minutes of TRC Meetings, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 031588119 Date: Mar 88

Title: Sampling and Analysis Plan Revision 1

Type: Final (IRP) Report
Category: 3.2
Author: COE
Recipient: TAFB

---

Document Number: 051788004 Date: May 88

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 051988002 Date: May 88

Title: Comments on Tinker AFB Health Assessment

Type: Memo
Category: 2.4
Author: Mr. Sven Rodenbeck
Recipient: Carl Hickham (ATSDR)

---

Document Number: 052088019 Date: May 88

Title: Health Assessment for Tinker AFB NPL Site
Oklahoma City, Oklahoma County, Oklahoma

Type: Final (IRP) Report
Category: 4.1
Author: Agency for Toxic Substances & Disease Registry
U.S. Public Health Service (ATSDR)
Recipient: Tinker AFB / EPA

---

Document Number: 062488001 Date: Jun 88

Title: Schedule for FFA (IAG) Negotiations

Type: Table memo
Category: 2.4
Author: Ms. S. Turner (EPA)
Recipient: File (EPA)

---

Document Number: 063088036 Date: Jun 88

Title: Hydrocarbon Abatement Proposal, North Fuel Tank
Area, Tinker AFB (Bldg 3001)

Type: Final (IRP) Report
Category: 5.2
Author: Groundwater Technology, Inc
Recipient: TAFB via COE (Tulsa)

---

Document Number: 071588161 Date: Aug 88

Title: Risk Assessment of the Building 3001 Site, TAFB

Type: Final (IRP) Report
Category: 4.3
Author: COE
Recipient: TAFB

---

Document Number: 102488005 Date: Aug 88

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 100388001 Date: Oct 88

Title: Delegation of CERCLA authority on Tinker AFB to EPA Region VI

Type: Memo
Category: 2.4
Author: Mr. Winston Porter (EPA)
Recipient: Mr. Robert Layton (EPA Region 6)

---

Document Number: 102588004 Date: Oct 88

Title: Ltr requesting discussion of the TRC Charter in the next TRC meeting

Type : Correspondence
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 111588006 Date: Nov 88

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Rcipient: TRC memebers

---

Document Number: 120988064 Date: Dec 88

Title: Federal Facility Agreement Under CERCLA Section 120 (Admin. Docket # NPL-U3-2-27)

Type: Final - Tinker FFA
Category: 2.2
Author: DOD/EPA
Recipient: EPA/OSDH/Tinker AFB / Public

---

Document Number: 121688001 Date: Dec 88

Title: FFA is signed by Tinker AFB, EPA & OSDH

Type: Newspaper Clipping
Category: 7.5
Author: Tinker Take Off
Recipient: Public

---

Document Number: 121588154 Date: Dec 88

Title: Safety and Occupational Health Plan for COE Personnel Revision 1

Type: Final (IRP) Report
Category: 4.1
Author: COE
Recipient: TAFB

---

Document Number: 122288001 Date: Dec 88

Title: Ltr requesting Mr. Peter G. Prince III to join The TRC as a public member.

Type: Correspondence
Category: 7.7
Author: Col. Ray Reaves (TAFB)
Recipient: Mr. Peter G. Prince III

---

Document Number: 010589001 Date: Jan 89

Title: Mr. Prince III accepts the invitation to join the TRC.

Type: Coreespondence
Category: 7.7
Author: Mr. Peter G. Prince III
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 011889001 Date: Jan 89

Title: OSDH Identifies Project Coordinator and Alternate

Type: Correspondence
Category: 2.4
Author: Mr. M. Coleman (OSDH)
Recipient: Col. Ray Reaves (TAFB)

---

Document Number: 012089001 Date: Jan 89

Title: FFA public comment period notice

Type: Newspaper Clipping
Category: 7.1
Author: Tinker AFB
Recipient: Public

---

Document Number: 020689001 Date: Feb 89

Title: Ltr Thanking Mr. Prince III in agreeing to join Tinker's TRC.

Type: Correspondence
Category: 7.7
Author: Maj. d. Cornell (TAFB)
Recipient: Mr. Peter G. Prince III

---

Document Number: 022189005 Date: Feb 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 022389003 Date: Feb 89

Title: Signed TRC Charter

Type: Charter document
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 022889005 Date: Feb 89

Title: Corps of Engineers (Tulsa) comments on FFA

Type: Correspondence
Category: 2.3
Author: Mr. F. Parker (COE)
Recipient: Mr. T. Underwood (EPA)

---

Document Number: 043089009 Date: Apr 89

Title: Response to Public Comments Tinker AFB Federal Facility Agreement Under CERCLA Section 120 Administrative Docket Number NPL-U3-2-27

Type: Comment Response (Final)
Category: 7.2
Author: COE/TAFB
Recipient: EPA / Public

---

Document Number: 052289006 Date: May 89

Title: EPA FFA (IAG) effective date

Type: Correspondence
Category: 2.4
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 052389003 Date: May 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 060289001 Date: Jun 89

Title: EPA Public Notice on availability to the TAG

Type: Newspaper Clipping
Category: 7.1
Author: EPA
Recipient: Public

---

Document Number: 062689001 Date: Jun 89

Title: TAFB announces new EM Director, Proj Coordinator and Project alternate

Type: Correspondence
Category: 2.4
Author: Maj. D. Cornell (TAFB)
Recipient: EPA (OSDH)

---

Document Number: 082289004 Date: Aug 89

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 092189001 Date: Sep 89

Title: EPA Announces new Superfund Enforcement Branch Chief

Type: Correspondence
Category: 2.3
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 10028902 Date: Oct 89

Title: EPA Approves Deadline Schedule

Type: Correspondence
Category: 2.4
Author: Mr. S. Becker (EPA Region VI)
Recipient: Mr. A. Lawrence (TAFB)

---

Document Number: 112889004 Date: Nov 89

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 021390003 Date: Feb 90

Title: Minutes of TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 0312900024 Date: Mar 90

Title: North Tank Area (NPL Site) Operable Unit to B3001 Design summary Report

Type: Final (IRP) Report
Category: 3.9
Author: COE (Tulsa)
Recipient: TAFB

---

Document Number: 031990001 Date: Mar 90

Title: TAFB Public Notice for North Tank Area Design Summary Report (Public Comment Period / Public Meeting Notice)

Type: Newspaper Clipping
Category: 7.1
Author: Tinker AFB Public Affairs Office
Recipient: The Daily Oklahoman (Public)

---

Document Number: 040590042 Date: Apr 90

Title: Building 3001 (NPL Site) Cleanup Plans April 1990, Tinker AFB [incl. N. Tank Area]

Type: Public Meeting Handout
Category: 7.5
Author: Tinker AFB Environmental Management Directorate
Recipient: Public

Note: Handout is located at end of Public Meeting Transcript (see next listing).

---

Document Number: 040590042 Date: Apr 90

Title: Transcript...Public Meeting...Building 3001 NPL Proposed Plan [incl. N. Tank Area Report]

Type: Final Transcript
Category: 7.4
Author: Tinker AFB Judge Advocate Office
Recipient: Public

---

Document Number: 043090006 Date: Undated (Apr 90)

Title: Public Comment on N. Tank Area Design Sum. Rep.

Type: Public Correspondence
Category: 6.2
Author: Mr J.R. Reid
Recipient: TAFB via EPA

---

Document Number: 041890010 Date: Apr 90

Title: Public Comment on N. Tank Area Design Sum. Rep.

Type: Public Correspondence (via EPA)
Category: 6.2
Author: Fred Jones
Recipient: TAFB via EPA

---

Document Number: 042790004 Date: Apr 90

Title: Public Comment on N. Tank Area Design Sum. Rep.

Type: Public Correspondence
Category: 6.2
Author: Kent Engineering (Kent Myers)
Recipient: TAFB via EPA

---

Document Number: 051590003 Date: May 90

Title: Minutes of the TRC Meeting, Tinker AFB

Type: TRC Minutes
Category: 7.7
Author: TAFB
Recipient: TRC members

---

Document Number: 053190001 Date: May 90

Title: Ltr. From Environmental Pullution Health Concerns Coalition requesting to join Tinker's TRC & TWG.

Type: Correspondence
Category: 7.7
Author: Mr. John Bowman (Chairman)
Recipient: TAFB (Environmental office - Maj Cornell)

---

Document Number: 062590001 Date: Jun 90

Title: Response Ltr. to Mr Bowman's request to join Tinker's TRC & TWG.

Type: Correspondence
Category: 7.7
Author: TAFB
Recipient: Mr. John Bowman, Chairman
Environmental Pollution Health
Concerns Coalition

---

Document Number: 071990001 Date: Jul 90

Title: OSDH (the state) concurs with B3001, N. Tank Area, Pit Q-51 Record of Decision (ROD)

Type: Correspondence
Category: 2.4
Author: Mr. Mark Coleman (OSDH)
Recipient: Mr. Robert Layton (EPA Region VI)

---

Document Number: 07319046 Date: Jul 90

Title: Tinker AFB Installation Restoration Program Community Relation Plan, Jul 90 version

Type: ComRel Plan
Category: 7.0
Author: TAFB
Recipient: Public

---

Document Number: 800001004 Date: Undated

Title: EPA Region 6 Index of various EPA technical & guidence documents

Type: References Index
Category: 8.2
Author: EPA Staff Consultants
Recipient: U.S. EPA Region 6 Site Files

---

Document Number: 081590094 Date: Aug 90

Title: Building 3001 (NPL Site) Record of Decision Tinker Air Force Base, Oklahoma City, Oklahoma

Type: ROD for B3001, N. Tank Area, Pit Q51
Category: 6.1
Author: COE Tulsa
Recipient: TAFB, EPA, OSDH, Public

---

Document Number: 081590094 Date: Aug 90

Title: ROD B3001, Appendix A...Responsiveness Summary

Type: Final response to public period comments
Category: 7.6
Author: COE Tulsa/TAFB
Recipient: Public, TAFB, EPA, OSDH

---