

**Closure Report  
For the UST Site 210  
Tinker Air Force Base, Oklahoma**

**Facility Number 55-08120  
Case Number 064-1897**



**Contract F34650-93-D-0106  
Delivery Order 5017**

**Department of the Air Force  
Oklahoma City Air Logistics Center  
Tinker Air Force Base**

**December 1999**

**CLOSURE REPORT  
FOR THE UST 210 SITE  
TINKER AIR FORCE BASE, OKLAHOMA**

**Facility Number 55-08120**

**Case Number 064-1897**

**December 1999**

**Prepared for**

**DEPARTMENT OF THE AIR FORCE  
OKLAHOMA AIR LOGISTICS CENTER  
TINKER AIR FORCE BASE**

**Prepared by**

**PARSONS ENGINEERING SCIENCE, INC.**

**MIDWEST CITY, OKLAHOMA**

**Contract F34650-93-D-0106**

**Delivery Order 5017**

Property of:  
Integrated Environmental Team Library  
OC-ALC/EM  
7701 Arnold St., Ste. 213A  
Tinker Air Force Base, OK 73145

**TABLE OF CONTENTS**

SECTION 1 INTRODUCTION ..... 1-1

    1.1 Site Location and Description ..... 1-1

        1.1.1 Adjacent Land Uses ..... 1-3

        1.1.2 Nearby Population ..... 1-4

        1.1.3 Surface and Groundwater Resources ..... 1-4

    1.2 Site History and Enforcement Activities ..... 1-6

        1.2.1 History ..... 1-6

        1.2.2 Regulatory Agency Activities ..... 1-7

    1.3 Community Participation ..... 1-8

SECTION 2 CURRENT SITE STATUS ..... 2-1

    2.1 Climatology ..... 2-1

    2.2 Geology and Soil ..... 2-1

        2.2.1 Soil Contamination ..... 2-2

    2.3 Hydrogeology ..... 2-3

        2.3.1 Groundwater Contamination ..... 2-3

    2.4 Surface Water ..... 2-4

    2.5 Receptors ..... 2-4

SECTION 3 RISK DETERMINATION ..... 3-1

SECTION 4 NO FURTHER ACTION ..... 4-1

SECTION 5 REFERENCES ..... 5-1

APPENDIX A CLOSURE REPORT

**TABLE OF FIGURES**

Figure 1.1 Base Map ..... 1-9

Figure 1.2 Site Map..... 1-10

Figure 1.3 Surface Water Drainage Paths ..... 1-11

Figure 2.1 Soil Boring/Well Location Site Map ..... 2-6

**LIST OF TABLES**

Table 2.1 Analytical Data Summary for Soil..... 2-7

Table 2.2 Analytical Data Summary for Groundwater ..... 2-11

**ACRONYMS AND ABBREVIATIONS**

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	Benzene, toluene, ethylbenzene, and xylene
COC	Chemicals of concern
°F	degrees Fahrenheit
DCE	1,1-Dichloroethene
DD	Decision document
DRO	Diesel range organics
ERPIMS	Environmental Resources Program Information Management System
FRP	Fiberglass-reinforced plastic
GRO	Gasoline range organics
GWMU	Groundwater Management Unit
HSZ	Hennessey saturated zone
IRP	Installation Restoration Program
IT	IT Corporation
LSZ	Lower saturated zone
msl	mean sea level
OAC	Oklahoma Administrative Code
OCC	Oklahoma Corporation Commission
ODEQ	Oklahoma Department of Environmental Quality
ORBCA	Oklahoma Risk-Based Corrective Action
Parsons ES	Parsons Engineering Science
PCE	Tetrachloroethylene
PZ	Producing zone
RBCA	Risk based corrective action
RBSLs	Risk based screening levels
RCRA	Resource Conservation and Recovery Act
SVOC	Semi-volatile organic compound
TCE	Trichloroethylene
TPH	Total petroleum hydrocarbons
USDA	United States Department of Agriculture
UST	Underground storage tank

*Acronyms and Abbreviations*

---

USZ	Upper saturated zone
VEP	Vacuum enhanced pumping
VOC	Volatile organic compound

## **SECTION 1**

### **INTRODUCTION**

This decision document (DD) supports the remedial actions completed, which have resulted in a no-further-action determination for the Underground Storage Tank (UST) 210 Site at Tinker Air Force Base (AFB), Oklahoma. The purpose of the DD is to summarize the existing data for the site and to describe the Air Force's rationale for selecting the no-further-action decision. The objectives of the DD for the UST 210 Site are:

1. To briefly describe the location, history and environmental setting of the site;
2. To summarize the results from previous investigations; and
3. To assess the risk to human health and the environment.

Data used to support the no-further-action decision for this site was obtained from the UST 210 Site Oklahoma Risk-Based Corrective Action (ORBCA) Assessment Report (Parsons ES, 1999a) and the First Quarter Monitoring Report for the UST 210 Site (Parsons ES 1999b).

#### **1.1 SITE LOCATION AND DESCRIPTION**

Tinker AFB is located in Oklahoma County in central Oklahoma, approximately 8 miles southeast of downtown Oklahoma City. Figure 1.1 shows the location of Tinker AFB. 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.

Tinker AFB was established in 1941 as an aircraft maintenance and supply depot, comprising 1,460 acres. Land has been acquired to the west, east and south. This land has been used over the years for additional depot facilities, support facilities, military housing and recreational facilities. Apart from the main Base, Tinker AFB operates 6 satellite areas. As of 1999, the base encompasses 5,277 acres and contains approximately 747 buildings. Tinker AFB presently serves as a worldwide repair depot for a variety of aircraft, weapons and engines.

*Introduction*

---

The UST 210 Site is located in the north central portion of Tinker AFB. As shown in Figure 1.2, the site is bounded by Arnold Street (formerly Second Street) and First Street to the north and south. Avenues "B" and "C" are the east and west site boundaries. The surrounding area within one-quarter mile of the site is Tinker AFB property. The closest Tinker AFB boundary is approximately 1,600 feet to the north (just south of I-40). The UST 210 Site contains several industrial facilities. These facilities include Building 210 (Hydraulic and Pneumatic Component Repair), Building 208 (Boiler Building) and Building 212 (Chemical Control for the Cooling Towers near Building 212). The Resource Conservation and Recovery Act (RCRA) regulated 290 Fuel Farm Site adjoins the eastern boundary of the UST 210 Site.

UST 210 and the affected media were defined and evaluated in accordance with the applicable requirements of the Oklahoma Administrative Code (OAC) 165:25-3 under Oklahoma Corporation Commission (OCC) case number 064-1897. Contamination at this site was confirmed during the excavation and removal of a 6,000 gallon UST (# 210) located adjacent to the southeast wall of Building 210. The tank was installed in 1956 to receive degreasing and component cleaning wastes. The UST was taken out of service in 1975, however, the tank was not excavated and removed until August 1997. Preceding the tank removal, approximately 1,500 gallons of mixed residual solvents and gasoline were found inside the tank. When the UST was excavated, free product was found floating on the groundwater inside the tank pit. Since free product and dissolved phase compounds including solvents were found in the groundwater, a remedial action was initiated. A twelve well vacuum enhanced pumping (VEP) treatment system was installed between Building 210 and Building 214 (located on the West Side of the 290 Fuel Farm Site) during the summer of 1998. Extraction wells were placed near Building 214 because free product had also been found along the west wall of Building 214 during a separate investigation. As shown in Figure 1.2, the VEP compound was constructed on the corner of First Street and B Avenue, immediately adjacent to the southwest corner of Building 214. The treatment system began free product, groundwater and soil vapor extraction operations in October 1998 (Parsons ES, 1999b).

### **1.1.1 Adjacent Land Uses**

The area surrounding the UST Site 210 consists of numerous on-base facilities. The closest occupied building to the tank release is Building 210, which is located just west and north of the former UST. The next nearest occupied buildings are Building 208 (Boiler Building) located approximately 300 feet northwest; Building 230 (552d Logistics Group Maintenance Complex) located approximately 300 feet south-southwest; and Building 214 (Engine Testing) located approximately 300 feet to the east. Building 201 and Building 3, both office buildings, are located, respectively, 500 feet west and 650 feet north of the UST site.

Several other UST sites are located near the UST 210 Site. The 290 Fuel Farm is just east and hydraulically upgradient of the UST 210 Site. Twenty-five USTs containing motor fuels, JP-4 jet fuel and aviation gas were abandoned in place at the 290 Fuel Farm. Highly contaminated soil and groundwater throughout the area has been attributed to these USTs. UST Site 14A is located south of Building 290 and west of Building 214, and consists of 6 fiberglass-reinforced plastic (FRP) USTs. Site 14B is situated south of Site 14A and contained a single 2,000-gallon FRP tank that was removed in 1995. Investigations of these two sites were terminated when it became apparent that the site contamination was intermingled with the multi-contaminants from the 290 Fuel Farm. Regulatory oversight of Sites 14A and 14B was transferred to the Oklahoma Department of Environmental Quality (ODEQ), the agency responsible for the cleanup at the 290 Fuel Farm site. UST Site 4 is located in a gravel-covered area to the east of "B" Avenue and north of Building 214. This site is located within the boundaries of the 290 Fuel Farm. This UST (# 347) was a 4,000-gallon, single-walled, FRP tank that contained discharge from an oil/water separator. Due to its location and proximity to the 290 Fuel Farm USTs, this site is now regulated as part of the RCRA investigation of the 290 Fuel Farm.

*Introduction*

---

### **1.1.2 Nearby Population**

The residential development nearest this site is located off-base approximately 2,500 feet north (across Interstate 40). This high-density residential development is in Midwest City and consists of both single family and multi-family housing. Several commercial business establishments are located in the area. The nearest on-base residential population, consisting of Air Force personnel, is located in the base housing facilities 2 miles west and southwest of the site. The base has 7 dormitories and 730 family housing units. Commercial on-base workers occupy the numerous buildings both on and around the site.

### **1.1.3 Surface and Groundwater Resources**

Tinker AFB is located within the Central Redbed Plains section of the Central Lowland Physiographic Province. Oklahoma County elevations range from about 850 feet to 1,400 feet above mean sea level (msl). The topography is characterized by near level to gentle rolling hills, broad flat plains and well-entrenched main streams. Secondary stream valleys may exhibit a sag and swale appearance indicating the erosion of residual soil. The ground surface at Tinker AFB varies in elevation from approximately 1,320 feet msl in the southeastern portion of the base to 1,190 feet msl in the northwestern portion of the base. Local relief is primarily the result of dissection by erosional activity and/or stream channel development (Parsons ES, 1999c).

The surface drainage on Tinker AFB is accomplished by overland flow of runoff to diversion structures, which then flow to area surface streams. Figure 1.3 shows the surface water drainage paths at Tinker AFB. Surface hydrology for Tinker AFB is dominated by Crutcho Creek, Kuhlman Creek, Soldier Creek and Elm Creek. Both Soldier Creek and Crutcho Creek are perennial streams. Soldier Creek, which would be intermittent at the base under natural conditions, is perennial due to discharges from the drainage feature and cooling towers associated with Building 3001. Soldier Creek flows into Crutcho Creek, which discharges into the North Canadian River, located approximately six miles north of Tinker AFB. Crutcho Creek and a tributary, Kuhlman Creek, drain most of the base. The northeastern portion of the base is drained by Soldier Creek, and the extreme southeastern portion of the base is drained by Elm Creek. Elm Creek and one small unnamed stream

*Introduction*

---

cross installation boundaries south of the main instrument runway. They generally do not receive significant quantities of base runoff due to site grading designed to preclude such drainage. Elm Creek discharges into Stanley Draper Lake, which is located less than one mile south of the southeastern border of the base (Parsons ES, 1999c).

An important source of potable groundwater for the Oklahoma City metropolitan area is the central Oklahoma aquifer system, which extends under much of central Oklahoma and includes water in the Garber Sandstone and Wellington Formation. The Garber Sandstone and the Wellington Formation portions of the central Oklahoma aquifer system are commonly referred to as the "Garber-Wellington aquifer" and are considered to be a single aquifer because these units were deposited under similar conditions. The nearby communities of Midwest City and Del City derive their water supplies from surface sources, but have wells using the aquifer in the event of an emergency. Industrial operations, individual homes, farm irrigation and small communities not served by municipal distribution systems depend on the Garber-Wellington aquifer. Several communities whose primary source of water is surface water, such as Oklahoma City, maintain well systems drilled into the Garber-Wellington as standby sources of water in the event of drought (Parsons ES, 1999c).

Tinker AFB lies within the limits of the Garber-Wellington groundwater basin. At the present time, Tinker AFB derives most of its water supply from this aquifer and supplements the supply by purchasing from the Oklahoma City Water. The closest Tinker AFB water supply well is well WS-32, which is located approximately one-half mile northwest of the site. All of Tinker AFB water supply wells, including Well WS-32, are producing from the production zone (PZ) of the Garber-Wellington Formation and are cased off from the Upper Saturated Zone (USZ) and the Lower Saturated Zone (LSZ) (Parsons ES 1999c).

## 1.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

### 1.2.1 History

In 1956, a 6,000 gallon UST was installed along the southeast wall of Building 210 to receive degreasing and component cleaning wastes generated from hydraulic and pneumatic control system refabrication operations. The tank was taken out of service in 1975. The tank was identified and investigated in January 1997. Following removal of approximately 1,500 gallons of mixed residual solvents and gasoline, the tank was excavated and removed in August 1997. There were several holes in the tank bottom and free product was floating on the groundwater within the tank pit. It was determined that the USZ was contaminated with fuel and solvent compounds. A twelve well VEP system was installed between Buildings 210 and 214 in the summer of 1998. Free product, dissolved phase, and vapor phase hydrocarbon recovery operations were initiated in October 1998 (Parsons ES, 1999a). Quarterly monitoring of the groundwater beneath the site began with baseline sampling at the end of September 1998 (immediately prior to startup) to evaluate the effectiveness of the remedial action.

In accordance with OAC 25-3-74, an ORBCA Tier 1/1A review of the site was performed in March 1999 (Parsons ES, 1999a). ORBCA assessments are conducted in conformance with the American Society for Testing and Materials (ASTM) Method E1739 for Risk-Based Corrective Action (RBCA).

The ORBCA assessment concluded:

1. Dermal contact with benzene in the shallow groundwater by construction workers is the only pathway which exceeds Tier 1 and Tier 1A Risk Based Screening Levels (RBSLs). However, the well which exceeds Tier 1/1A RBSLs is installed near the former UST 21407 which collected flow from an oil/water separator inside of Building 214. This well is not actually within the boundaries of the UST 210 site. Several fuel releases have been identified in the soil and groundwater around Building 214 particularly along the west side of the building. Also, free product has been found on the west side of Building 214.
2. The major sources of fuel contamination in the area are near Building 214 and not within the boundaries of the UST 210 site.

The ORBCA Assessment recommended the following actions:

1. UST 210 site should be closed under Tier 1/1A guidelines in accordance with OAC 165:25-3-79.
2. The VEP system should continue operating in order to reduce contaminant levels at Buildings 214 and 210.
3. Regulatory authority for overseeing cleanup of the solvent contaminated groundwater at the Building 210 site should be transferred to ODEQ, the agency responsible for cleanup (monitoring and remediation), at the 290 Fuel Farm Site.

Based on the results of the first quarterly monitoring report (Parsons ES, 1999b), the contaminants within the zone of influence of the VEP network are contained and their levels are being reduced. The wells containing free-phase product and the highest concentrations of dissolved phase contaminants are located near Building 214. This contamination appears to be associated with product released from the 290 Fuel Farm Site. Monitoring and VEP wells located in the direct vicinity of the former UST, located near Building 210, contain relatively low levels of dissolved hydrocarbon and solvent contamination.

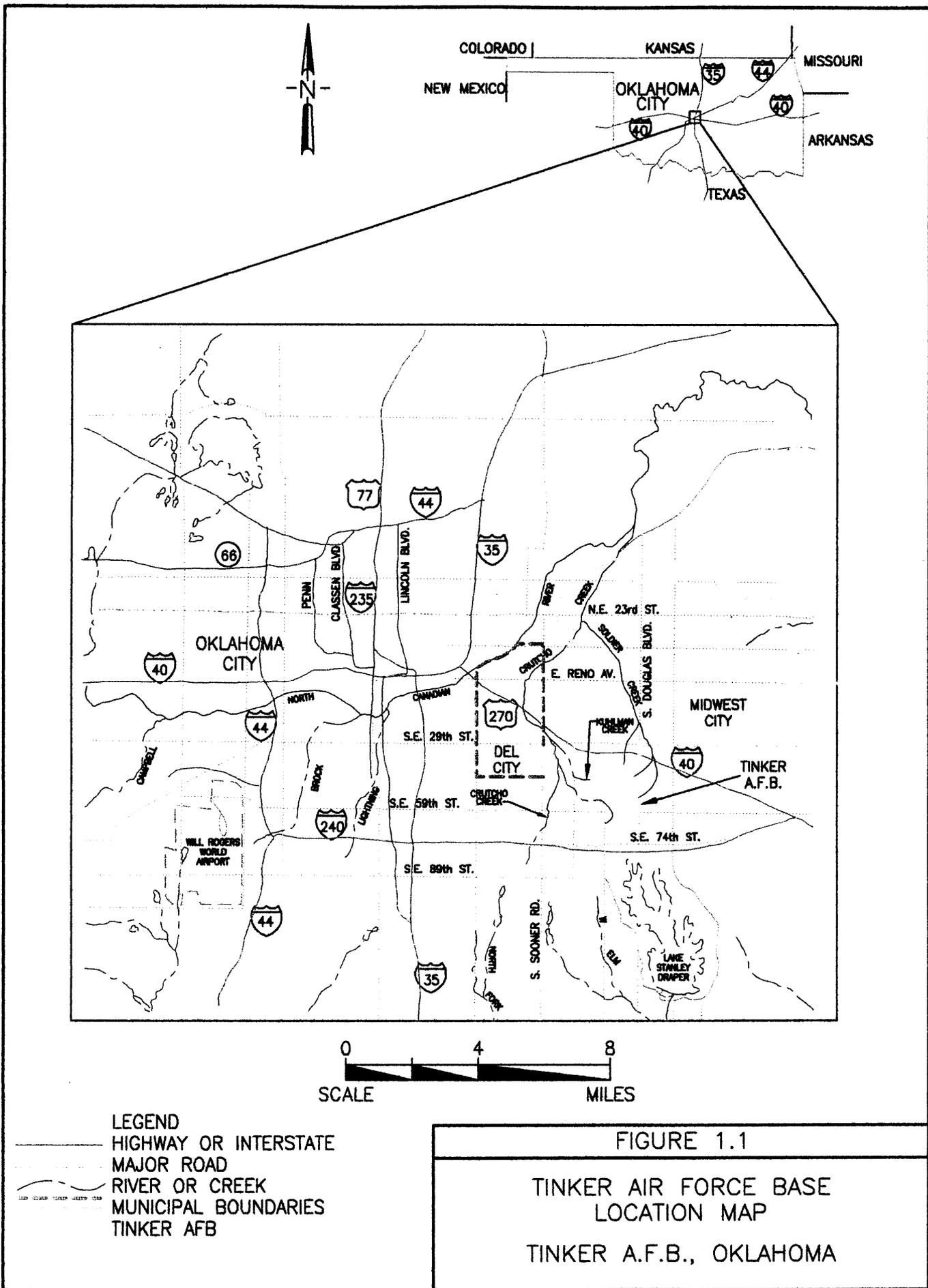
### **1.2.2 Regulatory Agency Activities**

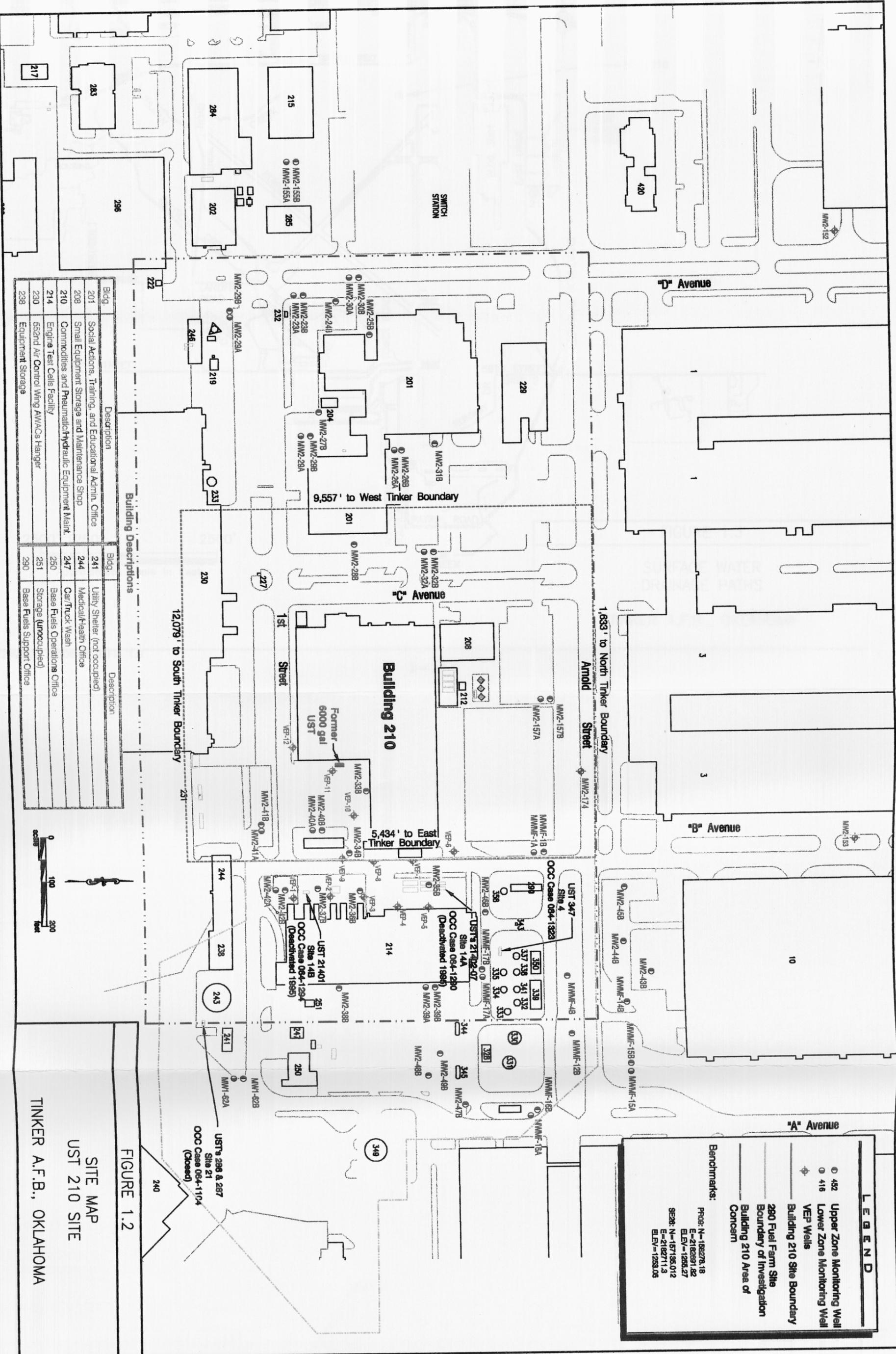
Following review of the UST 210 Site ORBCA Report (Parsons ES, 1999a) and subsequent quarterly monitoring, the OCC concurred with the recommendations made in the ORBCA Assessment and closed the case on October 13, 1999, in accordance with OAC 165:25-3-79.

The groundwater regulation for the site was released from OCC primary oversight and transferred to ODEQ for primary oversight. Presently, the groundwater beneath UST Site 210 is within an Installation Restoration Program (IRP) groundwater management unit (GWMU) at Tinker AFB. The GWMU is managed in conformance with RCRA requirements. As such, the groundwater beneath the site is still regulated by the ODEQ.

### **1.3 COMMUNITY PARTICIPATION**

There has been no community involvement in the ORBCA investigation conducted at the UST 210 Site at Tinker AFB, Oklahoma.





Bldg.	Description	Bldg.	Description
201	Social Actions, Training, and Educational Admin. Office	241	Utility Shelter (not occupied)
208	Small Equipment Storage and Maintenance Shop	244	Medical/Health Office
210	Commodities and Pneumatic/Hydraulic Equipment Maint.	247	Car/Truck Wash
214	Engine Test Cells Facility	250	Base Fuels Operators Office
230	552nd Air Control Wing AWACS Hanger	251	Storage (unoccupied)
238	Equipment Storage	290	Base Fuels Support Office

**LEGEND**

- 492 Upper Zone Monitoring Well
- 416 Lower Zone Monitoring Well
- ◆ VEP Wells
- Building 210 Site Boundary
- 290 Fuel Farm Site Boundary of Investigation
- Building 210 Area of Concern

**Benchmarks:**

PROB: N=198278.18  
 E=2162391.82  
 ELEV=1258.27

SE28: N=187188.012  
 E=2162711.3  
 ELEV=1258.05

FIGURE 1.2

SITE MAP  
 UST 210 SITE

TINKER A.F.B., OKLAHOMA

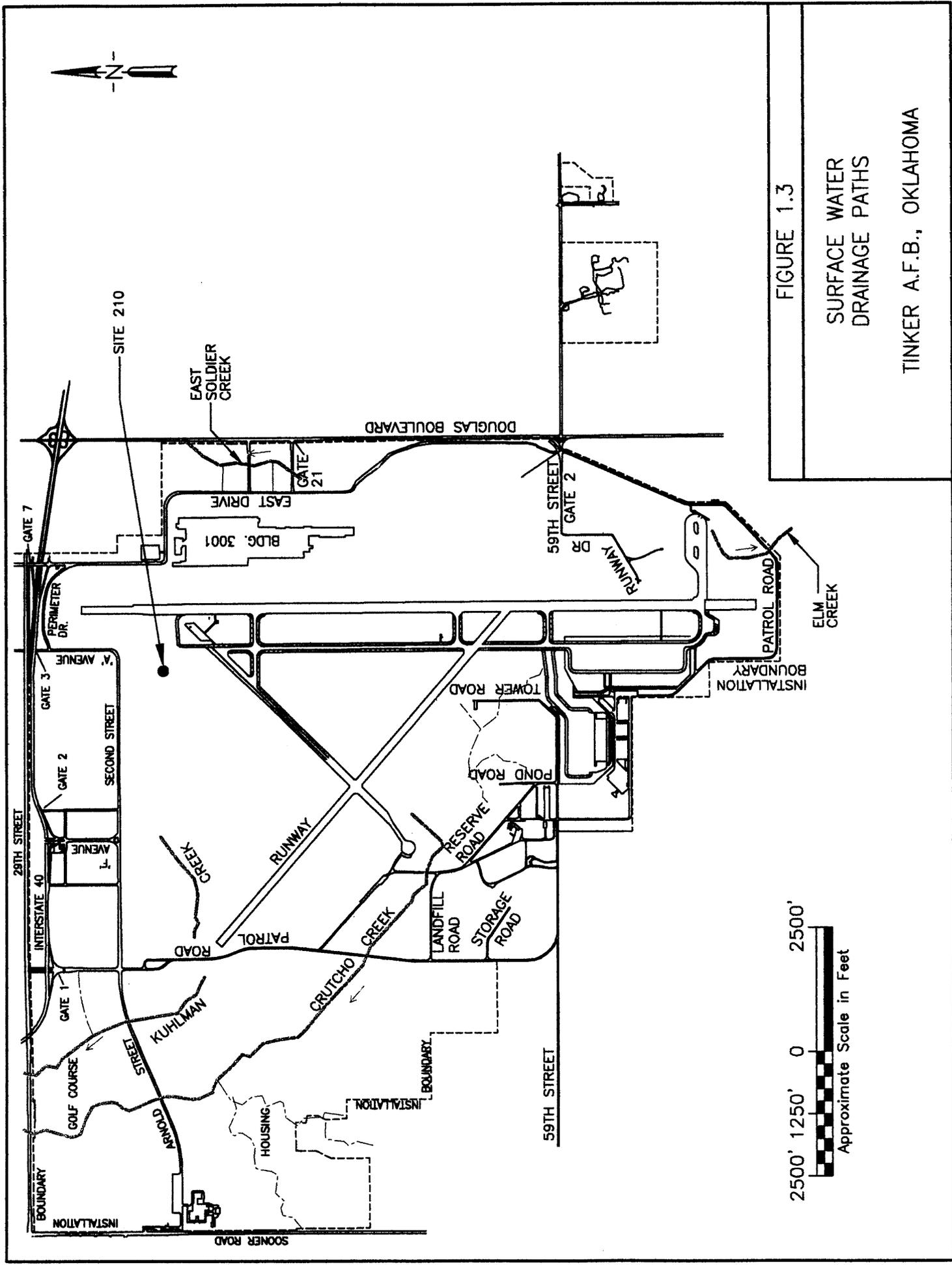


FIGURE 1.3

SURFACE WATER  
DRAINAGE PATHS

TINKER A.F.B., OKLAHOMA

## **SECTION 2**

### **CURRENT SITE STATUS**

#### **2.1 CLIMATOLOGY**

The climate at Tinker AFB is characterized by long, hot summers (occasional droughts of varying duration occur) and comparatively mild winters. During the summer months, average daily temperatures range from approximately 66 to 94 degrees Fahrenheit (°F). During the winter months, average daily temperatures range from approximately 26°F to 54°F. Maximum precipitation generally occurs in May and the average annual precipitation for the region is 40.45 inches. The average evaporation rate is approximately 50 inches. The prevailing wind direction is southerly. However, northerly and southerly winds occur with about equal frequency from December to March. The average monthly wind speed varies from 12 miles per hour in July and August to 16 miles per hour in March and April. Strong gusty winds occur with thunderstorms and low-pressure systems that migrate from west to east during winter and spring. Severe storms occur more frequently in the spring, but can occur in any month of the year (Parsons ES, 1999c).

#### **2.2 GEOLOGY AND SOIL**

The surface soils of the installation area are of three predominant types: residual, alluvial and urban land. The predominant soils are the Stephenville-Darsil, Renthen-Urban Land Complex, Kirkland-Urban Land Complex and Urban Land (USDA, 1996). Geologic units that outcrop at various locations within the Tinker AFB region are composed of Quaternary alluvium, terrace deposits and the bedrock units which include the Hennessey Group, the Permian Garber Sandstone and Wellington Formation. Quaternary alluvium, present along portions of Crutcho Creek and Soldier Creek, consists of unconsolidated interfingering lenses of sand, silt, clay and gravel. The terrace deposits, which were deposited by ancient streams, consist mostly of lenticular beds of sand, silt, clay and gravel. The bedrock units are composed of a sequence of sandstones, siltstones and shales. These formations are about 900 feet thick (Parsons ES, 1999c).

Subsurface soils around the UST 210 Site generally consist of reddish brown clays, silty clays and sandy clays to a depth of approximately 25 feet below ground surface (bgs). The Garber Sandstone is encountered at depths ranging from 5 to 10 feet bgs underneath the residual soils. The lithology of the Garber Sandstone immediately beneath the site consists of a series of red, poorly sorted, fine grained sands and weakly cemented sandstones with interbedded red clays and silty clays that are slightly to moderately plastic and soft to hard (Parsons ES, 1999a).

### **2.2.1 Soil Contamination**

Soil samples were collected during UST removal activities and the installation of monitor wells and recovery wells. A total of 92 soil samples were collected from the borings and wells. Figure 2-1 illustrates the locations of all the soil boring and wells installed at the UST 210 Site, as well as, the locations of the samples collected during tank excavation. Samples were analyzed for Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs), Total Petroleum Hydrocarbons (TPH), Diesel Range Organics (DRO), Gasoline Range Organics (GRO)) and metals. This data was submitted to the Air Force Center for Environmental Excellence (AFCEE) under the Environmental Resources Program Information Management System (ERPIMS) data management program. The ERPIMS site identification code number is eight. Table 2-1 summarizes the analytical data for the OCC chemicals of concern (COC): benzene, toluene, ethylbenzene, xylene (BTEX), naphthalene and TPH (GRO and DRO) (Parsons ES, 1999a).

BTEX, TPH and naphthalene concentrations were detected in 19 of the 92 soil samples. The OCC regulated COCs were almost all below laboratory detection limits. The highest concentrations of COC's are located in the vicinity of the USTs near Building 214. In addition to the fuel contaminants, solvents were detected in 18 of the 92 soil samples. The highest concentrations of solvents are centered at the USTs associated with Building 214. All of the samples collected from the former UST 210 tank pit and the monitoring and extraction wells near Building 210 had concentrations below laboratory detection limits for BTEX, TPH and naphthalene. However, trichloroethylene (TCE) was

detected in the UST 210 tank pit water during the UST excavation and removal (Parsons ES, 1999a).

## **2.3 HYDROGEOLOGY**

The groundwater conceptual model of Tinker AFB was formed by the integration of geologic and hydrologic data from across the base. The hydrogeologic system at Tinker AFB is complex, and this model provides both an approximation of depth to water and an estimated direction of groundwater movement. The groundwater and hydrogeologic system in the vicinity of the UST 210 Site has been investigated and is evaluated as part of a basewide groundwater study by the IT Corporation (IT, 1999).

Approximately 1,150 groundwater monitoring wells have been installed on the base during remedial investigations. The conceptual hydrologic model, based largely on data from these wells, divides the groundwater system under Tinker AFB into three principal aquifer zones: the USZ, LSZ and the PZ. At Tinker AFB the PZ starts at an average depth of 200 or 250 feet bgs. In addition, a less extensive zone, the Hennessey saturated zone (HSZ) has also been identified above the USZ on a portion of the base. Numerous shallow thin saturated beds of siltstone and sandstone may exist within the HSZ throughout the base (Parsons ES, 1999c).

The USZ and LSZ are recognized basewide. The USZ exists mainly under unconfined water table conditions, although subunits appear to be partially confined locally. The USZ is an unconfined aquifer at the site and its average depth is approximately 13 feet bgs with groundwater flow to the northwest. The LSZ is a confined aquifer at the site and its average depth is approximately 53 feet bgs with groundwater flow to the southwest. A clay/silt layer, approximately 15 feet thick, acts as an aquitard that separates the USZ from the LSZ, and the LSZ from the PZ in the vicinity of the UST 210 Site (Parsons ES, 1999a).

### **2.3.1 Groundwater Contamination**

As part of the site investigation, the 12 newly installed VEP recovery wells and 18 existing monitoring wells were sampled and analyzed for VOC, SVOC, TPH (GRO and

DRO) and metals. Figure 2-1 illustrates the locations of all monitoring wells installed at the UST 210 Site. BTEX and TPH concentrations were detected in 20 of the 26 groundwater samples collected from the USZ. In the LSZ, TPH-DRO was detected in 4 of the 5 wells at very low levels. The highest levels of fuel compounds detected are located in the USZ near Building 214. Groundwater and tank pit water samples collected in the vicinity of Building 210 were below laboratory detection limits for BTEX, TPH and naphthalene. However, various solvents such as TCE, tetrachloroethylene (PCE), 1,1-dichloroethene (DCE) and 2-butanone have been detected in groundwater and the tank pit water collected in the vicinity of the former Building 210 UST. Table 2-2 summarizes the analytical data for the OCC chemicals of concern (COC): BTEX, naphthalene and TPH (GRO and DRO).

Groundwater contamination in the USZ appears to have multiple sources in the area of UST 210. In addition, there are no residential receptors or private/domestic wells within 2,500 feet of the site. Because of these two factors, the groundwater in the area is being evaluated within a GWMU area regulated by ODEQ.

## **2.4 SURFACE WATER**

Surface water at the UST 210 Site drains toward Kuhlman Creek located approximately 1/2 mile southwest of the site. No surface water or sediment samples were collected as part of the UST 210 Site investigation.

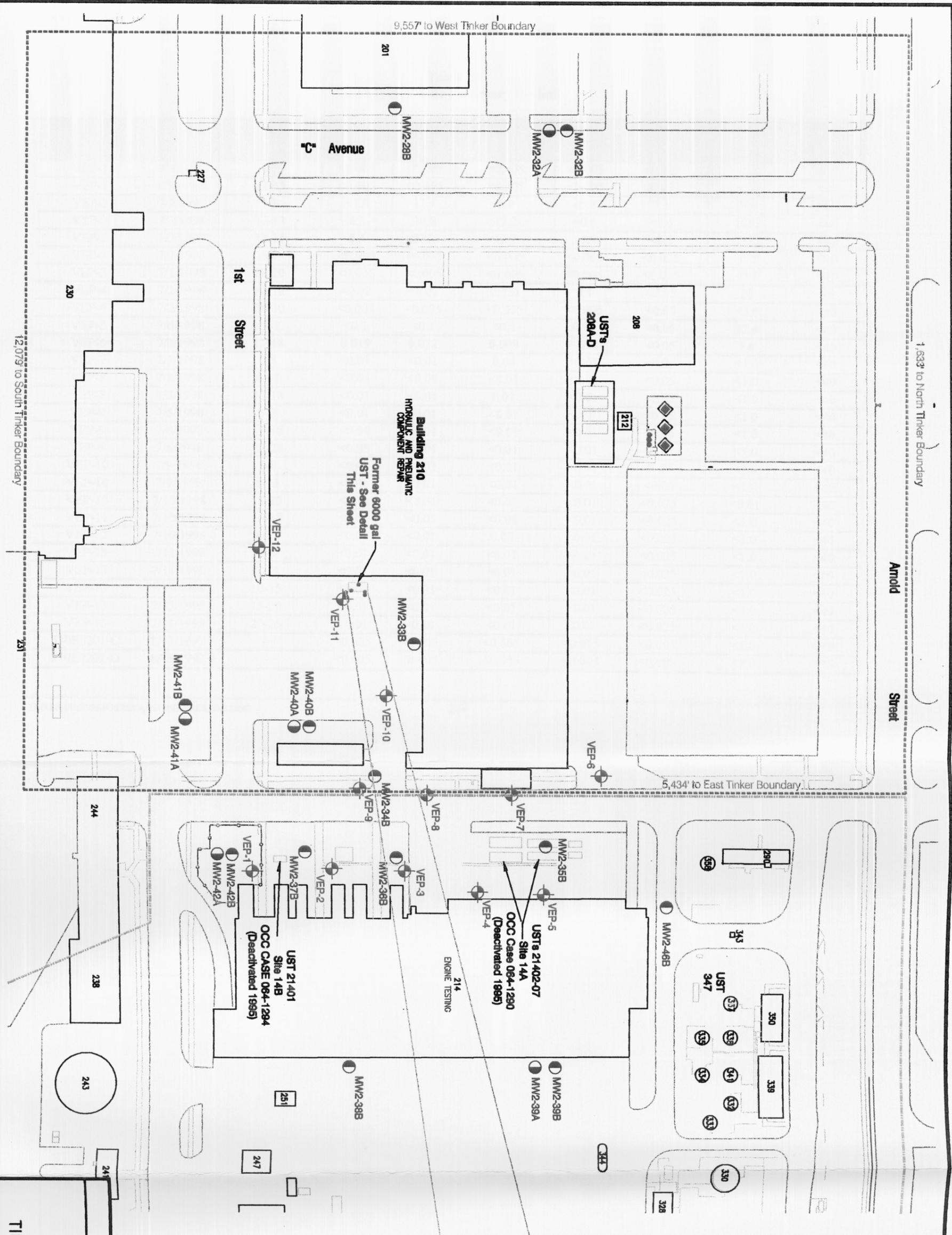
## **2.5 RECEPTORS**

Human receptors in the vicinity of UST 210 Site were divided into two groups, on-base and off-base receptors. Base residential housing is located approximately two miles west and southwest of the site. The base dormitories are located within 2 miles of the site. Commercial on-base workers occupy the various buildings around the site. The closest occupied building to the site is Building 210. The closest off-base residence is located 2,500 feet north of the site in a residential area of Midwest City.

*Current Site Status*

---

There are no private water supply wells within a one-half mile radius of the site. Tinker AFB water supply well No. 32 (WS-32) is located approximately 0.6 miles northwest of the site. This supply well is cased off from the USZ and LSZ and is completed from the production zone of the Garber-Wellington, which is a confined aquifer. This supply well is hydraulically upgradient from the groundwater contamination in the USZ, the LSZ, and the PZ.



**LEGEND**

- USZ Monitoring Well
- LSZ Monitoring Well
- VEP Extraction Well
- UST Sample Location
- UST 210 Site Investigation Boundary
- 290 Fuel Farm Site Investigation Boundary

**Benchmarks:**

FR09: N=18278.18  
E=2182691.82  
ELEV=1255.27

SE26: N=157135.012  
E=2182711.3  
ELEV=1253.05

**UST Detail**  
Approx. Scale: 1"=20'

The UST Detail diagram shows a rectangular former 6000-gal UST within a larger area labeled 'Limits of tank basin over excavation'. The UST is divided into four quadrants labeled A, B, C, and D. The coordinates for these points are: A (210E0102), B (210E0101), C (210E0201), and D (210E0202). A point E (210G0101) is also indicated.

FIGURE 2.1

DETAILED SITE MAP  
UST 210 SITE

TINKER A.F.B., OKLAHOMA

Table 2.1  
Analytical Data Summary for Soil

MW No./Sample Location	Sampling Date	Sample Depth [ft.]	Benzene [mg/kg]	Toluene [mg/kg]	Ethylbenzene [mg/kg]	Xylene [mg/kg]	Naphthalene [mg/kg]	TPH/GRO [mg/kg]	TPH/DRO [mg/kg]
VEP-1	6/30/1998	7-8	<0.005	<0.005	<0.005	<0.005	<0.025	<5.0	<40
VEP-1	6/30/1998	12-13	<0.005	<0.005	<0.005	<0.005	<0.025	<5.0	<40
VEP-2	7/2/1998	7-8	<1.0	11.4	8.8	45.8	1.5	994	1472
VEP-2	7/2/1998	12-13	6.5	30.8	12.2	60.6	<0.5	1092	<40
VEP-2	7/2/1998	13-15	8.3	27.2	12.2	58.9	<0.5	1172	<40
VEP-3	7/1/1998	5-7	<0.005	<0.005	<0.005	<0.005	<0.025	<5.0	<40
VEP-3	7/1/1998	18-20	<0.005	<0.005	<0.005	<0.005	<0.025	<5.0	<40
VEP-4	7/2/1998	10-12	<0.02	<0.02	0.056	0.4	<0.05	20	66
VEP-4	7/2/1998	28-30	<0.005	<0.005	<0.005	<0.005	<0.05	<5.0	<40
VEP-5	7/6/1998	8.5-13	<0.1	<0.1	<0.1	0.37	<0.05	12.4	<40
VEP-6	7/2/1998	13-18	0.019	0.022	0.009	0.024	<0.05	1.6	<40
VEP-7	7/7/1998	0-3	<0.01	<0.01	0.04	<0.01	<0.05	<1.0	<40
VEP-8	7/8/1998	8-13	<0.01	<0.01	<0.01	<0.01	<0.05	<1.0	<40
VEP-8	7/8/1998	13-18	<0.01	<0.01	0.01	<0.01	<0.05	<1.0	<40
VEP-9	7/8/1998	0-3	<0.01	<0.01	<0.01	<0.01	<0.05	<1.0	<40
VEP-9	7/8/1998	13-18	<0.01	<0.01	<0.01	<0.01	<0.05	<1.0	<40
VEP-9	7/8/1998	23-28	<0.01	<0.01	<0.01	<0.01	<0.05	<1.0	<40
VEP-10	7/9/1998	3-8	<0.01	<0.01	<0.01	<0.01	<0.05	<1.0	<40
VEP-10	7/9/1998	8-13	<0.01	<0.01	<0.01	<0.01	<0.05	<1.0	<40
VEP-10	7/10/1998	18-23	<0.01	<0.01	<0.01	<0.01	<0.025	<0.01	<40
VEP-11	7/10/1998	13-18	<0.01	<0.01	<0.01	<0.01	<0.025	<1.0	<40
VEP-12	7/10/1998	8-13	<0.01	<0.01	0.08	<0.01	<0.025	<1.0	<40
VEP-13	7/11/1998	0-5	<0.01	<0.01	<0.01	<0.01	<0.025	<1.0	<40
VEP-13	7/11/1998	5-10	<0.01	<0.01	<0.01	<0.01	<0.025	<1.0	<40
VEP-13	7/11/1998	10-15	<0.01	<0.01	<0.01	<0.01	<0.025	<1.0	<40
VEP-13	7/11/1998	15-20	<0.01	<0.01	<0.01	<0.01	<0.025	<1.0	<40
VEP-13	7/11/1998	20-25	<0.01	<0.01	<0.01	<0.01	<0.025	<1.0	<40
210E0201-C	8/13/1997	--	<0.005	<0.005	<0.005	<0.005	<0.005	<1.0	<1.0
210E0202-D	8/13/1997	--	<0.005	<0.005	<0.005	<0.005	<0.005	<1.0	<1.0

Table 2.1 (Continued)  
Analytical Data Summary for Soil

MW No./Sample Location	Sampling Date	Sample Depth [ft.]	Benzene [mg/kg]	Toluene [mg/kg]	Ethylbenzene [mg/kg]	Xylene [mg/kg]	Naphthalene [mg/kg]	TPH/GRO [mg/kg]	TPH/DRO [mg/kg]
210E0101-B	8/13/1997	--	<0.005	<0.005	<0.005	<0.005	<0.005	<1.0	<1.0
210E0102-A	8/13/1997	--	<0.005	<0.005	<0.005	<0.005	<0.005	<1.0	<1.0
MW2-28B	12/20/1993	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-28B	12/20/1993	9-10	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-28B	12/20/1993	12-13	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-32A	12/3/1993	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-32A	12/3/1993	9-10	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-32A	12/3/1993	11-12	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-32B	12/20/1993	3-4	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-32B	12/20/1993	9-10	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-32B	12/20/1993	11-12	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-33B	12/17/1993	3-4	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-33B	12/17/1993	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-33B	12/17/1993	6-7	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-33B	12/17/1993	14-15	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-35B	12/14/1993	0-1	<0.005	<0.005	<0.005	<0.005	<0.33	130	NA
MW2-35B	12/14/1993	3-4	<0.005	<0.005	<0.005	0.002	<0.33	20	NA
MW2-35B	12/14/1993	8-9	<0.005	0.095	0.31	2.2	1.4	730	NA
MW2-35B	12/14/1993	11-12	2.5	45	22	120	12	5400	NA
MW2-35B	12/14/1993	14-15	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-36B	11/11/1993	3-4	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-36B	11/11/1993	7-8	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-36B	11/11/1993	12-13	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-36B	11/11/1993	18-19	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-36B	11/11/1993	23-24	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-36B	11/11/1993	27-28	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-38B	12/15/1993	2-3	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-38B	12/15/1993	7-8	<0.005	<0.005	0.0013	0.0011	<0.33	17	NA
MW2-38B	12/15/1993	9-10	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA

Table 2.1 (Continued)  
Analytical Data Summary for Soil

MW No./Sample Location	Sampling Date	Sample Depth [ft.]	Benzene [mg/kg]	Toluene [mg/kg]	Ethylbenzene [mg/kg]	Xylene [mg/kg]	Naphthalene [mg/kg]	TPH/GRO [mg/kg]	TPH/DRO [mg/kg]
MW2-38B	12/15/1993	10-11	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-39A	11/30/1993	2-3	<0.005	0.0013	<0.005	<0.005	<0.33	35	NA
MW2-39A	11/30/1993	9-10	<0.005	<0.005	0.001	0.0012	0.92	130	NA
MW2-39A	11/30/1993	12-13	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-39A	11/30/1993	19-20	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-39A	11/30/1993	23-24	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-39B	12/13/1993	4-5	0.0022	0.035	0.013	0.15	0.16	12	NA
MW2-39B	12/13/1993	7-8	0.0021	12	4.9	42	2.8	1000	NA
MW2-39B	12/13/1993	13-14	<0.005	<0.005	<0.005	<0.005	0.12	98	NA
MW2-39B	12/13/1993	19-20	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-39B	12/13/1993	23-24	<0.005	<0.005	<0.005	0.002	<0.33	<10	NA
MW2-39B	12/13/1993	25-26	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-40A	12/1/1993	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-40A	12/1/1993	8-9	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-40A	12/1/1993	13-14	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-40B	12/17/1993	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-40B	12/17/1993	9-10	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-40B	12/17/1993	13-14	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41A	12/2/1993	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41A	12/2/1993	11.5-12.5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41A	12/2/1993	17-18	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41A	12/2/1993	22-23	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41A	12/2/1993	26-27	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41B	12/30/93	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41B	12/30/93	8-10	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41B	12/30/93	12-13	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41B	12/30/93	17-18	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-41B	12/30/93	23-24	<0.005	<0.005	<0.005	<0.005	<0.33	33	NA
MW2-41B	12/30/93	25-26	<0.005	<0.005	<0.005	<0.005	<0.33	33	NA

Table 2.1 (Continued)  
Analytical Data Summary for Soil

MW No./Sample Location	Sampling Date	Sample Depth [ft.]	Benzene [mg/kg]	Toluene [mg/kg]	Ethylbenzene [mg/kg]	Xylene [mg/kg]	Naphthalene [mg/kg]	TPH/GRO [mg/kg]	TPH/DRO [mg/kg]
MW2-42A	1/29/1993	4-5	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-42A	1/29/1993	9-10	<0.005	<0.005	<0.005	<0.005	<0.33	<10	NA
MW2-46B	11/2/1993	2-3	<0.005	<0.005	0.002	0.0039	<0.33	190	NA
MW2-46B	11/2/1993	6-7	<0.005	0.0023	0.023	0.0039	0.98	230	NA
MW2-46B	11/2/1993	12-13	<0.005	<0.005	0.001	0.001	<0.33	<10	NA

Table 2.2  
Analytical Data Summary for Groundwater

MW No./Sample Location	Installation Date	Screen Interval	Sampling Date	Water Level	Benzene [mg/l]	Toluene [mg/l]	Ethylbenzene [mg/l]	Xylene [mg/l]	Naphthalene [mg/l]	TPH/GRO [mg/l]	TPH/DRO [mg/l]
MW2-28B	12/20/1993	6-16	9/18/1998	10.58	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.048
MW2-32A	12/15/1993	56-65.7	9/18/1998	51.92	<0.025	<0.025	<0.025	<0.025	0.014	<5.0	<0.052
MW2-32B	12/20/1993	7-17	9/18/1998	11.98	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	<0.048
MW2-33B	12/17/1993	7-17	9/18/1998	10.03	<0.005	<0.005	<0.005	<0.005	0.001	<5.0	<0.048
MW2-34B	12/17/1993	6-16	9/18/1998	8.91	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	<0.048
MW2-35B	12/14/1993	6-16	9/18/1998	9.54	<0.005	<0.005	<0.005	<0.005	<0.005	--	0.63
MW2-36B	11/12/1993	18-28	9/18/1998	8.32	<0.005	<0.005	<0.0005	<0.005	<0.005	--	0.069
MW2-37B	12/14/1993	8-18	9/18/1998	10.82	16	9.3	0.45	2.6	0.23	--	1200000
MW2-38B	12/15/1993	7-17	9/18/1998	9.3	0.12	2.2	0.3	0.96	<0.250	--	6.4
MW2-39A	12/16/1993	51-61	9/18/1998	53.56	0.001	<0.005	<0.005	<0.005	<0.005	--	0.057
MW2-39B	12/13/1993	20-30.5	9/18/1998	9.63	<0.005	<0.005	<0.005	<0.005	<0.005	--	0.075
MW2-40A	12/20/1993	58-68	9/18/1998	52.4	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	0.26
MW2-40B	12/17/1993	14-24	9/18/1998	9.55	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	0.14
MW2-41A	12/20/1993	52-62	9/18/1998	50.62	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	1.4
MW2-41B	12/30/1993	24-34	9/18/1998	12.52	<0.005	<0.005	<0.005	<0.005	<0.005	<5.1	0.6
MW2-42A	12/7/1993	50.5-60.5	9/18/1998	55.11	<0.005	<0.005	<0.005	<0.005	<0.005	--	0.054
MW2-42B	12/15/1993	5-15	9/18/1998	13.08	<0.005	<0.005	<0.005	<0.005	<0.005	--	<0.048
MW2-46B	11/2/1993	unknown	9/18/1998	7.92	<0.025	<0.025	<0.025	<0.025	0.17	--	1300000
VEP-1	6/30/1998	11-21	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	<0.048
VEP-2	7/2/1998	12-22	9/17/1998	--	2.8	1.6	0.026	0.4	<0.005	8.2	4.6
VEP-3	7/1/1998	13-23	9/17/1998	--	0.012	0.006	<0.005	<0.005	<0.005	<5.1	2.2
VEP-4	7/2/1998	14-34	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.1	3.3
VEP-5	7/16/1998	14-34	9/17/1998	--	0.008	0.002	<0.005	<0.005	<0.005	<5.0	2
VEP-6	7/16/1998	14-34	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	4.6
VEP-7	7/7/1998	12-27	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	9.3
VEP-8	7/8/1998	12-22	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	4.4
VEP-9	7/8/1998	12-22	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	1.2
VEP-10	7/9/1998	14-34	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	0.8
VEP-11	7/9/1998	14-34	9/17/1998	--	<0.005	<0.005	<0.005	<0.005	<0.005	<5.0	0.9
VEP-12	7/9/1998	12-22	9/17/1998	--	0.003	0.004	0.002	0.003	<0.005	<5.0	6.2
210G0101-E	8/13/1997	--	8/13/1997	--	<0.005	<0.005	<0.005	<0.005	<0.005	3	1

### **SECTION 3**

#### **RISK DETERMINATION**

RBSLs were developed for commercial and construction workers. Soil and groundwater pathways for the on-base and off-base resident child and resident adult populations were considered incomplete and were not evaluated. Sub-surface soil and shallow groundwater inhalation scenarios for the commercial worker were considered. The construction worker was evaluated for ingestion, inhalation of vapors and dermal contact with soil and groundwater. The risk analysis indicated that dermal contact with benzene in shallow groundwater by construction workers is the only pathway that exceeds Tier 1 and Tier 1A RBSLs. However, the one well that exceeds Tier 1/1A RBSLs is installed near UST 214 at Building 214 and is not actually within the boundaries of the Building 210 site (Parsons ES, 1999a).

## SECTION 5

### REFERENCES

- IT Corporation, September 1999, Basewide Non-NPL Groundwater Phase II RCRA Facility Investigation for Appendix I and II SWMUs, Addendum 1, Volume 1-3, Tinker Air Force Base, Oklahoma.
- J.A. Jones Environmental Services Company, September 1997, Tank Closure Report for UST 210, Tinker Air Force Base, Oklahoma.
- Parsons ES, March 1999a, Oklahoma Risk-Based Corrective Action Tier 1/1A Summary Report for UST 210 Site (Building 210), Tinker Air Force Base, Oklahoma.
- Parsons ES, June 1999b, First Year, First Quarter Free Production Removal and Monitoring Report, 210 Site (Building 210), Tinker Air Force Base, Oklahoma.
- Parsons ES, April 1999c, Revision 1, Site Investigation Workplan for the Southeast Quadrant Wastewater Collection System, Tinker Air Force Base, Oklahoma.
- Tetra-Tech RCS, 1998, Final Report for the Installation of Recovery System, Well Field, and Recovery Compound Construction for the UST 210 Remediation Network, Tinker Air Force Base, Oklahoma.
- USDA, 1996, Draft-Preliminary Revised Soil Maps and Soil Designations Atlas Sheet #25 for Oklahoma County, Oklahoma.

**APPENDIX A**

**CLOSURE NOTICE**

BOB ANTHONY  
Commissioner

ED APPLE  
Commissioner

DENISE A. BODE  
Commissioner



OKLAHOMA CORPORATION COMMISSION  
PETROLEUM STORAGE TANK DIVISION  
(405) 521-4683 FAX: (405) 521-4945

JIM THORPE BLDG, ROOM 238 • P.O. BOX 52000-2000 • OKLAHOMA CITY, OKLAHOMA 73152-2000

October 13, 1999

Case ID # 064-1897  
Facility D # 55-08120  
Final Closure

CERTIFIED MAIL, RETURN RECEIPT REQUESTED  
CERTIFICATE NUMBER Z 228 414 391

OC-ALC/EMR  
Attn: Ms. Cathy Scheirman  
7701 2<sup>nd</sup> Street, Suite 204  
Tinker AFB, Oklahoma 74145-9100

RE: UST 210  
Building 210  
Tinker AFB, Oklahoma

Dear Ms. Scheirman:

Based upon the review of the Oklahoma Risk-Based Corrective Action Report, this case is closed. If in the future, levels of Chemicals of Concern are discovered to exceed those determined appropriate for this site, the case will be reopened. A copy of this letter is being sent to your consultant.

If you have any questions, please discuss them with your consultant or call me at (405) 521-3504 between 8:00 a.m. and 4:30 p.m. Monday through Friday. Please reference the appropriate OCC Facility Number and Case Number on all correspondence.

Sincerely,

Joseph E. Lopez  
Project Environmental Analyst

JEL/LB:la

cc: Parsons Engineering Science, Inc.  
Attn: Mr. John Osweiler  
5600 Liberty Parkway, Suite 700C  
Midwest City, Oklahoma 73110-2835

NOTE: The applicable Corporation Commission rule is found in the Oklahoma Administrative Code at 165:25-3-79. If you need a copy, please call us and we will send you one.