RCRA Part B Permit Renewal Application for Operation of the Hazardous Waste Storage Facility at Tinker Air Force Base, OK
EPA ID Number OK1571724391

Submitted by:

72 ABW/CC

72d Air Base Wing
Building 460, 7460 Arnold Street
Tinker AFB, OK 73145

Contract No.
FA8903-08-D-8778-0099, CDRL A015
Project: WWYK101178

February 2012

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Acronyms

552 ACW/CP	552nd Air Control Wing/Command Post
72 ABW/CC	72d Air Base Wing/Base Commander
72 ABW/CE	72d Air Base Wing/Civil Engineer
72 ABW/CEA	72d Air Base Wing/Civil Engineer/Asset Management Division
72 ABW/CEAN	72d Air Base Wing/ Civil Engineer/Natural Infrastructure Management Branch
72 ABW/CECOF	72d Air Base Wing/Liquid Fuels
72 ABW/CEF	72d Air Base Wing/Fire Department
72 ABW/CEPR	72d Air Base Wing/Environmental Restoration Office
72 ABW/CEX	72d Air Base Wing/Readiness Division
72 AMDS/SGBP	72d Aerospace Medicine Squadron/Bioenvironmental Engineering
72 OSS	72d Air Base Wing/Base Operations
72 SFS/CC	72d Security Forces Squadron/Commander
AES	atomic emission spectrometry
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AFCESA	Air Force Civil Engineer Support Agency
AFMC	Air Force Material Command
AOCs	Areas of Concern
ASTs	above-ground storage tanks
AWACS	Airborne Warning and Control System
BGS	below ground surface
BTEX	benzene, toluene, ethyl benzene, and xylene
BX	Base Exchange
CA	Corrective Action
CAOs	corrective action objectives
CAS	Corrective Action Strategy
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CGMU	Contaminated Groundwater Monitoring Unit
CHEMTREC	Chemical Transportation Emergency Center
CMS	Corrective Measures Study
COA	Central Oklahoma Aquifer
CRP	Compliance Restoration Program
CSM	conceptual site model
CVOCs	chlorinated organic compounds
DCA	1,2-dichloroethane
DCE	cis-1,2-dichloroethene
DD	decision document
DERP	Defense Environmental Restoration Program
DLA	Defense Logistics Agency

DMM	discarded military munitions
DoD	Department of Defense
DOT	U.S. Department of Transportation
DPE	dual-phase extraction
DQOs	data quality objectives
EPA	Environmental Protection Agency
ERPIMS	Environmental Restoration Program Information Management System
ESAR	EIG Small Arms Range
ESD	explanation of significant difference
FFA	Federal Facilities Agreement
FS	feasibility study
FTMF	fuel truck maintenance facility
GC	Gas Chromatograph
gpm	gallons per minute
GTS	Geostatistical Temporal Spatial
GWMU	Groundwater Monitoring Unit
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response (OSHA Standard)
HC	Hydrochloric Acid
HMIS	Hazardous Materials Information System
HRS	Hazardous Ranking System
HSWA	Hazardous and Solid Waste Amendments
HWBZ	Hennessey Water-Bearing Zone
HWMF	Hazardous Waste Management Facility
HWSF	Hazardous Waste Storage Facility
IAPs	Initial Accumulation Points
IC	Institutional Controls
ICP	Inductively Coupled Plasma
IR	Infrared Spectroscopy
IRP	Installation Restoration Program
IWP-1	Industrial Waste Pit #1
IWP-2	Industrial Waste Pit #2
IWTP	Industrial Wastewater Treatment Plant
JETC	jet engine test cell
LDR	Land Disposal Restrictions
LEPC	Local Emergency Planning Committee
LLSZ	lower-lower saturated zone
LSZ	lower saturated zone
LTM	long-term monitoring
LUC	land use control(s)
MC	munitions constituents
MCL	maximum contaminant limit
MEK	methyl ethyl ketone

MIBK	Methyl Isobutyl Ketone
MMRP	Military Munitions Response Program
MNA	monitored natural attenuation
MS	Mass spectrometer
MSDS	Material Safety Data Sheet
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	National Response Center
NTA	North Tank Area
OAC	Oklahoma Administrative Code
OC-ALC/EMOE	Oklahoma City Air Logistics Center/Environmental Management Operations Engineering
OC-ALC/JA	Oklahoma City Air Logistics Center/Judge Advocate
OC-ALC/SE	Oklahoma City Air Logistics Center/Safety Office
OCC	Oklahoma Corporation Commission
ODEQ	Oklahoma Department of Environmental Quality
OSDH	Oklahoma State Department of Health
OSHA	Occupational Safety and Health Administration
OSIC	On-Scene Incident Commander
OUs	operable units
OWS	oil-water-separator
PA/SI	preliminary assessment/site investigation
PCBs	Polychlorinated Biphenyls
PCE	perchloroethylene
pH	inverse log of hydronium ion concentration
POC	point of compliance
PPE	personnel protective equipment
ppm	parts per million
ppmw	parts per million by weight
PRB	permeable reactive barrier
psi	pounds per square inch
PZ	producing zone
QAPPs	Quality Assurance Project Plans
QI	Qualified Individual
RA	Remedial Action
RC	response complete
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigations
RI/FS	Remedial Investigation/Feasibility Study

RIP	remedy in place
ROD	Record of Decision
RPO	remedial process optimization
RRSE	relative risk site evaluation
RTDS	re-utilization, transfer, donation, or sale
SARA	Superfund Amendments and Reauthorization Act
SOP	Standard Operating Procedures
SPCC	Spill Prevention, Control and Countermeasure Plan
STLC	Soluble Threshold Limit Concentration
SUPSALV	Supervisor of Salvage
SVE	soil vapor extraction
SVOCs	semi-volatile organic compounds
SW	Storm Water
SWMUs	Solid Waste Management Units
SWPPP	Storm Water Pollution Prevention Plan
SWTP	sanitary wastewater treatment plant
TACAMO	Take Charge and Move Out
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TCP	tricresyl phosphate
TPOC	Technical Point of Contact
TSD	treatment, storage, and disposal
TSDF	treatment, storage, or disposal facility
TTLC	Total Threshold Limit Concentration
UEC	Unit Environmental Coordinator
UFP-QAPP	Uniform Federal Policy for Quality Assurance project Plans
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
USZ	upper saturated zone
UXO	unexploded ordnance
VEP	vacuum enhanced pumping
VI	vapor intrusion
VO	volatile organic
VOCs	volatile organic compounds
W.E.T.	waste extraction test
WAP	Waste Analysis Plan
WBZ	water-bearing zone
WSW	water supply well

Section 1 Part A of the RCRA Hazardous Waste Permit Renewal Application

1.1 Part A Application

[40 CFR 270.10(e)(1), 270.13]

This section contains the Resource Conservation and Recovery Act (RCRA) Hazardous Waste Permit Renewal Application of Tinker Air Force Base's hazardous waste permit number OK1571724391 for the operation of Building 810 Hazardous Waste Storage Facility (HWSF). There are two parts to the RCRA hazardous waste permit renewal application – Part A and Part B. Part A of the RCRA hazardous waste permit renewal application consists of EPA Form 8700-23 (includes both the RCRA Subtitle C Site Identification Form and the Hazardous Waste Permit Information Form), along with maps, drawings (or site plan), and photographs, as required by 40 Code of Federal Regulations (CFR) 270.13, and as listed below. Signatories and facility certifications are also provided in this Section and Section 2, as required by 40CFR 270.11.

- RCRA Subtitle C Site Identification Form
- Hazardous Waste Permit Information Form
- Signatories and Certifications
- Topographic map extending to at least one mile beyond the property boundaries
- HWSF, Building 810 Site Plan
- HWSF, Building 810 Aerial Photograph

1.2 Part B Application

[40 CFR 270.10(e)(4)]

Part B of the RCRA hazardous waste permit application contains updated and detailed site-specific information, which is provided in subsequent sections of this permit renewal application, and satisfies the information requirements in applicable sections of 40 CFR 270.14 through 270.27.

1.3 Reapplication and Recordkeeping

[40 CFR 270.10(e)(4)]

The existing Part B permit is in effect for 10 years and will expire on August 15, 2012. The permit requires a renewal application to be submitted to ODEQ at least one-hundred eighty (180) days before the current expires. This Part B permit renewal application will be submitted by Tinker AFB to ODEQ by February 15, 2012, unless ODEQ allows a later date.

Records of all data used to complete this permit applications and any supplemental information submitted under 40 CFR 270.10(d), 270.13, and 270.14 through 270.21 will be kept for a period of at least 3 years from the date the application is signed.

OMB# 2050-0024; Expires 12/31/2014

SEND COMPLETED FORM TO: The Appropriate State or Regional Office.	United States Environmental Protection Agency **RCRA SUBTITLE C SITE IDENTIFICATION FORM**
1. Reason for Submittal MARK ALL BOX(ES) THAT APPLY	**Reason for Submittal:** ☐ To provide an Initial Notification (first time submitting site identification information / to obtain an EPA ID number for this location) ☒ To provide a Subsequent Notification (to update site identification information for this location) ☐ As a component of a First RCRA Hazardous Waste Part A Permit Application ☐ As a component of a Revised RCRA Hazardous Waste Part A Permit Application (Amendment #_________) ☐ As a component of the Hazardous Waste Report (If marked, see sub-bullet below) ☐ Site was a TSD facility and/or generator of ≥1,000 kg of hazardous waste, >1 kg of acute hazardous waste, or >100 kg of acute hazardous waste spill cleanup in one or more months of the report year (or State equivalent LQG regulations)
2. Site EPA ID Number	**EPA ID Number** O K 1 5 7 1 7 2 4 3 9 1
3. Site Name	**Name:** Tinker Air Force Base
4. Site Location Information	**Street Address:** NW 1/4 of Section 27, Township 11N Range 2W **City, Town, or Village:** Tinker AFB — **County:** Oklahoma **State:** Oklahoma — **Country:** USA — **Zip Code:** 73145
5. Site Land Type	☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other
6. NAICS Code(s) for the Site (at least 5-digit codes)	**A.** 4 8 8 1 9 0 — **C.** **B.** 9 2 8 1 1 0 — **D.**
7. Site Mailing Address	**Street or P.O. Box:** 72 ABW/CEANO, 7535 5th Street, Building 400 **City, Town, or Village:** Tinker AFB **State:** Oklahoma — **Country:** USA — **Zip Code:** 73145-9100
8. Site Contact Person	**First Name:** Brandt — **MI:** L — **Last:** Fleharty **Title:** Hazardous Waste Program Manager **Street or P.O. Box:** 72 ABW/CEANO, Building 808, 7180 59th Street **City, Town or Village:** Tinker AFB **State:** Oklahoma — **Country:** USA — **Zip Code:** 73145-9100 **Email:** Brandt.Fleharty@tinker.af.mil **Phone:** (405) 734-3278 — **Ext.:** — **Fax:** (405) 734-3510
9. Legal Owner and Operator of the Site	**A. Name of Site's Legal Owner:** Tinker Air Force Base — **Date Became Owner:** 07-01-1991 **Owner Type:** ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other **Street or P.O. Box:** 72 ABW/CEANO, 7535 5th Street, Building 400 **City, Town, or Village:** Tinker AFB — **Phone:** (405) 734-3278 **State:** Oklahoma — **Country:** USA — **Zip Code:** 73145-9100 **B. Name of Site's Operator:** Tinker Air Force Base — **Date Became Operator:** 07-01-2013 **Operator Type:** ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

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EPA ID Number O K 1 5 7 1 7 2 4 3 9 1 OMB#: 2050-0024; Expires 11/30/2011

10. Type of Regulated Waste Activity (at your site)
Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities; Complete all parts 1-7.

Y ☒ N ☐ **1. Generator of Hazardous Waste**
If "Yes", mark only one of the following – a, b, or c.

- ☒ a. LQG: Generates, in any calendar month, 1,000 kg/mo (2,200 lbs./mo.) or more of hazardous waste; **or** Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lbs./mo) of acute hazardous waste; **or** Generates, in any calendar month, **or** accumulates at any time, more than 100 kg/mo (220 lbs./mo) of acute hazardous spill cleanup material.
- ☐ b. SQG: 100 to 1,000 kg/mo (220 – 2,200 lbs./mo) of non-acute hazardous waste.
- ☐ c. CESQG: Less than 100 kg/mo (220 lbs./mo) of non-acute hazardous waste.

If "Yes" above, indicate other generator activities.

Y ☐ N ☒ d. Short-Term Generator (generate from a short-term or one-time event and not from on-going processes). If "Yes", provide an explanation in the Comments section.

Y ☐ N ☒ e. United States Importer of Hazardous Waste

Y ☐ N ☒ f. Mixed Waste (hazardous and radioactive) Generator

Y ☐ N ☒ **2. Transporter of Hazardous Waste**
If "Yes", mark all that apply.

- ☐ a. Transporter
- ☐ b. Transfer Facility (at your site)

Y ☒ N ☐ **3. Treater, Storer, or Disposer of Hazardous Waste** Note: A hazardous waste permit is required for these activities.

Y ☐ N ☒ **4. Recycler of Hazardous Waste**

Y ☐ N ☒ **5. Exempt Boiler and/or Industrial Furnace**
If "Yes", mark all that apply.

- ☐ a. Small Quantity On-site Burner Exemption
- ☐ b. Smelting, Melting, and Refining Furnace Exemption

Y ☐ N ☒ **6. Underground Injection Control**

Y ☒ N ☐ **7. Receives Hazardous Waste from Off-site**

B. Universal Waste Activities; Complete all parts 1-2.

Y ☒ N ☐ **1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) [refer to your State regulations to determine what is regulated]. Indicate types of universal waste managed at your site. If "Yes", mark all that apply.**

a. Batteries	☒
b. Pesticides	☐
c. Mercury containing equipment	☒
d. Lamps	☒
e. Other (specify) ________	☐
f. Other (specify) ________	☐
g. Other (specify) ________	☐

Y ☐ N ☒ **2. Destination Facility for Universal Waste**
Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities; Complete all parts 1-4.

Y ☐ N ☒ **1. Used Oil Transporter**
If "Yes", mark all that apply.

- ☐ a. Transporter
- ☐ b. Transfer Facility (at your site)

Y ☐ N ☒ **2. Used Oil Processor and/or Re-refiner**
If "Yes", mark all that apply.

- ☐ a. Processor
- ☐ b. Re-refiner

Y ☐ N ☒ **3. Off-Specification Used Oil Burner**

Y ☐ N ☒ **4. Used Oil Fuel Marketer**
If "Yes", mark all that apply.

- ☐ a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
- ☐ b. Marketer Who First Claims the Used Oil Meets the Specifications

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D. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262 Subpart K

❖ You can **ONLY** Opt into Subpart K if:

- you are at least one of the following: a college or university; a teaching hospital that is owned by or has a formal affiliation agreement with a college or university; or a non-profit research institute that is owned by or has a formal affiliation agreement with a college or university; AND
- you have checked with your State to determine if 40 CFR Part 262 Subpart K is effective in your state

Y ☐ N ☑ 1. Opting into or currently operating under 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories **See the item-by-item instructions for definitions of types of eligible academic entities. Mark all that apply:**

☐ a. College or University

☐ b. Teaching Hospital that is owned by or has a formal written affiliation agreement with a college or university

☐ c. Non-profit Institute that is owned by or has a formal written affiliation agreement with a college or university

Y ☐ N ☑ 2. Withdrawing from 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories

11. Description of Hazardous Waste

A. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g., D001, D003, F007, U112). Use an additional page if more spaces are needed.

D001	D002	D003	D004	D005	D006	D007
D008	D009	D010	D011	D012	D013	D014
D015	D016	D017	D018	D019	D019	D021
D022	D023	D024	D025	D026	D027	D028
D029	D030	D031	D032	D033	D034	D035
D036	D037	D038	D039	D040	D041	D042
D043	F001	F002	F003	F004	F005	F006
F007	F008	F009	F019	F039	K045	P001
P012	P021	P029	F030	P042	P066	P097

B. Waste Codes for State-Regulated (i.e., non-Federal) Hazardous Wastes. Please list the waste codes of the State-Regulated hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

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11. Description of Hazardous Wastes (Cont.)

A. Waste Codes for Federally Regulated Hazardous Wastes

P077	P098	P099	P104	P105	P106	P108
P119	P121	U002	U003	U012	U020	U032
U036	U038	U041	U044	U051	U052	U056
U057	U058	U070	U075	U076	U080	U088
U103	U112	U117	U121	U122	U123	U129
U132	U133	U134	U135	U144	U151	U154
U159	U160	U161	U162	U188	U196	U210
U211	U213	U219	U220	U226	U239	U240
U248						

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12. Notification of Hazardous Secondary Material (HSM) Activity

Y☐ N☑ Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 261.2(a)(2)(ii), 40 CFR 261.4(a)(23), (24), or (25)?

If "Yes", you must fill out the Addendum to the Site Identification Form: Notification for Managing Hazardous Secondary Material.

13. Comments

14. Certification. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. For the RCRA Hazardous Waste Part A Permit Application, all owner(s) and operator(s) must sign (see 40 CFR 270.10(b) and 270.11).

Signature of legal owner, operator, or an authorized representative	Name and Official Title (type or print)	Date Signed (mm/dd/yyyy)
SJ Bleymaier	Steven J. Bleymaier, Base Commander	11 Jun 13

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United States Environmental Protection Agency

HARDOUS WASTE PERMIT INFORMATION FORM

1. Facility Permit Contact	**First Name:** James	**MI:** B	**Last Name:** Dawson
	Contact Title: Hazardous Waste Program Manager		
	Phone: (405) 734-3278	**Ext.:**	**Email:** James.Dawson@tinker.af.mil
2. Facility Permit Contact Mailing Address	**Street or P.O. Box:** 72 ABW/CEANO, 7535 5th Street, Building 400		
	City, Town, or Village: Tinker AFB		
	State: Oklahoma		
	Country: USA	**Zip Code:** 73145	
3. Operator Mailing Address and Telephone Number	**Street or P.O. Box:** 72 ABW/CEANO, 7535 5th Street, Building 400		
	City, Town, or Village: Tinker AFB		
	State: Oklahoma	**Phone:** (405) 734-3278	
	Country: USA	**Zip Code:** 73145-9100	
4. Facility Existence Date	**Facility Existence Date (mm/dd/yyyy):** 07/01/1991		

5. Other Environmental Permits

A. Facility Type *(Enter code)*	B. Permit Number													C. Description
N	0	0	0	0	8	0	9							Joint DEQ/EPA NPDES
E	0	K	R	0	0	A	5	2	7					EPA Stormwater
P	2	0	0	9	-	3	9	4	-	T	V	R		Title V Air Permit Renewal Application
E	0	0	2	9	-	F	C							OK City Industrial User Permit
E	M	S	G	P		G	P	-	0	0	-	0	1	Storm Water/ODEQ General Permit
E	O	K	R	1	0									Storm Water/General Permit for Construction Activities
E	O	K	R	0	5									Storm Water/Multi-Sector General Permit OKR05
E	O	K	0	0	3	5	2	0	3					Storm Water/OPDES Permit

6. Nature of Business:

Tinker AFB is a military installation owned and operated by the United States Air Force. Its primary mission is the maintenance, repair and modification of military aircraft. The principal organization at the base is the Oklahoma City Air Logistics Center (OC-ALC), which controls and directs that mission.

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7. Process Codes and Design Capacities – Enter information in the Section on Form Page 3

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. If more lines are needed, attach a separate sheet of paper with the additional information. For "other" processes (i.e., D99, S99, T04 and X99), describe the process (including its design capacity) in the space provided in Item 8.

B. PROCESS DESIGN CAPACITY – For each code entered in Item 7.A; enter the capacity of the process.

1. **AMOUNT – Enter the amount. In a case where design capacity is not applicable (such as in a closure/post-closure or enforcement action) enter the total amount of waste for that process.**
2. **UNIT OF MEASURE – For each amount entered in Item 7.B(1), enter the code in Item 7.B(2) from the list of unit of measure codes below that describes the unit of measure used. Select only from the units of measure in this list.**

C. PROCESS TOTAL NUMBER OF UNITS – Enter the total number of units for each corresponding process code.

Process Code	Process	Appropriate Unit of Measure for Process Design Capacity
	Disposal	
D79	Underground Injection Well Disposal	Gallons; Liters; Gallons Per Day; or Liters Per Day
D80	Landfill	Acre-feet; Hectares-meter; Acres; Cubic Meters; Hectares; Cubic Yards
D81	Land Treatment	Acres or Hectares
D82	Ocean Disposal	Gallons Per Day or Liters Per Day
D83	Surface Impoundment Disposal	Gallons; Liters; Cubic Meters; or Cubic Yards
D99	Other Disposal	Any Unit of Measure Listed Below
	Storage	
S01	Container	Gallons; Liters; Cubic Meters; or Cubic Yards
S02	Tank Storage	Gallons; Liters; Cubic Meters; or Cubic Yards
S03	Waste Pile	Cubic Yards or Cubic Meters
S04	Surface Impoundment	Gallons; Liters; Cubic Meters; or Cubic Yards
S05	Drip Pad	Gallons; Liters; Cubic Meters; Hectares; or Cubic Yards
S06	Containment Building Storage	Cubic Yards or Cubic Meters
S99	Other Storage	Any Unit of Measure Listed Below
	Treatment	
T01	Tank Treatment	Gallons Per Day; Liters Per Day
T02	Surface Impoundment	Gallons Per Day; Liters Per Day
T03	Incinerator	Short Tons Per Hour; Metric Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Gallons Per Day; Metric Tons Per Hour; or Million BTU Per Hour
T04	Other Treatment	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Short Tons Per Day; BTUs Per Hour; Gallons Per Day; Liters Per Hour; or Million BTU Per Hour
T80	Boiler	Gallons; Liters; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; or Million BTU Per Hour

Process Code	Process	Appropriate Unit of Measure for Process Design Capacity
	Treatment (Continued)	**(for T81 – T94)**
T81	Cement Kiln	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; Liters Per Hour; Kilograms Per Hour; or Million BTU Per Hour
T82	Lime Kiln	
T83	Aggregate Kiln	
T84	Phosphate Kiln	
T85	Coke Oven	
T86	Blast Furnace	
T87	Smelting, Melting, or Refining Furnace	
T88	Titanium Dioxide Chloride Oxidation Reactor	
T89	Methane Reforming Furnace	
T90	Pulping Liquor Recovery Furnace	
T91	Combustion Device Used in the Recovery of Sulfur Values from Spent Sulfuric Acid	
T92	Halogen Acid Furnaces	
T93	Other Industrial Furnaces Listed in 40 CFR 260.10	
T94	Containment Building Treatment	Cubic Yards; Cubic Meters; Short Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTU Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Metric Tons Per Day; Gallons Per Day; Liters Per Day; Metric Tons Per Hour; or Million BTU Per Hour
	Miscellaneous (Subpart X)	
X01	Open Burning/Open Detonation	Any Unit of Measure Listed Below
X02	Mechanical Processing	Short Tons Per Hour; Metric Tons Per Hour; Short Tons Per Day; Metric Tons Per Day; Pounds Per Hour; Kilograms Per Hour; Gallons Per Hour; Liters Per Hour; or Gallons Per Day
X03	Thermal Unit	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; or Million BTU Per Hour
X04	Geologic Repository	Cubic Yards; Cubic Meters; Acre-feet; Hectare-meter; Gallons; or Liters
X99	Other Subpart X	Any Unit of Measure Listed Below

Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code
Gallons	**G**	**Short Tons Per Hour**	**D**	**Cubic Yards**	**Y**
Gallons Per Hour	**E**	**Short Tons Per Day**	**N**	**Cubic Meters**	**C**
Gallons Per Day	**U**	**Metric Tons Per Hour**	**W**	**Acres**	**B**
Liters	**L**	**Metric Tons Per Day**	**S**	**Acre-feet**	**A**
Liters Per Hour	**H**	**Pounds Per Hour**	**J**	**Hectares**	**Q**
Liters Per Day	**V**	**Kilograms Per Hour**	**X**	**Hectare-meter**	**F**
		Million BTU Per Hour	**X**	**BTU Per Hour**	**I**

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7. Process Codes and Design Capacities (Continued)

EXAMPLE FOR COMPLETING Item 7 (shown in line number X-1 below): A facility has a storage tank, which can hold 533.788 gallons.

Line Number		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY (1) Amount (Specify)	(2) Unit of Measure	C. Process Total Number of Units	For Official Use Only
X	1	S	0	2	533.788	G	001	
	1	S	0	1	158796	G	001	
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
1	0							
1	1							
1	2							
1	3							

Note: If you need to list more than 13 process codes, attach an additional sheet(s) with the information in the same format as above. Number the line sequentially, taking into account any lines that will be used for "other" process (i.e., D99, S99, T04, and X99) in Item 8.

8. Other Processes (Follow instructions from Item 7 for D99, S99, T04, and X99 process codes)

Line Number (Enter #s in sequence with Item 7)		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY (1) Amount (Specify)	(2) Unit of Measure	C. Process Total Number of Units	For Official Use Only
X	2	T	0	4	100.00	U	001	

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9. Description of Hazardous Wastes - Enter Information in the Sections on Form Page 5

A. **EPA HAZARDOUS WASTE NUMBER** – Enter the four-digit number from 40 CFR, Part 261 Subpart D of each listed hazardous waste you will handle. For hazardous wastes which are not listed in 40 CFR, Part 261 Subpart D, enter the four-digit number(s) from 40 CFR Part 261, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. **ESTIMATED ANNUAL QUANTITY** – For each listed waste entered in Item 9.A, estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in Item 9.A, estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. **UNIT OF MEASURE** – For each quantity entered in Item 9.B, enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure, taking into account the appropriate density or specific gravity of the waste.

D. **PROCESSES**

1. **PROCESS CODES:**

For listed hazardous waste: For each listed hazardous waste entered in Item 9.A, select the code(s) from the list of process codes contained in Items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all listed hazardous wastes.

For non-listed waste: For each characteristic or toxic contaminant entered in Item 9.A, select the code(s) from the list of process codes contained in Items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

NOTE: THREE SPACES ARE PROVIDED FOR ENTERING PROCESS CODES. IF MORE ARE NEEDED:

1. Enter the first two as described above.
2. Enter "000" in the extreme right box of Item 9.D(1).
3. Use additional sheet, enter line number from previous sheet, and enter additional code(s) in Item 9.E.

2. **PROCESS DESCRIPTION:** If code is not listed for a process that will be used, describe the process in Item 9.D(2) or in Item 9.E(2).

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER – Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in Item 9.A. On the same line complete Items 9.B, 9.C, and 9.D by estimating the total annual quantity of the waste and describing all the processes to be used to store, treat, and/or dispose of the waste.
2. In Item 9.A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In Item 9.D.2 on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING Item 9 (shown in line numbers X-1, X-2, X-3, and X-4 below) – A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operations. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

Line Number		A. EPA Hazardous Waste No. (Enter code)				B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter Code)									D. PROCESSES (2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))
X	1	K	0	5 4		900	P	T	0	3	D	8	0				
X	2	D	0	0 2		400	P	T	0	3	D	8	0				
X	3	D	0	0 1		100	P	T	0	3	D	8	0				
X	4	D	0	0	2												Included With Above

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9. Description of Hazardous Wastes *(Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter Code)	D. PROCESSES (2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))
1	D001	*	T	S01	
2	D002	*	T	S01	
3	D003	*	T	S01	
4	D004	*	T	S01	
5	D005	*	T	S01	
6	D006	*	T	S01	
7	D007	*	T	S01	
8	D008	*	T	S01	
9	D009	*	T	S01	
10	D010	*	T	S01	
11	D011	*	T	S01	
12	D012	*	T	S01	
13	D013	*	T	S01	
14	D014	*	T	S01	
15	D015	*	T	S01	
16	D016	*	T	S01	
17	D017	*	T	S01	
18	D018	*	T	S01	
19	D019	*	T	S01	
20	D020	*	T	S01	
21	D021	*	T	S01	
22	D022	*	T	S01	
23	D023	*	T	S01	
24	D024	*	T	S01	
25	D025	*	T	S01	
26	D026	*	T	S01	
27	D027	*	T	S01	
28	D028	*	T	S01	
29	D029	*	T	S01	
30	D030	*	T	S01	
31	D031	*	T	S01	
32	D032	*	T	S01	
33	D033	*	T	S01	
34	D034	*	T	S01	
35	D035	*	T	S01	
36	D036	*	T	S01	

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9. Description of Hazardous Wastes *(Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter Code)	D. PROCESSES (2) PROCESS DESCRIPTION (If code is not entered in 9.D.1)
37	D037	*	T	S01	
38	D038	*	T	S01	
39	D039	*	T	S01	
40	D040	*	T	S01	
41	D041	*	T	S01	
42	D042	*	T	S01	
43	D043	*	T	S01	
44	F001	*	T	S01	
45	F002	*	T	S01	
46	F003	*	T	S01	
47	F004	*	T	S01	
48	F005	*	T	S01	
49	F006	*	T	S01	
50	F007	*	T	S01	
51	F008	*	T	S01	
52	F009	*	T	S01	
53	F019	*	T	S01	
54	F039	*	T	S01	
55	K045	*	T	S01	
56	P001	*	T	S01	
57	P012	*	T	S01	
58	P021	*	T	S01	
58	P029	*	T	S01	
60	P030	*	T	S01	
61	P042	*	T	S01	
62	P066	*	T	S01	
63	P097	*	T	S01	
64	P098	*	T	S01	
65	P099	*	T	S01	
66	P104	*	T	S01	
67	P105	*	T	S01	
68	P106	*	T	S01	
69	P108	*	T	S01	
70	P121	*	T	S01	
71	U002	*	T	S01	
72	U012	*	T	S01	

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9. Description of Hazardous Wastes *(Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter Code)	D. PROCESSES (2) PROCESS DESCRIPTION (If code is not entered in 9.D.1)
73	U020	*	T	S01	
74	U032	*	T	S01	
75	U036	*	T	S01	
76	U038	*	T	S01	
77	U041	*	T	S01	
78	U044	*	T	S01	
79	U051	*	T	S01	
80	U052	*	T	S01	
81	U056	*	T	S01	
82	U057	*	T	S01	
83	U058	*	T	S01	
84	U075	*	T	S01	
85	U076	*	T	S01	
86	U080	*	T	S01	
87	U088	*	T	S01	
88	U103	*	T	S01	
89	U112	*	T	S01	
90	U117	*	T	S01	
91	U121	*	T	S01	
92	U122	*	T	S01	
93	U123	*	T	S01	
94	U129	*	T	S01	
95	U132	*	T	S01	
96	U133	*	T	S01	
97	U134	*	T	S01	
98	U135	*	T	S01	
99	U144	*	T	S01	
100	U151	*	T	S01	
101	U154	*	T	S01	
102	U159	*	T	S01	
103	U160	*	T	S01	
104	U161	*	T	S01	
105	U162	*	T	S01	
106	U188	*	T	S01	
107	U196	*	T	S01	
108	U210	*	T	S01	

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9. Description of Hazardous Wastes ***(Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)***

Line Number	A. EPA Hazardous Waste No. (Enter code)				B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter Code)									D. PROCESSES (2) PROCESS DESCRIPTION (If code is not entered in 9.D.1)
109	U	2	1	1	*	T	S	0	1							
110	U	2	1	3	*	T	S	0	1							
111	U	2	1	9	*	T	S	0	1							
112	U	2	2	0	*	T	S	0	1							
113	U	2	2	6	*	T	S	0	1							
114	U	2	3	9	*	T	S	0	1							
115	U	2	4	0	*	T	S	0	1							
116	U	2	4	8	*	T	S	0	1							

*The total annual estimated quantity is 3,000 tons including all wastes. Each waste code may represent a portion or all of the annual quantity.

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10.	**Map**
	Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.
11.	**Facility Drawing**
	All existing facilities must include a scale drawing of the facility (see instructions for more detail).
12.	**Photographs**
	All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas (see instructions for more detail).
13.	**Comments**

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1.4 CERTIFICATIONS

[40 CFR 270.10(b), 270.11(a)(3), (b) and (d)]

Tinker Air Force Base (AFB) is a Department of Defense (DoD) Air Force Material Command Base that is a host to a number of DoD components. The hazardous waste storage facility (HWSF) at Tinker AFB is owned and operated by the U.S. Air Force. The DLA Disposition Services local office located on Tinker AFB has responsibility for day-to-day operations. Oversight and other tasks, such as maintaining this permit, are the responsibility of Tinker AFB.

1.4.1 Facility Certification

[40 CFR 270.11]

The Air Force's RCRA responsibilities include policy, programmatic funding, scheduling decisions, waste analysis, waste handling, monitoring, recordkeeping, reporting, contingency planning, and general oversight.This facility certification also designates the position noted within Section 1.4.3 that is authorized to sign the reports submitted on behalf of the facility. For purposes of the certification required by 40 CFR 270.11 (d), the following facility certification statement is provided:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Colonel Steven J. Bleymaier Installation Commander 72d Air Base Wing Tinker Air Force Base, Oklahoma City, OK Facility Owner	Twila C. Gonzalez SES Director DLA Disposition Services Facility Operator

1.4 CERTIFICATIONS

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Tinker Air Force Base (AFB) is a Department of Defense (DoD) Air Force Material Command Base that is a host to a number of DoD components. The hazardous waste storage facility (HWSF) at Tinker AFB is owned by the U.S. Air Force and is operated by Defense Logistics Agency (DLA) Disposition Services. The DLA Disposition Services local office located on Tinker AFB has responsibility for day-to-day operations. Oversight and other tasks, such as maintaining this permit, are the responsibility of Tinker AFB.

1.4.1 Facility Certification

[40 CFR 270.11]

The Air Force's RCRA responsibilities include policy, programmatic funding and scheduling decisions, as well as general oversight. DLA Disposition Services' RCRA responsibilities are for day-to-day operations, including, but not limited to, the following responsibilities: waste analyses and handling, monitoring, recordkeeping, reporting, and contingency planning.

This facility certification also designates the position noted within Section 1.4.3 that is authorized to sign the reports submitted on behalf of the facility. For purposes of the certification required by 40 CFR 270.11 (d), the following facility certification statement is provided:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

SJBleymaier

Colonel Steven J. Bleymaier Installation Commander 72d Air Base Wing Tinker Air Force Base, Oklahoma City, OK Facility Owner	Twila C. Gonzales SES Director DLA Disposition Services Facility Operator

1.4 Certifications

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1.4.1 Facility Certification

[40 CFR 270.11]

The Air Force's RCRA responsibilities include policy, programmatic funding and scheduling decisions, as well as general oversight. DLA Disposition Services' RCRA responsibilities are for day-to-day operations, including, but not limited to, the following responsibilities: waste analyses and handling, monitoring, recordkeeping, reporting, and contingency planning.

This facility certification also designates the position noted within Section 1.4.3 that is authorized to sign the reports submitted on behalf of the facility. For purposes of the certification required by 40 CFR 270.11 (d), the following facility certification statement is provided:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Colonel Steven J. Bleymaier
Installation Commander
72d Air Base Wing
Tinker Air Force Base, Oklahoma City, OK
Facility Owner

Twila C. Gonzales
Twila C. Gonzales
SES Director
DLA Disposition Services
Facility Operator

1.4.2 Engineering Certification

Technical oversight of the preparation of this document was conducted by Mr. James Dawson, Hazardous Waste Program Manager of Tinker AFB, and Ms. Lisa Gray, Environmental Branch Supervisor of DLA Disposition Services.

1.4.3 Signatories for Reports

[40 CFR 270.11(b) and (c)]The individuals in Section 1.4.1 above are authorized to sign permit applications pursuant to 40 CFR 270.11. Reports required by the Part B Permit may be signed by the signatory above, or duly authorized individuals who have been given written authorization from the primary signatory. The authorized signatory for reports and other information will be Mr. Keith Buehler, Branch Chief of 72 ABW/CEAN, Asset Management Natural Infrastructure Branch (Environmental Compliance). Notification will be provided to Oklahoma Department of Environmental Quality (ODEQ) concerning personnel changes at Tinker AFB affecting the facility certification signatory or the duly authorized person(s).

1.4.4 Disclosure Statement

This Part B renewal concerns hazardous waste storage within an engineered structure with a secondary containment system. Tinker AFB's waste management operations do not include on-site waste disposal and transportation of hazardous waste, which will be conducted by waste haulers with EPA-issued identification numbers. Therefore, a completed and signed Disclosure Statement per Section 2-7-109 of the Oklahoma Hazardous Waste Management Act is not applicable to this permit renewal request.

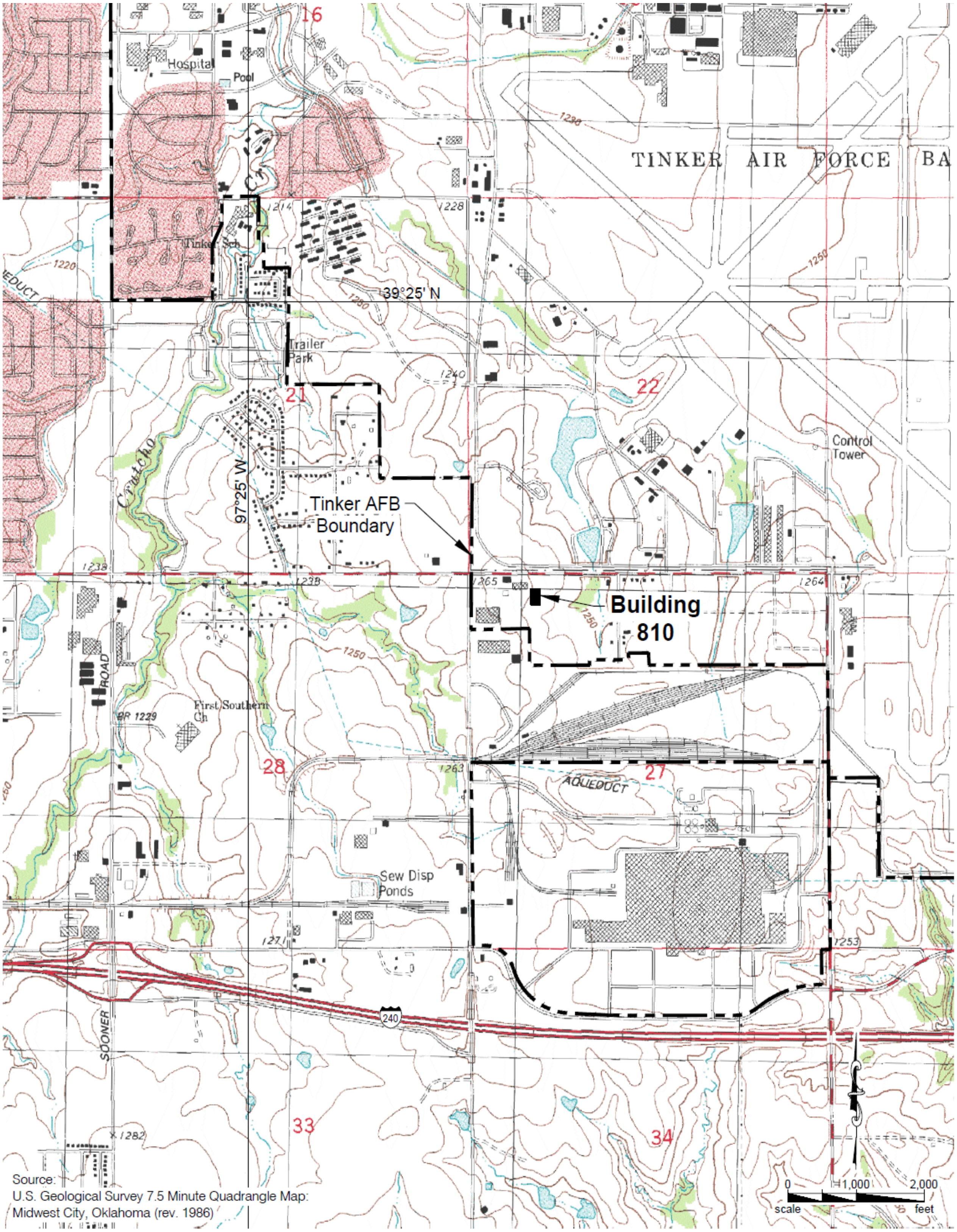

Figure 1-1: Topographic Map Extending to at Least One Mile Beyond Property Boundaries

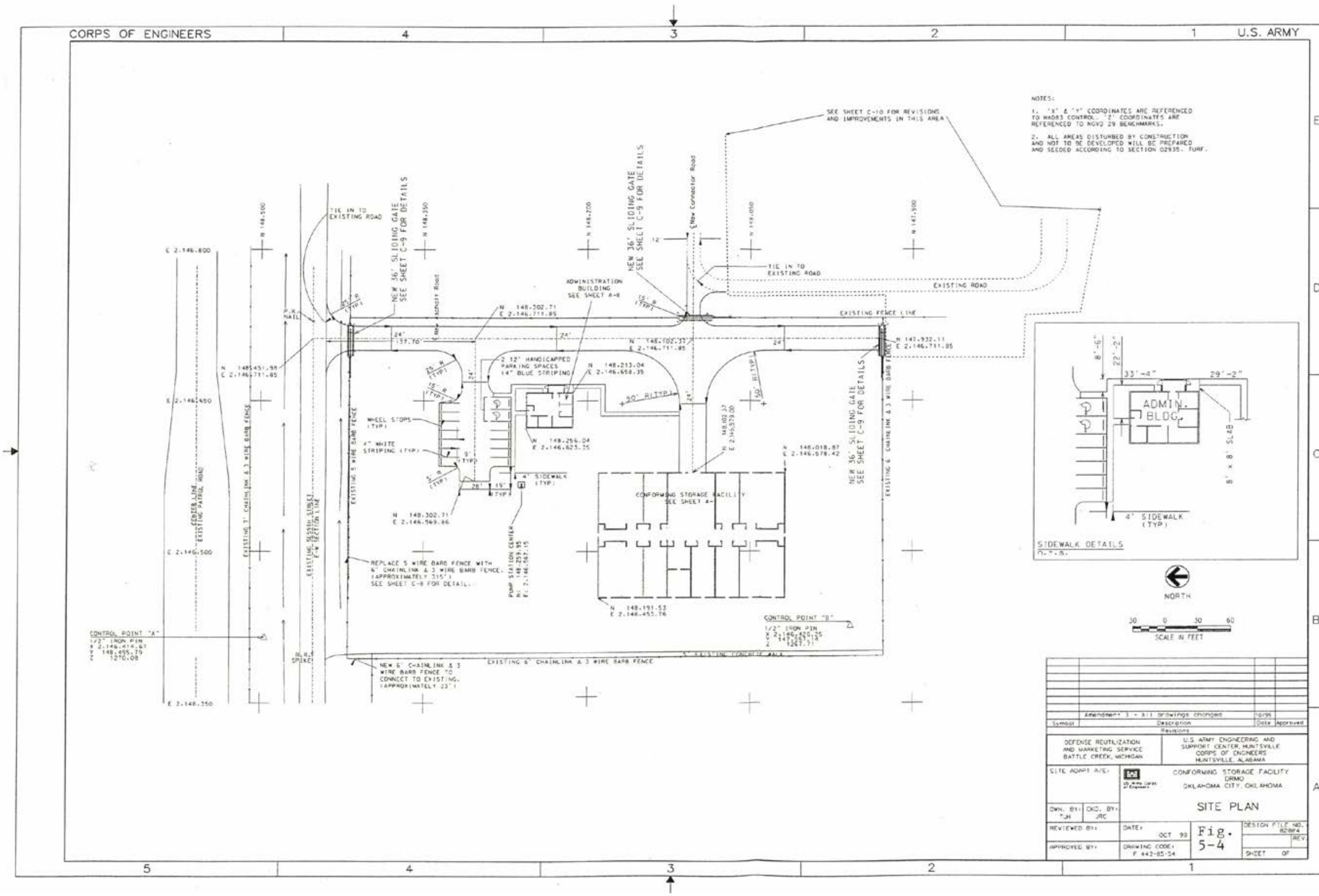

Figure 1-2: Building 810 Site Plan

Figure 1-3: HWSF, Building 810 Aerial Photograph

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Section 2 General Facility Information

2.1 INSTALLATION DESCRIPTION

[40 CFR 270.14(b)(1)]

Tinker AFB is located in central Oklahoma, within the corporate limits of Oklahoma City, about ten miles southeast of the downtown area and adjacent to the suburbs of Midwest City and Del City. The base is bordered by Interstate 40 on the north side, Douglas Boulevard on the east, Sooner Road on the west, and Southeast 74th Street on the south.

Tinker AFB is a military installation owned and operated by the United States Air Force. Its primary mission is the maintenance, repair, and modification of military aircraft. The principal organization at the base is the Oklahoma City Air Logistics Complex (OC-ALC), which controls and directs the base's primary mission. Approximately 27,000 military and civilian personnel are employed at the base.

Tinker AFB Building 810 comprises the permitted Hazardous Waste Storage Facility that is the subject of this application. For purposes of Corrective Action, however, the definition of "facility" encompasses the entire contiguous installation.

2.2 FACILITY LOCATION AND SETTING

[40 CFR 270.14(b)(11), 270.15(c)]

The HWSF, Building 810, is located within the DLA Disposition Services storage compound. This facility is operated by DLA Disposition Services, which is a tenant of Tinker AFB, and lies in the southwest corner of Tinker AFB about 150 feet south of Southeast 59th Street.

No public schools, education institutions, child care facilities, nursing homes or hospitals are located within one mile of the facility. A medical clinic housing the 72d Medical Group is located less than a quarter-mile to the northeast of the HWSF. A recreation park, Tinker AFB's South Forty Recreation Area, which is open to the Air Force community, is located approximately four hundred feet north of the HWSF.

2.2.1 Area Maps

[40 CFR 270.14(b)(19)]

Figure 2-1 illustrates the location of the facility relative to Tinker AFB. Figure 2-2 is a topographic map of the Building 810 area with a contour interval of two feet. Topography, water courses, and cultural development on and around the base are shown. Lake Stanley Draper, a major recreation for the Oklahoma City area, is slightly over one mile south of the HWSF. All of the surface drainage is to the north and does not drain into Lake Stanley Draper.

The municipalities of Oklahoma City, Del City and Midwest City adjoin Tinker AFB (Figure 2-3). These municipalities are 0.12, 1.5 and 2 miles from the HWSF, respectively.

A review of the Oklahoma Water Resources Board's records indicate only one reported water supply well within the SE/4 of Section 21, SW/4 of Section 22, NW/4 of Section 27 and the NE/4 of Section 28 of T11N-R2W. A Tinker AFB water supply well (#29) is located approximately 2000 feet east of the HWSF (Figure 2-2). Tinker's well #29 produces water from the Garber-Wellington Aquifer (screen interval > 200 feet below ground surface). The Hennessey Formation is a confining layer above the Garber-Wellington Aquifer. The Hennessey is characterized by clay-rich, low permeability shale units that serve as barriers to greatly reduce the downward infiltration of any fluid (rainfall, liquid wastes, etc.) that falls on or is spilled on the ground surface. The confining nature of the Hennessey causes rainfall to remain near ground surface and to flow laterally, rather than vertically downward, until it discharges to local streams. In the area of Tinker AFB which contains Hennessey shale, the inhibition of downward vertical groundwater flow into the deeper saturated zones contained within the Garber-Wellington Aquifer helps protect these sources of portable groundwater.

2.2.2 Seismic Standard

[40 CFR 270.14(b)(11)(ii)]

The HWSF is not subject to the seismic standard because it does not fall within any county, township, or election district listed in 40 CFR 264, Appendix VI.

2.2.3 Flood Plain Standard

[40 CFR 270.14(b)(11)(iii)]

The HWSF is not located in the 100-year flood plain. See Figure 2-2 for the outlines of the 100-year flood plain. The information for determining the location of the flood plain was obtained from 2007 Tinker AFB Integrated Natural Resources Management Plan.

2.2.4 Wind Rose

[40 CFR 270.14(b)(19)(v)]

Figure 2-4 presents the prevailing wind direction at Tinker AFB.

2.3 Geology

The primary geologic formations of interest at Tinker AFB are the Quaternary age alluvium, and the Permian age Hennessey Group, Garber Sandstone, and Wellington Formation. Quaternary age alluvium and terrace deposits can be found in and near present-day stream valleys. The Quaternary deposits are very poorly sorted and unconsolidated-to-partially consolidated, while the Permian strata predominantly consist of layered and consolidated to partially consolidated rock material. The Hennessey Group, present at the surface over the southern and western half of Tinker AFB, ranges from nearly 70 ft thick in the southwest quadrant to thin or absent in the northeast portion of the Base. The surficial geology in the northeast quadrant is dominated by the Garber Sandstone. The Garber Sandstone and the Wellington Formation together are approximately 900 ft thick in the area (SAIC 2008[1]). The Permian strata predominantly consist of layered and consolidated to partially consolidated rock material. Sandstone units tend to be lenticular in nature, forming (where interconnected) complex pathways for groundwater movement (IT 2002[2]). The finer grain sedimentary materials consist of siltstones and mudstones (though commonly described as shales). The major lithologic units in the area of the Base are relatively flat lying and have a dip of about 0.0076 ft/ft to the west-southwest (Bingham and Moore 1975.[3])

2.4 REGIONAL HYDROGEOLOGY

The most important source of potable groundwater in the Oklahoma City metropolitan area is the Central Oklahoma Aquifer (COA) System. Two of the primary water-bearing units of this system include the Garber Sandstone and the Wellington Formation. Together, they are commonly referred to as the Garber-Wellington Aquifer and are considered to be a single aquifer because the units were deposited under similar conditions and because many of the best producing wells are completed in this zone. Tinker AFB obtains much of its water from this source while nearby Oklahoma City, Midwest City, and Del City derive only a portion of their water supply from this aquifer. The Base water supply wells (WSWs) are screened or perforated at depths of 200 to 750 ft below ground surface (BGS).

Geologic structural features, such as the Oklahoma City Anticline and regional dip, control regional groundwater flow in the Central Oklahoma Aquifer. In addition, regional groundwater flow is influenced by discharge points such as the Deep Fork River, the Canadian River, and water supply wells.

Recharge of the Central Oklahoma Aquifer occurs by rainfall infiltration and percolation of surface waters crossing outcrop areas. The Garber outcrops beneath much of Tinker AFB and, therefore, much of Tinker AFB occurs within a recharge zone. The quality of groundwater derived from the aquifer is generally good, although wide variations in concentrations of naturally occurring constituents are known to occur.

2.4.1 Local Hydrogeology

The HWBZ is the only aquifer zone identified for the Hennessey Group at Tinker AFB. The HWBZ is largely absent in the northeastern portion of the Base. Three WBZs (in descending order) have been identified for the Garber Sandstone and Wellington Formation (Garber-Wellington Aquifer) under Tinker AFB: the USZ, the LSZ, and the PZ. A fourth WBZ, the LLSZ, has been

[1] Science Applications International Corporation (SAIC). 2008. Corrective Measures Study for Industrial Waste Pit 1. Tinker AFB, Oklahoma.

[2] IT Corporation. 2002. Final Basewide Non-NPL Groundwater Phase II, RCRA Facility Investigation for Appendix I and II SWMUs Addendum 3, Tinker AFB, Oklahoma, September 2002.

[3] Bingham RH, Moore RL. 1975. Reconnaissance of the Water Resources of the Oklahoma City Quadrangle, Central Oklahoma: Oklahoma Geological Survey Hydrologic Atlas 4, 4 sheets, scale 1:250,000.

added to discussions of the local hydrogeology to address a significant downward component of groundwater flow in the LSZ, which is noted within the aquifer under Tinker AFB. The magnitude of this vertical flow component varies across the Base and is much less under the western one-third of Tinker AFB where the overlying Hennessey Group is thicker.

The HWBZ is present in the southwestern portion of Tinker AFB where the Hennessey Group thickens and becomes locally saturated with groundwater. The horizontal hydraulic conductivity is low; test data indicate it is generally less that 0.5 ft/day. The HWBZ is not considered a significant source of drinking water. The unit receives recharge from precipitation where it is exposed at the surface, at localized areas where sandstone outcrops at the surface, and in locations of desiccation cracks with higher conductivity.

Generally, groundwater in this unit flows toward lower topographical elevations. In some areas, potentiometric lows mapped in the HWBZ are coincident with potentiometric highs on the USZ surface and suggest that vertical downward flow paths exist between the two zones. Downward vertical flow (and possibly lateral flow) and communication with the USZ are enhanced by the presence of desiccation cracks where the Hennessey Group is 30 ft or less in thickness.

The USZ is the uppermost WBZ of the Garber-Wellington Aquifer and is delineated from the LSZ by a basal aquitard. The USZ is approximately 50 ft thick, measured from the base of the overlying Hennessey Group to the base of the underlying aquitard, except where portions have been removed by erosion along down-cutting streams such as Crutcho Creek. The saturated portion typically is much thinner (less than 1 ft to 20 ft), and truncates along a line extending from near the Base boundary and the westward toward Douglas Boulevard to just west of West Soldier Creek near the Industrial Wastewater Treatment Plant (IWTP), looping through the old Kimsey Addition located north of Building 3001, and turning northwestward around the north end of Runway 17/35. Truncation of the saturated zone is primarily due to westward geologic dip and stream erosion. Desiccation cracks are also present in the USZ where it is exposed at the surface. Vertical contaminant transport from surface spills may impact deeper portions of the USZ more quickly due to the presence of desiccation cracks. Open desiccation cracks would provide relatively little resistance to water and contaminant infiltration, and movement through the desiccation cracks in the unsaturated USZ could be rapid.

The USZ has a large areal extent and occurs throughout Tinker AFB, except in a small part of the northeast quadrant and east of the Base where Soldier Creek has eroded the Garber Sandstone to a point below the basal aquitard. Over much of the Base, the USZ occurs under unconfined conditions. In some areas, such as where fractures in the overlying Hennessey Group extend at depth, it may also be semiconfined.

The USZ becomes confined in the farthest southwestern corner of the Base and to the west of the Base where it is confined by the overlying Hennessey Group. The depth to the top of the USZ potentiometric surface ranges from near the land surface in the northeastern portion of the Base where streams have cut deep enough (portions of Crutcho Creek and Kuhlman Creek) to 70 ft BGS in the southwestern portion of the Base. The depth to the base of the USZ occurs at land surface in the northeastern area of the Base where overlying portions have been removed by erosion, to approximately 120 ft BGS in the southwestern area. Horizontal hydraulic conductivity test data yield values that range from 0.04 to 6.7 ft/day.

Groundwater flow in the USZ under Tinker AFB is generally to the west or southwest due to geologic dip. However, local variations in flow direction exist on the western part of the Base, due either to structural features related to the Oklahoma City Anticline or to the presence of Crutcho Creek, and on the eastern part of the Base due to a leaky aquitard under the USZ and man-made features. Locally, surface discharge of USZ groundwater occurs where creeks have eroded into the top of the Garber Sandstone, such as westward flow across the northern half of the Base, while most of the shallow groundwater under the southern half leaves Tinker AFB as groundwater in the aquifer flowing southwestward. In addition, eastward groundwater flow west of Crutcho Creek off of the Oklahoma City Anticline and under the north half of the Base also discharges to Crutcho Creek, while under the south part of the Base it turns southward with other USZ groundwater.

Numerous mudstone layers, which act locally as aquitards, exist within the Garber-Wellington Aquifer saturated units. However, only two of these layers occur on a semi-regional basis under Tinker AFB; these are more laterally continuous and actually function as semi-regional aquitards. The uppermost aquitard (basal USZ) occurs between the USZ sands and LSZ and is referred to as the USZ/LSZ Aquitard. The second aquitard occurs between the LSZ and PZ and is referred to as the PZ Aquitard. These aquitards, however, do not consist of a single continuous mudstone unit. Instead, they are zones composed of interbedded mudstones and fine sandstones and siltstones with a higher proportion of clay relative to sand, are generally continuous across the Base (except where removed by erosion), and serve as partial hydraulic barriers to cross-aquifer groundwater flow.

The USZ/LSZ Aquitard is composed of overlapping discontinuous mudstone lenses with interbedded thin sand lenses. The aquitard interval varies in thickness from less than 10 ft to greater than 25 ft. Based on the distribution of chemical contaminants, the USZ/LSZ Aquitard is believed to allow some hydraulic communication between the USZ and the LSZ through natural and man-made discontinuities. A vadose zone exists locally between the base of the USZ/LSZ Aquitard and the saturated portion of the LSZ. This vadose zone, roughly 10 to 20 ft thick in the northeastern portion of the Base, thins to the west and is no longer present west of north-south taxiway G beneath the airfield. Head differences of up to 6 ft occur between the USZ and LSZ at the western Base boundary and up to 40 ft on the east side of the Base. The USZ/LSZ Aquitard outcrops between 15 and 20 ft above the creek along the west bank of Soldier Creek just south of the IWTP.

The next deeper zone in the Garber-Wellington Aquifer is the LSZ. This saturated interval is approximately 150 ft thick. However, as previously noted, this zone is sub-divided into the LSZ and the LLSZ for modeling and discussion purposes based on the recognition of a vertical component of the flow gradient. Generally, the LSZ consists of the upper one-half of the section, while the LLSZ is considered as the lower half. The LSZ portion directly underlies the

USZ/LSZ Aquitard and includes the vadose zone, is extensive and is found throughout Tinker AFB. Horizontal hydraulic conductivity test data show the horizontal hydraulic conductivity of the LSZ ranges from 0.25 to 8.7 ft/day. Flow is generally to the west and southwest under the Base but, as with the USZ, local variations exist under the west portion of Tinker AFB due to structural features related to the Oklahoma City Anticline. Just east and north of Tinker AFB, changes in recharge and interaction with Soldier Creek create variable flow directions. Locally, recharge to the LSZ occurs primarily by lateral inflow of LSZ groundwater from farther east. Some recharge occurs by precipitation and infiltration into the geologic units that outcrop just east of the base. Where the USZ overlies the LSZ, the downward movement of groundwater through the USZ/LSZ Aquitard also contributes to LSZ recharge. Groundwater in the LLSZ generally flows in the same direction as groundwater in the LSZ at any given location on Tinker AFB. Recharge to the LLSZ is by downward leakage from the LSZ and by lateral inflow of groundwater from the area east of the Base. A pumping test was conducted at well cluster 1-91PW in the northeastern corner of the Base in November 1994 as part of the IWTP/Soldier Creek Groundwater OUs RI. The horizontal hydraulic conductivity values calculated from the pumping test ranged from 0.78 to 15.6 ft/day. The results from the pumping test indicate that the LLSZ is interconnected with the LSZ.

The PZ Aquitard occurs at the base of the LSZ (LLSZ) and separates it from the underlying PZ. The isolation of the PZ from the LLSZ is demonstrated by head differences of up to 70 ft across the unit. This aquitard appears to be similar to the USZ/LSZ Aquitard, being formed by a series of overlapping mudstones with interbedded sand lenses. Well log data suggest that the PZ Aquitard is present beneath the entire Base. The aquitard appears to be at least 30 ft thick; however, studies of the Garber-Wellington Aquifer suggest that this aquitard may be up to 80 ft thick regionally. Data supplied by Wood and Burton (1968) from the Nichols Hills area to the northwest of the Base suggest that there is little vertical communication between the PZ and shallower zones. In support of this conclusion are the results of the U. S. Army Corps of Engineers pump test involving WSW-14, WSW-15, and WSW-16, originally located just east of Building 3001. Several shallow wells in the LSZ were monitored during the pump test and none of these LSZ wells exhibited any measurable drawdown.

The PZ lies below the PZ Aquitard and extends downward approximately another 500 ft. At around 700 ft BGS, the PZ grades progressively into saline water, which forms the lower limit of usable drinking water in the PZ. A physical boundary between the PZ and underlying units (i.e., the Chase, Council Grove, and Admire Formations) occurs somewhat deeper. Flow direction is influenced locally by production from WSWs. The natural flow direction in the PZ is difficult to identify due to the influence of the WSWs and limited data coverage but is most likely to the west. An average horizontal hydraulic conductivity of approximately 5 ft/day has been calculated for the Garber-Wellington sandstones and from production well data in the Oklahoma City area. A total of 34 Tinker AFB WSWs have been completed in the PZ; ten have since been plugged, one (#8) is slated to be plugged, and one new well (#34) is in the process of being placed in operation. Twenty-one of the wells are currently operational.

2.4.2 Surface Water

The northern half of Tinker AFB is dissected by several tributaries of the North Canadian River; similarly, the southeastern part of the Base is dissected by tributaries of the Little River. A drainage divide crosses the southern part of the Base, separating these two drainage basins. Crutcho Creek is joined by two tributaries as it flows northward to the North Canadian River. Kuhlman Creek joins Crutcho Creek just north of the Tinker AFB property boundary; whereas, Soldier Creek joins Crutcho Creek several miles north of the Base. Elm Creek is in the southeastern corner of Tinker AFB and drains south to Stanley Draper Lake and eventually to the Little River. Portions of Crutcho Creek and Kuhlman Creek are gaining streams and are perennial due to recharge from ground water. Surface water runoff channeled through ditches and diversion structures is the principal source of water to the numerous unnamed ephemeral streams that drain other portions of the Base. Other small surface water bodies on Tinker AFB include sixteen (16) retention ponds (Beaver Pond, Beaver Pond March Filter, Redbud Pond, Prairie Pond, Primrose Pond, Woodduck Pond, Golf Course East Pond, Golf Course Central Pond, and Golf Course West Pond, Reserve 1 North Pond, Reserve 1 Southwest Pond, Reserve 1 Southeast Pond, Reserve 3 North Pond, Reserve 3 South Pond, TAC pond, GWTP Pond) and three (3) detention ponds (Fire Pond, Landfill Detention Basin and detention basin located on the western edge of the golf course). A comparison of potentiometric surface maps with bathymetric maps of these ponds suggests that six of them are probably fed, in part, by seepage from the HWBZ. The six ponds include the westernmost Golf Course Pond as well as Prairie Pond, Woodduck Pond, Primrose Pond, Redbud Pond, and Beaver Pond. The Golf Course Central and East Ponds receive groundwater from the USZ. In the absence of seep and flow testing, it is not possible to quantify the extent to which groundwater feeds these ponds.

The main branch of Soldier Creek is an important surface water feature located east of Tinker AFB. The creek drains northward and has two main tributaries that drain from the Base: East Soldier Creek and West Soldier Creek. East Soldier Creek originates north of Building 3705 and flows northward east of East Drive, and adjacent to B62511 and the industrial wastewater treatment plant. East Soldier Creek ultimately connects to the main branch of Soldier Creek just outside of the base boundary. West Soldier Creek originates west of Building 3001 and flows northward toward the main branch of Soldier Creek.

2.5 TRAFFIC/ACCESS

[40 CFR 270.14(b)(19)]

2.5.1 Routes

The primary route for the transportation of hazardous waste generated at Tinker AFB into the HWSF compound is through a gate located along the east side of the compound, which provides access from the Hazardous Waste Management Facility, Building 809. Hazardous waste transported from other Department of Defense facilities enter the Tinker AFB through Gate 34 and travel east on Patrol Road to the HWSF. Hazardous waste transported from Tinker AFB for re-utilization, transfer, donate, or sale (RTDS) or disposal may exit the HWSF compound and travel west on Patrol Road and depart Tinker AFB through Gate 34. Vehicles transporting hazardous waste to and from Tinker AFB will utilize Tinker AFB's Gate 34 and access the southern interstate highway system by traveling on Air Depot Boulevard, past southeast of 74th Street, at the railroad overpass, to I-240, or the northern interstate highway system by traveling on Southeast 59th Street to Sooner Road and Sooner Road to I-40.

2.5.2 Traffic Control

[40 CFR 270.14(b)(10)]

Traffic controls along the access routes consist of traffic signal lights at the intersections of the following: Southeast 59th Street and Air Depot Boulevard, Southeast 59th Street and Sooner Road, Southeast 74th Street and Air Depot Boulevard, on Air Depot Boulevard between Southeast 59th Street and Southeast 74th Street by Building 9001, at the Sooner Road gate south of 29th Street, Sooner Road and I-40, and Southeast 29th Street and Sooner Road. All other major intersections are controlled by stop signs or traffic signals.

2.5.3 Road Surfacing/Load Bearing Capacity

[40 CFR 270.14(b)(10)]

All of the off-base streets that will be used for the transportation of hazardous waste are asphalt or concrete surfaces meeting Oklahoma Department of Transportation roadway design standards. The quantitative load bearing capacity of the off-base streets is not known, but the streets are approved for three-axle vehicle and five-axle vehicle capacities of up to 54,000 pounds and 80,000 pounds, respectively.

2.6 Delegated Authority for Reports and Points of Contact

The mailing address of the Civil Engineering Branch, which has been delegated authority to manage the hazardous waste program, is:

Branch Chief of 72 ABW/CEAN Natural Infrastructure Management (Environmental Compliance)

Building 400
7535 5th Street
Tinker AFB, OK 73145-9100

The point of contact for hazardous waste management activities at Tinker AFB is:

Kyle Barton
Hazardous Waste Program Manager
72ABW/CEIEC
Building 400
7535 5th Street
Tinker AFB, OK 73145-9100
(405) 734-3278

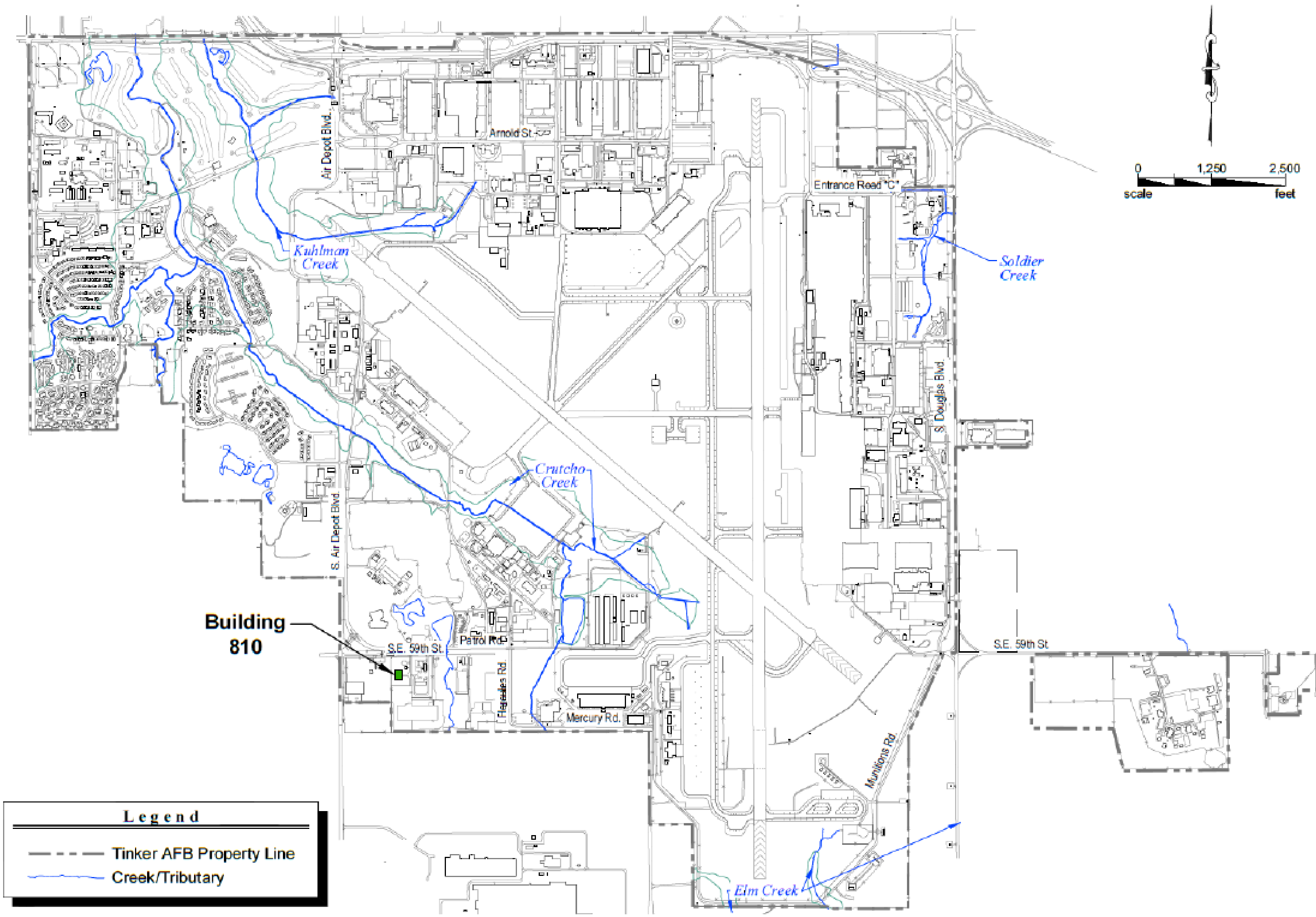


Figure 2-1: Building 810 Site Location Map

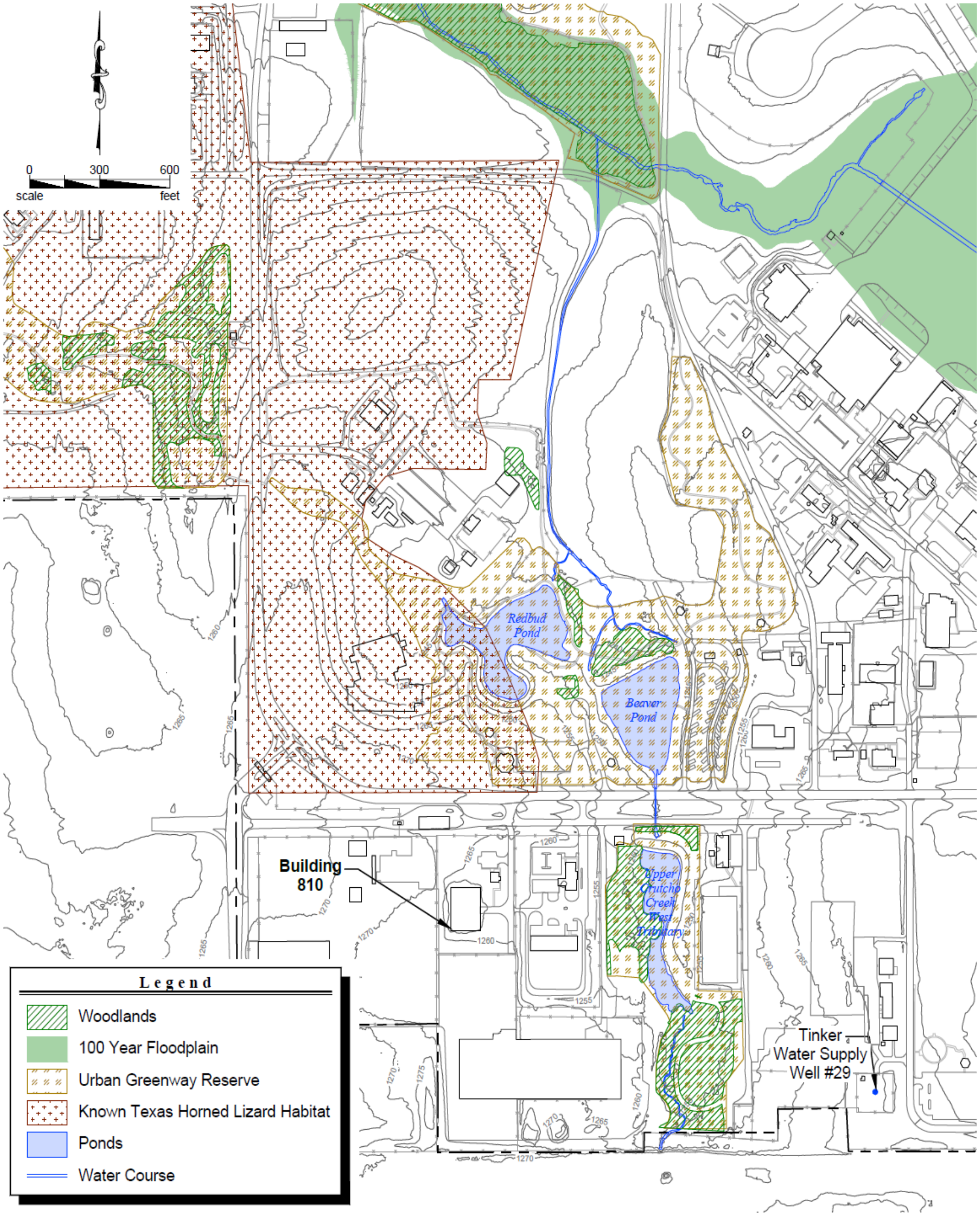
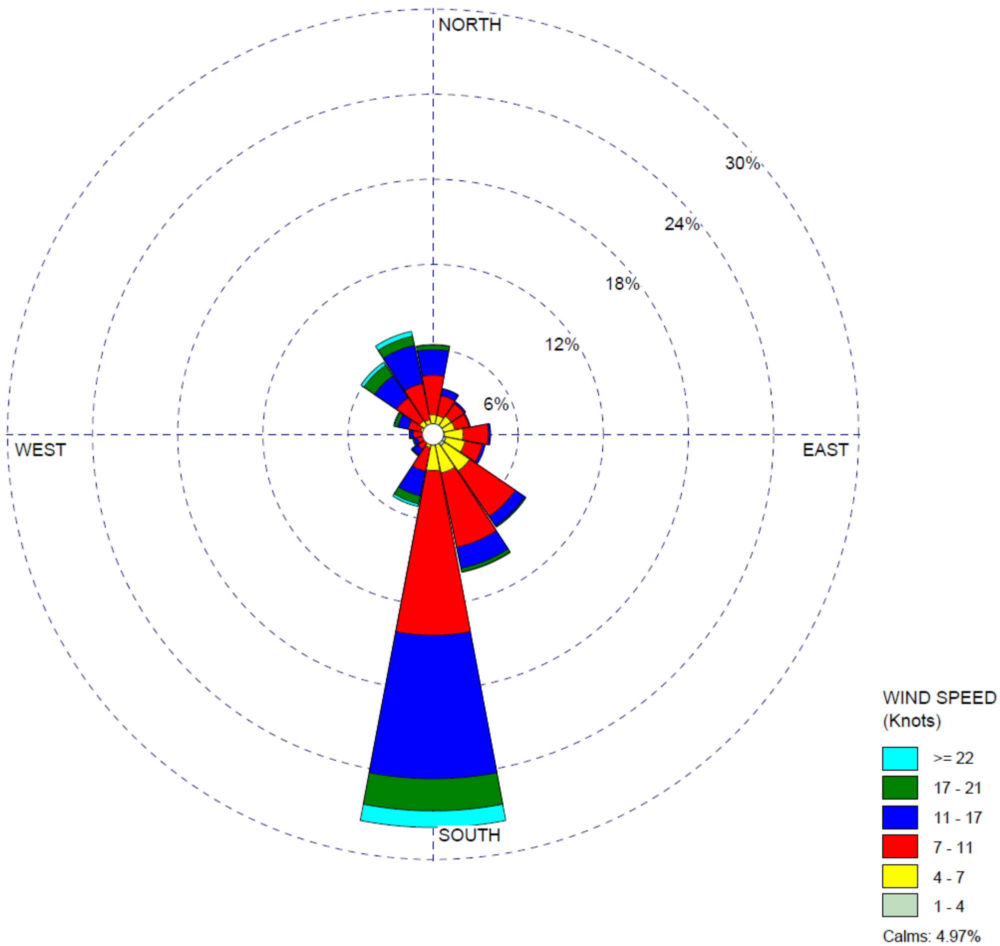


Figure 2-2: Building 810 Topographic Map Showing Wetlands, Floodplains and Nearby Cultural Development

Figure 2-3: Regional Map

WIND ROSE PLOT:
Tinker Air Force Base, Oklahoma
Annual Wind Rose - 2010

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD: **Start Date: 1/1/2010 - 00:00** **End Date: 12/31/2010 - 23:00**	COMPANY NAME: **PARSONS**	
		MODELER:	
	CALM WINDS: **4.97%**	TOTAL COUNT: **8650 hrs.**	
	AVG. WIND SPEED: **9.51 Knots**	DATE: **9/29/2011**	PROJECT NO.: **748229-03000**

WRPLOT View - Lakes Environmental Software

Figure 2-4: Wind Rose

Section 3 Waste Characteristics and Waste Analysis Plan

3.1 WASTE CHARACTERIZATION

[40 CFR 270.14(b)(2)]

Typically, containerized waste is characterized in the Hazardous Waste Management Facility (HWMF - Building 808 the 90-day barrel yard), prior to the waste being transported to the HWSF. An adequate number of samples are collected so as to provide a representative profile of the waste for proper disposal and regulatory reporting. Analyses of the major waste streams generated at Tinker AFB have been provided in ODEQ Form 858 in previous submittals to ODEQ.

Process knowledge alone may also be used to characterize a hazardous waste stream generated at Tinker AFB. For example, if hazardous materials that are off-specification, have passed the desirable shelf-life, or otherwise cannot be used are turned in with their original labeling, the Material Safety Data Sheets (MSDS) will be used to characterize the waste. The generators of the waste are required to provide process information to HWSF personnel.

3.1.1 Waste Generation

The physical and chemical characteristics of the waste stored at the HWSF are described in this section.

The majority of waste streams stored at the HWSF are those generated at Tinker AFB from aircraft maintenance, modification, and jet engine overhaul activities. However, the HWSF also may receive hazardous wastes from other DoD facilities. Wastes submitted to the HWSF for storage, irrespective of whether they are from on-site or off-site sources, will meet the characterization requirements of Tinker AFB's Waste Analysis Plan. Most of the DoD wastes have similar physical and chemical characteristics as those currently permitted for storage. A list of permitted waste codes is shown in the Part A application forms (see Section 1).

The largest waste streams generated at Tinker AFB result from surface preparation of aircraft skin, structural members, and engine parts. This activity includes paint removal and application; grease, dirt, and carbon removal; metal etching and priming; and abrasive blasting. These processes generate spent solvents, corrosive acids and bases, ignitable liquids, and solutions contaminated with heavy metals. Other large waste streams result from alteration of metal surfaces through removal by grinding and cutting operations or through build-up by electroplating and plasma-spray operations. These processes generate RCRA metals, cyanide solutions, contaminated cutting and coolant fluids, and corrosive liquids.

Maintenance of both aircraft and ground vehicles, which includes oil, filters, and antifreeze replacement as well as purging of tanks, fuel systems, and hydraulic lines generates large quantities of used oil, aircraft fuel, gasoline, antifreeze and hydraulic oil. Much of this material is sent to recyclers for energy recovery or reclamation. Occasionally, contamination by heavy metals or solvents requires shipment for disposal.

Sludge resulting from operation of the Industrial Wastewater Treatment Plant (IWTP) also comprises a large portion of the hazardous waste stream generated at the base. The sludge results from treatment of wastewater from nearly all of the above described processes. The greatest volume of sludge is contaminated with heavy metals and may be corrosive. Sludge from the bottoms of oil-water separators has a high organic content and also contains heavy metals. Liquid oils and fuel from the tops of these separators are shipped to recyclers for energy recovery. Such bulk wastes are typically pumped into a tank truck and taken directly to an appropriate treatment, storage, or disposal facility (TSDF).

Other significant waste streams resulting from daily operations include soil, sorbents, and debris contaminated with solvents, oils, fuels, and corrosives from clean-up of spills; photographic developers, fixers; and universal waste and other items, including batteries, fluorescent light end caps/ballast, aerosol cans, mercury instruments, glues, and adhesives.

In addition to the activities described above, hazardous waste streams generated at Tinker also result from RCRA corrective actions and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remediation of previously contaminated sites. These wastes may contain solvents, hydrocarbons, and metal contaminated soil and debris removed during remediation projects.

3.2 WASTE ANALYSIS PLAN

[40 CFR 270.14(b)(2)]

3.2.1 Purpose and Scope

The purpose of the Waste Analysis Plan is to establish procedures for the analysis of hazardous wastes required before treatment, storage, or disposal according to RCRA (40 CFR Parts 264.13, 265.13, and 268.7) and Title 252, Oklahoma Administrative Code, Chapter 205. Wastes are thoroughly characterized prior to turn-in to the HWSF; this is the responsibility of 72 ABW/CEA. Characterization is accomplished through process knowledge, analysis, and/or supporting documentation such as material safety data sheets. The *Tinker Waste Analysis Plan* provides procedures for identifying waste characteristics necessary for safe storage of waste before shipment off-site for further management. Although not all encompassing, the procedures cover the majority of the waste streams that Tinker AFB generates. The remaining waste streams are generated or are expected to be generated on a one-time or infrequent basis either on-site or off-site. Therefore, additional analytical procedures will need to be added or adapted from existing procedures on a case-by-case basis. This section presents an overview of the Waste Analysis Plan (see Section 3.3.2 below) with specific reference to regulatory requirements. The Base Waste Analysis Plan, including specific discussion of analytical protocols, is also found in Attachment 1, *Hazardous Waste Management, Tinker Instruction 32-7004.*

3.2.2 Overview

3.2.2.1 Responsibilities

The Tinker AFB Asset Management Division (72 ABW/CEA) is responsible for ensuring that proper analysis of waste streams to determine hazardous waste characteristics is accomplished, and that the laboratories that Tinker AFB uses follow acceptable quality control/quality assurance procedures. Wastes submitted to the HWSF for storage, irrespective of whether they are from on-site or off-site sources, will meet the waste characterization requirements of Tinker AFB's Waste Analysis Plan. Waste received from other DoD facilities may require a confirmation fingerprint or characterization analysis. Waste analysis is performed if process knowledge is absent or to supplement process knowledge.

3.2.2.2 Laboratories

72 ABW/CEA is responsible for ensuring that proper analysis of hazardous wastes is accomplished before handing in waste to the HWSF for storage prior to off-site treatment, storage or disposal. The Tinker Environmental Laboratory is capable of performing all normal operational waste stream analysis requirements including the Toxicity Characteristic Leaching Procedure (TCLP).

72 ABW/CEA maintains a contract with an outside accredited laboratory to provide analysis in case of work overload, an analytical confirmation is needed, or when a special procedure is required.

3.2.2.3 Parameters and Rationale

[40 CFR 264.13(b)(1)]

The hazardous waste analyses performed by Tinker AFB will enable the completion of the Disposal Plan as required by the ODEQ (see section 3.2.2.4). Copies of the Disposal Plan and appended waste analyses reports will be submitted to ODEQ and will be kept on file at 72 ABW/CEA. In addition, analyses are required to have a complete Material Profile Sheet per waste stream sampled.

The rationale for selecting parameters for analysis is based on the need to know the chemical characteristics of the wastes, so that wastes can be safely stored at the HWSF. The parameters that may be analyzed for are: primary chemical and physical form characteristics, chemical element, composition, percent solids, specific weight, pH, flash point, organic components, heavy metals, and other inorganic components. Tinker's Waste Analysis Plan discusses typical types of wastes and the analyses needed for each. The rationale for selecting the analytical procedures are based on generator's knowledge of the chemicals used, processes performed, and contaminants generated during these processes.

3.2.2.4 Oklahoma Disposal Plan

[OAC 252:205-5-1]

- ODEQ requires RCRA hazardous waste generators to complete a Disposal Plan for each hazardous waste stream generated. Tinker AFB has been assigned Disposal Number 55066, which applies to all approved waste streams; each waste stream is assigned a unique number. The provisions listed below will be followed with respect to Disposal Plans. Changes to the Disposal Plan will be submitted to the ODEQ at least five days before transporting affected hazardous waste off-site.
- Hazardous waste will not be transported until the ODEQ approves change to Disposal Plan.
- Change requests are to include supporting documentation such as laboratory analyses, and process information.
- If emergency clean-up, spill, or other unusual hazardous waste is generated that is not covered by an existing Disposal Plan, a one-time Disposal Plan may be issued pursuant to 252 OAC 205-5-1, para. (2).

3.2.2.5 Test Methods

[40 CFR 264.13(b)(2)]

The Waste Analysis Plan identifies the test methods to be used to analyze for selected parameters. These methods are those provided in EPA publication SW-846 (SW-846), entitled Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

The SW-846 procedures are designed primarily for trace determinations, and may not always be best suited for a given sample. If a method other than the EPA method is used to analyze a sample, the analytical report will be annotated to indicate the particular method used. Sources of these non-EPA methods will be documented and kept on file by the laboratory.

When necessary to characterize a particular waste or to determine its status under land disposal restrictions, the Toxicity Characteristic Leaching Procedure (TCLP) method will be used.

3.2.2.6 Sampling Methods

[40 CFR 264.13(b)(3)]

Representative samples of the waste streams will be collected from containers using the sampling procedures recommended by SW-846 and Appendix I to 40 CFR Part 268. Typical methods for common waste types are shown in Table 3-1.

3.2.2.7 Waste Management

This plan mandates that the individual waste streams be isolated, containerized, and not commingled unless process knowledge or waste analysis indicates that these streams are compatible. The problems created by commingling are:

- Risk of mixing incompatible materials,
- Increased difficulty in obtaining a representative sample,
- Increased time and costs of analysis,
- Reduction of resale value of potentially recyclable wastes, and
- Additional difficulty and increases in the costs of waste disposal.

3.2.2.8 Frequency of Analysis

[40 CFR 264.13(b)(4)]

Hazardous wastes generated at Tinker AFB will be characterized as often as waste streams or processes change to ensure analysis is accurate and up-to-date. The current set of hazardous wastes analyses will be reviewed annually by the Asset Management Division. Although not required for storage and not applicable to this permit application, additional analyses will be accomplished, when necessary, to determine whether a waste is restricted from land disposal according to 40 CFR Part 268.

3.2.3 Procedures for Analysis:

All hazardous wastes generated at Tinker AFB will be characterized as often as waste streams or processes change to ensure characterization is accurate and up-to-date. At the very least, 72 ABW/CEA will review the current set of hazardous waste profiles annually to determine if analyses are required. The analytical procedures discussed herein are to be used by the Tinker Environmental Laboratory as well as by outside laboratories that perform hazardous waste analysis for Tinker AFB. Appendix 3-1 is a list of abbreviations used for the various analytical procedures discussed. Elements are identified by standard chemical symbols.

3.2.3.1 Representative Samples, Analyses, and Profile Sheets

When needed for characterization, representative samples will be collected from drums, tanks and vats using the sampling procedures outlined in EPA publication SW-846. Samples will be submitted to the Tinker Environmental Laboratory or to contract laboratories for analysis as required. Tinker's contract laboratories must be certified by the Oklahoma Water Resources Board, provide proof of participation in the EPA's Proficiency Analytical Program, proof of certification in the NIOSH Proficiency Analytical Program, and proof of certification from the American Association for Laboratory Accreditation. All certifications must be maintained throughout the contract.

Waste analysis will be accomplished as required by 40 CFR Parts 264.13 and 268.7 using methods outlined in EPA publication SW-846. Quality assurance/quality control procedures will meet or exceed all requirements for waste analysis.

In addition to information for a complete Material Profile Sheet per waste stream sample, all hazardous waste analysis will provide information required for the ODEQ Disposal Plan. One or more of the parameters are analyzed: primary chemical and physical form, characteristics, chemical element, composition, percent solids, specific weight, pH, flash point, organic and inorganic components and heavy metals.

Profile Sheets for each waste stream generated will be filed by 72ABW/CEA.

3.2.3.2 Rationale for Analysis

Section 3.2.5 and Table 3.1 present sixteen (16) waste streams and one or more of the analytical procedures that may be used for each. The procedures are designed for the effective analysis of the various categories of wastes. Although not all encompassing, the procedures cover the majority of the waste streams that the base generates. However, additional analytical procedures may need to be added on a case-by-case basis.

The rationale for selecting the analytical procedures listed in this waste analysis instruction are based on knowledge of the chemicals used, processes performed, and contaminants generated during these processes. Analytical methods appropriate to the target analytes, matrices, and anticipated concentrations will be used.

The waste stream being analyzed will be isolated, containerized and not commingled prior to analysis. The problems created by commingling are: risk of mixing incompatible materials, increased difficulty in obtaining a representative sample, increased time and costs of analysis, reduction of resale value of the wastes and additional treatment difficulty and cost increase of disposal.

EPA methods are cited for various analytical procedures and are designed primarily for trace determinations and may not always be best suited for a given sample. If a method other than the cited EPA method is used to analyze a sample, the analytical report will be annotated to indicate the method used. Non-EPA methods will be documented and kept on file by the Tinker Environmental Laboratory.

APPENDIX 3-1: ABBREVIATIONS USED IN THE WASTE ANALYSIS PLAN

Abbreviations Used in the Waste Analysis Plan	
AES	Atomic emission spectrometry using flame photometry or spark emission
Cr	Chromium (Total)
Cr(VI)	Hexavalent Chromium
ECD	Electron capture detector for GC.
FID	Flame ionization detector for GC.
GC	Gas Chromatograph, usually with a capillary column.
HC	Hydrochloric Acid
ICP	Inductively coupled plasma atomic emission spectrophotometry
IR	Infrared spectroscopy, preferably by Fourier transform method
MIBK	Methyl Isobutyl Ketone
MS	Mass spectrometer detector for GC
PID	Photoionization Detector for GC
pH	Hydronium Ion Concentration
TCLP	Toxicity Characteristic Leaching Procedure

3.2.4 Testing for LDRs

[40 CFR 264.13(b)(6)]

In accordance with 40 CFR Part 268.7, all waste streams must be characterized to determine if they are subject to land disposal restrictions. The general extraction procedure to be used for this purpose is outlined in Appendix II of 40 CFR Part 261 and is known as the Toxicity Characteristic Leaching Procedure or TCLP. After an extract has been obtained, additional analysis as outlined below will be used to test for particular constituents.

3.2.4.1 Metals Analysis

Metals will generally be analyzed by ICP (Inductively Coupled Plasma). EPA methods for As, Ba, Cd, Cr, Hg, Pb, Se, and Ag as listed in SW-846 will be used.

3.2.4.2 Solvents

Solvents can be analyzed by GC (Gas Chromatograph) in either liquid or vapor phase. IR (Infrared Spectroscopy) also can analyze solvents. Either method is acceptable, as long as it is appropriate for the matrix and anticipated concentration range.

3.2.5 Specific Waste Type Analysis

Table 3-1 provides a current listing of routine hazardous waste streams along with the identified visual, physical, and chemical parameters that are capable of being assessed and tested for at the on-site laboratory or a certified contract laboratory.

Table 3-1: Specific Waste Type Analysis

WASTE STREAM	PARAMETER ANALYSIS		
	VISUAL	PHYSICAL	CHEMICAL
ABSORBENTS	1. Solid, dry or absorbed liquid.	1. Flash point (Free liquid)	1. Percent extractable organics; identify by GC or IR.
	2. Color of material.	2. Toxicity: solvents, oils, metals, additives, etc.	1.1. Hydraulic fluid, tricresyl phosphate by GC and Ba by ICP.
	3. Free liquid.		1.2. Transformer oils, PCBs by GC.
	4. Odor.		1.3. Fuels/Motor oils, Pb by ICP.
			2. Solid, for total Pb, Zn and Ba.
ACIDS / PLATING SHOP	1. Color of solution.	1. pH	1. Analysis of liquid phase
	2. Phases: number, type and volume.	2. Reactivity	1.1. Total Ag, Cd, Cr, and Pb; by ICP.
		2.1. All acids are incompatible with cyanide and sulfide containing waste.	1.2. Percent Acid by titration or specific gravity.
		2.2. Nitric acid solutions/metals produce nitrogen oxide gases.	1.3. Free fluoride by specific ion electrode.
		2.3. Strong nitric acid solutions are oxidizers.	1.4. Chromium (VI) by colorimetry or ion chromatography.
		2.4. Concentrated sulfuric acid/water releases heat.	2. Analysis of sludge phase.
		3. Toxicity: heavy metals and fluoride.	2.1. Identify by IR.
			2.2. Total Ag, Cd, Cr and Pb; by ICP
CAUSTICS AND ALKALINE CLEANERS	1. Color of solution.	1. pH	1. Analysis of liquid phase.
	2. Phases: number, type and volume.	2. Reactivity	1.1. Total Cd, Cr and Pb; by ICP.
		2.1. Strong Caustic Solutions/aluminum and zinc produce hydrogen gas.	1.2. Water content by evaporation.
		2.2. Concentrated caustics/water releases heat.	1.3. Alkali content by titration.
		2.3. Toxicity: cyanides, sulfides and heavy metals.	1.4. Total Cyanide by distillation and colorimetry or titrametric.
			2. Analysis of sludge phase.
			2.1. Identify by IR.
			2.2. Cd, Cr, and Pb; by ICP.

WASTE STREAM	PARAMETER ANALYSIS		
	VISUAL	PHYSICAL	CHEMICAL
CYANIDE PLATING SOLUTIONS	1. Color of solution.	1. pH.	1. Analysis of liquid phase.
	2. Phases: number, type and volume.	2. Reactivity.	1.1. Total Ag, Cd and Pb; by ICP.
		2.1. All cyanide-containing solutions have severe toxic capabilities.	1.2. Water content by evaporation.
		2.2. Contact with acids of any type releases highly toxic hydrogen cyanide gas.	1.3. Total cyanide by distillation and colorimetry or titrametric.
		2.3. Contact with acidic chlorine solutions releases highly toxic cyanogen chloride gas.	2. Analysis of sludge phase.
		3. Toxicity: cyanide and heavy metals.	2.1. Total Ag, Cd and Pb; by ICP.
			2.2. Total cyanide by distillation and colorimetry or titrametric.
			2.3. Identify by IR or wet chemistry.
PLATING SOLUTIONS (Metals)	1. Color of solution.	1. pH.	1. Analysis of liquid phase.
	2. Phases: number, type and volume.	2. Reactivity: Tank specific (e.g., cyanide) or reaction/acid solutions.	1.1. Total Ag, Cd, Cr and Pb; by ICP.
		3. Toxicity: cyanide, fluoride and other heavy metals.	

WASTE STREAM	PARAMETER ANALYSIS		
	VISUAL	PHYSICAL	CHEMICAL
CHROMATE SOLUTIONS	1. Color of solution.	1. pH.	1. Analysis of liquid phase.
	2. Phases: number, type and volume.	2. Reactivity.	1.1. Total Cr, Cd and Pb; by ICP.
		2.1. Many chromate solutions are strongly acidic.	1.2. Optional analysis Cr(VI) by colorimetry, iodimetry or ion chromatography.
		2.2. Same incompatibilities and reactions as with acid solutions.	
		3. Toxicity: hexavalent chromium, other heavy metals or fluoride.	
ELECTROLESS COPPER PLATING	1. Color of solution.	1. pH.	1. Analysis of liquid phase.
	2. Phases: number, type and volume.	2. Toxicity: formaldehyde, presence copper.	1.1. Water content.
			1.2. Formaldehyde by MS.
ADHESIVES, SEALANTS AND PREPEGS	1. Color of material.	1. Flash point.	1. Analysis of volatiles.
	2. Phases: number, type and volume.	2. Toxicity: Aromatic amines, expoxides, formaldehyde, phenols, isocynates, solvents.	1.1. Percent volatiles.
	3. Viscosity.		1.2. Identify volatiles by GC, GC/MS or IR.
	4. Layers.		2. Analysis of nonvolatiles.
			2.1. Identify by IR: epoxy, polysulfide, acrylic, etc.

WASTE STREAM	PARAMETER ANALYSIS		
	VISUAL	PHYSICAL	CHEMICAL
WASTE PAINT: NEW, USED, OR PAINT CONTAMI-NATED RAGS	1. Color of material.	1. Flash point.	1. Analysis of volatiles.
	2. Phases: number, type and volume.	2. Toxicity: Aromatic solvents, non-aromatic solvents or heavy metals.	1.1. Percent of volatiles.
			1.2. Identify volatiles by GC, GC/MS or IR.
			2. Analysis of nonvolatiles.
			2.1. Percent extractable organics.
			2.2. Identify extractables by GC, GC/MS or IR.
			3. Analysis of nonextractable material.
			3.1. Identify material by IR.
			3.2. Total Cd, Cr, Ba, Hg, etc.
			4. Analysis of contaminated rags.
			4.1. Volatiles by Headspace/GC or GC/MS.
			4.2. Total Cd, Pb, Cr, Ba, etc. by ICP.
PAINT REMOVER (METHYLENE CHLORIDE TYPE)	1. Color of material.	1. pH.	1. Analysis of volatiles
	2. Phases: number, type and volume.	2. Flash point.	1.1. Identify volatiles by GC, GC/MS or IR.
		3. Toxicity: solvents, heavy metals, amines, ketones or phenols.	2. Analysis of non-volatiles.
			2.1. Percent extractable organics.
			2.2. Identify extractables by GC, GC/MS or IR.
			3. Analysis of nonextractable material.
			3.1. Identify material by IR.
			3.2. Total Pb, Cd, Cr, etc. by ICP.

WASTE STREAM	PARAMETER ANALYSIS		
	VISUAL	PHYSICAL	CHEMICAL
PAINT STRIPPER (SOLVENT TANK AND HOT STRIPPERS)	1. Color of material.	1. pH.	1. Analysis of volatiles.
	2. Phases: number, type and volume.	2. Flash point.	1.1. Percent volatiles.
		3. Toxicity: solvents, amines, ethers, heavy metals.	1.2. Identify volatiles by GC, GC/MS or IR.
			2. Analysis of nonvolatiles.
			2.1. Identify nonvolatiles by IR.
			2.2. Total Pb, Cd, Cr, etc. by ICP.
DEGREASER SOLVENTS	1. Color of solution.	1. Toxicity: solvents (aromatic, halogenated, etc.), heavy metals in sludge.	1. Analysis of liquid phase.
	2. Phases: number, type and volume.		1.1. Percent volatiles.
			1.2. Identify volatiles by GC, GC/MS or IR.
			2. Analysis of sludge.
			2.1. Percent extractable organics.
			2.2. Identify extractables by GC, GC/MS or IR.
			2.3. Identify nonextractables by IR.
DEGREASING DETERGENTS	1. Color of solution.	1. Phases: number, type and volume.	1. Analysis of sludge.
			1.1. Percent extractable organics.
			1.2. Identify extractables by GC, GC/MS or IR.
			1.3. Identify nonextractables by IR.
			1.4. Total Ag, Cr, Cd, Pb, etc. by ICP.

WASTE STREAM	VISUAL	PHYSICAL	CHEMICAL
	PARAMETER ANALYSIS		
OILS NOT COMMINGLED (HYDRAULIC, AIRCRAFT)	1. Color of materials.	1. Flash point.	1. Analysis of oil phase.
	2. Phases: number, type and volume.	2. Toxicity: heavy metals, esters, solvents.	1.1. Identify by GC, GC/MS or IR.
			1.2. Percent volatiles by Headspace GC.
			1.3. Identify volatiles by GC, GC/MS.
			1.4. Metals Pb, Cr and Cd by ICP.
			2. Analysis of rags contaminated with oil.
			2.1. Percent extractable organics.
			2.2. Identify extractables by GC, GC/MS or IR.
WASTE FUELS	1. Color of material.	1. Flash point.	1. Identify type of fuel by GC, GC/MS and IR.
	2. Phases: number, type and volume.	2. Toxicity: solvents, lead, hydrocarbon fuels.	2. Percent volatiles.
			3. Identify volatiles by GC, GC/MS and IR.
			4. Identify heavy hydrocarbons by GC, GC/MS and IR.
INDUSTRIAL WASTE TREATMENT SLUDGE	1. Color of materials.	1. pH.	1. Analysis of water.
	2. Phases: number, type and volume.	2. Toxicity: heavy metals, cyanide, fluoride, sulfide, pesticides, herbicides, phenols.	1.1. Ag, As, Ba, Cd, Cr, Hg, Pb, and Se; by ICP.
			1.2. Total cyanide by distillation and colorimetry or titrametric.
			1.3. Total fluoride by distillation and specific ion electrode.
			2. Analysis of volatiles.
			2.1. Identify volatiles by GC, GC/MS.
			3. Analysis of non-volatiles.
			3.1. Percent extractable organics.
			3.2. Identify extractables by GC, GC/MS or IR.
			4. Analysis of nonextractable material.
			4.1. Identify material by IR.
			4.2. Total Pb, Cd, Cr, etc. by ICP.

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Section 4 Process Information

4.1 HAZARDOUS WASTE STORAGE FACILITY (BUILDING 810)

4.1.1 General

Building 810, also known as the HWSF, constitutes the permitted hazardous waste facility on Tinker Air Force Base. Building 810 and landscaping features are located within an approximately 2.2 acre compound within the Base..

4.1.2 Construction Details

[40 CFR 264.175(c), 270.15(a)(1)-(a)(5)]

The HWSF building is constructed of concrete masonry unit walls and a metal roof. The HWSF is fully enclosed, with a roll-up bay door and pedestrian doors to control access. The interior of the HWSF consists of the following storage areas:

- Four (4) double-wide, fully enclosed storage modules (Modules 103, 107, 120, and 123) to allow for the storage of drums and other large containers of waste and materials up to 20,790 gallons for each module
- Five (5) standard sized storage modules (Modules 102, 108, 113, 119, and 125) to allow for the storage of drums and other containers of waste and materials; up to 10,692 gallons for each module
- One (1) smaller standard sized storage module (Module 115) to allow for the storage of drums and other containers of waste and materials; up to 4,752 gallons (a door on the west side of this module is used to access Module 116, the mechanical room).
- Six (6) large closets (Modules 109, 110, 111, 112, 118, and 124) for storing smaller quantities of waste and materials; up to 1,118 gallons for each closet
- Four (4) small closets (Modules 104, 117, 121, and 122) for storing smaller quantities of waste and materials; up to 594 gallons for each closet
- One (1) area (Staging Area 101) will be used for staging incoming and outgoing wastes

The HWSF storage modules and/or closets are separated by concrete masonry walls. Figure 4-1 is a building plan of the facility; Figure 4-2 shows a typical module layout.

All floors within the HWSF building are constructed of concrete. The HWSF building has no floor drains. All floor surfaces are flat except for ramp areas. In accordance with 40 CFR 264.175 (b)(1), the floor surfaces are free of cracks or gaps (construction joints are sealed) and are sufficiently impervious to contain leaks or spills until the released material is detected and removed (see Section 6.2 for inspection procedures and frequency).

Secondary containment for potential spills is provided by a two-inch high concrete block curbing around the entire interior perimeter of the HWSF building. The floors of each storage module and closet are depressed four inches from the main corridor, resulting in a net six inches of containment height, with entrance ramps leading down into the module or closet. Joints in the concrete floor are sealed and the floor is coated with a chemical-resistant epoxy sealant. The secondary containment volume requirements for each storage module and closet within the HWSF are presented in Section 4.1.4 below. As shown in Figures 4-3 and 4-4, run-on into the HWSF is prevented by modifying the drainage pattern of the site to divert storm water away from the HWSF.

The interior lighting of the HWSF meets appropriate illuminating standards. The HWSF is equipped with two emergency shower/eye wash stations to comply with 29 CFR (Figure 4-1).

Security for the HWSF building is discussed in Section 6.1.

4.1.3 Design Capacity

[40 CFR 270.15(a)(1)]

Storage in the HWSF consists of containers placed on pallets which are typically placed on heavy duty metal racks. Sturdy pallets are used as storage platforms, to assist in container handling and to reduce the potential for damage to containers. The pallets also help prevent rust or other moisture damage by elevating the containers above the floor and by providing space for the tines of a mechanical fork-lift when movement of the containers is necessary. Flammable waste liquids will not be stacked directly on top of one another; however, stacking one flammable waste pallet above another on metal racks is not considered direct stacking. The pallet and metal rack system provides additional storage capacity without stacking pallets directly on top of one another. Small containers may be placed directly on the metal racks without the use of pallets.

A standard pallet is 48 inches by 48 inches. Most of the waste stored at the HWSF is contained in 55-gallon drums. For this purpose, larger pallets measuring 49 inches by 56 inches in size are used. This will provide additional space to hold four 55-gallon drums thereby reducing the chance of a drum falling off the pallet and being damaged.

The physical storage capacity of the HWSF has been calculated based on rows of pallet storage racks placed inside each storage module or closet. Calculations were made assuming pallets could be stacked three tiers high on storage racks in all storage modules and storage closets. All pallets were assumed to hold four 55-gallon drums that are 90% full (i.e., 49.5 gallons each). Occasionally, overpack drums (85-gallons) may be used to contain leaking 55-gallon drums or 55-gallon drums with poor integrity. The 85-gallon overpack drum does not affect the following volume calculations since they are not used as primary containers. The effective volume would still be 49.5 gallons. Based on these assumptions, the following volumes were calculated for each storage module and closet.

- <u>Modules 103, 107, 120, and 123</u>: 420 55-gallon drums (90% full) for a total volume of 20,790 gallons in each module
- <u>Modules 102, 108, 113, 119, and 125</u>: 216 55-gallon drums (90% full) for a total volume of 10,692 gallons in each module
- <u>Module 115</u>: 96 55-gallon drums (90% full) for a total of 4,752 gallons
- <u>Modules 109, 110, 111, 112, 118, and 124</u>: 24 55-gallon drums (90% full) for a total of 1,188 gallons in each closet
- <u>Modules 104, 117, 121, and 122</u>: 12 55-gallon drums (90% full) for a total of 594 gallons in each closet

Storage of hazardous waste beyond normal hours of operation in the staging area may at times be necessary before loading onto vehicles or transferring to other designated modules or closets within the HWSF. In this case, hazardous waste containers with free liquids will be provided with secondary containment trays; each tray has a containment capacity equal to or greater than the total volume of containers in the tray. Maximum overnight storage in the staging area will be two 10-pallet rows stacking two high, or 40 pallets holding 160 55-gallon drums (90% full) for a total of 7,920 gallons.

Including the staging area, the maximum storage capacity of the HWSF is 158,796 gallons.

4.1.4 Secondary Containment System Design and Capacity

[40 CFR 270.15(a)(3)]

In accordance with 40 CFR 264.175 (b)(3), the containment system must have sufficient capacity to contain ten percent of the volume of all containers in the system, or the volume of the largest container in the system, whichever is greater. The maximum sized containers used to store liquid wastes in the HWSF will be 55-gallon drums, which will hold 49.5 gallons of liquid when filled approximately ninety percent full according to operating procedures. All secondary containment areas will far exceed the required containment capacity for a 55-gallon drum, and will meet the ten percent total volume capacity requirement.

The base of each storage module or closet is made of concrete and is four inches lower than the corridor elevation. This, combined with the two-inch curbing around the interior perimeter of the building, provides a six-inch deep containment area the size of the storage module or closet.

The secondary containment capacity was determined by multiplying the horizontal dimensions of each module or closet by the height of the curbing, then converting to gallons. See Appendix 4-1 for detailed calculations.

Each containment module and closet provides sufficient capacity to contain more than ten percent of the aggregate volume of hazardous waste to be stored. A comparison of the intended storage capacities and secondary containment volumes is shown in Table 4-1.

Note: The Staging Area will only be used to stage drums during their shipment. Should hazardous waste containers with free liquids be stored in this area, the containers will be provided with secondary containment trays. Each tray will have a containment capacity equal to or greater than the largest container placed on a pallet.

Table 4-1: Storage Capacities vs. Secondary Containment Capacity Requirements

Module or Closet Number	Hazardous Waste Storage Capacity (gallons)	Containment Capacity Required (10% of Storage Capacity) (gallons)	Containment Capacity Available (gallons)
103, 107, 120, and 123	20,790 gallons per module	2,079 gallons per module	8,114 gallons per module
102, 108, 113, 119, and 125	10,692 gallons per module	1,069 gallons per module	3,989 gallons per module
115	4,752 gallons	475 gallons	1,399 gallons
109, 110, 111, 112, 118, and 124	1,188 gallons per closet	119 gallons per closet	170 gallons per closet
104, 117, 121, and 122	594 gallons per closet	59 gallons per closet	91 gallons per closet

4.2 DESCRIPTION OF STORAGE CONTAINERS

[40 CFR 264.171]

The container types that will be used to store hazardous waste at the HWSF include, but are not limited to: metal drums, barrels, kegs, plastic drums, carboys, cans, pails, boxes (including cubic yard boxes), and bottles. Containers will be visually inspected prior to acceptance of a shipment into the HWSF to ensure that they are compatible with the waste, not leaking and capable of withstanding sustained storage. Containers of hazardous waste transported into and from the HWSF will meet DOT specifications.

4.3 CONTAINER MANAGEMENT PRACTICES

[40 CFR 270.15(b) and (d)]

The containers are used and managed in accordance with 40 CFR 264 Subpart I. Loading and off-loading of wastes will be conducted in the Staging Area (Figure 4-1) where waste containers will be separated and categorized based on their contents. The content or chemical characteristic of a waste that arrives at the HWSF will be used to determine where the waste will be stored within the HWSF All waste containers must be known to contain only permitted wastes for acceptance into the HWSF. At no times shall any “Unknown” or non-permitted wastes be brought into the facility.

The compatibility of a waste with other wastes will be determined in accordance with the most current compatibility chart located in Appendix V of 40 CFR 264. The HWSF building will be configured to accept three basic compatibility groups: toxics, flammables, and corrosives (acids and bases, separately). An inventory will be maintained showing the name, storage location, and quantity of all wastes being stored. This inventory will be maintained as part of the HWSF operating record.

Flammable wastes constitute the largest of the waste groups and thus require the most space, especially since pallets holding drums of flammable liquids cannot be stacked. The volume of toxic and flammable waste varies considerably. Therefore, it is frequently necessary to convert the use of a bay from storage of one compatibility group to storage of another. An entire bay is normally converted. If it becomes necessary to place more than one compatibility group in the same bay, only one group will be subject to that bay's secondary containment. The other group will be placed in secondary containment devices which are compatible with, and which can hold one-hundred percent of, the waste being contained.

In the event that incompatible wastes must be stored within the same storage module, the incompatible wastes will be separated from one another by means of temporary diking, berms, or some other similar device in accordance with the requirement of 40 CFR 264.177(c). The entire HWSF is permitted for hazardous waste storage, but unused hazardous materials may also be stored on a space available basis.

A detailed description of container management practices is contained in Tinker AFB Attachment 1, *Hazardous Waste Management,* Tinker Instruction 32-7004.

Typically, the storing, labeling, and consolidation (as needed) of wastes will be performed at the 90-day storage area, i.e., HWMF, Building 809, prior to being transported to the HWSF. Occasionally, wastes may be staged at the generation sites and transported directly to the HWSF. Building 809 (or HWMF) is located just east of and adjacent to the HWSF (Building 810). The wastes will be transported to the HWSF by tractor-trailer combinations or straight trucks. Upon arrival at the HWSF, inspections of containerized hazardous wastes will be performed. If the containers are accepted, they will be removed from the transport vehicles using forklifts and placed in the staging area of the HWSF. From the staging area, the containers will be placed directly into the appropriate storage module in the HWSF.

Containers of hazardous waste will always be closed during storage, except when collecting samples or when transferring waste from one container to another, which requires prior approval from the Asset Management Division. Inspections with recorded results will be conducted weekly, checking for leaking or deteriorating containers as discussed in Section 6 of this application.

Hazardous wastes will not be handled or stored in a manner which will impair the integrity of the container. Containers will typically be stored on pallets for ease of inspection and movement with forklifts and to avoid contact with accumulated liquid, if any, in the containment area.

Typically, pallets of size 49 inches by 56 inches will be used to store four 55-gallon drums. Smaller pallets, measuring approximately 48 inches square, may be used to hold 1 to 30-gallon cans, cartons, bottles, and other containers. When used to hold 55-gallon drums, the pallets will not be stacked more than three high. Pallets holding flammable liquid wastes will not be stacked directly on top of one another; however, stacking one flammable waste pallet above another on a pallet storage rack (up to 3 levels) is allowed. Multi-level pallet storage racks are installed in the HWSF to allow the storage of stacked drums on pallets.

Containers without free liquids will be managed in the same manner as containers with free liquids.

4.3.1 Container Management

[40 CFR 264.173]

- A waste that is incompatible with any other waste or material that is stored such that contact between them might occur during a mutual spill must be separated or protected from contact by a dike, berm, wall, or other device.
- Wastes will be placed in containers that are in good condition without excessive dents, rust, or other corrosion.
- Wastes will be placed in containers that are compatible with those wastes so the ability of the device to hold the waste is not impaired. Containers containing residues of incompatible wastes will not be used.
- Containers must be closed except when sample verification is necessary to determine the nature or characteristics of the contents, or transferring contents to a good container.
- Hazardous wastes will never be handled or stored in a manner that will impair the integrity of the container.
- Palletized containers holding hazardous waste must be placed vertically and placed on metal storage racks.
- No more than four 55-gallon drums will be placed on a single pallet.
- When used to hold 55-gallon drums, the pallets will not be stacked more than three high.
- Pallets holding flammable liquid wastes will not be stacked directly on top of one another; however, stacking one flammable waste pallet above another on a pallet storage rack will allowed.
- When moving containers on pallets within the facility, they will be strapped to each other to provide extra stability and prevent damage from falling. Containers of hazardous waste will always be closed during storage, except when collecting samples

or when transferring waste from one container to another which requires prior approval from A72 ABW/CEA.

- Leaking containers will be placed in an 85-gallon DOT approved overpack drum. Labels and markings identical to those on the leaking container will be placed on the overpack. Any spills will be contained and cleaned-up. The absorbents utilized for clean-up will be properly disposed.
- Containers without free liquids will be managed in the same manner as containers with free liquids.

4.4 AIR EMISSION STANDARDS FOR CONTAINERS

[40 CFR Part 264 Subpart CC, 270.27]

The RCRA 40 CFR 264 Subpart CC regulations (§264.1080 et seq.) apply to containers with hazardous waste that has an average volatile organic (VO) concentration at the point of waste generation greater than 500 parts per million by weight (ppmw) as determined by direct measurement method. For a container having a design capacity of greater than 0.1 cubic meters (m^3) (approximately 26.4 gallons) and less than or equal to 0.46 m^3 (approximately 121.5 gallons), the owner or operator is required to control air pollutant emissions from the container in accordance with the Container Level 1 standards. Among other control measures, the standards can be satisfied by using containers that meet the applicable U.S. Department of Transportation (DOT) regulations on packaging of hazardous materials for transportation.

Containers with a design capacity greater than 0.46 m^3 managing hazardous waste with an average VO content greater than 500 ppmw are subject to Container Level 2 standards. Container Level 2 standards may also be met by using containers that meet applicable U.S. DOT regulations on packaging hazardous materials for transportation.

The facility will not stabilize organic hazardous wastes in containers; thus, Container Level 3 standards will not apply.

Some of the containers that will be managed at the HWSF will have an average VO content greater than 500 ppmw at the point of generation. All containers that enter into the HWSF will be packaged in accordance with DOT 49 CFR 178 to ensure compliance with Subpart CC.

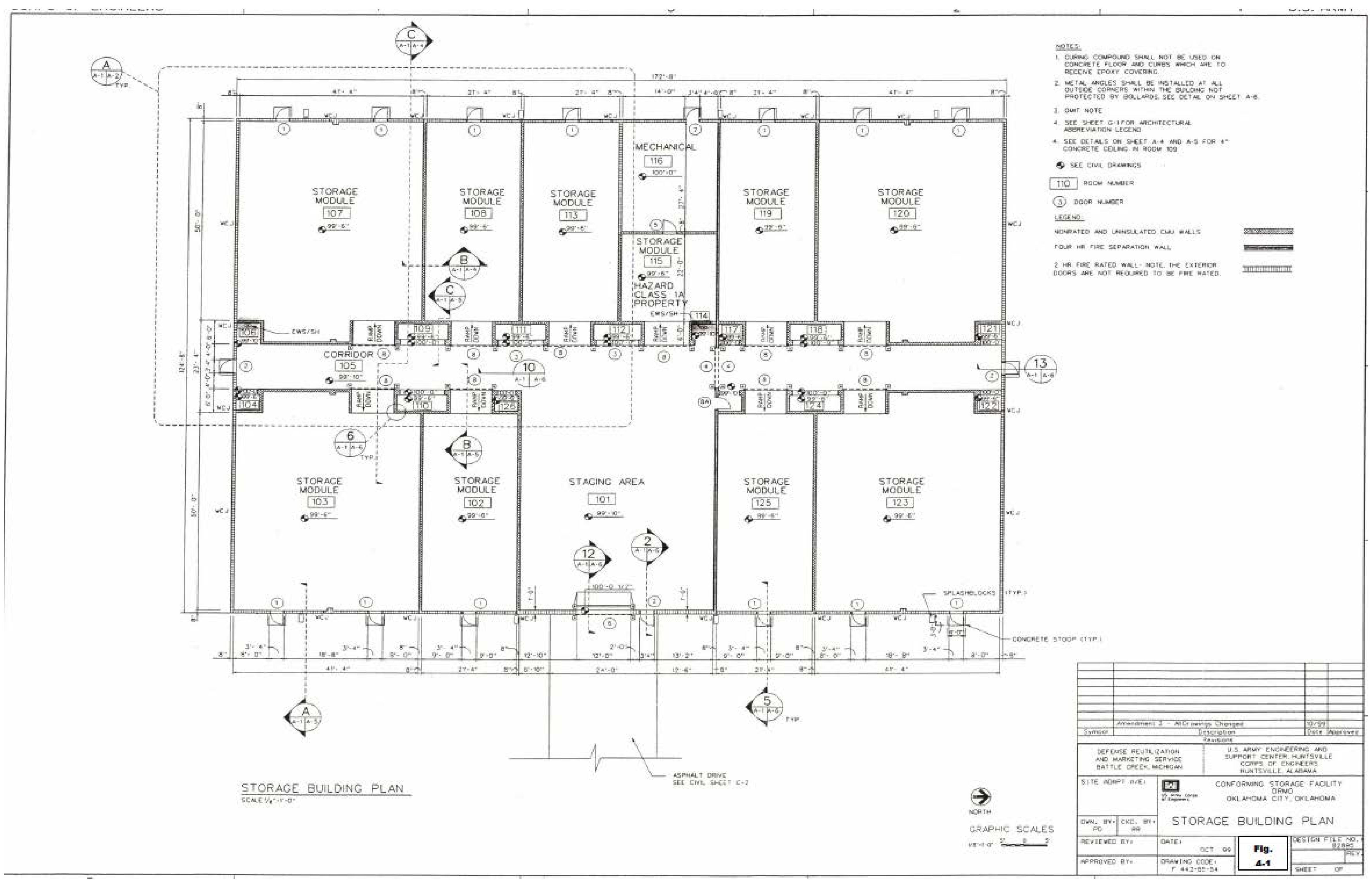

Figure 4-1: Building 810 Building Plan

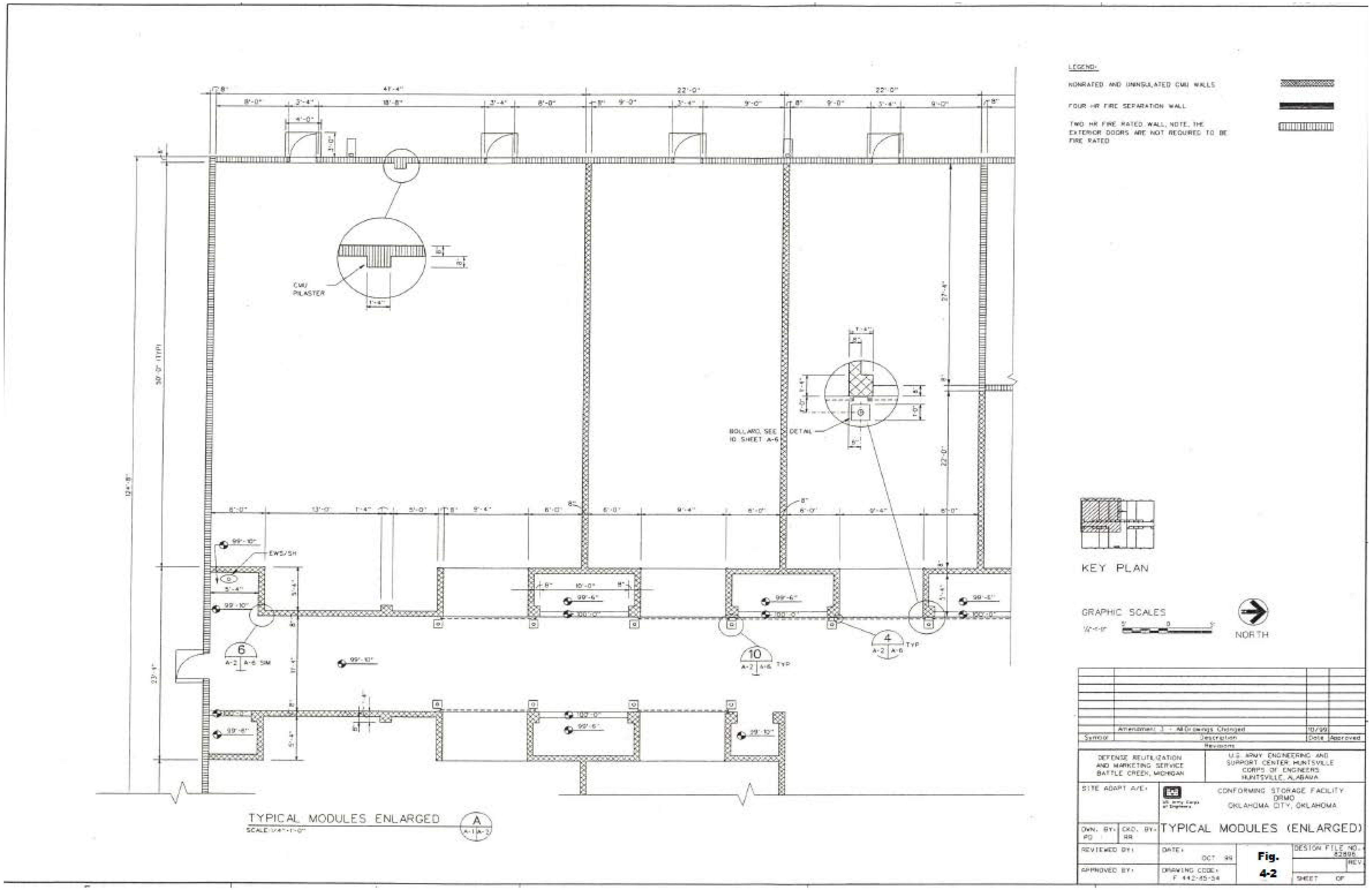

Figure 4-2: Typical Modules

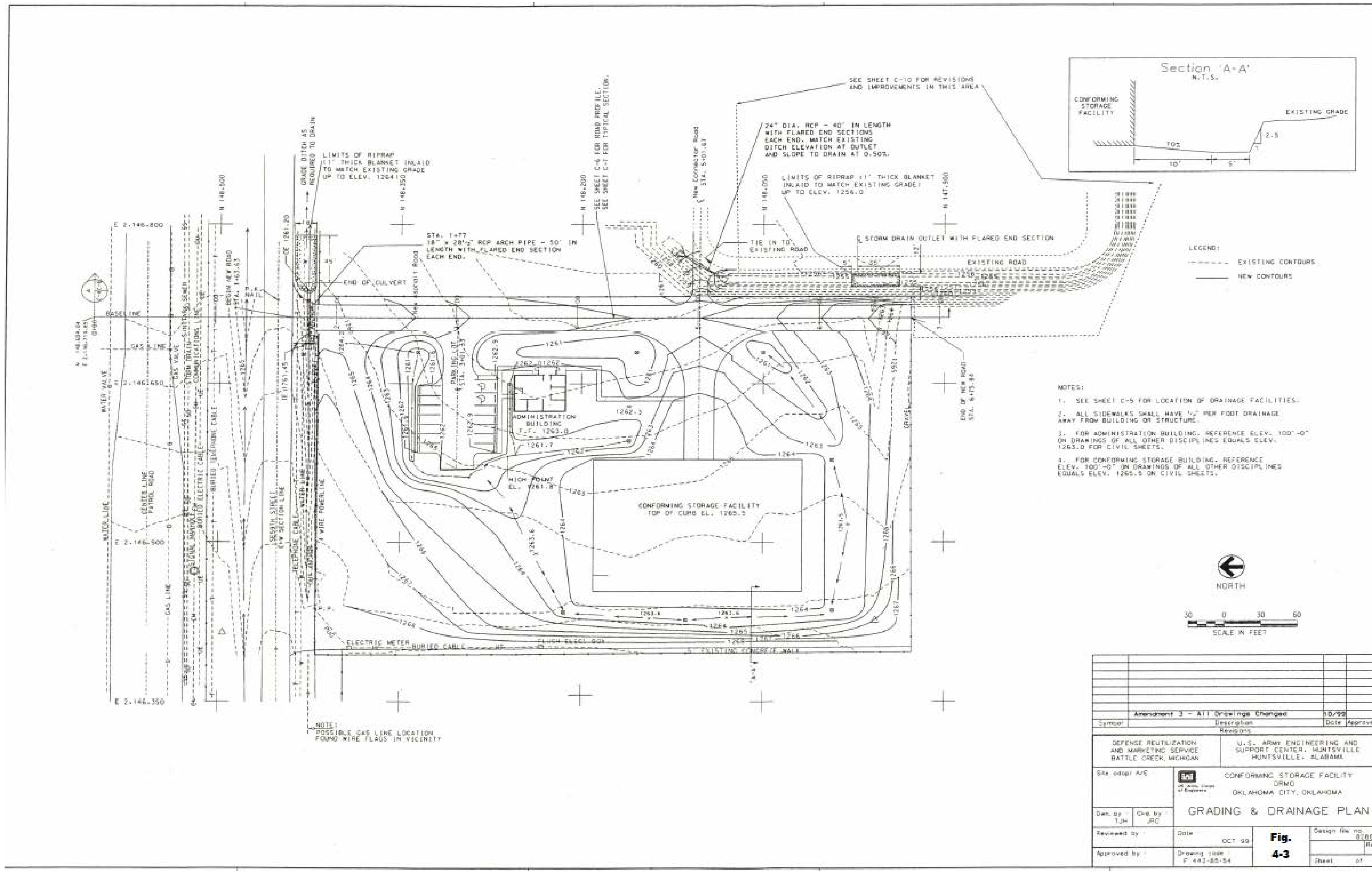

Figure 4-3: Grading and Drainage Plan

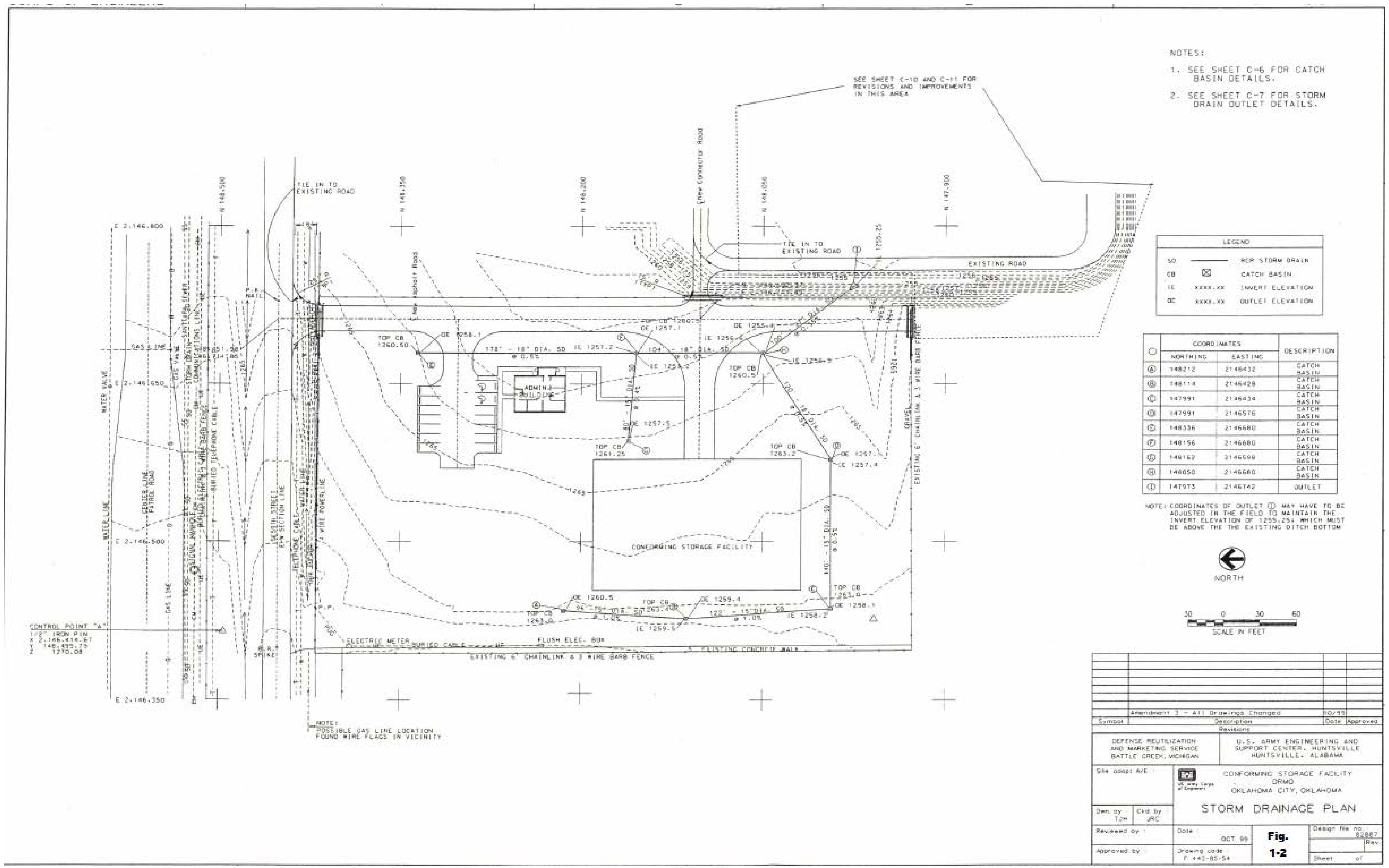

Figure 4-4: Storm Drainage Plan

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APPENDIX 4-1: SECONDARY CONTAINMENT CALCULATIONS

Height of containment is based on:

Concrete curbing 6 inches (0.5 feet) high

Assuming level concrete floor.

Each module is either rectangular or can be artificially divided into rectangular sections for the purpose of calculating surface area.

Volume of containment is determined by the relationship:

Volume (ft^3) = Length (ft) x Width (ft) x Height (ft)

Volume (gal) = Volume (ft^3) x 7.48 gallons/ft^3

No displacement of available containment volume because waste containers are raised above the floor.

A. Modules: 107, 103, 120, and 123

Rectangle 1: 50 feet x 41.33 feet x 0.5 feet = 1,033.25 cubic feet

Rectangle 2: 5.33 feet x 19.33 feet x 0.5 feet = 51.51 cubic feet

Total Volume: 1,033.25 cubic feet + 51.51 cubic feet = 1,084.76 cubic feet

Convert to Gallons: 1,084.76 cubic feet x 7.48 gallons/cubic foot = 8,114.04 gallons

B. Modules: 102, 108, 113, 119, and 125

50 feet x 21.33 feet x 0.5 feet = 533.25 cubic feet

Convert to Gallons: 533.25 cubic feet x 7.48 gallons/cubic foot = 3,988.71 gallons

C. Module: 115

17 feet x 22 feet x 0.5 feet = 187 cubic feet

Convert to Gallons: 187 cubic feet x 7.48 gallons/cubic foot = 1,398.76 gallons

D. Closets: 109, 110, 111, 112, 118, and 124

4 feet x 11.33 feet x 0.5 feet = 22.66 cubic feet

Convert to Gallons: 22.66 cubic feet x 7.48 gallons/cubic foot = 169.50 gallons

E. Closets: 104, 117, 121, and 122

(4.66 feet x 4.66 feet + 0.67 feet x 4 feet) x 0.5 feet = 12.2 cubic feet

Convert to Gallons: 12.2 cubic feet x 7.48 gallons/cubic foot = 91.26 gallons

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Section 5 Management Procedures

The following procedures refer to those used at the HWSF by Tinker AFB personnel, the operators of the facility. For waste management procedures used throughout Tinker AFB see Attachment 1, Tinker Instruction 32-7004, Hazardous Waste Management. A policy of "No Endangerment or Degradation" in accordance with Oklahoma Administrative Code (OAC) Chapter 200-9.1 is practiced throughout Tinker AFB.

Most hazardous waste received at the HWSF originates from Initial Accumulation Points (IAPs) located throughout Tinker AFB, is channeled through the HWMF, and is transported by tractor-trailer or straight truck to the HWSF. Hazardous waste generated from spills or from cleaning out a process tank may be turned in directly to the HWSF. In addition, hazardous materials that are excess, past shelf-life or off-specification may be turned in directly to the HWSF. Typically, the waste from the HWMF is contained in 55-gallon Department of Transportation (DOT) containers. Overpack drums are allowed for deteriorating or leaking containers. Excess, past shelf-life, or off-specification hazardous materials are typically in the original containers which may be cardboard boxes, plastic or glass bottles, tin cans, bags, and wooden crates. Other container types include glass carboys, metal hoppers, and plastic wrapping. Various structurally sound DOT-approved containers of other sizes are also utilized.

All containers holding hazardous wastes are visually inspected when they arrive at the HWSF to ensure they meet DOT specification packaging, and are compatible with the waste, not leaking, and capable of withstanding sustained storage. Appendix 5-1 outlines acceptance requirements. If found unacceptable, the waste will be rejected until proper containment is provided.

Following inspection, the waste containers are removed from the vehicles and placed into Staging Area 101 within the HWSF (see Figure 4-1). A determination of the compatibility of the waste being stored is made prior to moving the containers into the appropriate storage module or closet for storage.

5.1 Container Marking and Labeling

Hazardous waste must be properly identified at all times by appropriate markings and labels on the container in which it is being stored in accordance with 40 CFR 262.31 and 262.32.

- All containers of hazardous waste will be marked with the words "HAZARDOUS WASTE". The accumulation start date will also appear on individual containers.
- Affix appropriate shipping labels on hazardous waste containers for off-site waste shipment. The commonplace yellow, vinyl "Hazardous Waste" label is typically used. Tinker AFB will ensure that the following information required for the label is included:

INFORMATION ITEM	EXAMPLE
EPA WORDS	HAZARDOUS WASTE
EPA ADDITIONAL WORDS	FEDERAL LAW PROHIBITS IMPROPER DISPOSAL. IF FOUND, ETC
DOT SHIPPING NAME	"RQ" WASTE PAINT RELATED MATERIAL
HAZARD CLASS	3
PACKING GROUP	III
DOT ID NUMBER	UN1263
GENERATOR INFORMATION	72 ABW/CEA
	TINKER AFB
	OKC OK 73145
EPA ID NUMBER FOR BASE	OK1571724391
EPA WASTE NO.	D001, D035, F005
ACCUMULATION START DATE	02 JUNE 11
MANIFEST DOCUMENT NO.	0025858

- When transporting, or offering for transportation off-site, any shipment of hazardous waste will comply with DOT regulations on hazardous materials under 49 CFR part 172.

All containers shipped off-site will meet DOT requirements for the waste contained. Before containers are transported off-site, they will be marked in accordance with 49 CFR 172 Subpart D, 40 CFR 262.32(b), and labeled in accordance with 49 CFR 172 Subpart E.

5.2 Waste Tracking

An inventory is maintained showing the name, storage location, and quantity of all wastes being stored. This inventory is maintained as part of the HWSF operating record.

DLA Disposition Services and Tinker AFB have waste minimization programs that promote re-utilization, transfer, donation, or sale (RTDS) of all hazardous wastes or materials that are generated within the base. If arrangements cannot be made to reutilize, transfer, donate, or sell a hazardous waste or material, it is stored until arrangements can be made through a contract administered by DLA Disposition Services to transport it to an EPA or State permitted off-site TSD facility. However, wastes subject to land disposal restrictions will not be stored longer than one year unless demonstration is made to show that such storage is necessary to facilitate proper recovery, treatment, or disposal.

All hazardous wastes shipped off-site to a TSD Facility will be in containers and overpacks that meet DOT specifications for those wastes. Hazardous waste may be temporarily stored in Staging Area 101 prior to removal from the facility.

On-Site Tracking of Hazardous Waste. Tinker AFB Personnel will be required to use the Air Force's HWTS to track all wastes that may enter the building. All wastes must be assigned a profile number and/or MSDS number, hazard class and proper shipping name prior to storing in facility. Containers will be stored in segregated rooms by DOT Hazard Class..

Off-Site Tracking of Hazardous Waste Shipments. This procedure relates to the preparation of containers for off-site shipment of hazardous waste and the tracking procedures to be used after shipment to a designated facility. It completes the trail of records that previous parts have followed only as far as DLA Disposition Services.

In accordance with 40 CFR 264.73 (b)(2), a procedure for recording the quantity and location of hazardous wastes at the storage facility has been established as follows:

DRMS Form 1712, Hazardous Waste Log (Appendix 5-3) or equivalent, which can be computerized, is used to monitor the storage and movement of containers through the HWSF. The date of receipt is the date entered on the DD Form 1348-1A (Issue Release/Receipt Document, also known as the Turn-in Document") when the waste physically arrived at the HWSF. DRMS Form 1712, or equivalent, also provides the date when the container of waste was transported off-site, the manifest number, a description of the waste, the quantity, and the generating organization, and a container number assigned for internal tracking by the Tinker AFB HWMF. When completed, each DRMS Form 1712, or equivalent, is maintained permanently on-site.

5.3 USE OF MANIFEST

[40 CFR 262.20]

Shipment Documentation (Hazardous Waste Manifest). An EPA Form 8700-22, *Uniform Hazardous Waste Manifest* (Appendix 5-4) will accompany any shipment of hazardous waste being transported on a public highway. A manifest is the shipping paper for hazardous waste. All generators are required to use the Uniform Hazardous Waste Manifest. Some states have additional requirements beyond the Uniform Hazardous Waste Manifest. Any additional state requirements will also be met if shipments are made to facilities outside of Oklahoma.

DLA Disposition Services will complete the generator's copy of the manifest and will deliver it to 72 ABW/CEAN within two hours after the initial transporter accepts shipment. 72 ABW/CEAN will review the manifest with special emphasis on waste identification, waste codes, shipping names, quantities and costs as outlined on the DD Forms 1348-1A corresponding to the wastes being shipped. 72 ABW/CEAN will monitor the return of manifests signed by the designated facility. When the copy of manifest signed by the designated facility is received, it will be filed and maintained for at least three years.

If a copy of the manifest signed by the designated facility is not received within 35 calendar days after acceptance by the initial transporter, the transporters, the designated facility and/or others will be contacted to verify the status of the waste. An exception report will be sent to ODEQ in accordance with 40 CFR 262.42 if the manifest copy signed by designated facility is not received within 45 calendar days after initial transporter accepts the waste shipment.

5.4 Record Keeping

[40 CFR 264.73]

Records of all phases of hazardous waste management will be maintained on site to enable certification of compliance with regulations and to document results of waste minimization efforts.

- DRMS Form 1713, Inspection Log (or equivalent, which can also be computerized) will be maintained on site for at least three years.
- DRMS Form 1712, Hazardous Waste Log, (or equivalent, which can also be computerized) will be maintained on site until closure of the facility.
- Exception reports will be kept on file for at least three years after the due date of the reports.
- Job descriptions and records of training received for all personnel will be maintained at the site until closure for current employees, and for three years after former employees last worked there.
- A complete copy of OC-ALC Plan 19-2, Spill Response Plan (Attachment 2), will be available at the permitted facility, and Chief of Engineering/Tinker AFB Hazardous Waste Coordinator's Office.
- A site-specific contingency plan for the HWSF is also maintained at the permitted facility, and Chief of Engineering/Tinker AFB Hazardous Waste Coordinator's Office.
- A copy of this permit will be available for review in the office area of the permitted facility, and Asset Management Division Hazardous Waste Program Manager’s Office.

5.5 Reporting

72 ABW/CEAN will prepare and transmit reports concerning the generation, shipment and disposal of hazardous wastes. These include the Biennial Report (40 CFR 262.41 and 264.75), exception reports (40 CFR 262.42), and monthly and quarterly reports to ODEQ.

APPENDIX 5-1: HWSF CONTAINER ACCEPTANCE REQUIREMENTS

Containers and packaging material for hazardous wastes generated by waste operations or DoD components must meet DOT requirements prior to acceptance into the HWSF.

- Drums
  - No rust which is deteriorating the metal;
  - No sharp dents or creases in the metal;
  - No extensive denting on the sides of the drum;
  - No dents in the lip or rings;
  - No bulging in the top or bottom (above or below rim);
  - Bung gaskets and covers in place and bung cover tight;
  - Drums upright and strapped to each other;
  - No more than four 55-gallon drums to a pallet;
  - Pallets in good condition and sturdy enough to contain the weight of the drums;
  - Drums may not exceed approximately 90% full. Unit of issue will be pounds and the quantity must be accurate;
  - Department of Defense Turn-In Document (DD Form 1348-1, 1348-1A, or equivalent) properly completed.
- Bags or Cartons
  - Bags must be intact;
  - Cartons must be sound and able to support the inner materials;
  - Inner packages must not be broken, uncapped, torn or otherwise not able to contain the product completely;

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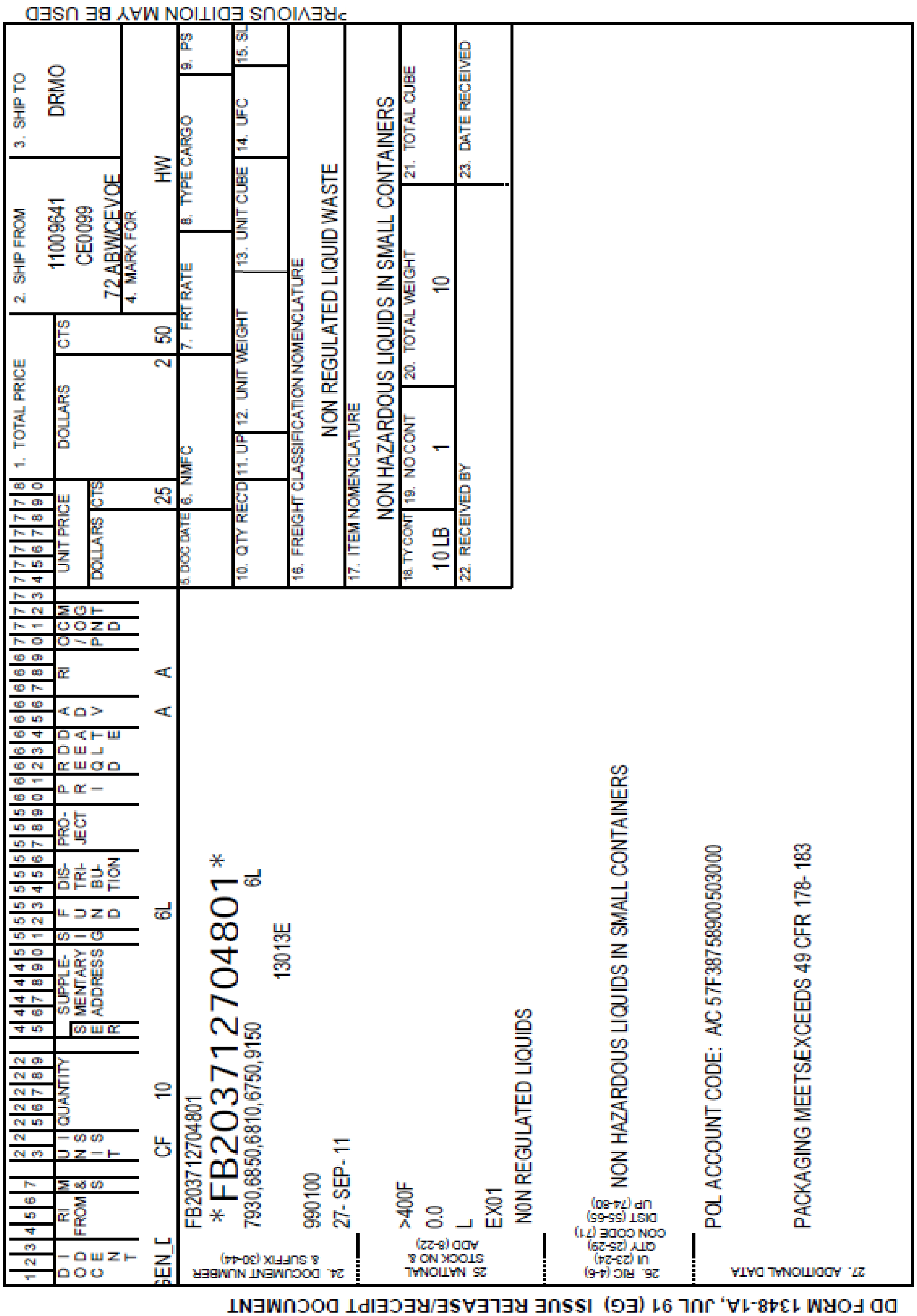
APPENDIX 5-2: DEPARTMENT OF DEFENSE TURN-IN DOCUMENT, EXAMPLE FORM 1348-1A


PREVIOUS EDITION MAY BE USED

1. TOTAL PRICE — DOLLARS 2, CTS 50
2. SHIP FROM — 11009641, CE0099, 72 ABW/CEVOE
3. SHIP TO — DRMO
4. MARK FOR — HW

DOC IDENT: GEN_D | RI FROM | M&S | UNIT ISS: CF | QUANTITY: 10 | SER | SUPPLEMENTARY ADDRESS | SIG | FUND: 6L | DISTRIBUTION | PROJECT | PRI | REQD DATE | ADV: A | RI: A | O/P | COND | MGT

UNIT PRICE — DOLLARS | CTS 25

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS
10. QTY REC'D | 11. UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE: NON REGULATED LIQUID WASTE

17. ITEM NOMENCLATURE: NON HAZARDOUS LIQUIDS IN SMALL CONTAINERS

18. TY CONT: 10 LB | 19. NO CONT: 1 | 20. TOTAL WEIGHT: 10 | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44):
FB203712704801
FB203712704801
7930,6850,6810,6750,9150 6L
13013E
990100
27- SEP- 11

25. NATIONAL STOCK NO & ADD (8-22):
>400F
0.0
L
EX01
NON REGULATED LIQUIDS

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-65) UP (74-80):
NON HAZARDOUS LIQUIDS IN SMALL CONTAINERS

27. ADDITIONAL DATA:
POL ACCOUNT CODE: A/C 57F387589005030000
PACKAGING MEETS/EXCEEDS 49 CFR 178- 183

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

APPENDIX 5-3: HAZARDOUS WASTE LOG – EXAMPLE DRMS FORM 1712

RESET FORM PRINT FORM

HAZARDOUS WASTE LOG *(Prescribing Authority: DRMS-I 4160.14, Sec 2, Ch. 8)*

DRUM NO.	DTID NO.	GENERATOR DATA		DESCRIPTION OF CONTENTS	PHY. FORM	RECEIPT MANIFEST NO.	EST/MANIFESTED		STORAGE		DISPOSAL MANIFEST NO. OR REQUISITION NO.	
		ORG SYMBOL	BLDG. NO.				WT/VOL VALUE	SYMBOL	LOCATION			
	NSN/LSN	NAME	PHONE	DESCRIPTION OF CONTENTS	EPA HAND-LING CODE	EPA HAZ. WASTE NO.	DENSITY		DATE		CONTRACT NO.	DELIVERY ORDER NO.
							VALUE	SYMBOL	IN	OUT		

DRMS FORM 1712, FEB 2002 (EF)

HAZARDOUS WASTE LOG

APPENDIX 5-4: EPA FORM 8700-22, EXAMPLE *UNIFORM HAZARDOUS WASTE MANIFEST*

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

VOID

GENERATOR

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number

5. Generator's Name and Mailing Address

Generator's Site Address (if different than mailing address)

Generator's Phone:

6. Transporter 1 Company Name — U.S. EPA ID Number

7. Transporter 2 Company Name — U.S. EPA ID Number

8. Designated Facility Name and Site Address — U.S. EPA ID Number

Facility's Phone:

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
	1.					
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name — Signature — Month Day Year

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: ______

Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name — Signature — Month Day Year

Transporter 2 Printed/Typed Name — Signature — Month Day Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name — Signature — Month Day Year

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)

Section 6 Procedures to Prevent Hazards

6.1 SECURITY

[40 CFR 264.14, 270.14(b)(4)]

This subsection describes the measures in place to prevent the unknowing entry, and to minimize the potential for unauthorized entry, of persons and livestock into the HWSF.

6.1.1 Tinker Air Force Base

Tinker AFB is an active military installation. As such, access to the Base is restricted by fencing, guards, and a 24-hour security patrol. Entry to the Base is restricted to a limited number of gates, all manned by armed Air Force Police or other security personnel.

6.1.2 Hazardous Waste Storage Facility (Building 810)

The HWSF, Building 810, is located in the southwestern portion of the Base, adjacent to an area formerly known as the "Defense Reutilization and Marketing Office Compound." Building 808, the administrative office for the HWSF and HWFM, is located adjacent to the east.

The compound is surrounded by a six-foot high chain link security fence, topped with three-strand barbed wire. Two gates provide access to the compound; one through the access road by Patrol Road north of the facility, and the other is through the HWMF compound. Typically, these gates will be open only during hours of operation, which are normally from 0700 to 1600, Monday through Friday. The gates will be left open while HWSF personnel are working in order to provide easy egress routes from the area in case of fire or other emergency. If HWSF personnel are not working in the compound and must leave the compound unattended for any reason during normal operating hours, the compound gates will be locked. Outside of operating hours gates will be kept locked.

Visitors to the HWSF will be required to register with HWSF staff in Building 808 before entering the HWSF. Visitors must provide information concerning the organization they represent and the purpose for their visit. No visitors are allowed to enter the HWSF unescorted.

6.1.3 Warning Signs

[40 CFR 264.14(c)]

Warning signs will be affixed to the compound perimeter fence at each gate and at intervals of approximately 50 feet, so that they are visible from any approach to the compound. The signs will be posted at a height of 4-6 feet. The signs will be in English and legible from a distance of at least 25 feet. The signs will carry the legend, "Danger – Unauthorized Personnel Keep Out", or equivalent language.

6.2 INSPECTION PLAN AND SCHEDULE

[40 CFR 264.15, 270.14(b)(5)]

The following formal inspection program is designed to monitor compliance with regulations and to occur often enough to prevent threats to human health and the environment. A complete visual inspection of the hazardous property, facility storage areas, and personal protective clothing and equipment will be made weekly. Inspection of hazardous waste containers and their storage sites for leakage is largely qualitative. Visual observations are used by Tinker AFB personnel to detect leaks. However, it is relatively easy to detect whether or not hazardous waste containers are marked and stacked properly and whether the incompatible wastes are segregated from each other. Regular inspection of the hazardous waste storage facility and its contents will ensure the hazardous waste is stored safely.

6.2.1 Facility and Container Inspections

[40 CFR 264.174]

Tinker AFB personnel will conduct general inspections of the hazardous waste storage facility for structural integrity of the facility, secondary containment system, security devices, operating machinery, operating procedures, and evidence of potential leaks or discharges. The inspection of applicable items will reduce the potential for release of hazardous waste constituents that may adversely impact of human health and the environment. The frequency of general inspections depends upon equipment malfunctions, incidents of environmental or human health problems, and nature of problems identified. As part of the general inspection, the secondary containment structures will be checked for cracks or gaps.

Weekly inspections of the containers will be conducted using DRMS Form 1713, Inspection Log (Appendix 6-1) or equivalent to record comments by an employee trained in hazardous waste management procedures. These visual inspections will concentrate on integrity of containers and their management including labeling, handling, and compatibility issues.

When a container is found to be seriously deteriorated or is leaking, authorized personnel will cleanup any spilled material. As necessary, waste may be transferred to another 55-gallon container that is in good condition, or the leaking container may be placed in an 85-gallon DOT approved overpack drum. Labels and markings identical to those on the leaking container will be placed on the overpack.

Containers will be inspected to ensure proper storage. Pallets and palletiers holding drums of flammable liquid wastes will not be stacked directly one upon another; however, stacking one flammable waste pallet above another on a pallet storage rack will not be considered direct stacking.

Containers with ignitable or reactive hazardous wastes will be stored at least fifty feet from the HWSF property line. This requirement is met for any containers stored within the confines of the HWSF building.

Where forklifts are used, the inspector will ensure that sufficient aisle space (at least ten feet), is provided between stacks or groups of drums within each storage module to allow for the movement of forklifts and personnel.

6.2.2 Inspection Log

Information gathered during general and container inspections will be recorded on DRMS Form 1713, Inspection Log (Appendix 6-1) or equivalent, which will be maintained in the administrative area of the HWMF. Information on these logs includes the name of the inspector, date and time of inspection, item, problems observed, and the date and nature of repairs and remedial action(s).

6.2.3 Remedial Action

If inspections reveal that non-emergency maintenance is needed, the hazardous waste inspector, hazardous waste program manager, and the facility managerare authorized to initiate immediate action for the correction of the unacceptable condition. If a hazard is imminent, is occurring during the course of an inspection, or has occurred between inspections, remedial action will be taken according to the Contingency Plan as explained in Section 7.

6.3 Prevention of Reaction of Ignitable, Reactive and Incompatible Waste

[40 CFR 264.17, 264.176, 264.177, 270.14(b)(9)]

Container management practices are in place for the prevention of reaction of ignitable, reactive and incompatible waste in accordance with 264.176 and 264.177. Smoking in the staging area and in the HWSF is banned. In addition, before performing hot work (e.g., welding, cutting, etc.) within the HWSF, permission must be obtained from Hazardous Waste Program Manager and the Tinker Fire Department.

6.3.1 Procedures for Handling Ignitable, Reactive or Incompatible Waste

6.3.1.1 Management of Ignitable or Reactive Wastes in Containers

The HWSF is located at least fifty feet from the nearest property line of the base, and therefore will be in compliance with the recommended National Fire Protection Association (NFPA) standards for container storage holding ignitable or reactive wastes. Also, pallets holding drums of flammable liquid material/wastes are not stacked, except on pallet storage racks. This ensures stability in the event of accidental impact and allows easy inspection for spillage. Visual inspections are conducted weekly in the storage areas to detect spills or leaks, to ensure maintenance of aisle space, and to minimize the potential for accidents.

6.3.1.2 Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Wastes

Hazardous wastes received at the facility are required to be in non-leaking containers that comply with DOT container regulations (49 CFR Parts 173, 178 and 179). This minimizes the potential for ignition and reaction of hazardous wastes.

The compatibility of wastes with other wastes is determined in accordance with the most current compatibility chart located in Appendix V of CFR 264. Tinker AFB has the option to use a more stringent compatibility comparison if they elect to do so. Other available information to determine hazard characteristics and compatibility are the Department of Defense's Hazardous Materials Information System (HMIS) information, other standard hazardous material reference data such as Material Safety Data Sheet (MSDS), and/or laboratory analyses. Specific precautions taken to prevent ignition or reaction include the following:

- Incompatible wastes will not be placed in the same container per procedures described in *Hazardous Waste Management, Tinker Instruction 32-7004* (see Attachment 1).Tinker AFB
- Hazardous wastes will not be placed in an unwashed container that previously held an incompatible waste. Only new or reconditioned DOT approved or equivalent containers will be used to store waste.
- Containers holding incompatible wastes will be separated and protected from nearby wastes by physical means such as a berm or wall. These wastes will be segregated at the storage facility as described in Section 4 of this permit application.
- Incompatible and reactive wastes are protected from sources of ignition or reaction, such as open flames, smoking, cutting and welding, hot surfaces, frictional heat, and sparks (static, electrical or mechanical). An obvious potential cause of accidents associated with handling and storing ignitable waste is facility personnel smoking. For this reason, smoking is prohibited inside the HWSF building and in the staging area. A sign with the legend "NO SMOKING BEYOND THIS POINT" is posted at the entrance to the facility. Areas with drums containing ignitable and reactive wastes prominently display a sign clearly marked with the legend "No Smoking". Spark-proof tools (brass hammers, wrenches) are used in the management of containers storing ignitable/reactive wastes. No welding or other activities that are known to produce open flames, hot surfaces, frictional heat, spontaneous ignition or radiant heat are allowed in the HWSF building or staging area without the prior approval of the Tinker Fire Department.
- Mixing of wastes will not be conducted at this facility. Wastes are not transferred from one container to another on a regular basis at this facility unless previously approved by the Asset Management Division. The transferring of waste is performed only by trained personnel.

6.4 PREPAREDNESS AND PREVENTION

[40 CFR 270.14(b)(8)]

The HWSF, is designed, constructed, operated, and maintained in a manner to minimize the possibility of fire, explosion or any unplanned sudden or non-sudden releases of hazardous waste or hazardous waste constituents to the environment. This section addresses the appropriate subject areas of 40 CFR 270.14, 264 Subpart C and the corresponding ODEQ requirements for the prevention of hazards at the HWSF.

6.4.1 Equipment Requirements

[40 CFR 264.32]

The HWSF is equipped with the emergency response, spill control, and decontamination equipment to respond to a fire, explosion or unplanned release of hazardous waste. This equipment consists of internal and external communication capabilities: alarm system equipment, portable fire extinguishers, fire control equipment, spill control equipment, decontamination equipment and access to an adequate water supply volume and pressure to supply water hose streams or foam producing equipment.

6.4.1.1 Internal Communication

Personnel within the HWSF carry two-way radios at all times or implement the buddy system. In the event of an emergency, the HWSF personnel will report the emergency by pulling the fire alarm, using two-way radios, or via voice command with the administrative office. Personnel located at the administrative office under the authority of the Incident Command System will summon emergency assistance using a telephone system that can access assistance as outlined in Section 7 of this permit application.

6.4.1.2 External Communication

If necessary as determined by the Incident Commander, the Incident Commander or his/her designee will activate the Spill Prevention and Response Plan (Contingency Plan) to summon off-site assistance (e.g., local emergency response of fire departments, hospitals, etc.). See Section 7 of this permit application.

6.4.1.3 Emergency Equipment and Materials

There are portable dry chemical fire extinguishers stored at various convenient locations within the HWSF where a potential for fire hazards could exist, i.e., the flammable and reactive storage areas. Spill control equipment such as absorbers, shovels and brooms, overpack drums, and sodium bicarbonate are located in designated storage closets within the HWSF (see Section 7 of this permit application). Personnel decontamination equipment includes two eyewash/shower stations located within the HWSF building (Figure 4-1).

6.4.1.4 Water for Fire Control

A fire hydrant with adequate volume and pressure is available for the HWSF to combat non-chemical or non-electric fires. A fire hydrant is located within the compound near the front of Building 810. The fire hydrant has a static pressure of sixty psi, a residual pressure of approximately fifty psi and will produce approximately 1,057 gpm.

6.4.2 Aisle Space Requirement

[40 CFR 264.35]

A minimum of ten feet of aisle space is maintained in the HWSF storage areas that require the use of a forklift for movement of pallets. A minimum of two feet of aisle space is maintained in all other areas of the HWSF where hazardous waste is stored. This allows the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment in the event of an emergency.

6.4.3 Preventive Procedures, Structures, and Equipment

6.4.3.1 Unloading Operations

Unloading operations at the HWSF take place at Staging Area 101 which is located within the HWSF. Accidental spills during loading or unloading will be swept up or soaked up using an absorbent material and containerized.

6.4.3.2 Run On/Run-Off

[40 CFR 270.15(a)(4)]

The HWSF building was built on a site graded such that it is slightly higher in elevation relative to the surrounding area, minimizing the possibility of run-on into the building. Run-on is further prevented by the building walls and berms. The HWSF is constructed so that all waste handling, including loading and unloading activities, will be conducted within the covered and diked building. Therefore, any waste that is spilled within the HWSF building will be contained and will not run-off or contact environmental media during routine operations. In the unlikely event of an emergency, the Tinker AFB fire department and responders will take necessary measures to contain any run-off that has the potential of being contaminated.

6.4.3.3 Water Supplies

The HWSF is operated in such a way that it should not release hazardous waste to environmental media. In the unlikely event that a release should occur, the release would be immediately cleaned up and/or contained. The operational practices of the HWSF protect surface and groundwater supplies from contamination.

6.4.3.4 Equipment, Instruments and Power Failure

The HWSF relies on the local power company for power to light and ventilate the HWSF. Operations will be shut down when the power supply is interrupted. During a power outage, waste handling will cease, i.e., waste will not be removed or staged.

6.4.3.5 Personnel Protection Equipment

Personnel are required to wear protective clothing when exposure to waste could occur (e.g., sampling of drums and bulking). Only properly trained and authorized personnel can sample or open waste containers.

Level D personnel protective equipment (PPE), such as coveralls, gloves, chemical resistant disposable overboots, safety glasses or chemical splash goggles and face shields, are maintained and provided to personnel working at the HWSF. Emergency equipment is listed in Section 7.

6.4.3.6 Prevention of Releases to the Atmosphere

Hazardous wastes that are handled at the HWSF are in containers of 55-gallons or less. The containers remain closed at all times unless the waste must be sampled or transferred to a different container. Transfer of wastes will not be performed regularly. When necessary, it will be performed in the staging area away from sources of heat or ignition. Overpack drums are available for highly volatile waste that must be transferred to a different container. In this case, the waste may be left in its original container and then placed in the overpack drum. The potential of release to the atmosphere is considered minimal due to the small volumes of containers that will be opened or transferred. Waste transfer or handling will only be undertaken by authorized personnel.

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APPENDIX 6-1: EXAMPLE INSPECTION LOG -DRMS FORM 1713

INSPECTION LOG

(Prescribing Authority: DRMS-I 4160.14 Sec. 2, Ch. 8)

DATE/TIME	AREA/BLDG *(Specify when HM/HW is stored off-site of DRMO)*	SIGNATURE OF INSPECTOR

ITEM SAFETY AND EMERGENCY EQUIPMENT	TYPE OF PROBLEM	SAT	UN-SAT	NA	LOCATION AND PROBLEMS OBSERVED	DATE & NATURE OF CORRECTIVE ACTIONS	FREQUENCY
Face Shield & chemical goggles	Broken, dirty or missing						Weekly
Protective clothing	Holes, worn, missing						Weekly
Absorbents (e.g., sorb-all Vermiculite)	Saturated, contaminated, below minimum quantity						Weekly
Empty drums/containers	Corrosion, structural damage, securely stored						Weekly
Emergency eyewash/shower	Water pressures. leaking, flushed						Weekly
Ventilation systems	Not operating, blocked						Weekly
Shovel nonsparking	Missing, damaged						Weekly
Fire extinquishers	Not charged, not mounted, missing						Monthly
Fire alarm system	Not operating						Monthly
Telephone system	Not operating						Monthly
First Aid equipment & supplies	Items out of stock, outdated, expired supplies						Monthly
Non-sparking bung wrench	Missing, damaged						Weekly
Push broom	Missing, damaged						Weekly
SECURITY							
Warning signs	Illegible, missing						Weekly
Security lights	Not operating						Weekly
Building doors, locks, fence and gates	Locks missing, unlocked, signs of tampering						Weekly*

DRMS FORM 1713, DEC 2007 (EF) Page 1 of 3 *Daily when in use

INSPECTION LOG

ITEM	TYPE OF PROBLEM	SAT	UN-SAT	NA	LOCATION AND PROBLEMS OBSERVED	DATE & NATURE OF CORRECTIVE ACTIONS	FREQUENCY
BUILDING LOAD/UNLOAD AREA							
General debris & refuse	Orderliness, obstructions, general housekeeping						Weekly*
Odor, fumes	Detectable by smell, eye or nose irritation						Weekly*
Bases or foundation, containment trenches, ramps, roof, walls	Wet spots from containers, evidence of leaking						Weekly*
	Structural integrity, e.g. erosion, uneven settlement, cracks, etc.						Monthly
Battery charging area	Well ventilated, identified, located outside Flammable storage area						Monthly
CONTAINER STORAGE AREA							
Containers	Corrosion, structural defects, serious dents						Weekly*
Sealing of containers	Open lids, leaking contents						Weekly
Labeling of containers	Improper identification; date or waste codes missing; not intact; not readable						Weekly
Housekeeping	Aesthetics, obstruction						Weekly*
Containment area coating/sealeant	Cracks, worn spots, presence of accumulated liquids						Weekly*
Load/unload area and valves	Leaks, incorrect position, spots indicating spills						Weekly*
Container placement and stacking	Insufficient aisle space, heights of stacks excessive						Weekly
Segregation of incompatible wastes	Incompatible wastes in same area Improper dist. between barriers						Weekly
Pallets	Damaged (e.g. broken wood, warping, nails missing)						Weekly
Containment system coating/sealant	Present, cracks, worn spots, presence of liquid						Weekly*
Identification of storage areas (rooms)	Signs posted (e.g., FLAMMABLE, ACID, TOXIC)						Weekly*
Lighting	Bulbs missing, burned out, broken fixtures						Weekly

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Page 2 of 3

*Daily when in use

INSPECTION LOG

ITEM MATERIAL HANDLING EQUIPMENT	TYPE OF PROBLEM	SAT	UN-SAT	NA	LOCATION AND PROBLEMS OBSERVED	DATE & NATURE OF CORRECTIVE ACTIONS	FREQUENCY
Brakes	Worn pads, rotors, bands						PTEU**
Hydraulics	Leaking						PTEU**
Lights-running emergency	Not operational						PTEU**
Horn/sirens	Not operational						PTEU**
Battery	Not operational						PTEU**
Lubrication (oil. grease)	Low level, lack of						PTEU**
Tires	Worn, low pressure						PTEU**
Safety equipment	Not operational, missing						PTEU**
Instruments	Not operational, missing						PTEU**
General condition	Deficiencies						PTEU**
Lift, shift, tilt, control mechanisms	Not functional, loose, worn						PTEU**
Accessories	Missing, inoperative						PTEU**
Fire extinquishers	Missing, serviceable						PTEU**
Rated for area of use	DY, EE, EX for flammable storage areas						PTEU**
Overhead protection (Forklifts)	Missing, damaged						PTEU**

DRMS FORM 1713, DEC 2007 (EF) Page 3 of 3 **PTEU - Prior to each use but not more often than once per day

Section 7 Contingency Plan

[40 CFR 270.14(b)(7)]

The Tinker AFB contingency plan Tinker AFB is outlined in *OC-ALC Plan 19-2, Spill Prevention and Emergency Response Plan* (Attachment 2), which is on file at the HWMF and other offices where hazardous material spills could occur. A summary of the Plan's provisions is presented here. The specifics of this plan are subject to updating and revisions as needed to address staffing and operational changes and alterations of the Tinker AFB facilities.

7.1 Emergency Coordinator/On-Scene Incident Commander (OC-ALC Plan 19-2, [March 2010])

Tinker AFB has identified the contacts listed in Table 7-1 as key Base personnel and spill response team members who may be notified in the event of a discharge of a hazardous substance.

In the event of a spill, the person recognizing the spill will immediately call 911 and ask for the Tinker AFB Fire Department and will notify the activity supervisor. The Tinker AFB Fire Department will notify the Base Civil Engineer (who will act as the On-Scene Incident Commander [OSIC]), Civil Engineer Contractor Customer Service, and Asset Management Division. The OSIC will coordinate the spill response activities and take action to notify and assemble needed members of the spill response team. Asset Management Division will provide technical support to the OSIC.

Table 7-1: Key Base Personnel, Offices, and Spill Response Team Members

Position	Title	Telephone Number
(IC) and Qualified Individual (QI)	Base Civil Engineer (72 ABW/CE)	(405) 734-3451
Alternate OSIC	Tinker AFB Fire Department (72 ABW/CEF)	911 (405) 734-7964 Non-emergency
Alternate QI	Asset Management Division (72ABW/CEA)	(405) 734-2941
Sub-Alternate QI	Asset Management Division Natural Infrastructure Branch Operations (72 ABW/CEANO)	(405) 734-4582
SPCC Technical Point of Contact (TPOC)	Asset Management Division Natural Infrastructure Branch Operations (72 ABW/CEANO)	(405) 734-4582
Tinker AFB Fire Department	(72 ABW/CEF)	911 (405) 734-7964 Non-emergency
Base Fire Marshall	(72 ABW/CE)	(405) 734-3451
Security Forces Squadron	(72 SFS/CC)	(405) 734-3737
Command Post	(552 ACW/CP)	(405) 739-2171
Base Commander	(72 ABW/CC)	(405) 734-2101
Safety Office	(OC-ALC/SE)	(405) 739-3263
Bioenvironmental Engineering	(72 AMDS/SGPB)	(405) 734-3719
Photo Lab	(72 CS/DMS)	(405) 734-2661
Staff Judge Advocate - Contact in the event of personnel injury.	(OC-ALC/JA)	(405) 739-7397
Tinker AFB Spill Team - Contact if requested.		(405) 370-7924 or (405) 370-7925
Civil Engineer Contractor	Customer Service (72 ABW/CECOW) Liquid Fuels (72 ABW/CECOF) Readiness Division (72 ABW/CECX)	(405) 734-3117 (405) 734-2753 (405) 734-5313
Base Operations - Contact if flying should be restricted. Note: Tinker AFB Fire Department also has direct line to tower to notify AWACS, Navy and 507th if necessary.	(72 OSS)	(405) 734-2191
HAZMINCEN (Navy)	HAZMAT Officer HAZMAT Duty Pager Lead Petty Officer Pager	(405) 831-3482 (800) 759-8888, PIN #1849841 (877) 690-2430
Facility Response Coordinator (LEPC Point of Contact)	Asset Management Division Natural Infrastructure Branch Operations (72 ABW/CEANO)	(405) 734-4582

Asset Management Division Natural Infrastructure Branch Operations (72 ABW/CEANO) will notify the off-base agencies identified in Table 7-2, in the event of a discharge of hazardous substances. The organizations will be contacted in the order listed.

Table 7-2: Spill Notification List

Agency	Telephone Number
National Response Center (NRC) (must call within 30 minutes of discharge)	(800) 424-8802[1] (202) 267-2675
Oklahoma Department of Environmental Quality (ODEQ) Environmental Complaints and Spill Reporting Program	405-739-1386 [1]
USAF, Headquarters, AFMC Environmental Office Command Post	 DSN 787-5879 DSN 574-6314
Oklahoma City Dispatch Public Service Midwest City Communications Dispatch Center Del City Dispatch	(405) 297-3430 (405) 732-2266 (405) 677-3344
U.S. EPA, Region 6	(800) 887-6063[1]
U.S. Fish and Wildlife Service	(918) 382-4500
Air Force Civil Engineer Support Agency (AFCESA)	(850) 283-6422 DSN 523-6422
Chemical Transportation Emergency Center (CHEMTREC)	(800) 424-9300[1]
Oklahoma County Local Emergency Planning Committee (LEPC)	(405) 713-1360 website: http://www.okcountylepc.org

[1] This is a 24-hour number.

Large spills that exceed the installation's capabilities will require support from a spill cleanup contractor or other outside support. Contact information regarding spill cleanup contractors at Tinker AFB is included in Table 7-3.

Table 7-3: Spill Cleanup Contractor List

Cleanup Contractor	Telephone Number
Dunamis Environmental Group[1]	(405) 619-5744

[1] This is a 24-hour number.

7.2 EMERGENCY EQUIPMENT

Facility emergency equipment is listed in Table 7-4 below.

Table 7-4: Emergency Equipment

Emergency Equipment	Location	Capabilities
Fire extinguishing system: sprinklers	Throughout HWSF	Automatic water sprinkler system activated by heat, flows water to extinguish fires
Portable fire extinguishers (ABC)	Throughout HWSF	Used to fight incipient stage fires
Portable fire extinguisher (D)	Throughout HWSF	Used to fight incipient stage fires involving combustible metals
Telephones	North Wall Staging Area	Communication
Spill kits (include absorbent, absorbent pads, absorbent socks, absorbent pigs and plastic bags in overpack drums)	A601 and A0701	Spill Response
Eyewash/Shower	South and Center of Building	Personal Protection

7.3 EVACUATION

The facility evacuation map is provided in Figure 7-1.

7.4 INITIAL SPILL RESPONSE PROCEDURES

Appendix 7-1 is the current Site-specific Contingency Plan for the HWSF. This Plan outlines the initial spill response procedures and evacuation routes for the facility.

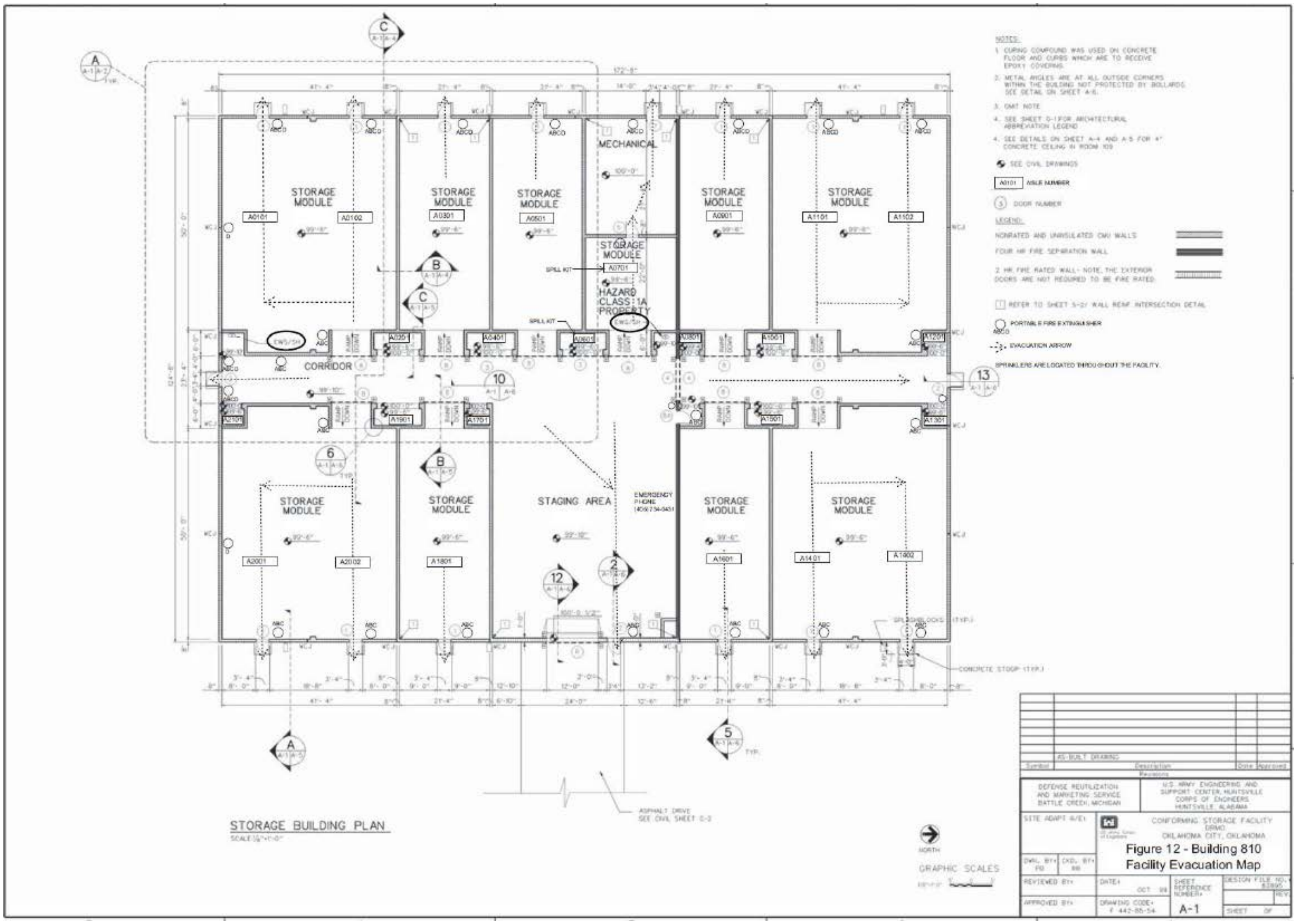

Figure 7-1: Facility Emergency Evacuation Route Map

7.5 REQUIRED REPORTS

[40 CFR 264.56(j)]

The emergency coordinator will ensure that the incident reporting requirements identified in the basic plan portion of OC-ALC Plan 19-2 are completed. The coordinator will ensure that the emergency and post-emergency notifications outlined in 40 CFR 264.56 are met. Records of the incidents including initial spill response records will be maintained in the operating record at the facility until closure. Implementation of the contingency plan will be documented in the Tinker Command Post log, the Tinker Fire Department log, and the Base Civil Engineer incident log. Also, within 15 days a report will be submitted as required by 40 CFR 264.56(j).

7.6 EMERGENCY COORDINATION

[40 CFR 264.37]

Tinker AFB has signed mutual assistance agreements with the Fire Departments of Oklahoma City, Midwest City, and Del City. For medical and ambulance assistance, Tinker AFB has access to a base clinic as well as hospitals and other facilities in the regional area through an arrangement with the Veteran's Affairs Medical Center in Oklahoma City. For support in incidents involving explosive ordnance, agreements have been made with the 61st Ordnance Detachment at Ft. Sill, OK, McAlester Army Ammunition Depot, and with the Oklahoma County Sheriff's Department. Copies of these mutual aid agreements are in Appendix 7-2.

APPENDIX 7-1: CONTINGENCY PLAN FOR BUILDING 810 (HWSF)

Buildings 810, Hazardous Waste Storage Facility

CONTACT INFORMATION: This shop may be reached by contacting the Hazardous Waste Program Manager at 734-3278, or the HWMF front desk at 734-3285.The contacts may also be notified to obtain a current inventory list.

PURPOSE: This Appendix describes the potential for a spill or discharge associated with this shop and the procedures and prevention measures to be taken to prevent and contain a spill to the maximum extent possible.

GENERAL: The HWSF is utilized to store hazardous wastes generated by Base activities prior to off-site management and also stores hazardous materials. The inventory has a high turnover and Hazardous Waste Program personnelshould be contacted to determine the current inventory when needed.

<u>Emergency Response Procedures</u> – In the event of a spill or discharge, the person recognizing the spill shall immediately call 911 asking for Tinker AFB Fire Department and notify the activity supervisor.

The following emergency actions will be taken to the maximum extent possible and, if safe to do so, with the help of other available personnel.

- Stop the Product Flow: Stop transfers, secure pumps, close valves, etc.
- Warn Personnel: Sound alarm, enforce safety/security measures, make site "off-limits" to unauthorized personnel; initiate evacuation if necessary.
- Secure Ignition Sources: Shut off motors, secure electrical circuits, and extinguish open flames.
- Initiate Containment: Secure drain valves or block drains, deploy absorbent materials, oil boom, or other containment equipment where possible.
- Make Notifications: If not yet contacted, call 911 asking for Tinker AFB Fire Department, the Hazardous Waste Program Manager at 724-3278, HWMF personnel at 734-3285,, the activity supervisor and any other installation offices as necessary or as directed.
  - When notifying the Tinker AFB Fire Department, provide as much information about the incident as possible, including the following:
    - Name and contact number for facility
    - Date and time of incident

- Location and source of spill
- Substance spilled
- Amount spilled and rate of discharge
- Any damages or injuries involved
- Extent of area impacted
- Potential hazards
- Actions taken
- Organizations which have already been contacted

Special Precautionary Measures - Proper safety equipment shall be worn when handling hazardous substance as prescribed by DRMS-M 6050.1, Chapter 8, Section V, Chemical handling Procedures.

Probable Spill Route - Spills that breach containment and of sufficient quantity will flow to storm drains with runoff leaving Tinker AFB at Outfall A2 as described in the SWPPP.

Evacuation Plan - The signal to begin evacuation will be by voice command as initiated by the person discovering the spill or appropriate supervisor.

Containment and Countermeasures

- If possible, spill will be contained by creating dikes using absorbent material.
- Small spill cleanup of material or waste shall be performed by Tinker AFB personnel, once material/waste is determined to be a level D cleanup by the appropriate office.

Posting Requirements - This site-specific contingency plan shall be posted in a prominent place in Buildings 810, with the responsible organization’s supervisor and the site monitor.

APPENDIX 7-2: CONTINGENCY AGREEMENTS WITH LOCAL INSTITUTIONS

AGREEMENT FOR MUTUAL AID IN FIRE PROTECTION AND HAZARDOUS MATERIALS INCIDENT RESPONSE

This agreement, entered into this 1st day of May 2009, between the Secretary of the Air Force acting pursuant to the authority of 42 U.S.C. 1856a and the City of Choctaw, Oklahoma is securing to each the benefits of mutual aid in fire prevention and hazardous materials incident response, in the protection of life and property from fire, hazardous materials incident and in fire fighting.

It is agreed that:

a. On request to a representative of the Tinker Air Force Base Fire Department by a representative of the City of Choctaw Fire Department, fire fighting equipment and personnel of the Tinker Air Force Base Fire Department will be dispatched to any point within the area for which the City of Choctaw Fire Department, normally provides fire protection or hazardous materials incident response as designated by the representatives of the City of Choctaw Fire Department.

b. On request to a representative of the City of Choctaw Fire Department by a representative of the Tinker Air Force Base Fire Department, fire fighting equipment or hazardous materials incident response and personnel of the City of Choctaw Fire Department will be dispatched to any point within the fire fighting or hazardous materials incident response jurisdiction of the Tinker Air Force Base Fire Department as designated by the representative of the Tinker Air Force Base Fire Department.

c. Any dispatch of equipment and personnel pursuant to this agreement is subject to the following conditions:

(1) Any request for aid hereunder shall include a statement of the amount and type of equipment and personnel requested and shall specify the location to which the equipment and personnel are to be dispatched, but the amount and type of equipment and the number of personnel to be furnished shall be determined by a representative of the responding organization.

(2) The responding organization shall report to the officer in charge of the requesting organization at the location to which the equipment is dispatched, and shall be subject to the orders of that official.

(3) A responding organization shall be released by the requesting organization when the services of the responding organization are no longer required or when the responding organization is needed within the area for which it normally provides fire protection.

(4) In the event of a crash of an aircraft owned or operated by the United States or military aircraft of any foreign nation within the area for

which the City of Choctaw Fire Department normally provides fire protection, the chief of the Tinker Air Force Base Fire Department or his or her representative may assume full command on arrival at the scene of the crash.

(5) Where local agencies do not assign an incident safety officer, an Air Force representative will be assigned to act as the incident safety officer for Tinker Air Force Base to observe Air Force operations.

d. The City of Choctaw Fire Department may claim reimbursement for the direct expenses and losses that are additional fire fighting or hazardous materials incident costs above the normal operating costs incurred while fighting a fire or hazardous materials incident response under this agreement as provided in 44 CFR Part 151, *Reimbursement for Costs of Fire Fighting on Federal Property*

e. Both parties agree to implement the National Incident Management System during all emergency responses on and off installations in accordance with NFPA 1561.

f. Each party waives all claims against every other party for compensation for any loss, damage, personal injury, or death occurring as a consequence of the performance of this agreement. This provision does not waive any right of reimbursement pursuant to paragraph d above.

g. All equipment used by the City of Choctaw Fire Department in carrying out this agreement will, at the time of action hereunder, be owned by it; and all personnel acting for City of Choctaw Fire Department under this agreement will, at the time of such action, be an employee or volunteer member of the City of Choctaw Fire Department.

For City of Choctaw Fire Department;

For the Secretary of the Air Force

ALLEN J. JAMERSON, Colonel, USAF
Commander, 72nd Air Base Wing

AGREEMENT FOR MUTUAL AID IN FIRE PROTECTION AND HAZARDOUS MATERIALS INCIDENT RESPONSE

This agreement, entered into this 10th day of August 2010, between the Secretary of the Air Force acting pursuant to the authority of 42 U.S.C. 1856a and the City of Del City Fire Department is securing to each the benefits of mutual aid in fire prevention and hazardous materials incident response, in the protection of life and property from fire, hazardous materials incident and in fire fighting.
It is agreed that:

1) On request to a representative of the Tinker Air Force Base Fire Department by a representative of the Del City Fire Department, firefighting equipment and personnel of the Tinker Air Force Base Fire Department will be dispatched to any point within the area for which the Del City Fire Department normally provides fire protection or hazardous materials incident response as designated by the representatives of the Del City Fire Department.

2) On request to a representative of the Del City Fire Department by a representative of the Tinker Air Force Base Fire Department fire department, firefighting equipment or hazardous materials incident response and personnel of the Del City Fire Department will be dispatched to any point within the fire fighting or hazardous materials incident response jurisdiction of the Tinker Air Force Base Fire Department fire department as designated by the representative of the Tinker Air Force Base Fire Department fire department.

3) Any dispatch of equipment and personnel pursuant to this Agreement is subject to the following conditions:

   a) Any request for aid hereunder shall include a statement of the amount and type of equipment and personnel requested and shall specify the location to which the equipment and personnel are to be dispatched, but the amount and type of equipment and the number of personnel to be furnished shall be determined by a representative of the responding organization.

   b) The responding organization shall report to the officer in charge of the requesting organization at the location to which the equipment is dispatched and shall be subject to the orders of that official.

   c) A responding organization shall be released by the requesting organization when the services of the responding organization are no longer required or when the responding organization is needed within the area for which it normally provides fire protection.

   d) In the event of a crash of an aircraft owned or operated by the United States or military aircraft of any foreign nation within the area for which the Del City Fire Department normally provides fire protection, the chief of the Tinker Air Force Base Fire Department fire department or his or her representative may assume full command on arrival at the scene of the crash.

   e) Where local agencies do not assign an incident safety officer, an Air Force representative will be assigned to act as the incident safety officer for Tinker Air Force Base Fire Department to observe Air Force operations.

4) The City of Del City Fire Department may claim reimbursement for the direct expenses and losses that are additional fire fighting or hazardous materials incident costs above the normal operating costs incurred while fighting a fire or hazardous materials incident response under this Agreement as provided in 44 CFR Part 151, (*Reimbursement for Costs of Fire Fighting on Federal Property*).

5) Both parties agree to implement the National Incident Management System during all emergency responses on and off installations in accordance with NFPA 1561.

6) Each party waives all claims against every other party for compensation for any loss, damage, personal injury or death occurring as a consequence of the performance of this Agreement. This provision does not waive any right of reimbursement pursuant to paragraph (d) above.

7) All equipment used by Del City Fire Department in carrying out this Agreement will, at the time of action hereunder, be owned by it; and all personnel acting for Del City Fire Department under this Agreement will, at the time of such action, be an employee or volunteer member of the City of Del City Fire Department.

For The City of Del City Fire Department

Brian E. Linley

For the Secretary of the Air Force

Robert D. LaBrutta

ROBERT D. LABRUTTA, Colonel, USAF
Commander, 72d Air Base Wing

AGREEMENT FOR MUTUAL AID IN FIRE PROTECTION AND HAZARDOUS MATERIALS INCIDENT RESPONSE

This agreement, entered into this 1st day of May 2009, between the Secretary of the Air Force acting pursuant to the authority of 42 U.S.C. 1856a and the City of Midwest City, Oklahoma is securing to each the benefits of mutual aid in fire prevention and hazardous materials incident response, in the protection of life and property from fire, hazardous materials incident and in fire fighting.

It is agreed that:

a. On request to a representative of the Tinker Air Force Base Fire Department by a representative of the City of Midwest City Fire Department, fire fighting equipment and personnel of the Tinker Air Force Base Fire Department will be dispatched to any point within the area for which the City of Midwest City Fire Department, normally provides fire protection or hazardous materials incident response as designated by the representatives of the City of Midwest City Fire Department.

b. On request to a representative of the City of Midwest City Fire Department by a representative of the Tinker Air Force Base Fire Department, fire fighting equipment or hazardous materials incident response and personnel of the City of Midwest City Fire Department will be dispatched to any point within the fire fighting or hazardous materials incident response jurisdiction of the Tinker Air Force Base Fire Department as designated by the representative of the Tinker Air Force Base Fire Department.

c. Any dispatch of equipment and personnel pursuant to this agreement is subject to the following conditions:

(1) Any request for aid hereunder shall include a statement of the amount and type of equipment and personnel requested and shall specify the location to which the equipment and personnel are to be dispatched, but the amount and type of equipment and the number of personnel to be furnished shall be determined by a representative of the responding organization.

(2) The responding organization shall report to the officer in charge of the requesting organization at the location to which the equipment is dispatched, and shall be subject to the orders of that official.

(3) A responding organization shall be released by the requesting organization when the services of the responding organization are no longer required or when the responding organization is needed within the area for which it normally provides fire protection.

(4) In the event of a crash of an aircraft owned or operated by the United States or military aircraft of any foreign nation within the area for which the City of Midwest City Fire Department normally provides fire protection, the chief of the Tinker Air Force Base Fire Department or his or her representative may assume full command on arrival at the scene of the crash.

(5) Where local agencies do not assign an incident safety officer, an Air Force representative will be assigned to act as the incident safety officer for Tinker Air Force Base to observe Air Force operations.

d. The City of Midwest City Fire Department may claim reimbursement for the direct expenses and losses that are additional fire fighting or hazardous materials incident costs above the normal operating costs incurred while fighting a fire or hazardous materials incident response under this agreement as provided in 44 CFR Part 151, *Reimbursement for Costs of Fire Fighting on Federal Property*

e. Both parties agree to implement the National Incident Management System during all emergency responses on and off installations in accordance with NFPA 1561.

f. Each party waives all claims against every other party for compensation for any loss, damage, personal injury, or death occurring as a consequence of the performance of this agreement. This provision does not waive any right of reimbursement pursuant to paragraph d above.

g. All equipment used by the City of Midwest City Fire Department in carrying out this agreement will, at the time of action hereunder, be owned by it; and all personnel acting for City of Midwest City Fire Department under this agreement will, at the time of such action, be an employee or volunteer member of the City of Midwest City Fire Department.

For City of Midwest City Fire Department;

[illegible], Fire Chief

[illegible], Director of Emergency operations.

For the Secretary of the Air Force

ALLEN J. JAMERSON, Colonel, USAF
Commander, 72nd Air Base Wing

AGREEMENT FOR MUTUAL AID IN FIRE PROTECTION AND HAZARDOUS MATERIALS INCIDENT RESPONSE

This Agreement, entered into this 1st day of September 2010, between the Secretary of the Air Force acting pursuant to the authority of 42 U.S.C. 1856(a) and the City of Oklahoma City Fire Department is securing to each the benefits of mutual aid in fire prevention and hazardous materials incident response, in the protection of life and property from fire, hazardous materials incident and in fire fighting. The duration of this contract shall be effective on 1 September 2010 and continue until 31 August 2020, and will be reviewed on a yearly basis, but will be subject to renewal every ten years. It is agreed that:

a. On request to a representative of the Tinker Air Force Base Fire Department by a representative of the Oklahoma City Fire Department, firefighting equipment and personnel of the Tinker Air Force Base Fire Department will be dispatched to any point within the area for which the Oklahoma City Fire Department normally provides fire protection or hazardous materials incident response as designated by the representatives of the Oklahoma City Fire Department.

b. On request to a representative of the Oklahoma City Fire Department by a representative of the Tinker Air Force Base Fire Department, firefighting equipment or hazardous materials incident response and personnel of the Oklahoma City Fire Department will be dispatched to any point within the fire fighting or hazardous materials incident response jurisdiction of the Tinker Air Force Base Fire Department as designated by the representative of the Tinker Air Force Base Fire Department.

c. Any dispatch of equipment and personnel pursuant to this Agreement is subject to the following conditions:

   (1) Any request for aid hereunder shall include a statement of the amount and type of equipment and personnel requested and shall specify the location to which the equipment and personnel are to be dispatched, but the amount and type of equipment and the number of personnel to be furnished shall be determined by a representative of the responding organization.

   (2) The responding organization shall report to the officer in charge of the requesting organization at the location to which the equipment is dispatched, and shall be subject to the orders of that official.

   (3) A responding organization shall be released by the requesting organization when the services of the responding organization are no longer required or when the responding organization is needed within the area for which it normally provides fire protection.

   (4) In the event of a crash of an aircraft owned or operated by the United States or military aircraft of any foreign nation within the area for which the Oklahoma City Fire Department normally provides fire protection, the chief of the Tinker Air Force Base Fire Department or his or her representative may assume full command on arrival at the scene of the crash.

(5) Where local agencies do not assign an incident safety officer, an Air Force representative will be assigned to act as the incident safety officer for Tinker Air Force Base Fire Department to observe Air Force operations.

d. The City of Oklahoma City Fire Department may claim reimbursement for the direct expenses and losses that are additional fire fighting or hazardous materials incident costs above the normal operating costs incurred while fighting a fire or hazardous materials incident response under this Agreement as provided in 44 CFR Part 151, *Reimbursement for Costs of Fire Fighting on Federal Property*.

e. Both parties agree to implement the National Incident Management System during all emergency responses on and off installations in accordance with NFPA 1561.

f. Each party waives all claims against every other party for compensation for any loss, damage, personal injury, or death occurring as a consequence of the performance of this Agreement. This provision does not waive any right of reimbursement pursuant to paragraph (d) above.

g. All equipment used by Oklahoma City Fire Department in carrying out this Agreement will, at the time of action hereunder, be owned by it; and all personnel acting for Oklahoma City Fire Department under this Agreement will, at the time of such action, be an employee or volunteer member of the City of Oklahoma City Fire Department.

For The City of Oklahoma City Fire Department

For the Secretary of the Air Force

ROBERT D. LABRUTTA, Colonel, USAF
Commander, 72d Air Base Wing

APPROVED by the City Council and **SIGNED** by the Mayor of The City of Oklahoma City this **14TH** day of **September**, 2010.

THE CITY OF OKLAHOMA CITY

VICE MAYOR

ATTEST:

CITY CLERK

REVIEWED for form and legality.

ASSISTANT MUNICIPAL COUNSELOR

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Section 8 Personnel Training Plan

[40 CFR 270.14(b)(12)]

8.1 Overview of Training Requirements

Personnel involved in hazardous waste management at Tinker AFB must complete a program of instruction that enables them to perform their duties in a manner that meets Department of Defense/Air Force policy and procedures, as well as the regulatory requirements of the ODEQ. Training requirements for Tinker AFB personnel are documented in Tinker AFB Attachment 1, *Hazardous Waste Management,* Tinker Instruction 32-7004. Job descriptions and training records for HWSF employees are maintained at the HWMF Administration Building (Building 808). ODEQ requirements are outlined in 40 CFR 264.16 for HWSF workers and staff managers, and 40 CFR 262.34 for a less than 90-day storage facility (i.e., the HWMF) and other generator accumulation areas.

Personnel who work with hazardous waste as well as their immediate supervisors must receive and successfully complete hazardous waste training before working with hazardous waste. The required training courses for a specific job level must be completed within six months of an individual's job assignment. Personnel may not work unsupervised until training is received.

The training requirements outlined below are "general" requirements. The Tinker AFB Training program, as well as other DoD or contractor-provided courses, can be used to satisfy these requirements. Depending on job responsibilities, some personnel may not require training in all elements. For example, administrative or management personnel who are not the first-line supervisors will only receive those elements most appropriate for their job functions. The elements are as follows:

- Introduction to the Resource Conservation and Recovery Act
- Identification of Hazardous Waste
- Container Selection and Use
- Accumulation Point Management
- Waste Turn-In Procedures
- Waste Minimization
- Manifesting and Transportation of Hazardous Waste
- Spill Prevention and Response
- Personnel Safety

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Section 9 Closure Plan

[40 CFR 270.14(b)(13)]

This section is submitted in accordance with the requirements of 40 CFR 270.14(b)(13), 264.110 through 264.115, and 264.178. This Plan identifies steps that will be necessary to completely close the hazardous waste management facility, located in Building 810 near the southwest corner of Tinker AFB, at the end of its intended operating life. A copy of the approved closure plan and all revisions to the plan will be maintained onsite. Revisions will be made whenever any modifications are made to the existing equipment, structures, instruments, or procedures related to the management of the facility. Revisions will be subject to ODEQ's permit modification procedures.

9.1 Closure Performance Standard

[40 CFR 264.111]

This closure plan is designed to ensure that the facility will not require further maintenance and controls, and to eliminate threats to human health and the environment upon completion of closure.

9.2 Partial Closure Activities

The need for partial closure activities is not anticipated over the life of the permit.

9.3 Maximum Waste Inventory

[40 CFR 264.112(b)(3)]

At a maximum, there will be 158,796 gallons of hazardous waste stored in containers at Building 810 at any one time during its operational life.

9.4 Inventory Disposal, Removal or Decontamination of Equipment

[40 CFR 264.112(b)(4)]

Upon formal notification to proceed with facility closure, no additional hazardous waste will be accepted at the HWSF. Furthermore, all hazardous waste remaining in inventory will be removed in accordance with contractual agreements to permitted TSDFs or recycling site(s). If this process cannot be accomplished within 90 days after starting closure activity, the hazardous waste will be transferred to another DoD owned location with a valid approved TSD facility permit. After the final inventory of waste has been removed, the hazardous waste storage facility will be inspected for loose items, i.e., paper, pallets, or empty containers. These items will be removed and disposed of properly.

Trained personnel wearing appropriate protective equipment (rubber gloves, rubber boots, and coveralls) will remove and clean-up all visible signs of contamination. The building (modules, closets, staging area, and other areas that stored hazardous waste or had the potential to come into direct contact with hazardous wastes or solid wastes) will be power washed or steam cleaned. Samples of the washwater will be analyzed for appropriate parameters to determine if the washwater meets any definition of hazardous waste outlined in 40 CFR 261 Subparts C and D. If the analysis indicates that the washwater is hazardous, it will be collected in drums and disposed of as hazardous waste. If the analysis shows no evidence of contamination, the washwater will be discharged into the base's Industrial Wastewater Treatment Plant after approval has been received from the ODEQ. If ODEQ does not give approval, the washwater will be collected in drums and transferred off-site to an approved disposal facility.

Unless the equipment will continue to be used at some new on-base HWSF, the equipment that has come into contact with hazardous waste will be decontaminated at closure, or shipped off-site to a permitted hazardous waste disposal site. Decontamination will be performed last in an enclosed area where washing, scrubbing or triple rinsing can be performed and the washwater collected.

The facility as a whole, along with each individual storage module and closet, is designed to prevent contamination of the surrounding soil if there is an accidental spill inside the building. If an accident occurs involving release of hazardous waste in or adjacent to the HWSF in such a quantity that cannot be safely handled by HWSF personnel, the Contingency Plan will be followed and any soil contamination will be thoroughly cleaned up.

The above procedures should ensure that no releases have occurred prior to closure. To test the possibility that releases could have occurred, soil samples will be taken around the HWSF and analyzed for the same parameters as the washwater. If preliminary results indicate contamination, further sampling may be conducted to identify the extent of contamination, assess risk, and determine if remedial action is required.

Facility decontamination procedures will be conducted by trained personnel. The services of these personnel will be obtained at the time of closure notification, under contractual procedures established by DoD. DoD will prescribe requirements for decontamination and will require the contractor to provide all necessary equipment and protective clothing. As appropriate, swipe tests could be performed to ensure proper decontamination.

9.5 CLOSURE OF CONTAINERS

[40 CFR 264.112(b)(4)]

Containers remaining at the time of facility closure (in the event that another HWSF does not exist at Tinker AFB) will be sealed and labeled prior to shipment in accordance with 40 CFR 262 and applicable Department of Transportation regulations. Manifests for container removal will be maintained by the U.S. Air Force in the event closure involves the whole of Tinker AFB. If closure merely involves relocating the HWSF on Tinker AFB, manifests will be maintained at the Directorate of Civil Engineering.

9.6 SCHEDULE OF CLOSURE

[40 CFR 264.112(b)(6)]

Tinker AFB is an integral part of the Defense system of the United States. It is not anticipated that closure of the entire base will occur in the foreseeable future. However, an arbitrary future estimated closure date of 2050 is provided for the HWSF to meet regulatory requirements for closure plans. This corresponds to the default estimated life span for the HWSF building. It is likely that the existing HWSF will be closed at the end of its useful life and a new facility constructed at a different location on Tinker AFB.

Notification of intent to close will be sent to the Executive Director of the ODEQ at least 45 days before beginning final closure. Upon receipt of the final volume of hazardous wastes, closure activities will be initiated. Table 9-1 presents an estimated schedule for closure which gives an estimate of the total time required to close the facility. The schedule may be affected by the terms of the Anti-Deficiency Act, 31 U.S.C. 1341. Any payment or obligation of funds in the absence of appropriated funds would be a violation of this act.

Final closure will be supervised and certified by an independent registered professional engineer. Within 60 days after completion of final closure, a certification that the facility has been closed will be submitted to ODEQ.

9.7 EXTENSIONS FOR CLOSURE TIME

[40 CFR 264.113]

No extension for closure time is anticipated. If, however, an extension would be necessary to properly close the facility, a petition will be sent amending the closure schedule listed in Table 9-1. This petition will demonstrate one or more of the following:

- The need for more than 90 days to remove all hazardous waste inventory, or more than 180 days to complete all closure activities.
- There is a reasonable likelihood that a person other than the owner/operator will recommence operation of the facility within one year.
- Closure would be incompatible with continued operation.
- Steps have and will be taken to prevent threats to human health and the environment from the unclosed but inactive facility.

Table 9-1: Estimated Closure Schedule

Activity	Elapsed Days
Receipt of final volume of hazardous waste	0
Conduct final drum inventory, inspect and repack drums (if needed), prepare waste manifest, prepare drums for shipment	1-15
Removal/disposal of final waste inventory	15-45
Solvent wash and decontamination of drum storage areas	45-50
Removal, manifesting and disposal of solvent washing	50-85
Soil sampling and analysis (if needed)	80-110
Removal, manifesting and disposal of contaminated soil (if needed)	110-140
Accounting of all waste shipment manifests	170
Completion of all closure activity and performance of closure inspection by a Professional Engineer	180
Submittal of closure certification	240

Section 10 Corrective Action

10.1 INTRODUCTION

The purpose of corrective action at Tinker Air Force Base (AFB) is to protect human health and the environment and satisfy the requirements of 40 CFR 264 Subpart F for releases from Solid Waste Management Units (SWMUs) at this hazardous waste management facility as provided in §§ 264.90 and 264.101. There are no regulated units (surface impoundments, waste piles, land treatment units, or land disposal units that received hazardous waste after July 26, 1982) at Tinker AFB as defined under § 264.90(a)(2). Therefore the requirements for regulated units under §264.91 through §264.100 are not applicable. Tinker AFB is conducting, or has already conducted, corrective action and remediation at the SWMUs and other release areas identified in Tables 10-1 through 10-4 (with provisions for any newly discovered releases) in compliance with §264.90 and §264.101. The Tinker AFB corrective action program has similar elements to those required for regulated units.

Section 10 includes includes a brief overview of area geohydrology as well as information on SWMUs, AOCs. It also includes corrective action that is required under § 270.14(d). Additional information is provided in order to: define Tinker AFB's corrective action strategy under Oklahoma Department of Environmental Quality (ODEQ) oversight of the non-NPL portion of the Installation Restoration Program (IRP), implemented by the Air Force (AF) at Tinker AFB in July 1981**.** This section of the RCRA renewal permit application provides information available at the time of preparation. However the specifics of the corrective action program may change as further information is gathered and studies are completed. Tinker AFB will inform, and coordinate with, ODEQ regarding these changes. Attachment A provides additional detailed information and clarification for development of the compliance and sentinel well concept for Tinker AFB at specific plumes within the four Contaminated Groundwater Management Units (CGMUs) at the base known as Air Force (AF) sites CG037, CG038, CG039, and CG040. Attachment B provides a general Conceptual Site Model (CSM) and facility overview, which is periodically updated as new data is gathered.

Corrective Action at Tinker AFB will be performed in accordance with the 2015 United States Environmental Protection Agency (USEPA) Region 6 Corrective Action Strategy (CAS) guideline (February 2015), that has been approved and adopted by the ODEQ Land Protection Division. The proposed CAS for Tinker AFB will be a holistic approach to all of the solid waste management units (SWMUs), areas of concern (AOCs), and other release areas. The CAS will be conducted in accordance with § 264.90 and 264.101, ensuring that the requirements of a corrective action program are implemented and maintained. The emphasis will be on streamlining the process of corrective action to achieve results that satisfy all of the stakeholders.

The CAS is a risk management, performance based, alternate corrective action approach using the development of corrective action objectives (CAOs). The performance standards and achievement of CAOs are based on current and reasonably anticipated land and groundwater uses associated with Tinker AFB. A Corrective Action Strategy Work Plan, a Risk Managent Plan, as well as a Notice of Intent have been completed for the Base.

A major component of the CAS for Tinker AFB will be the groundwater monitoring program, which is detailed in Section 10.5, Groundwater Monitoring Program. The program will work hand-in hand with the August 2012 Tinker *Basewide Work Plan*, which follows the format and guidance set out in the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP). The UFP-QAPP guidelines were prepared by an Intergovernmental Data Quality Task Force including representatives from the U.S. Environmental Protection Agency, the Department of Defense (DoD), and the Department of Energy to provide instructions for preparing Quality Assurance Project Plans (QAPPs). The Basewide Work Plan, provided previously to the ODEQ, describes the data quality objectives (DQOs), sampling and analysis procedures, and reporting protocols for the monitoring program. Under the proposed CAS, the point of compliance for Tinker AFB is the property boundary of the base. The groundwater protection standard will be achieved at the point of compliance in order to protect human health and the environment in accordance with §264.101.

10.1.1 Regional and Tinker Hydrogeology

The hydrogeology at and around Tinker Air Force Base is complex. Geologic units consist of Permian redbeds deposited as terrestrial and shallow sea sediments around 230 to 280 million years ago. The nature of these strata plays a significant role in both horizontal and vertical migration of contamination at the Base. Surface strata consist primarily of the Hennessey Group and the Garber Sandstone. The Wellington Formation, which together with the Garber Sandstone makes up the Garber-Wellington Aquifer, underlies the Garber Sandstone but outcrops east of the Base. The Garber-Wellington Aquifer is a subset of the Central Oklahoma Aquifer (COA), which underlies a large portion of central Oklahoma, including Oklahoma City. A more detailed discussion of regional and local stratigraphy and hydrogeology is included in Attachment B.

10.1.2 History of Restoration Sites at Tinker AFB

The Air Force implemented the Installation Restoration Program at Tinker AFB in July 1981. Since that time, the Air Force has maintained the lead role in environmental cleanup at Tinker AFB and has been committed to identification, investigation, and remediation of sites under the IRP and other environmental restoration programs.

10.1.3 SWMUS, AOCs, and Other Release Areas

[40 CFR 264.90]

As a permit condition pursuant to the Resource Conservation and Recovery Act of 1976 (RCRA) and the reauthorization of RCRA in the Hazardous and Solid Waste Amendments of 1984 (HSWA), the USEPA was given the authority to require facilities to take corrective action for any releases of hazardous waste or constituents from any SWMU at a treatment, storage, or disposal (TSD) facility. Tinker AFB entered into a Federal Facilities Agreement (FFA) with USEPA Region 6, and the Oklahoma State Department of Health (OSDH) on December 9, 1988. The FFA defines the geographic boundary on Tinker AFB that lies between the National Priority List (NPL) site, administered under CERCLA and the non-NPL sites (administered under RCRA). Any sites that are not identified as part of the FFA are considered non-NPL and subject to RCRA authority. The State of Oklahoma provides lead oversight for the non-NPL sites on the base. On July 1, 1991, OSDH (now ODEQ) and USEPA Region 6 issued the RCRA Part B Hazardous Waste Management Permit (No. OK1571724391), which formally authorized Tinker AFB to operate as a hazardous waste storage facility. RCRA was administered at Tinker AFB by the OSDH and USEPA until USEPA Region 6 granted ODEQ administrative authority in 1994. ODEQ is the lead oversight agency for the RCRA Hazardous Waste Management Permit and Corrective Action.

The 1991 RCRA Permit and its successor renewals (August 2002 and this application for 2012) require Tinker AFB to investigate any newly identified SWMUs, areas of concern (AOCs), and newly-discovered releases at SWMUs and AOCs, and to take further corrective action where appropriate. All of the SWMUs identified to date are presented on Table 10-1. A list of AOCs identified to date is presented on Table 10-2. SWMUs and AOCs from Tables 10-1 and 10-2 that have not yet reached a “no further action” (NFA) status as well as newly proposed AOCs that are being carried forward under this permit application are listed in Tables 10-3 and 10-4 respectively.

A RCRA Facility Assessment was performed in 1989 which identified 80 SWMUs (two with multiple subunits/process units). An additional SWMU was added to the 1991 RCRA Permit application, after the RFA was conducted, and has reached no further action (NFA) status. In total, 81 SWMUs have been identified through the RCRA permitting process through August 2002. Of these, 73 SWMUs have achieved NFA status.

The 1989 RFA also identified 19 AOCs. No additional AOCs were added through August 2002. Of the original 19 AOCs, 15 have reached NFA status. Table 10-2 includes all previous AOCs and an additional 12 sites that are being proposed for inclusion as AOCs with this permit application.

Table 10-1: Complete List of Solid Waste Management Units From 1989 to Present

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
1	1			LF016	Landfill 6	Listed as a SWMU in the 1991 and 2002 RCRA Permits. Final Phase I RFI report completed September 1994. Final Phase II RFI report completed June 1997. RCRA landfill cap upgrades were completed in 2001. Long term monitoring and care of the RCRA cap was approved as the remedy for this site in a letter from ODEQ dated 6/1/2001.	Long Term Monitoring and Care of the RCRA cap.
2	2			LF015	Landfill 5	Listed as a SWMU in the 1991 and 2002 RCRA Permits. Final Phase I RFI report completed September 1994. Final Phase II RFI completed September 1995. RCRA landfill cap installed in 1998. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 10/4/2001.	Long Term Monitoring and Care of the RCRA cap.
3	3			LF011	Landfill 1	Listed as a SWMU in the 1991 and 2002 RCRA Permits. RCRA landfill cap installed in 1991. Final Phase I RFI report completed September 1994. Final Phase II RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 7/25/2001.	Long Term Monitoring and Care of the RCRA cap.
4	4			LF012	Landfill 2	Listed as a SWMU in the 1991 and 2002 RCRA Permits. Final Phase I RFI report completed September 1994. RCRA landfill cap installed in 1998. Final Phase II RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 7/25/2001.	Long Term Monitoring and Care of the RCRA cap.
5	5			LF013	Landfill 3	Listed as a SWMU in the 1991 and 2002 RCRA Permits. RCRA landfill cap installed in December 1991. Final Phase I RFI report completed September 1994. Final Phase II RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 7/11/2001.	Long Term Monitoring and Care of the RCRA cap.

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
6	6			LF014	Landfill 4	Listed as a SWMU in the 1991 and 2002 RCRA Permits. RCRA landfill cap installed in December 1991. Final Phase I RFI report completed September 1994. RCRA landfill cap installed in 1998. Final Phase II RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 10/29/2001.	Long Term Monitoring and Care of the RCRA cap.
	7			FT021	Fire Training Area #1	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
8	8				Fire Training Area #2	Listed as a SWMU in the1991 RCRA Permit. Final Phase I RFI report completed September 1994. Final Phase II RFI report completed March 1995. Following LTM, the Air Force requested NFA in September 2000. NFA is proposed for soils associated with Fire Training Areas #2 and #3. Listed as a SWMU in the 2002 RCRA Permit. **The Air Force prepared a Statement of Basis (SB) for the underlying groundwater management unit CG039 in August 2006.** ODEQ approved MNA as the remedy.	**10/23/2000 ODEQ NFA letter for soils. GW is under basewide GW program. Removal from Permit requested.**
--	9*				Fire Training Area #3	Identified in the 6/15/89 USEPA Region 6 RFA. Not listed/included in the 1991 RCRA Joint Hazardous Waste Management Permit. This unit was merged with Fire Training Area #2 and all investigations and corrective action are performed in conformance with requirements for SWMU 8	**10/23/2000 ODEQ NFA. See SWMU No. 8 above.**
--	10*			FT024	Fire Training Area #4	The Air Force determined that there is no physical evidence that the site exists and prepared an internal NFRAP Document on 8/25/90. The unit was not listed or referenced in the 1991 RCRA Permit.	NFA - not carried over into 1991 Permit
11	11			WP017	Supernatant Pond	Listed as a SWMU in the 1991 and 2002 RCRA Permjts. RFI completed 1991. In-situ solidification stabilization performed in 1992. Following LTM from 1993-2004, the Air Force requested NFA from ODEQ on July 26, 2004. ODEQ concurred with TAFB's determination that no additional corrective action is required by letter dated 8/2/2004 and recommended that the AF apply for NFA through formal permit modification procedures including public comment.	**8/2/2004 ODEQ NFA letter and removal from Permit requested**

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
12	12			WP018	Industrial Waste Pit #1	Listed as a SMWU in the 2002 RCRA Permit. RFI completed March 1999. ICMs performed between 1999 and 2008. In an email dated 10/1/08, The Air Force completed the Final CMS in December 2008, recommending NFA for the Soil and MNA for the groundwater with ICs and LUCs. ODEQ accepted the Statement of Basis October 2015. The Class II Tier I Permit Mod was completed in September 2016.	NFA for soils and MNA for groundwater with ICs/LUCs
13	13			WP019	Industrial Waste Pit #2	Listed as a SWMU in the 1991 and 2002 RCRA Permits. The Air Force submitted NFA request to ODEQ on January 29, 2004. ODEQ concurred with Air Force's determination that no additional corrective action is necessary by letter dated February 20, 2004, and recommended that the AF apply for NFA following formal permit modification procedures including public comment.	**2/20/2004 ODEQ NFA letter and removal from Permit requested**
14	14				Sludge Drying Beds	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
15	15*			ST008	Building 201 South Alcove	The ODEQ approved the Air Force's CMS recommendation for Monitored Natural Attenuation (MNA) for groundwater on January 20, 2004 and advised the AF to initiate public notice proceedings.	**8/1/2001 ODEQ letter NFA and removal from Permit requested**
16	16			ST008	Building 201 West Alcove	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
17	17			ST008	Building 201 North Side	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
18	18			ST008	Building 214 Southwest Corner	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
19	19			RW025	Radioactive Waste Disposal Site 1030W	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
20	20			RW026	Radioactive Waste Disposal Site 201S	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
21	21			RW027	Radioactive Waste Disposal Site 62598	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
22	22			RW028	Radioactive Waste Disposal Site 1022E	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
24.14	23				Industrial Wastewater Treatment Plant Abandoned Waste Tanks	Identified as a SWMU in the 1991 RCRA Permit. In the 2002 RCRA Permit, the SWMU number for Industrial Waste Treatment Plant Abandoned Waste Tanks changed from 23 to 24.14. The ODEQ approved the Air Force's NFA request in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
24	24			OT034	IWTP - Industrial Wastewater Treatment Plant Soils	Identified as a RCRA SWMU in the 1991 and 2002 RCRA Permits. Phase I RFI report completed April 1994, Phase II RFI report completed July 1996. CMS report completed June 2003. The Air Force submitted a decision document to ODEQ (April 23, 2004) proposing the selected remedy be vapor extraction from the soils. The ODEQ concurred with the Air Force in a letter dated May 5, 2004.	Remedy in place – vapor extraction from soils
24.1	24.1				Lift Station #2	Active process unit within ITWP. The IWTP (and all of its components) was permitted as pre-treatment facility with OKC on April 1996. The outfall (001), discharging into Soldier Creek was taken out of service and the IWTP was connected to discharge piping to the OKC Sanitary Sewer System. The current OKC permit is effective until December 31, 2015.	**No longer a SMWU. Removal from Permit requested**

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
24.2	24.2				Tanks D-1 and D-2	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
24.3	24.3				Oil Separator	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
24.4	24.4				Valve Vault	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
24.5	24.5				Equalization Basins	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
24.6	24.6				Main Flow Valve	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
24.7	24.7				Mixing Basin 1, 2, 3	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
24.8	24.8				Solids Contact Clarifier	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
24.9	24.9				Wet Lift Station	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
24.10	24.10				Softener Basin	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
24.11	24.11				Activated Sludge Unit	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
24.12	24.12				Secondary Clarifiers	Active process unit within IWTP. See 24.1 above	**See 24.1 Above**
--	24.13				Chlorine Contact Chamber	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	24.14				Pressure Filters	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	24.15				Sludge Thickener	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	24.16				Sludge Holding Tank	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	24.17				Vacuum Belt	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	24.18				Sludge Hopper Area	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
24.13	24.19				Industrial Sludge Drying Beds	Identified as a SWMU in the 1991 RCRA Permit. In the 2002 RCRA Permit, the SWMU number for the Industrial Sludge Drying Beds changed from 24.19 to 24.13. The ODEQ approved the Air Force's NFA request in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	25				Hazardous Waste Storage Tank Facility	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
26	26			OD051	Ordnance Disposal Area	The ODEQ approved the Air Force's NFA request in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	27*				Kuhlman Creek Oil and Grease Trap	As required by the 7/1/91 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location; however, the potential for releases to soil, groundwater, and surface water was reported as high in the 1989 RFA. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	28				Permanent Hazardous Waste Storage, Building 3728	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	29				Permanent Hazardous Waste Storage, Building 3770	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	30*				Temporary Hazardous Waste Staging Building 3726	As required by the 1991 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water was reported as low, and the potential for generation of subsurface gas was reported as low in the 1989 RFA. Not listed as a SWMU in the 2002 RCRA Permit. The building was demolished in 2011.	NFA – not carried over into 2002 Permit
--	31*				Empty Paint/Solvent Can Trash Dumpster, DRMO Facility	As required by the 1991 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The unit was not in use as of December 1992. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water was reported as non-existent in the 1989 RFA. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
32	32				SWTP - Sanitary Wastewater Treatment Plant Components and Soils	Identified as a RCRA SWMU in the 1991 and 2002 RCRA Permits. Phase I RFI report completed April 1994, Phase II RFI report completed July 1996. The entire SWTP was demolished in 2002. A CMS report was completed June 2003. The Air Force prepared a Site Closure Report in February 2004 proposing NFA.	**5/5/2004 ODEQ NFA letter and removal from Permit requested**
32.1	32.1				Parshall Flume	These process units were demolished and removed in 2002.	**See above**
32.2	32.2				Flocculation Chamber	These process units were demolished and removed in 2002.	**See above**
32.3	32.3				Primary Clarifier	These process units were demolished and removed in 2002.	**See above**
32.4	32.4				Trickling Filters	These process units were demolished and removed in 2002.	**See above**
32.5	32.5				Final Clarifiers	These process units were demolished and removed in 2002.	**See Above**
32.6	32.6				Former Chlorine Contact Chamber	These process units were demolished and removed in 2002.	**See above**
--	32.7				Anaerobic Digester	These process units were demolished and removed in 2002.	**See above**

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
32.7	32.8				Drying Beds	These process units were demolished and removed in 2002. In the 2002 RCRA Permit, the SWMU number for Drying Beds changed from 32.8 to 32.7.	**See above**
--	33				Abrasive Hopper Storage Area	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed/included in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	34				Temporary Storage Site MAT, Building 236 (North side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed/included in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	35*				Hazardous Waste Storage Tank, Building 230	As required by the 1991 RCRA Permit, a summary of release potential at Building 230 was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The tank had been misidentified and was reclassified as a lift station. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water was reported as low. The potential for generation of subsurface gas was reported as low. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	36*				Malfunctioning Air Scrubber Dry Well, Building 289	As required by the 1991 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water was reported as minimal. The potential for generation of subsurface gas was reported as low. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	37*				Temporary Storage Site, Building 289 (NW corner)	As required by the 1991 RCRA Permit, an evaluation of management practices for this less than 90 day drum storage area was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water was reported as minimized. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	38				Temporary Storage Site, Alert Maintenance Hanger, Building 976	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	39*				Malfunctioning Air Scrubber Dry Well, Building 976	As required by the 1991 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water was reported as minimal or minimized. The potential for generation of subsurface gas was also reported as minimized. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
40	40				Building 976, AFFF Fire Control Holding Pond	The ODEQ approved the Air Force's NFA request in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	41				Building 1030, Oil and Grease Trap	As required by the 1991 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water was reported as minimal or minimized. The potential for generation of subsurface gas was also reported as minimized. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	42				Temporary Storage Site, Building 1068 (SW corner)	As required by the 1991 RCRA Permit, an evaluation of management practices for this < 90 day drum storage area was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. The potential for releases to air, are minimized by covering the container. Soil and groundwater contamination potential was minimized by drum overpacking and locating the drum in a low traffic area. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	43				Building 1071, Oil and Grease Trap	As required by the 1991 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The unit was described as closed and dismantled. There were no documented releases from this location. Previous release potential for air was described as low due to the low volatility of contaminants, even though release potential was eliminated when the unit was removed, release potential to Crutcho Creek was rated as high, Soil and GW were under evaluation as of Dec. 1992. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	44				Building 1041, Oil and Grease Trap	As required by the 1991 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. Release potential for air was described as low. Release potential to soil/groundwater and surface water is described as minimal. Not listed as a SWMU was cited in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	45				Building 1058, Oil and Grease Trap	As required by the 7/1/91 RCRA Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. Release potential for air was described as low due to the low closed top construction and low volatility of constituents. Release potential to Soil and GW were described as moderate. Release potential to surface water was rated as low because of the in-ground construction and location of surface water pathways. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	46				Temporary Storage Site, MAB 2121 (North side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	47				Temporary Storage Site, MAB 2121 (South side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. There were no documented releases from this location. Release potential for air was described as minimized using capped funnels to control emissions. Release potential to Soil and groundwater were described as minimized due to the concrete foundation. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	48				Temporary Storage Site, MAQ North of 2122	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. There were no documented releases from this location. Release potential for air was described as minimized using capped funnels to control emissions. Release potential to Soil and GW were described as minimized due to the concrete foundation. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	49				Temporary Storage Site, MAB 2280 (SE corner)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. There were no documented releases from this location. Release potential for air was described as zero since the unit had been removed. Release potential to Soil and GW were described as minimized due to the concrete foundation. No evidence for soil contamination. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	50				Waste Storage Area, Portable B-3 (in the U of Building 1)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit, required an evaluation of management practices for this product storage area. There were no documented releases from this location. Release potential for air was described as minimal. Release potential to Soil and GW were described as minimal due to the concrete foundation. No secondary containment; therefore a release potential for runoff to storm drains was high. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	51				Hazardous Waste Storage Tank, Building 16, NE corner	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day temporary storage tank. This is an acid tank that is described as sealed except when pumped out. Air emissions would be minimized. Soil and groundwater release potential is minimal because this tank is in a vaulted structure. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	52				Temporary Storage Site, Building 17 (Enviropacs)	As required by the 1991 RCRA Permit, the regulatory status and a summary of release potential were documented in the December 1992 Description Of Current Conditions for Tinker AFB. There were no documented releases from this location. The potential for releases to air, soil, groundwater, and surface water is described as low both past and ongoing. Soil gas generation potential is also described as low. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	53				Waste Asbestos Storage Shed (Near Building 17)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 2002 Permit
54	54			WP035	Stained Drainage Ditch and Drums (Near Building 17)	NFA and removal from Permit authorized in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	55				Temporary Storage Site, MAD 210 (North side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. There were no documented releases from this location. Release potential for air was described as minimized using caps to control emissions. Release potential to Soil and GW were described as minimized due to the concrete pad. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	56				Waste Storage Area (North of Building 210)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit	NFA – not carried over into 1991 Permit
--	57				Building 214: Engine Testing, Container Storage Cabinet	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed/included in the 7/1/91 RCRA Joint Hazardous Waste Management Permit	NFA – not carried over into 1991 Permit
--	58				In-ground Storage Tank #7, Building 214	Not listed as a SWMU in the 1991 RCRA Permit; however, as required by the Permit, a summary of release potential was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The unit was described as an active in-ground double wall fiberglass tank. No longer used for fuel waste collection in 1990. Release potential for all media was stated as relatively low. Only eyewash and floor water residues drain to tank. No releases had been reported. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	59				Building 229: Parachutes and Textile, Container Storage	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit	NFA – not carried over into 1991 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	60				Temporary Storage Site MAT 1055 (South side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit, required an evaluation of management practices for this < 90 day drum storage area. There were no documented releases from this location. Release potential for air was described as minimized using funnel caps to control emissions. Release potential to Soil and groundwater were described as minimized due to a concrete pad underlying the containers and asphalt diking. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	61				Building 2101: Vehicle Motor Pool, Used Oil Tank	Not listed as a SWMU in the 1991 RCRA Permit; however, as required by the Permit, an evaluation of management practices was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The tank was closed in place in 1990. There were no documented releases from this location; however, the potential for releases to soil and groundwater was reported as high. No further discussion of this SWMU was cited in the 8/12/2002 RCRA Operations Permit Renewal.This building was demolished in 2011	NFA – not carried over into 2002 Permit
--	62				Building 2101: Vehicle Motor Pool, Enviropac	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	63				Building 2101: Vehicle Motor Pool, Waste Paint Can Storage	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. There were no documented releases from this location. However, residual staining was noted on the concrete beneath the pallets that the drums sat on. Joint seals also appeared impaired Release potential for air was described as minimized using caps to control emissions. Release potential to Soil and GW were described as potential because of the condition of the concrete. Not listed as a SWMU in the 2002 RCRA Permit. This building was demolished in 2011. Additional investigations will be conducted by the AF subsequent to the demolition	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	64				Temporary Storage Site MAD 2102	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	65				Hazardous Waste Storage Tank 2217	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day temporary storage tank. This 2500 gal. steel tank reportedly handled wash waters that contain jet fuel. It was pumped out at regular intervals. Potential for release to soil or groundwater was reported as modest. The tank was scheduled for removal/replacement in 1993. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	66				Temporary Storage Site Building 2129 (West)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. There were no documented releases from this location. The drums contained paint chips. The process was discontinued in 1988. The drums were on pallets. The site is on asphalt with asphalt berms around the pallets. Release potential for air was zero since the site was inactive. Release potential for surface water soil groundwater and soil gas listed as minimal. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	67				Temporary Storage Site MAT 2210 (NE corner)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. Trichloroethene and pd-680 were stored here from the early 1980s; storage was discontinued in 1989.There were no documented releases from this location. Drums were on pallets, and the site was on asphalt with asphalt berms around the pallets. Release potential for air was reported as zero since the site was inactive in 1989. Release potential for surface water soil groundwater and soil gas were described as minimal. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	68				Hazardous Waste Storage Tank - Building 2210	Not listed as a SWMU in the 1991 RCRA Permit. As required by the Permit, an evaluation of management practices and release potential for this < 90 day temporary storage tank was documented in the December 1992 Description Of Current Conditions for Tinker AFB. Unit was described as a steel tank with a liner added in 1991. It was operational from 1975 through 1992 and had been scheduled for replacement under the military construction program. Hazardous waste was gravity fed to the tank. Water and waste oils were allowed to accumulate then collected by DRMO for recycling. Soil and GW potential releases defined as minimal. Concrete cover at surface would protect soil and groundwater. Tank is situated in a below grade structure Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	69				Temporary Storage Site Building 3001 (SW corner)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. It was operated from 1986 to 1989, and managed hydraulic fluid and Freon. Drums on pallets with concrete floor. Sandbags were used for spill control. There were no documented releases from this location. Air emissions release potential was controlled by funnel caps on drums and described as zero when the site was de-activated in 1989. Release potential for surface water, soil, groundwater and soil gas were reported as minimal. Any release to soil or groundwater would be subject to CERCLA. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	70				Hazardous Waste Storage Tank, Building 3001-A103	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day temporary storage tank. There were seven alkaline holding tanks in a concrete pit completely surrounded by concrete walls and floor. Tank removal was planned in 1992. Emissions to air were stated as only when the tank was pumped out. It was reported that the potential for release to soil would only occur if the concrete pit was to fail. Any release to soil or groundwater would be subject to CERCLA. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	71				Hazardous Waste Storage Tank, Building 3001-M61	Not listed as a SWMU in the 1991 RCRA Permit. As required by the Permit, an evaluation of management practices and release potential for this < 90 day temporary storage tank was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The tanks are essentially concrete sumps used for the accumulation of chrome and cyanide wastes, as well as mixed acid. Potential releases to air have been minimized. Potential releases to soil and groundwater were being investigated at the time of the 1992 report. Any release to soil or groundwater would be subject to CERCLA. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	72				Temporary Storage Site MAQ 3105 (North side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. Operated from 1987 to 1990. Drums not on pallets with concrete floor. Sandbags and asphalt diking were used for secondary containment. Most containers were empty. There were no documented releases from this location. Air emissions release potential was controlled by caps on drums. Release potential for surface water, soil, groundwater and soil gas were reported as generally controllable by the concrete and diking. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	73				Temporary Storage Site MAD 3117 (West side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for these < 90 day temporary storage tanks. The tanks are portable and meant to transport machine oil. Release potential for air was reported as minimal. It appears the potential for spills is elevated due to the mobile nature of the tanks, but the 1992 report indicated that there had not been a sufficient release of machine oil to the soil to affect groundwater. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	74				Drum Washing at Building 3125	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	75				Hazardous Waste Central Receiving Area, South Building 3125	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	76				Temporary Storage Site, MAE 3703 (South Side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit; however, the Permit required an evaluation of management practices for this < 90 day drum storage area. No releases identified. Potential impacts to air are minimized with capped funnels. Potential Impacts to Soil/Groundwater considered minimal. Potential releases to air are minimized. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	77				Temporary Storage Site, MAT 209 (East Side)	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
--	78				Temporary Storage Site, East of Building 1005	NFA was recommended in the June 15, 1989 USEPA Region 6 RFA. Not listed as a SWMU in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
--	79				Hazardous Waste Storage Tank, Building 3001-G51	Not listed as a SWMU in the 1991 RCRA Permit. As required by the Permit, a summary of release potential or this < 90 day temporary storage tank was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The tank is a 2500 gallon underground storage tank and was scheduled for removal/replacement in 1993. Potential release to air was reported as low due to the nature of the material in the tank, PD-680. The tank is covered by concrete. The potential for release, described as low, exists during transfer of material into the tank. Any release to soil or groundwater would be subject to CERCLA. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
--	80				Hazardous Waste Storage Tank, Building 3106	Not listed as a SWMU in the 1991 RCRA Permit. As required by the Permit, a summary of release potential or this < 90 day temporary storage tank was documented in the December 1992 Description Of Current Conditions for Tinker AFB. The tank was a steel underground storage tank scheduled for removal in 1992. The tank is inside of a concrete pit. Release potential was described as moderate due to two reported releases in 1989. Not listed as a SWMU in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
-					Fuel Truck Maintenance Area	The Fuel Truck Maintenance Area was recognized as a RCRA SWMU after the 1991 RCRA Permit was issued. No SWMU or AOC number was assigned to this site. The ODEQ approved the Air Force's NFA request in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit

Note 1: Historical RCRA SWMUs previously removed from prior permits are listed in red font.

Note 2: NFA is achieved at industrial level unless specified at residential.

References:

Draft RCRA Facility Assessment, Tinker Air Force Base, Oklahoma. Prepared by PRC Environmental Management, Inc. and ICF, Inc. for the U.S. Environmental Protection Agency Region 6, under EPA Contract No. 68-W9-0041, Work Assignment No. R260201, June 15, 1989.

Joint Hazardous Waste Management Permit, Tinker Air Force Base, Oklahoma. Prepared by U. S. Environmental Protection Agency, Region 6, July 1, 1991.

Description of Current Conditions, Part C, Tinker Air Force Base, Oklahoma. Prepared by Tinker Air Force Base, December 1992.

Resource Conservation And Recovery Act Operations Permit, Tinker Air Force Base, Oklahoma. Prepared by the Oklahoma Department of Environmental Quality, August 12, 2002.

Table 10-2: Complete List of Areas of Concern From 1989 to Present

AF Site Number	Current AOC No.	RFA AOC No.	Site Name	Activity History	Current Status
ST007	--	1	Fuel Farm (290 POL Facility)	AOC 1 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed as an AOC in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of previous studies was documented in the December 1992 Description Of Current Conditions for Tinker AFB. This AOC was not listed in the 2002 RCRA Permit. However, a RFI report was completed in 1995, and an additional Draft Site Investigation Report was completed in December 1996. Two vacuum enhanced pumping (VEP) systems were installed at the site between 1998 and 2000 as interim corrective measures. Collectively, the two systems extract groundwater and soil vapor from 34 recovery wells around Building 214, the former Building 210, near Tank 349, and near Building 117.	Remedy in place - Groundwater and Soil Vapor Extraction with on-site treatment
	--	2	Spill Pond (Drainage Spillway behind Building 1030)	The Spill Pond (Drainage Spillways behind Building 1030) was identified as AOC 2 in the 6/15/89 USEPA Region 6 RFA, but an AOC number was not assigned in the 1991 RCRA Permit. The ODEQ approved the Air Force's NFA request in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
OT010	--	3	Kuhlman Creek	AOC 3 was identified in the 6/15/89 USEPA Region 6 RFA, but the AOC was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of previous studies was documented in the December 1992 Description Of Current Conditions for Tinker AFB. An RI was completed in September 1992. Semi-annual surface water and sediment sampling was performed on this creek between 1994 and 2004. **This AOC was not listed in the 2002 RCRA Permit. The Air Force requested termination of further sampling on December 16, 2005. ODEQ concurred that further surface water and sediment sampling was not warranted under the RCRA permit on January 12, 2006.**	NFA – not carried over into 2002 Permit
OT009	--	4	Crutcho Creek	AOC 4 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of previous studies was documented in the December 1992 Description Of Current Conditions for	NFA – not carried over into 2002 Permit

				Tinker AFB. An RI was completed in September 1992. Semi-annual surface water and sediment sampling was performed on this creek between 1994 and 2004. **This AOC was not listed in the 2002 RCRA Permit. The Air Force requested termination of further sampling on December 16, 2005. ODEQ concurred that further surface water and sediment sampling was not warranted under the RCRA permit on January 12, 2006.**	
OT002	--	5	Soldier Creek	Not Applicable – regulated by USEPA Region 6 under the 12/9/88 FFA.	CERCLA / NPL
	--	6	Fuel Jettison Area	AOC 6 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of previous studies was documented in the December 1992 Description Of Current Conditions for Tinker AFB. This AOC was not listed in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
OT003	--	7	North Tank Area	Not Applicable – regulated by USEPA Region 6 under the 12/9/88 FFA.	CERCLA / NPL
	--	8	Southwest Tank Area	AOC 8 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of previous studies was documented in the December 1992 Description Of Current Conditions for Tinker AFB. An RFI was completed in April 1994. A Focused Feasibility Study and NFRAP decision document were completed in March 1997, recommending continued operation of the interim action (bioslurping). The treatment system was upgraded in April 1998. This AOC was not listed in the 2002 RCRA Permit. The entire system was decommissioned and removed in April 2007. Groundwater beneath the site is regulated under CERCLA as part of the B3001 operable unit to the NPL.	NFA – not carried over into 2002 Permit
	--	9	Building 3001	Not Applicable – regulated by USEPA Region 6 under the 12/9/88 FFA.	CERCLA / NPL
	2	10	Old Pesticide Storage Area, Building 1005	The Old Pesticide Storage Area, Building 1005, was identified as AOC 10 in the 6/15/89 USEPA Region 6 RFA. It was listed as an AOC in the 1991 RCRA Permit, but without a number. It is referred to as AOC 2 in the 2002 RCRA Permit. The ODEQ approved the Air Force's NFA request in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
	--	11	Diesel Fuel	AOC 11 was identified in the 6/15/89	NFA – not

			Area (North of Building 210)	USEPA Region 6 RFA, but qas not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of release potential was documented in the December 1992 Description Of Current Conditions for Tinker AFB, stating that no releases had occurred at this location, and the potential for release to air, soil, groundwater, and surface water was low as well as generation of subsurface gas. This AOC was not listed in the 2002 RCRA Permit.	carried over into 2002 Permit
	--	12	Temporary Storage Site MAE 3001	AOC 12 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of release potential was documented in the December 1992 Description Of Current Conditions for Tinker AFB. No releases were reported and release potential was considered low for air, soil, groundwater, and generation of subsurface gas. Release potential to surface water was considered possible. The site ceased operations in 1988. This AOC was not listed in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
	--	13	Cooling Tower Blowdown: Building 3306	AOC 13 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of release potential was documented in the December 1992 Description Of Current Conditions for Tinker AFB. This unit is permitted under the National Pollutant Discharge Ellimination System (NPDES) Permit #OK0000809 and WD-79-031. The report stated that historical releases and release potential of this unit are not applicable to the RCRA permit. This AOC was not listed in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
	--	14	Cooling Tower Blowdown: Building 212	AOC 14 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of release potential was documented in the December 1992 Description Of Current Conditions for Tinker AFB. This unit is permitted under NPDES Permit #OK0000809 and WD-79-031. The report stated that historical releases and release potential of this unit are not applicable to the RCRA permit. This AOC was not listed in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
	--	15	Cooling Tower	AOC 15 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in	NFA – not carried over

			Blowdown: Building 3108	the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of release potential was documented in the December 1992 Description Of Current Conditions for Tinker AFB. This unit is permitted under NPDES Permit #OK0000809 and WD-79-031. The report stated that historical releases and release potential of this unit are not applicable to the RCRA permit. This AOC was not listed in the 2002 RCRA Permit.	into 2002 Permit
	--	16	Outfalls 002, 003, 004, and 005	AOC 16 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit.	NFA – not carried over into 1991 Permit
	--	17	Sanitary Sewer System Lift Station, Building 1030	AOC 17 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a determination whether the Building 1030 lift station was managing hazardous wastewaters was provided in the December 1992 Description Of Current Conditions for Tinker AFB. Samples collected on 12 November 1992 indicated that the wastewater was not hazardous. This AOC was not listed in the 2002 RCRA Permit.	NFA – not carried over into 2002 Permit
	--	18	Undergroun d Storage Tanks	AOC 18 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a list of 213 underground storage tanks including location, date of construction, results of pressure tests, leak identifications and any corrective actions undertaken was documented in the December 1992 Description Of Current Conditions for Tinker AFB. This AOC was not listed in the 2002 RCRA Permit	NFA – not carried over into 2002 Permit
	--	19	Below-Ground Industrial Wastewater Sewer System	AOC 19 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, documentation on the integrity of the industrial waste lines was provided in the December 1992 Description Of Current Conditions for Tinker AFB. This AOC was not listed in the 2002 RCRA Permit	NFA – not carried over into 2002 Permit
WP036			Waste Fuel Dump Site	The Waste Fuel Dump Site was recognized as a RCRA SWMU after the 1991 RCRA Hazardous Waste Management Permit was issued. No SWMU or AOC number was	NFA – not carried over into 2002 Permit

				assigned to this site. The ODEQ approved the Air Force's NFA request in the 8/12/2002 RCRA Operations Permit Renewal.	
ST008	**20**		Building 201 Vapor Intrusion	A potential vapor intrusion condition was identified at Building 201 during a base-wide vapor intrusion survey (inventory) in 2010.	RFI scheduled
CG040	**21**		Gator Groundwater Management Unit	CG040 encompasses chlorinated solvent impacted groundwater underneath an adjunct facility approximately one mile east of the eastern boundary of Tinker AFB near the intersection of SE 59th St. and Post Road. The facility is non-industrial; only one building used for administrative purposes was found at the site. No unique source has been identified for this contamination. A groundwater extraction and treatment system began operation as an interim action in October 1999. The RFI report was completed in December 2003 and the CMS report was completed in July 2006. A Statement of Basis was completed as a decision document between Tinker AFB and the ODEQ, and was signed by ODEQ on July 31, 2006.	Corrective Action – GW extraction system and bioreactor
CG041	**22**		AWACS Sector	CG041 encompasses impacted groundwater beneath the tarmac and taxiways south of Building 230. This site was introduced to ODEQ at the October 2009 RAB meeting.	RFI underway
OT058	**23**		Jet Engine Test Cells (Bldg. 3703)	A site investigation report was completed in July 2002; Interim Corrective action using soil gas vapor and groundwater extraction was initiated in 2002 with the report issued in May 2003. A CMS was completed in May 2005. The VEP system continues to operate until the interim RIP is either adopted or an improved remedy is selected.	RFI underway
OT062	**24**		Building 230	A RFI report was completed in March 2004. A VEP system was installed as an interim corrective measure to mitigate the potential risk posed by subsurface contaminants along the north and west sides of Building 230. A Phase I CMS was completed in April 2007 and a draft Phase II CMS was completed in May 2011. The VEP system continues to operate until the interim RIP is either adopted or an improved remedy is selected.	RFI underway
OT064	**25**		Building 210	A Draft Final RFA was completed in July 2008. A potential vapor intrusion condition was identified.	RFI underway
OT065	**26**		Building	A potential vapor intrusion condition was	RFI underway

			283, Building 284, Building 296	identified at Buildings 283, 284, and 296 during a base-wide vapor intrusion survey (inventory) in 2010.	
OT066	**27**		Building 2110 Oil Water Separator	Same Location as the Fuel Truck Maintenance Area AOC (see Table 10-1). The ODEQ approved the Air Force's NFA request in the 8/12/2002 RCRA Operations Permit Renewal. However, a fuel leak from the oil water separator to the oil was noticed in 2004.	RFI underway
OT067	**28**		Building 2101	This building is the former motor pool which has been demolished and will not be replaced. Due to the nature of the motor pool operations, solvent and fuel leaks are suspected.	RFI underway
OT068	**29**		Replaced" Fuel Hydrant System	In 1992, fuel releases from the hydrant system were detected when fuel would seep to the surface between the joints in the concrete of the tarmac. .	RFI underway
OT069	**30**		Building 2121 and Building 2122	A RFA/RFI report was completed in March 2001 followed by a supplemental SI/RFI report in September 2001 and a CMS Report in October 2001 at Building 2122. Soil contamination was identified, but concluded that it was not impacting the groundwater. Similar process activities occurred at Building 2121 in the past, though no investigations have been performed at building 2121. Results for sub slab soil gas sampling beneath Building 2121 and 2122 were reported in a Vapor Intrusion Assessment that was completed in August 2011.	RFI underway
ST033	**31**		Area A Service (Fuel) Station	Soil and groundwater investigations conducted in 1990 and 1992 showed the presence of mogas contamination. A product recovery system was installed in 1992 to pump fuel from the groundwater. By 1996, the extent of soil contamination was delineated, the USTs were removed and the product recovery system expanded. VEP remediation began June 1997, and fuel product recovery was completed by 1999. The OCC approved site closure on December 18, 2000; however, this is limited to only petroleum hydrocarbons in soil and groundwater. A TCE plume (along with other chlorinated compounds) has been identified in the groundwater beneath the site. The VEP system was shut down I November, 2012 and replaced with an	Corrective Action underway – In Situ Remediatoin

				Emuslfied vegetable oil mixture injection – In Situ.	

Note: Historical RCRA AOCs previously removed from prior permits are listed in red font.

10.1.4 National Priorities List

A portion of Tinker AFB is on the National Priorities List (NPL) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The NPL is administered by USEPA Region 6 under CERCLA of 1980. Congress amended CERCLA in 1986 through the Superfund Amendments and Reauthorization Act (SARA). SARA waived sovereign immunity for federal facilities. At Tinker AFB, USEPA's CERCLA Hazard Ranking System (HRS) ranking criteria mandated placement of Soldier Creek/Building 3001 (B3001) on the NPL in July 1987. The 1988 FFA designated the Air Force as the lead agency for cleanup of the national priority list (NPL) site at Tinker AFB. However, the USEPA is the lead oversight agency for the cleanup of federal facilities under CERCLA/SARA and has the final authority to select the remedial action at federal facilities placed on the NPL if the USEPA and relevant federal agency cannot concur in the selection. The NPL site is a distinct unit defined in December 1988 and cannot be expanded or appended. Any contaminated sites outside of the NPL are deemed non-NPL sites, and as such, are subject to RCRA authority, with ODEQ as the current lead oversight agency.

The Soldier Creek/B3001 site consists of four operable units identified as: Operable Unit (OU) 1 – The Building 3001 OU, OU 2 – The Soldier Creek Sediment and Surface Water OU, OU 3 – The Soldier Creek Groundwater OU, and OU 4 – The Industrial Wastewater Treatment Plant Groundwater OU. Operable Units 2 and 3 have reached NFA status with the USEPA. Environmental work on OU 4 will be combined with OU 1, since the contaminated groundwater at OU 4 is migrating to OU 1 and is in the same saturated zone.

10.1.5 Military Munitions Response Program

The Military Munitions Response Program (MMRP) was created in 2002 in response to the NCP. Congress delegated management of this program to the Department of Defense (DOD) under the Defense Environmental Restoration Program (DERP). The purpose of the MMRP is to address unexploded ordnance (UXO), discarded military munitions (DMM) and munitions constituents (MC) located on current and former defense sites. Eligible sites include those where releases of UXO, DMM, or MC are known or suspected to exist and the release occurred prior to September 30, 2002. Five MMRP physical sites have been identified at Tinker AFB: OD051 – Ordnance disposal Area, TS090 – Skeet Range #1, FR092 – Firing-in Buttress #2, TS093 – Skeet Range #2, SR094 – 38th EIG Small Arms Range. The NCP designated the Department of Defense as the lead agency with EPA oversight. Although not directly applicable to this permit renewal request, MMRP sites are mentioned for reference purposes. These sites have been investigated under CERCLA/NCP; in October 2012. To date the Department of Defense Explosives Safety Board granted a No Further Action ESS for all but the FR092 – Firing-in Buttress #2 site, which is programmed to be remediated at a future date.

10.2 CORRECTIVE ACTION STRATEGY

[40 CFR 264.90, 264.101, and 270.14(d)]

10.2.1 Basis

The USEPA Region 6 CAS is an alternate corrective action approach, which has been adopted by the State of Oklahoma, and can be implemented during any phase of corrective action at a facility. Tinker AFB proposes continuing the CAS approach as the framework for current and future corrective action by utilizing CAS Guidance; the Tinker AFB remediation strategy is consistent with the corrective action requirements set out in the U.S. EPA *Region 6 Corrective Action Strategy (CAS)* dated February 2015. The document states "The policies and procedures set forth in the United States Environmental Protection Agency (EPA) Region 6 Corrective Action Strategy (CAS) are provided as guidance for the implementation of Resource Conservation and Recovery Act (RCRA) corrective action at sites with releases of hazardous waste or hazardous waste constituents. In addition, "The CAS provides guidance to EPA Region 6 and the states in Region 6 as one way to implement and complete RCRAcorrective action. The CAS primary objectives are to streamline corrective action administrative procedures, to provide tools that aid in the implementation and completion of corrective action, and to focus corrective action on releases that may require remediation, resulting in advancing the protection of human health and the environment." The guide "…describes a risk management approach that can be implemented during any phase of corrective action, to better focus time and money on releases that pose a significant and unacceptable risk. The CAS is a performance-based approach that emphasizes *results* over *process*." As noted in the guidance, EPA's authority to require facility-wide correction action comes from RCRA statue sections §§3004(u)&(v), 3005(c)(3), 3008(h), 3013, and 7003. EPA's regulatory provisions for corrective action at permitted facilities are found primarily in 40 CFR Part 264 Subpart F – Releases from Solid Waste Management Units (SWMUs).

Tinker AFB proposes to continue to use the CAS Guidance Document to the fullest extent practicable for planning and implementing corrective action without superseding existing Federal, State, and local regulations.

10.2.2 Applicability

The CAS will only apply to existing SWMUs and AOCs that are identified in this Permit Application (as shown on Tables 10-3 and 10-4). The CAS will not apply to the former SWMUs and sites that have reached a no further action (NFA) determination, NPL Site (operable units) or MMRP sites, which are being addressed under the National Contingency Plan regulatory framework. Newly discovered sites will be addressed by the CAS when identified. The process for implementing the CAS at existing and newly discovered sites is discussed below in Section 10.2.3.

10.2.3 Approach

Since the last RCRA Permit Renewal in August 2002, Tinker AFB has requested a determination of NFA status for five SWMUs – namely SWMUs 8, 11, 12, 13, 15, and 32. ODEQ concurred that technical requirements have been met for NFA designation, but public participation requirements must be satisfied. The public participation process to be conducted with the permit issuance process will satisfy these requirements. Because Tinker AFB has received ODEQ concurrence for no further action (NFA) at the following SWMUs, removal from the permit is hereby requested:

- SWMU 8 Fire Training Area 2, soil contamination;
- SWMU 11 Supernatant Pond;
- SWMU 12 Industrial Waste Pit 1;
- SWMU 13 Industrial Waste Pit 2;
- SWMU 15 Building 201, South Alcove;
- SWMU 24.1, 24.3 – 24.8, 24.11 & 24.12 Industrial Waste Treatment Plant components (IWTP);
- SWMU 32 Sanitary Wastewater Treatment Plant (SWTP).

There were 13 SWMUs identified on the 2002 RCRA Operations Permit for Tinker AFB. Tinker AFB will either continue operating the remaining eight SWMUs that were identified in the August 2002 Permit in accordance with the latest documents submitted to the ODEQ, or update the Statement of Basis (SB) for public review so that a document can be provided for the 2012 RCRA permit.

The CAS will be implemented under a facility wide approach focusing corrective action first on releases that pose the greatest risk, and using resources to best benefit the protection of human health and the environment. The eight ongoing SWMUs are currently being addressed through either a remedy in place and/or long term monitoring; closed landfills include care of the RCRA cap. The fourteen AOCs are areas where known or suspected contaminant releases have been reported. These fourteen AOCs are in varying stages of investigation or remediation. Corrective Action Objectives using performance based remediation standards will be developed for the Air Force sites and, as appropriate, for the eight existing SWMUs. The primary CAS performance standard will be containment of groundwater contamination. Remedial activities, including possible source removal activities, will be planned and implemented in support of the primary performance standard. The hazardous constituents are discussed in Section 10.5.

Tinker AFB will address alternative actions that may be necessary in the event that analysis of monitoring results from the groundwater management units shows that a plume is not being contained or is otherwise increasing, either in contaminant concentration or area.

Expectations for the outcome of corrective action at a facility are established in a CAS by three performance standards, namely: 1) a Source Control Performance Standard, 2) a Statutory and Regulatory Performance Standard, and 3) a Final Risk Goal Performance Standard. Through the application of the performance standards and screening with the current USEPA Regional Screening Levels, it is proposed that Tinker AFB and ODEQ will determine whether a release must be addressed through corrective action, and whether such corrective actions are protective of human health and the environment.

Tinker AFB will notify the ODEQ in writing of any newly-identified SWMU(s) and potential AOC(s) (i.e., a unit or area not specifically identified during previous corrective action assessments, RFA, etc.), discovered in the course of groundwater monitoring, field investigations, environmental audits, or other means, no later than thirty (30) calendar days after discovery. In addition, Tinker AFB will notify ODEQ in writing, no later than fifteen (15) calendar days after discovery, of any release(s) from a SWMU or AOC of hazardous waste or hazardous constituents identified during the course of ground water monitoring, field investigation, environmental auditing, or other means. Such newly-discovered releases may be from newly-identified SWMUs or AOCs, newly-constructed SWMUs, or from SWMUs or AOCs for which, based on the findings of the CSM, or investigation of an AOC(s), the Administrative Authority had previously determined no further investigation was necessary. Any newly identified SWMU, AOC or release is subject to the three performance standards defined in the CAS.

10.2.4Land-Use Controls (LUCs)

The Tinker Air Force Base property is located at (¼, ¼, ¼, Section, Township, Range) NE1/4, SW1/4, SW1/4, Section 22, Township 11N, Range 2WIM.

The current land use for Tinker Air Force Base is primarily industrial. The Air Force, as property owner, has the authority to determine the future anticipated land use and is responsible for determining, and applying institutional and engineering land-use controls. As provided in the Base Master Plan, the long-term land use plan is for continued industrial use of this site. The current land use of adjacent and surrounding land is a mixture of industrial and non-industrial uses. The current use of adjacent and surrounding land is also expected to remain the same for the foreseeable future. Environmental restoration sites and land-use controls are identified in the Base Civil Engineer Master Plan, which includes provisions for the following:

- Restricted land use/access, with sites within the flight line having additional restricted access. Entry to the Base is limited, with additional requirements in place to enter the air field proper;
- Long-term groundwater use restrictions. Restrictions regarding location of water supply wells and usage of specific aquifer zones are included, as well as discharge of construction water at or near contaminated environmental sites;

- The Environmental Restoration office participates in the Dig Permit process. The dig permit identifies impacted sites and any environmental infrastructure such as monitoring wells and remedial system components;

- The Environmental Restoration office participates in the "332" coordination & approval process. The 332 form is a Base Civil Engineer work request form as directed in AFI 32-1001. Environmental issues (such as location of impacted sites, potential safety protocols, and waste handling requirements) are identified and coordinated through this form before work can begin at a site on Base.

10.3 Existing Solid Waste Management Units

[40 CFR 270.14(d)(1), (d)(2)]

The locations of the seven remaining SWMUs that require continued regulatory oversight under this RCRA Permit renewal are listed on Table 10-3 and shown on Figure 10-1, which is contained in a pocket at the end of this document. The status of each remaining SWMU, as of September 2013, is presented in the following subsections. A general discussion of the location of each of the units, operation and history, waste types, estimated waste volume, investigation summary of waste impacts, and any hazardous waste releases are provided in the following subsections. Although not formally in postclosure, the six Tinker landfills are currently treated as such under the ongoing IRP program at the Base.

Table 10-3: Ongoing Solid Waste Management Units

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
1	1			LF016	Landfill 6	Listed as a SWMU in the 1991 and 2002 RCRA Permits. Final Phase I RFI report completed September 1994. Final Phase II RFI report completed June 1997. RCRA landfill cap upgrades were completed in 2001. Long term monitoring and care of the RCRA cap was approved as the remedy for this site in a letter from ODEQ dated 6/1/2001.	Long Term Monitoring and Care of the RCRA cap.
2	2			LF015	Landfill 5	Listed as a SWMU in the 1991 and 2002 RCRA Permits. Final Phase I RFI report completed September 1994. Final Phase II RFI completed September 1995. RCRA landfill cap installed in 1998. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 10/4/2001.	Long Term Monitoring and Care of the RCRA cap.
3	3			LF011	Landfill 1	Listed as a SWMU in the 1991 and 2002 RCRA Permits. RCRA landfill cap installed in 1991. Final Phase I RFI report completed September 1994. Final Phase II	Long Term Monitoring and

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
						RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 7/25/2001.	Care of the RCRA cap.
4	4			LF012	Landfill 2	Listed as a SWMU in the 1991 and 2002 RCRA Permits. Final Phase I RFI report completed September 1994. RCRA landfill cap installed in 1998. Final Phase II RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 7/25/2001.	Long Term Monitoring and Care of the RCRA cap.
5	5			LF013	Landfill 3	Listed as a SWMU in the 1991 and 2002 RCRA Permits. RCRA landfill cap installed in December 1991. Final Phase I RFI report completed September 1994. Final Phase II RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 7/11/2001.	Long Term Monitoring and Care of the RCRA cap.
6	6			LF014	Landfill 4	Listed as a SWMU in the 1991 and 2002 RCRA Permits. RCRA landfill cap installed in December 1991. Final Phase I RFI report completed September 1994. RCRA landfill cap installed in 1998. Final Phase II RFI completed April 1999. Long term monitoring and care of the RCRA cap as the remedy for this site was documented in a letter from ODEQ dated 10/29/2001.	Long Term Monitoring and Care of the RCRA cap.
12	12			WP018	Industrial Waste Pit #1	Listed as a SMWU in the 2002 RCRA Permit. RFI completed March 1999. ICMs performed between 1999 and 2008. In an email dated 10/1/08, ODEQ indicated acceptance of the Draft CMS and Statement of Basis pending incorporation of ODEQ's recommended revisions in to the final CMS. The Air Force completed the Final CMS in December 2008, recommending MNA with ICs and LUCs.	NFA for soils, MNA for GW and ICs/LUCs
24	24			OT034	IWTP - Industrial Waste water Treatment Plant	Identified as a RCRA SWMU in the 1991 and 2002 RCRA Permits. Phase I RFI report completed April 1994, Phase II RFI report completed July 1996. CMS report completed June 2003. The Air Force submitted a decision document to ODEQ (April 23, 2004) proposing the selected remedy be vapor extraction from the soils.	Corrective Action complete - soil removal

Current SWMU No.	RFA SWMU No.	Current AOC No.	RFA AOC No.	AFSite No.	Original Site Name	Activity History	Current Status
					Soils	The ODEQ concurred with the Air Force in a letter dated May 5, 2004. In 2016, an additional non-time critical removal was performed to remove soil hot spots discovered to be slightly above industrial levels. A Corrective Action Completion report is scheduled to be completed late 2017.	

Note: [Red Font] RCRA SWMU #12 is requested be removed from upcoming permits see Section 10.2.3.

10.3.1 Landfills Postclosure

[40 CFR 264/265.112, 116-120]

Six landfills were operated at Tinker AFB during successive time periods between 1942 and 1979. Tinker AFB's six closed landfills are carefully and routinely monitored to insure that erosion and settlement do not compromise the final RCRA cover systems. In addition, the landfills are monitored to detect ground water contamination in accordance with the basewide groundwater monitoring program (subsection 10.5). It is no longer necessary to monitor migration of landfill gases per the *Landfill Gas Survey and Ready for Reuse Study* (Parsons, May 2007) since this study concluded that, with respect to state standards, no Oklahoma toxic air contaminant (TAC) maximum ambient air concentration (MAAC) levels are being exceeded. ODEQ issued a certificate of "Ready for Anticipated Use" for landfills 1, 2, 3, 4 and 6 on March 28, 2008.

Annual post-closure inspection reports will be provided to demonstrate that each site has been inspected on a regular basis to evaluate the integrity and stability of the final cover and surface water diversion systems. If post-closure inspections of any landfill identify problems which require maintenance or repair, these problems and associated remedies will be discussed in detail within the site report. The purpose of these reports, inclusive of photos, will be to demonstrate that the surface and subsurface of the landfill continues to be stable and will not require further maintenance or repairs.

10.3.1.1 SWMU #1, Landfill 6

Landfill 6 (AF Site #LF016) is situated east of the main base south of Southeast 59th Street and ½ mile east of Douglas Boulevard. Landfill 6 is designated as SWMU #1. It occupies about 25 acres of a 40 acre site that Tinker AFB has leased from Oklahoma City from 1969 to the present. The landfill was operated from 1970 through 1979. The landfill was used to dispose of approximately 500,000 cubic yards of general refuse. There are reports that some paints, insecticides, solvent containers and IWTP sludge were also disposed of at the landfill. After the landfill ceased operating in 1979, the trenches were covered with several feet of compacted soil, and then planted with grasses.

A private well was sampled north of the site in 1983, and results of the sampling indicated some contamination. A follow-on sampling effort of several private wells in the area was performed by the OSDH, but no contamination was found in any of these wells. The residence where contamination was discovered was connected to the Tinker AFB water supply at that time, but the residence no longer exists.

In January 1986, a compacted clay cap cover system was installed over much of the landfill as part of an interim action. Subsequently, investigations revealed that additional uncapped trenches existed and an extension to the cap cover system was constructed in 1988. During the site investigation in 1990, solid waste samples of the trenches revealed VOCs and some metals. The upper saturated zone (USZ) at the site also was sampled with the majority of contamination (arsenic, barium and cadmium) found in the western portion of the landfill. Groundwater is the primary route of contamination migration at the landfill. A 25-acre RCRA cap was installed over the landfill in 2000 as part of an interim action to reduce surface water infiltration, minimize the possibility of leachate migrating into the groundwater, and prevent any direct contact with the site. Long term care of the RCRA cap remains the RIP for Landfill 6, and monitoring of the groundwater around the site will continue as part of the remedy.

10.3.1.2 SWMU #2, Landfill 5

Designated as SWMU #2, Landfill 5 (AF Site #LF015) encompasses about 6.0 acres and is located in the south central portion of Tinker AFB. The landfill is bordered by Tower Road on the west, the TACAMO (Navy) ramp to the south and Crutcho Creek to the north and east. While it was in operation from 1968 to 1970, the landfill accepted approximately 75,000 cubic yards of general refuse with small quantities of industrial waste. Preliminary sampling indicated the presence of both metals and organic compounds including TCE. An interim 12-inch compacted clay cap was installed in August 1990 to minimize infiltration of surface water into the landfill. In 1998, a 6-acre RCRA cap was installed over the landfill as part of an interim action to reduce surface water infiltration, minimize the possibility of leachate migrating into the groundwater, and prevent any direct contact with the site. Landfill 5 lies within the boundary of the East Contaminated Groundwater Management Unit, Site #CG039. Long term care of the RCRA cap will continue for Landfill 5, and monitoring of groundwater around the site will continue as part of the CG039 RIP.

10.3.1.3 SWMU #3, Landfill 1

Landfill 1 (AF Site #LF011) is designated as SWMU #3. Located east of Patrol Road and south of Crutcho Creek, it covers an area of 1.5 acres. During its operation from 1942 through 1945, the landfill received general refuse and industrial waste generated at Tinker AFB. Trench water sampling and soil borings revealed low concentrations of VOCs and semi-volatile organic compounds (SVOCs) along with low levels of metals. An investigation of Crutcho Creek did not reveal any indication that contamination had migrated into the creek. Land use near the site does not include any ecologically sensitive areas, but military housing is located roughly 1500 feet to the west. A 2-acre RCRA cap was installed over the landfill in 1991 as part of an interim action to reduce surface water infiltration, minimize the possibility of leachate migrating into the groundwater, and prevent any direct contact with the site. The site lies within the boundary of the Southwest Contaminated Groundwater Management Unit, Site #CG038. The 2002 RFI for CG038 concluded that Landfill 1 does not appear to be a source of contamination to CG038. Long term care of the RCRA cap will continue for Landfill 1, and monitoring of groundwater around the site will continue as part of the CG038 RIP.

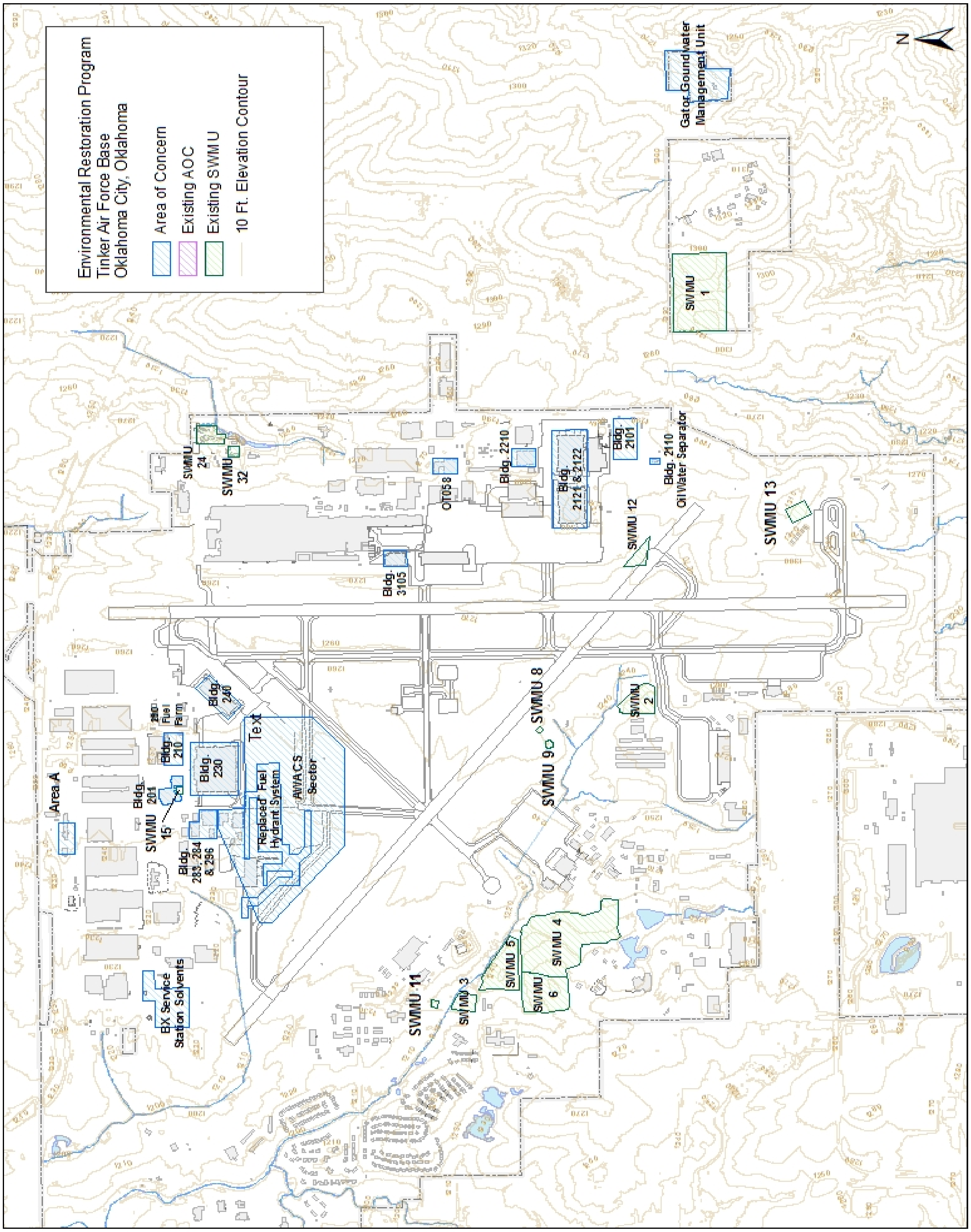

Figure 10-1: Location of Existing SWMUs and Other Release Areas at Tinker AFB

10.3.1.4 SWMU #4, Landfill 2

Landfill 2 (AF Site #LF012) covers 27.5 acres and is located south of Vanaman Road and adjacent to Landfill 4 on the southwest side of the base. This landfill is designated as SWMU #4. Dates of operation for Landfill 2 have been reported as being from 1945 through 1952; however, aerial photos suggest that the range of use of the site might be closer to 1945 through 1963. This landfill primarily received general refuse from the base, including sanitary and industrial waste. Soil and groundwater investigations were performed between 1985 and 1990 to determine if environmental contamination in the area occurred as a result of disposal and management practices. Trench water sampling showed low concentrations of VOCs (including TCE and vinyl chloride) and SVOCs. Low levels of metals such as barium, cadmium, chromium, lead and nickel were also detected. The possibility of leachate migrating into Crutcho Creek from the landfill was thought to exist; however, samples collected in the creek do not indicate that this occurred. In addition, a radiological waste disposal site once located within Landfill 2, was remediated through soil removal actions performed in 1992 and 1997.

A 28-acre RCRA cap was installed over the Landfill 2 in 1998 as part of an interim action to reduce surface water infiltration, minimize the possibility of leachate migrating into the groundwater or to the creek, and prevent any direct contact with the site. Landfill 2 lies within the boundary of the Southwest Contaminated Groundwater Management Unit, Site #CG038. A RFI/CMS was conducted between 2002 and 2004 for CG038, and concluded that the burial trenches and other waste management activities within Landfill 2 are a likely source of chlorinated hydrocarbon contamination to CG038. Between 2004 and 2008 additional studies have identified and delineated hexavalent chromium contamination in the groundwater beneath Landfill 2. Long term care of the RCRA cap will continue for Landfill 2, and monitoring of groundwater around the site will continue as part of the CG038 RIP.

10.3.1.5 SWMU #5, Landfill 3

Landfill 3 (AF Site #LF013), designated as SWMU #5, covers approximately eight acres and is located north of Vanaman Road and south of Crutcho Creek in the southwestern portion of the base. It is reported to have been in operation from 1952 through 1961, although aerial photo evidence suggests trenching may have started around 1951. The landfill was used primarily for disposal of general refuse, but included some industrial waste as well. The waste burial trenches were closed in 1961, but a sludge dump operated in the south-central area of the landfill from roughly 1961 until 1968. Soil and groundwater investigations were performed between 1986 and 1990 to determine if environmental contamination in the area occurred as a result of disposal and management practices. Trench water sampling revealed low concentrations of VOCs including TCE, methyl ethyl ketone (MEK) and toluene as well as SVOCs. Metals in the trench water samples included barium, chromium, cadmium, lead, mercury and zinc. In addition, laboratory results for soil samples recovered from 3 to 18 foot deep borings around the sludge pit were indicative of high concentrations of both solvent and fuel compounds.

An 8-acre RCRA cap was installed over the landfill in 1991 as part of an interim action to reduce surface water infiltration, minimize the possibility of leachate migrating into the groundwater, and prevent any direct contact with the site. An investigation and report of landfills 1 through 4 incorporating data back to 1987, was completed in 1993. After the landfill was capped, additional groundwater investigations were conducted to delineate the contaminant plumes beneath the landfill. The site lies within the boundary of the Southwest Contaminated Groundwater Management Unit, Site #CG038. A RFI/CMS conducted between 2002 and 2004 for CG038 concluded that the former Sludge Dump Area in Landfill 3 was the primary source of the chlorinated hydrocarbon contamination at the north solvent plume in CG038. Near the southern boundary of Landfill 3, high concentrations of several VOCs, including vinyl chloride and cis-1,2-dichloroethene (DCE) have been detected in groundwater. Long term care of the RCRA cap will continue for Landfill 3, and monitoring of groundwater around the site will continue as part of the CG038 RIP.

10.3.1.6 SWMU #6, Landfill 4

Landfill 4 (AF Site #LF014) covers 12.4 acres and is located immediately west of Landfill 2. Landfill 4, designated as SWMU # 6, is south of Vanaman Road and was mainly operated from 1961 through 1968. Aerial photo evidence, however, suggests that trenching occurred as early as 1948 in the northwest corner of the landfill, and again in 1953. Waste placed in the landfill consisted mostly of general refuse with some drums containing solidified solvent and metal shavings. Soil and groundwater investigations were performed between 1985 and 1990 to determine if environmental contamination in the area occurred as a result of disposal and management practices. Trench water sampling showed low concentrations of VOCs including TCE, MEK, and toluene as well as SVOCs. Metals in the trench water contained chromium and manganese. Soil samples obtained from 5 to 18 foot below surface revealed acetone, MEK and chromium. The possibility of leachate migrating into Crutcho Creek was thought to exist. However, an investigation of Crutcho Creek did not show any indication that this has ever occurred. A 13-acre RCRA cap was installed over the landfill in 1998 as part of an interim action to reduce surface water infiltration, minimize the possibility of leachate migrating into the groundwater or to the creek, and prevent any direct contact with the site. Landfill 4 lies within the boundary of the Southwest Contaminated Groundwater Management Unit, Site #CG038. A RFI/CMS was conducted between 2002 and 2004 for CG038, and concluded that the burial trenches within Landfill 4 are potentially sources of chlorinated hydrocarbon and hexavalent chromium contamination to CG038. Long term care of the RCRA cap will continue for Landfill 4, and monitoring of groundwater around the site will continue as part of the CG038 RIP.

10.3.2 SWMU #24 IWTP – Industrial Wastewater Treatment Plant - Soils

The IWTP (SWMU #24), a component of AF Site #OT034, is located in the northeast corner of Tinker AFB and is the process pre-treatment plant for all industrial and sanitary wastewater generated at Tinker AFB. The site is designated as SWMU #24. The IWTP was constructed in

1972 to treat industrial wastewater generated at the base, including electroplating, chemical cleaning and paint-stripping operations. These operations generated wastewater containing oil, grease, metals and organic solvents. In April 1996, Tinker AFB permanently diverted discharge from both the IWTP and sanitary sewer sources to the Oklahoma City wastewater collection system under a City of Oklahoma City Industrial User Permit. Since 1996, the IWTP no longer discharges into Soldier Creek.

Subsequent to the 1988 Federal Facilities Agreement (FFA), it was decided that the soils associated with the IWTP would be managed under RCRA guidance, and the groundwater media would be managed under CERCLA. Under this permit application, remedial action at SWMU #24 therefore is only concerned with the soils associated with the IWTP. SWMU #24 was defined as consisting of thirty-three process units, thirteen of which were designated SWMUs.

A RFI, which included soil, was conducted between 1993 and 1996. Results of the investigations indicated the presence of chlorinated and non-chlorinated VOCs, SVOCs, phenolic compounds and metals in the soil, as well as VOCs in the soil gas. The 1996 Phase II RFI concluded that soil contamination existed at IWTP and corrective measures were implemented to treat the soil media within the IWTP facility.

In 2000, the industrial waste sludge drying beds were removed as an interim corrective measure and a vacuum enhanced pumping (VEP) system with five extraction wells was installed to recover subsurface liquids and soil gas in the vicinity of the former drying beds. In 2001, the former industrial waste tanks D-1 and D-2 were demolished and removed from the IWTP.

In 2003, the VEP system was expanded to recover vapors and liquids from the soils beneath the former tanks D-1 and D-2. The Air Force submitted a decision document to ODEQ in February 2004 selecting VEP as the remedy for treating the remaining IWTP soils. ODEQ approved the selected remedy for IWTP soils on May 5, 2004. During the summer of 2016, a non-time critical soil removal was conducted to remove additional soil contamination that was discovered to be above industrial risk screening levels. A RCRA Corrective Action Completion Report is scheduled to be completed by early 2018.

10.4 Areas of Concern

A general discussion of each of the fourteen existing and proposed AOCs is provided in the following sections. The AOCs are listed in Table 10-4 and are located on Figure 10-1.

Table 10-4: Ongoing (non-NPL) Areas of Concern

AF Site Number	Current AOC No.	RFA AOC No.	Site Name	Activity History	Current Status
ST007	**1**	1	Fuel Farm (290 POL Facility)	AOC 1 was identified in the 6/15/89 USEPA Region 6 RFA, but was not listed as an AOC in the 1991 RCRA Permit. As required by the 1991 RCRA Permit, a summary of previous studies was documented in the December 1992 Description Of Current Conditions for Tinker AFB. This AOC was not listed in the 2002 RCRA Permit. However, a RFI report was completed in 1995, and an additional Draft Site Investigation Report was completed in December 1996. Two vacuum enhanced pumping (VEP) systems were installed at the site between 1998 and 2000 as interim corrective measures. Collectively, the two systems extract groundwater and soil vapor from 34 recovery wells around Building 214, the former Building 210, near Tank 349, and near Building 117. The two systems where shut down in April 2012.	ICM – completed in 2012. New RFI underway
ST008	**20**		Building 201 Vapor Intrusion	A potential vapor intrusion condition was identified at Building 201 during a base-wide vapor intrusion survey (inventory) in 2010.	RFA completed for soil vapors
CG040	**21**		Gator Groundwater Management Unit	CG040 encompasses chlorinated solvent impacted groundwater underneath an adjunct facility approximately one mile east of the eastern boundary of Tinker AFB near the intersection of SE 59th St. and Post Road. The facility is non-industrial; only one building used for administrative purposes was found at the site. No unique source has been identified for this contamination. A groundwater extraction and treatment system began operation as an interim action in October 1999. The RFI report was completed in December 2003 and the CMS report was completed in July 2006. A Statement of Basis was completed as a decision document between Tinker AFB and the ODEQ, and was signed by	Corrective Actoin - GW extraction system and bioreactor with insitu remediation

AF Site Number	Current AOC No.	RFA AOC No.	Site Name	Activity History	Current Status
				ODEQ on July 31, 2006. **Ultimate goal is to achieve UU/UE site close out.**	
CG041	**22**		AWACS Sector	CG041 encompasses impacted groundwater beneath the tarmac and taxiways south of Building 230. This site was introduced to ODEQ at the October 2009 RAB meeting.	RFI underway
OT058	**23**		Jet Engine Test Cells (Bldg. 3703 and Bldg 3234)	A site investigation report was completed in July 2002; Interim Corrective action using soil gas vapor and groundwater extraction was initiated in 2002 with the report issued in May 2003. A CMS was completed in May 2005. The VEP system continues to operate until the interim remedy in place (RIP) is either adopted or an improved remedy is selected.	RFI underway
OT062	**24**		Building 230	A RFI report was completed in March 2004. A VEP system was installed as an interim corrective measure to mitigate the potential risk posed by subsurface contaminants along the north and west sides of Building 230. A Phase I CMS was completed in April 2007 and a draft Phase II CMS was completed in May 2011. The VEP system continues to operate until the interim RIP is either adopted or an improved remedy is selected.	RFI underway
OT064	**25**		Building 210	A Draft Final RFA was completed in July 2008. A potential vapor intrusion condition was identified.	RFI underway
OT065	**26**		Building 283, Building 284, Building 296	A potential vapor intrusion condition was identified at Buildings 283, 284, and 296 during a base-wide vapor intrusion survey (inventory) in 2010.	RFI underway
OT066	**27**		Building 2110 Oil Water Separator	Same Location as the Fuel Truck Maintenance Area AOC (see Table 10-1). The ODEQ approved the Air Force's NFA request in the 8/12/2002 RCRA Operations Permit Renewal. However, a fuel leak from the oil water separator to the oil was noticed in 2004. The RFI report was completed in 2016. **Ultimate goal is to achieve UU/UE site close out.**	Corrective Action - Non-time critical OWS removal work plan underway
OT067	**28**		Building 2101	This building is the former motor pool which has been demolished and will not be replaced. Due to the nature of the motor pool operations, solvent and fuel leaks are suspected. The RFI report was completed	Corrective Action – is scheduled for late 2017.

AF Site Number	Current AOC No.	RFA AOC No.	Site Name	Activity History	Current Status
				in June 2015. The CMA workplan completed in March 2017. A non-time critical soil removal action is planed for late 2017. **Ultimate goal is to achieve UU/UE site close out.**	
OT068	**29**		Replaced" Fuel Hydrant System	In 1992, fuel releases from the hydrant system were detected when fuel would seep to the surface between the joints in the concrete of the tarmac. .	RFI underway
OT069	**30**		Building 2121 and Building 2122	A RFA/RFI report was completed in March 2001 followed by a supplemental SI/RFI report in September 2001 and a CMS Report in October 2001 at Building 2122. Soil contamination was identified, but concluded that it was not impacting the groundwater. Similar process activities occurred at Building 2121 in the past, though no investigations have been performed at building 2121. Results for sub slab soil gas sampling beneath Building 2121 and 2122 were reported in a Vapor Intrusion Assessment that was completed in August 2011.	RFI underway
ST033	**31**		Area A Service (Fuel) Station	Soil and groundwater investigations conducted in 1990 and 1992 showed the presence of mogas contamination. A product recovery system was installed in 1992 to pump fuel from the groundwater. By 1996, the extent of soil contamination was delineated, the USTs were removed and the product recovery system expanded. VEP remediation began June 1997, and fuel product recovery was completed by 1999. The OCC approved site closure on December 18, 2000; however, this is limited to only petroleum hydrocarbons in soil and groundwater. A TCE plume (along with other chlorinated compounds) has been identified in the groundwater beneath the site. The VEP system was shut down in November, 2012 and replaced with an Emuslfied vegetable oil mixture injection – In Situ.	Corrective Action – In Situ Remediation for CVOCs.
VI080	**32**		Building 3105	Suspected releases of solvents from drain lines beneath Building 3105 were reported at this site in August 2009.	RFI underway

10.4.1 AOC #1, Fuel Farm (290 POL Facility)

Designated as AOC #1, the 290 Fuel Farm site (AF Site #ST007) is located in the north-central area of the base. The site is bounded by First and Arnold Streets on the north and south and by "A" and "B" Avenues on the east and west, respectively. The original Fuel Farm consisted of five 18,000-gallon USTs and 20 25,000-gallon USTs. The tanks were used to store motor fuel, aviation gasoline and JP-4. Two major spills of 6,000 and 10,000 gallons, respectively, occurred in 1979 and 1980. The USTs were removed and replaced with above-ground storage tanks (ASTs) in 1988. Investigations conducted in 1985, 1987, and 1988 found fuel-related contaminants in the soil and groundwater. An additional investigation was conducted at the site in 1994 to determine the amount of fuel remaining in the soil and the full extent of groundwater contamination. TCE and other chlorinated solvents were also identified in the RI. In 1986, a two-well pump and treat system was installed at the site as part of an interim action. This operated until 1989 when it was shut down. Two VEP systems were installed at the site between 1998 and 2000. Collectively, the two systems extract groundwater and soil vapor from 34 recovery wells around Building 214, the former Building 210, near Tank 349, and near Building 117. The two VEP systems were shut down in April, 2012 to allow for the groundwater to rebound and evaluate the current nature and extent of the contamination. An RFI report is scheduled to be completed by early 2018.

10.4.2 AOC #20, Building 201

Building 201 (AOC #20) is currently the base personnel and training office. It is used for administrative processing of employees on Tinker AFB. There are no current industrial activities ongoing inside of the building; however, the building was used for industrial purposes for a number of years after it was constructed in the 1940s. Sub slab soil gas sampling was conducted in 2009 and 2010 and the investigations indicated that a vapor intrusion condition may exist within the building. Building 201 is part of AF site ST008, which includes 4 SWMUs that have reached NFA status. Three of these SWMUs are located in close proximity to Building 201 but are not considered the sources of the soil gas measurements obtained in 2009 and 2010. However, there are several industrial waste lines to the south and east of the building and a chlorinated hydrocarbon plume in the USZ groundwater is located underneath most of Building 201. Analytical results at one subslab location indicate significant levels of TCE in the soil gas media, although the areal extent has not been determined.

10.4.3 AOC#21 Gator Contaminated Groundwater Management Unit

AOC #21, the Gator Contaminated Groundwater Management Unit (AF Site #CG040), was designated as a groundwater management unit in 1996. It is located at an adjunct facility approximately one mile east of the eastern boundary of Tinker AFB near the intersection of SE 59th St. and Post Road. The facility is non-industrial; only one building used for administrative purposes is found at the site. Chlorinated solvents including TCE have been detected above regulatory limits in the groundwater since the first monitoring wells were installed in 1995. No unique source has been identified for this contamination. A chlorinated plume has impacted shallow groundwater in the USZ and Lower Saturated Zone (LSZ); both are part of the Garber-Wellington Aquifer. Residences with private wells are extremely close to the site, one within 50 feet. This well has been tested several times by Tinker AFB and shows no contamination.

A groundwater extraction and treatment system began operation as an interim action in October 1999. The extraction system consists of two french drain segments in the USZ and a single pumping well in the LSZ. Contaminated groundwater is being pumped to an air stripper designed to treat contaminated groundwater to drinking water standards or better. The single pumping well in the LSZ was designed to capture the entire LSZ plume. Surrounding wells are monitored to ensure capture. Treated groundwater is discharged into a sanitary sewer near the site. The RFI report was completed in December 2003 and the CMS report was completed in July 2006. A Statement of Basis was completed as a decision document between Tinker AFB and the ODEQ, and was signed by ODEQ on July 31, 2006. The selected remedy consisted of continued operation of the groundwater extraction and treatment system along with institutional and engineering controls. In 2013, an insitu-bioremediation treatment system was installed to further treat the higher concentrations of VCOCs within the plumes. The overall goal of the insitu system is to treat the groundwater contamination below MCLs and achieve Site Closeout at residential levels – Unlimited Use/Unrestricted Exposure (UU/UE).

10.4.4 AOC #22, AWACS Sector

AOC #22, known as the Air Warning and Control System (AWACS) Sector Contaminated Groundwater Management Unit (AF Site #CG041), consists of chlorinated solvent groundwater plumes in the vicinity of the AWACS flight apron. The site is in the north central portion of Tinker AFB and encompasses the contaminated groundwater beneath the tarmac and taxiways south of Building 230. The site also extends beneath several industrial buildings to the west of Building 230 and unpaved areas to the south, east, and west of the tarmac. The facilities overlying CG041 have been used for industrial purposes since 1942.

Two chlorinated solvent plumes exist within CG041. One is largely under the industrial buildings on the north side of CG041, while the other plume is on the southern border of CG041 underneath the tarmac and taxiways. The northern plume has impacted only the USZ, whereas the southern plume has impacted both the USZ and LSZ. For the northern plume, suspected sources of the contamination include: 1) USTs containing unknown materials that were located adjacent to the former Building 267 (a demolished vehicle maintenance shop), 2) former Building 227 (a demolished motor repair shop), 3) an abandoned waste tank (tank 226) located near the former Building 228 that contained miscellaneous contaminated oil, 4) two 50,000 gallon USTs formerly located under the southwest corner of Building 289, and 5) potential leaks and breaks in the industrial waste lines in the vicinity of Building 289. For the southern plume, historical solvent usage on the tarmac from the 1940s to the 1970s is the suspected source.

Currently, concentrations of chlorinated compounds are generally either stable or decreasing in the USZ and generally stable in the LSZ. A RCRA Facility Investigation (RFI) was conducted to evaluate the nature and extent of the contamination. The RFI report was completed in August, 2014 with a recommendation to conduct a Corrective Measure Study – currently underway.

10.4.5 AOC #23, Jet Engine Test Cells (Building 3703)

Area of Concern #23 (AF Site #OT058), consisting of Building 3703, is located within CG039. The Jet Engine Test Cells (JETC) site is in the eastern portion of Tinker AFB, on Turbine Drive between East Drive to the west and Cells Road on the east. The combined facility serves to mechanically test and service rebuilt jet engines and after-burners prior to redeployment. Wastewater associated with jet engine testing and cleaning is discharged to the industrial wastewater collection system. Building 3703 was constructed in 1951 and originally included four test cell chambers. Subsequently, four additional chambers were added. Currently, all eight jet engine test cell chambers are operational. Solvents, such as TCE, were reportedly used at both buildings in the past to clean the jet engines. Presently, JP-5 is the most commonly used fuel for engine testing. The fuel is transported to the facility by pipeline from the 3700 Fuel Yard. These fuel lines were entirely underground until the 1970s, at which time a portion were convered to aboveground. The fuel system is also known as the Nancy Hydrant System.

There are two known release sources at Building 3703: 1) leaks in the JP-5 supply line to Building 3703 within the building's underground duct bank; and 2) the oil-water-separator (OWS) system on the western side of Building 3703, which released industrial wastewater to the subsurface. Since 1992, actions performed to remediate contaminant leakage at Building 3703 include the replacement of various industrial waste lines and OWS upgrades. A RFI was conducted between 2000 and 2002. An interim remedial action began in May 2002 to extract groundwater, vapor, and mobile nonaqueous phase liquids from the subsurface, and is still operating. A CMS was completed in 2005.

The same RFI also identified the possibility that contamination at the northwest corner of Building 3234 is the result of JP-5 fuel releases from the nearby Nancy Hydrant system. The contaminant releases at the northeast corner of Building 3234 are a result of faulty installation of an industrial waste line that has since been corrected and/or replaced.

The most prevalent contaminants found in groundwater at this AOC are fuel-related compounds (i.e., TPH-gasoline, TPH-diesel, and BTEX) and chlorinated solvents (including PCE, TCE, and their anaerobic degradation products such as cis-1,2-DCE, 1,2-DCA, and vinyl chloride). Chlorinated solvent contamination in the USZ and LSZ extends beyond the boundary of OT058 to the east, south, and west. Some of the highest concentrations of TCE are directly south of OT058 near a former Industrial Waste Evaporation Basin which overlies the USZ. Groundwater contamination beyond the boundaries of OT058 is being evaluated as part of CG039. Within the boundaries of the site, substantial amounts of dissolved and vapor phase contaminants have been recovered; however, no free product has been observed at the site. Nevertheless, significant contamination remains throughout OT058, particularly petroleum hydrocarbons and chlorinated compounds.

Soil gas sampling conducted in 2007 near Building 3703 indicates that there are probable contaminant sources beneath Building 3703 either in the soil, the groundwater, or both. PCE was detected in soil gas beneath Building 3703 at 41,000 parts per billion by volume. Therefore, contaminants in soil and/or groundwater beneath the building have the potential to migrate into indoor air via vapor intrusion (VI). A RCRA Facility Investigation (RFI) has been conducted to evaluate the nature and extent of the contimation with a report due to be completed by late 2017.

10.4.6 AOC #24, Building 230

Building 230 (AF Site #OT062) is designated as AOC #24. The site is in the north central portion of Tinker AFB, between First Street and the ramp area at “C” Avenue. Building 230 is a four-bay hangar with support facilities that was used as a central repair hangar during World War II. Industrial activities in the building included aircraft overhaul, cleaning, retrofitting, upgrades, and general maintenance. Industrial processes are still conducted on the north end of the building, but are primarily limited to dry operations. There is an extensive network of industrial waste water drain lines along the north side of Building 230 and running north-south beneath the building.

Chemicals were released to the environment from leaks in sumps and the industrial waste water drain lines at Building 230 as well as from spills, allowing chemicals to percolate into the soil. The migrating contaminants have reached the uppermost units of the Garber Sandstone in the vadose zone above the USZ. Contaminants in soil are primarily located on the north and west sides of Building 230 from approximately 2 to 9 feet below ground surface (bgs). The primary contaminants at the site are BTEX, carbon tetrachloride, cis-1,2-DCE, Freon 113 (1,1,2-trichloro-1,2,2-triflouroethane), methane, MEK, TCE, and vinyl chloride.

A VEP system was installed as an interim corrective measure to mitigate the potential risk posed by subsurface contaminants along the north and west sides of Building 230. The VEP system was operated continuously since startup in May 2005 until shutdown in 2011 . The system uses groundwater extraction wells and horizontal soil vapor extraction wells to remove contaminated groundwater and soil gas, respectively, that is then directed to a treatment plant constructed specifically for this cleanup action. A RCRA Facility Investigation (RFI) has been conducted to evaluate the nature and extent of the contimation with a report due to be completed by late 2017.

10.4.7 AOC #25, Building 210

The Building 210 site (AF Site #OT064) is located in the north-central area of the base and consists of Buildings 210 and 213, an unpaved grassy area, and a parking lot. The site, designated as AOC #25, is situated north of First Street between “B” and “C” Avenues. The original Building 210 structure was built in 1942 and was used to refabricate and overhaul hydraulic and pneumatic control systems. The building included a paint shop, parts cleaning area, machine shop, test cells, and instrument repair area. Activities at the original Building 210 required the extensive use and storage of fuels, lubricants, and degreasing solvents. In addition, mercury filled manometers and temperature/pressure controls were used in the former test cells. In 2003-2004, approximately 90 percent of the building was demolished and removed. Most of the former Building 210 is now a paved parking lot. The northeast corner of the former Building 210 remains intact and contains a compressor room that serves a repair and maintenance facility located directly north in Building 200. This remnant of the original Building 210 is also currently used as a turbine maintenance and repair shop. In addition, Building 213, which is another turbine maintenance and repair shop built in 1993, is located in the southeast corner of OT064.

When a 6,000 gallon UST at the site was removed in August 1997, several holes were observed on the underside. Approximately 1,500 gallons of mixed residual solvents and gasoline remained in the tank during excavation, and free product was also encountered on the shallow groundwater during the removal of the UST. At least three additional USTs were also located within the boundaries of OT064, although these are indicated as having been abandoned prior to 1987. Two of these USTs stored fuels and one stored solvents. During demolition of the test cell area of Building 210 in 2003-2004, free-phase mercury was encountered in the test cell drain lines and surrounding soil. The drain lines and the surrounding mercury-impacted soil were excavated and removed in 2004

VOCs have been detected in groundwater at the site; however, no groundwater plumes have been identified previously within OT064. There are chlorinated solvent groundwater plumes to the east, west, and south of OT064 in both the USZ and LSZ and fuel plumes to the east, northeast, and west of OT064 in the USZ. Soil gas data from 9 near slab soil gas probes collected from 2005 to 2009 around Buildings 210 and 208 indicate soil gas vapors exist along the northern boundary of OT064 at concentrations that may impact Building 200 directly to the north. As an interim remedial action, VEP extraction and recovery wells were installed in 1998 in the eastern portion of OT064. An additional VEP well was installed along the northern boundary of OT064 in 2007 near Building 200. These wells have been removing both contaminated soil vapor and groundwater from the site and continue to operate.

A recent site investigation has indicated that a solvent plume may exist under the site and further study is planned to be conducted in the near future (budget pending).

10.4.8 AOC #26, Buildings 283, 284, and 296

AOC #26 is located in the north-central portion of Tinker AFB and consists of three buildings: Building 283 (Flight Simulator Training Facility & 552nd Squadron Operations Facility), Building 284 (Data Processing and AWACS Training Facility), and Building 296 (AWACS Supply Warehouse). Although currently used for administrative and storage purposes, these buildings were once industrial in nature. The buildings are collectively referred to as AF Site #OT065. Sentry Road runs east-west through the center of OT065 with Building 284 on the north side and Building 283 and Building 296 on the south side of Sentry Road. The intersection of Sentry Road and “D” Avenue is adjacent to the northeast corner of Building 296.

Past waste streams associated with OT065 include fuels (i.e., JP-4, JP-5, JP-8, and motor gasoline) and photographic developer waste from Building 283. In 1992, during the construction of Building 296, several abandoned utility lines were found containing jet fuel from a leaking adjacent JP-4 transfer line. Subsequently, the leaking JP-4 transfer line was cleaned of the remaining fuel and abandoned in place. The abandoned JP-4 transfer line runs north-south under the eastern portion of Building 296. Several other utility lines run under the east side of Building 296, including the main Tinker AFB industrial waste water line and a fuel distribution line. There is also an OWS south of Building 296, just beyond the boundary of the site. Wash racks, a radar maintenance facility, and a motor repair shop previously existed in the vicinity of Buildings 283, 284, and 296 as well.

Subslab soil gas sampling conducted in 2009 at Building 296 revealed concentrations of TCE as high as 7630 parts per billion by volume. In the USZ, a TCE plume exists beneath the southeastern corner of B296 and extends beyond the boundary of OT065 to the northeast, south and southwest. High concentrations of TCE exist in the USZ directly south of Building 296, and at the southeastern corner of Building 289. In addition, cis-1,2-DCE and vinyl chloride plumes in the USZ have been found below the eastern portion of Building 296. There is also a BTEX groundwater plume underneath Building 296 that extends west under Building 283 and northwest to Sentry Road. A LSZ TCE plume identified beneath Building 283 and Building 296 extends beyond the boundary of OT065 to the northeast.

10.4.9 AOC #27, Building 2110 Oil Water Separator

Building 2110 (AF Site #OT066) is used as a fuel truck maintenance facility (FTMF). In operation since 1957, Building 2110 includes a wash rack oil water seperator (OWS); residual fuel is released to the OWS and is then recycled. The OWS, designated as AOC #27, includes potentially impacted soil and groundwater. During construction operations at Building 2110 in November 1990, soil and water contamination were discovered under the concrete floor. A RFI of the soils was conducted at Building 2110 between 1993 and 1994. Contaminants within the soils were found to consist of petroleum hydrocarbons including BTEX and chlorinated compounds typical of degreasers (acetone, chlorobenzene, and PCE). The 1994 RFI determined that these contaminants were released to the soils from the floor drain of Building 2110, but the report contended that contamination attributed to the FTMF is limited to the upper 15 feet of soils and does not extend down to the water table. However, chlorinated solvent groundwater contamination in the USZ was independently found to occur beneath Building 2110 and could potentially originate with the OWS. The RFI report has been completed and approved by ODEQ in October, 2016. The OWS, and any associated contaminated soil is planned to be removed with the demolition of Building 2110 in the near future.

10.4.10 AOC #28, Building 2101

Building 2101 (AF Site #OT067) was built in the 1940s and was the original location of the motor pool. The suspected source of the groundwater contamination at AOC #28 is leaks in the wastewater drain lines for Building 2101. This site includes contaminant releases from Building

2101 to environmental media including soil and groundwater. Chlorinated solvent groundwater contamination is located immediately downgradient of Building 2101, and may be present under the building. A facility inspection was completed in August 2009. The building has been demolished (2011). A RFI report was finalized in June 2015 and ODEQ has approved the workplan for a non-time critical soil removal of hot spots. The removal action is scheduled for late 2017.

10.4.11 AOC #29, “Replaced” Fuel Hydrant System

AOC #29 (AF Site OT068) is known as either the Phillips Hydrant System #66230, the “Replaced” Fuel Hydrant System. It is located in the north central portion of Tinker AFB. The fuel hydrant system is contained mostly within AF site CG041. The Phillips Hydrant System is an underground fueling system used to deliver fuel to aircraft on the north tarmac at Tinker AFB. The fuel hydrant system is constructed beneath the tarmac and extends eastward from Building 260 to a point approximately 500 feet south of the center of Building 230.

Prior to system upgrades conducted in 1992, fuel releases from the hydrant system were detected when fuel would seep to the surface between the joints in the concrete of the tarmac. At least six fuel releases from the hydrant system have been reported, with each release resulting in the removal of approximately 500 cubic yards of contaminated soil. A plan to replace the fuel hydrant system included a component to remove contaminated soil. Test borings were drilled in the area subsequent to the hydrant replacement activities. Field measurements from one soil boring sample indicated high levels of volatile vapors at a depth of 4.5 feet bgs. BTEX has been detected at low concentrations in two wells in the USZ near the southern portion of the hydrant system. The RFI report was completed in August, 2014 with a recommendation to conduct a Corrective Measure Study – currently underway.

10.4.12 AOC #30, Building 2121 and Building 2122

The area including Buildings 2121 and 2122 (AF Site #OT069) is designated as AOC #30. The two buildings are hangars located in the southeast quadrant of Tinker AFB. Aircraft maintenance has been conducted in both buildings since the early 1940s, including the use of solvents and stripping agents. More recently Building 2121 has been used for non-chemical maintenance operations; however, Building 2122 is still one of the main hangars for paint stripping operations using a variety of solvents. Products containing dichloromethane, phenol, monoethanolamine, and chromic acid were still in use in 2001. Degradation in caulking in the floor expansion joints has resulted in approximately 3/4-inch gaps open to the subgrade adjacent to the wastewater collection trenches. The solvents and wastewater have been observed to migrate through the expansion joints to the subgrade. A SI/RFI was performed at Building 2122 between 1999 and 2000, followed by a Supplemental SI/RFI in 2002, and a CMS in 2003. Results of the investigations at Building 2122 indicated that the soils beneath Building 2122 were impacted by waste water leaking through floor/drains joints. Subsurface soil was impacted but localized and shallow. The identified levels of soil contamination have not impacted the shallow groundwater zone, primarily due to presence of the building floor slabs and foundation. The CMS stated that the current level of soil contamination does not pose significant risk to human health and environment, and there are no significant routes for further migration, provided that potential future releases are controlled. Current controls include using proper materials to seal the floor joints. In 2006, sub slab and indoor air sampling was performed in the administrative area of Building 2122. It was determined that contaminants were left in receptacles beneath the floor from shop activities performed in the past. The receptacles were drained and the contamination mitigated. In 2009 and 2010, sub slab soil gas sampling was performed at Buildings 2121 and 2122 to evaluate potential contaminant sources beneath the buildings. Groundwater releases are addressed under groundwater management unit CG039. An RFI is currently underway with the report scheduled to be submitted in late 2017.

10.4.13 AOC #31, Area A Service (Fuel) Station

AOC #31, located south of the original Building 414, is known as the former Area A Service Station. This area served as a motor fuel station from 1942 until it closed in 1990. Gasoline and diesel fuels were stored in four USTs. Two of the tanks were used for leaded and unleaded gasoline storage, a third tank stored unleaded gasoline, and the fourth tank, installed in 1975, was used for diesel storage. The third and fourth tanks noted above were taken out of service when the station closed in 1990. Soil and groundwater investigations conducted in 1990 and 1992 showed the presence of mogas contamination. A product recovery system was installed in 1992 to pump fuel from the groundwater. By 1996, the extent of soil contamination was delineated, the remaining USTs were removed and the product recovery system expanded. VEP remediation began June 1997, and fuel product recovery was completed by 1999. The Oklahoma Corporation Commission (OCC) approved site closure on December 18, 2000; however, this is limited to only petroleum hydrocarbons in soil and groundwater. A TCE plume (along with other chlorinated compounds) was also identified in the groundwater beneath the site. The TCE groundwater plume borders the base boundary. The VEP system was shut down I November, 2012 and replaced with an Emuslfied vegetable oil mixture injection – In Situ remedy.

10.4.14 AOC #32, Building 3105

AOC #32, Building 3105 (AF Site #VI080), was used for aircraft maintenance, including mechanical sanding, calibration of hydraulic fuel pumps, and maintenance of electrical systems. This building is located approximately 700 feet east of the North-South Runway between West Drive and the southern extent of Building 3001. Building 3105 is suspected to have leaking drain lines. A TCE groundwater plume immediately downgradient of Building 3105 has TCE concentrations up to 1,180 parts per billion. This site includes contaminant releases from Building 3105 to environmental media including soil. The groundwater is addressed as part of the Soldier Creek/Building 3001 NPL site. An RFI is currently underway.

10.5 GROUNDWATER MONITORING PROGRAM

[40 CFR 264.90, 264,101, and 270.14(d)]

This section contains information regarding groundwater characteristics and groundwater monitoring programs at Tinker AFB. The proposed groundwater monitoring and remediation program satisfies the SWMU groundwater provisions of 40 CFR Part 264, Subpart F §§ 264.90 and 264.101 for groundwater detection monitoring and compliance monitoring. The groundwater monitoring program is presented herein to address the informational requirement for RCRA permit applications under § 270.14(d) in reference to corrective action for SWMUs. During the life of the permit, revisions to the groundwater monitoring program will be made as required and appropriate to maintain conditions protective of human health and the environment.

Groundwater monitoring at Tinker AFB will, at a minimum, consist of a detection monitoring system for the upper approximately 250 feet of the Garber-Wellington Aquifer in accordance with the requirements specified in this permit application. Tinker AFB will maintain a groundwater monitoring program including consistent sampling and analysis procedures that are designed to ensure monitoring results that provide a reliable indication of groundwater quality at the base property in accordance with the Standard Operating Procedures (SOPs) for Groundwater Monitoring defined in the Tinker *Basewide Work Plan* (August 2012), designed after the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) guidance document. The program includes protocols, procedures and quality control for such tasks as sample collection, sample preservation and shipment, analytical procedures, chain of custody control, water level measurements, and data reduction and evaluation among others.

Site status and the overall Corrective Action Strategy can be found in Section 10.2 of this permit application. A description of the hydrogeologic framework, including relevant geologic units and aquifer zones for Tinker AFB can be found in Section 2, General Information. The relationship of SWMUs, Air Force Installation Restoration Program (IRP) sites, and groundwater plumes to Groundwater Contaminated Management Units (CGMUs) and Groundwater Management Units (GWMUs) at Tinker AFB has been described and reviewed through previous document submittals, such as the September 2001 document titled *Basewide Non-NPL Groundwater Phase II RCRA Facility Investigation Report for Appendix I and II SWMUS, Addendum 3,* approved by the ODEQ on November 1, 2002. Four CGMUs have been identified; each CGMU may contain one or more GWMUs. A GWMU may include one or more plumes depending on source information, whether plumes are comingled, or for other reasons. GWMUs boundaries continue to be modified as necessary to reflect any new groundwater data. The most recent published set of analytical and water level data for Tinker AFB's ongoing groundwater monitoring program is found in a report titled *2009 Basewide Environmental Groundwater Sampling and Water Level Measurements, Tinker Air Force Base, Oklahoma*, which was submitted to the ODEQ on March 22, 2011. Table 10-5 has been included to provide a summary of previous and on-going remediation at currently active sites where contamination has been found or was once thought to exist; associated groundwater management units are listed in the second column. In addition, this table provides a summary of the chemicals of concern (COCs) found at each site, where contamination exists or has existed. Rather than insert long lists of individual constituents however, the list of COCs for each site has been condensed to either VOCs-chlorinated solvents, Fuel, Total Petroleum Hydrocarbons (TPH) and Hexavalent Chromium (Cr[VI]). The primary chlorinated solvents are Tetrachloroethene (PCE), Trichloroethene (TCE), 1,2-Dichloroethene (1,2-DCE), Vinyl Chloride (VC), and 1,2-Dichloroethane (1,2-DCA). Although other chlorinated species do occur, the listed constituents are the principal drivers of risk at Tinker contaminated sites, as previously approved by the ODEQ.

Table 10-5: Completed Remediation and Chemicals of Concern at SWMUs

Current SWMU or AOC No.	Contaminated Groundwater Unit	AF Site No.	Original Site Name	Completed & Ongoing Remediation	Chemicals of Concern
1	NA (GWMSU 5A)	LF016	Landfill 6	Preliminary 18-inch clay cap installed in 1986; the cap was extended to cover additional trenches discovered later in 1988. Full RCRA cap started in 1999; vegetation was completed in 2001. Landfill is fenced. Any groundwater contamination is being addressed under GWMU 5.	VOCs – chlorinated solvents
2	CG039 (GWMSU 3A)	LF015	Landfill 5	Initial clay cap installed in 1990 as an interim action. RCRA landfill cap installed in 1998. The landfill is fenced on the non-airfield sides. Any groundwater contamination is being addressed under CG039 (GWMU 3).	VOCs – chlorinated solvents; SVOCs.
3	CG038 (GWMSU 2C)	LF011	Landfill 1	RCRA landfill cap installed in 1991. The landfill is fenced. Any groundwater contamination is being addressed under CG038 (GWMU 2). Interim action groundwater extraction (pump & treat) system installed in 1998; pumping and treatment from a subset of wells is ongoing. RA optimization via EVO injections started 2012.	Primarily household refuse/garbage, non-industrial wastes.
4	CG038 (GWMSU 2E	LF012	Landfill 2	RCRA landfill cap installed in 1998. ISCO (KMNO4) pilot test performed in 2002-2003. The landfill is fenced. Any groundwater contamination is being addressed under CG038 (GWMU 2). Interim action groundwater extraction (pump & treat) system installed in 1998; pumping and treatment from a subset of wells is ongoing. RA optimization via EVO injections started 2012.	VOCs – chlorinated solvents; Cr(VI)
5	CG038 (GWMSU 2D)	LF013	Landfill 3	A low temperature thermal desorption pilot test to treat contaminated soils conducted at central sludge dump at this landfill in 1989. RCRA landfill cap installed in December 1991. The landfill is fenced. Permeable Reactive Barrier (zero valent iron) installed in 2004 across the toe of the GWMSU 2D Plume. Any groundwater contamination is being addressed under CG038 GWMU 2). Interim action groundwater extraction (pump & treat) system installed in 1998; pumping and treatment from a subset of wells is ongoing. RA optimization via EVO injections started 2012.	VOCs – chlorinated solvents
6	CG038 (GWMSU 2D/2E/2F)	LF014	Landfill 4	RCRA landfill cap installed in December 1998. Cr(VI) pilot study performed at GWMSU 2F in 2008-2009. The landfill is fenced. Any groundwater contamination is being addressed under CG038 GWMU 2). Interim action groundwater extraction (pump & treat) system installed in 1998; pumping and treatment from a subset of wells is ongoing. RA optimization via EVO injections started 2012.	VOCs – chlorinated solvents; Cr(VI)

Current SWMU or AOC No.	Contaminated Groundwater Unit	AF Site No.	Original Site Name	Completed & Ongoing Remediation	Chemicals of Concern
24	NA (Groundwater is part NPL Operable Unit #4)	OT034	IWTP - Industrial Wastewater Treatment Plant Soils	Since investigations of the IWTP began, several interim measures (IMs) have been completed. These include removal of the abandoned waste tanks (SWMU 23, later renumbered SWMU 24.14) in 1992, the removal of blending tanks D1/D2 (SWMU 24.2) in 2000, removal of SWMU 24.19 in 1999 and 2000, demolition of SWMU 32 (the STP) in 2001 and 2002, and installation of a dual-phase extraction system, called a vacuum enhanced pumping (VEP) system, between 2000 and 2003. The removal of the 11 underground storage tanks (USTs) associated with SWMU 23 (later renumbered to SWMU 24.14) occurred in 1992 and the SWMU was closed in 1993. In 2000, the D1/D2 tanks were taken out of service and replaced by two aboveground closed-top tanks in another area of the site. Tanks D1/D2 were demolished and removed in 2001. Instead of removing all the impacted subsurface materials, flowable fill was placed in the excavation as a fluid and vapor barrier. Between 2000 and 2003, a seven-well dual phase VEP system was installed at the SWMU 24.2 and SWMU 14.19 areas of the site. Two VEP wells (OT034-VEP-6 and OT034-VEP-7) were installed at the former D1/D2 tanks location. The VEP system approached asymptotic contaminant mass recovery at SWMU 24.2; the VEP system was shut down in June 2012 in preparation for an interim RA. Soil excavation and disposal occurred in 2016.	VOCs; TPH
-	NA (NPL sub-unit to Operable Unit 1)	OT003	North Tank Area	Not Applicable – regulated by USEPA Region 6 under the 12/9/88 FFA; CERCLA / NPL. Fuel recovery began 1991 and shut down April 2015	Fuel
-	NA (NPL Operable Unit 1)	OT001	Building 3001	Not Applicable – regulated by USEPA Region 6 under the 12/9/88 FFA; CERCLA / NPL. Includes Pit Q51 and MN36 area.	VOCs, CrIVI)
AOC 21	CG040 (GWMSU 5B)	CG040	Gator Groundwater Management Unit or CHOT Site.	A groundwater extraction and treatment system (Groundwater Stabilization System or GWSS) including extraction well and French drains began operation as an interim corrective action in October 1999. EVO with wells and bioreactor ongoing. EVO injection wells installed between December 2012 and April 2013; injection beganan in 2012. Bioreactors installed in 2013, began operating May 2013. GWSS turned off December 2016.	VOCs
AOC 22	CG037	CG041	AWACS Sector	No site remediation to date	VOCs, Fuel

Current SWMU or AOC No.	Contaminated Groundwater Unit	AF Site No.	Original Site Name	Completed & Ongoing Remediation	Chemicals of Concern
AOC 24	CG037 (GWMSU 1C/1D)	OT062	Building 230	An oil/water separator (OWS) was located near the northwest corner of the building. It was filled with concrete in 2000. In the mid-1980s, fuel underground storage tanks (USTs) near the southeast corner of the building were removed. Free mercury was found in and around the drain line located in the building; a removal action was initiated that removed approximately 19 cubic yards of mercury contaminated soil. In 2004 a dual phase VEP system was installed on the northern and western sides of B230 as an interim corrective measure to mitigate the potential risk posed by subsurface contaminants; system began operations November 2005. The VEP system was turned off April 26, 2012 and the treatment building removed.	VOCs, including methylene chloride, MEK; Fuel constituents (TPH), methane, mercury
AOC 25	CG037 (GWMSU 1X)	OT064	Building 210	UST 210 removed in October 1999. Mercury in soil north of B210 excavated and disposed of. UST on southeast side of building removed in 1997.	VOCs; Fuel (TPH); mercury

Current SWMU No.	Contaminated Groundwater Unit	AFSite No.	Original Site Name	Completed & Ongoing Remediation	Chemicals of Concern
AOC 26	CG037 (GWMSU 1X)	OT065	Building 283, Building 284, Building 296	No remediation to date.	VOCs
AOC 27	CG039 (GWMSU 4X)	OT066	Building 2110 Oil Water Separator	No remediation to date.	Fuel
AOC 28	CG039 (GWMSU 4X)	OT067	Building 2101	No remediation to date. Planned contaminated soil excavation proposed to occur before 2020.	VOCs
AOC 30	CG039 GWMSU 4X)	OT069	Building 2121 and Building 2122	No remdiation to date. Cleanup of contaminated soil planned proposed to occur before 2020.	VOCs, FREON, MEK fuel constituents (xylene, toluene); SVOCs
AOC 31	CG037 (GWMSU 1A)	ST033	Area A Service (Fuel) Station	A product recovery system was installed in 1992 to pump fuel from the groundwater installed under OCC. By 1996, the extent of soil contamination was delineated, the USTs were removed and the product recovery system expanded. VEP remediation began June 1997, and fuel product recovery was completed by 1999. The VEP system was shut down November 12, 2012. RA optimization via EVO injections started 2012.	VOCs, Fuel (benzene), mogas, MTBE
-	CG037	CG037	CG037 Groundwater Management Unit	Additional vegetable oil injections are ongoing at hot spots in GWMSU 1D (west end) in the USZ and at GWMSU 2B in the LSZ.	VOCs; Fuel
-	CG039	CG039	CG039 Groundwater Management Unit	This contaminated groundwater site includes contaminated groundwater in GWMU 3 and 4. Primary contaminated sites not otherwise addressed in this table are Fire Training Area (FTA)2 and Waste Pit 1. FTA2 (GWMU 3B): A field test to evaluate enhanced in situ aerobic degradation of chlorinated solvents conducted at FTA2 in 2003. Injection wells for EVO installed and a mulch bioreactor constructed in 2013. Injections began 2013 . Waste Pit 1 (GWMU 4B): Excavation and partial treatment of contaminated soils initiated in 1998 (interim corrective action). In 2002, a thermal desorption and metals stabilization pilot test was conducted with excavation of contaminated soils and sludge. A dual phase extraction (DPE) pilot test (soil and groundwater) was conducted at the pit in 2004. Just west of the pit, a groundwater nanoscale iron injection test was completed at well 2-308B. EVO injection wells and injection completed in 2013 in two hot spot areas of GWMSU 4B at and near the waste pit.	VOCs
AOC 32	Groundwater	VI080	Building 3105	No remediation to date.	VOCs

	NPL Operable Unit 1				
AOC 20	CG037	OT008	Building 201	UST 204 (west side of building in south alcove) abandoned in place in 1972; UST removed in 1996. No remediation yet for potential indoor vapor intrusion issue noted recently.	VOCs

Note #1: COCs include: PCE, TCE, 1,2-DCE, VC, 1,2-DCA as primary risk drivers.

10.5.1 Corrective Action Program

The Tinker AFB remediation strategy is consistent with the corrective action requirements set out in the U.S. EPA *Region 6 Corrective Action Strategy (CAS)* dated February 2015. This serves as notice to the State of Oklahoma Department of Environmental Quality of Tinker Air Force Base's intent to continue to conduct corrective action using the CAS. The corrective action strategy at Tinker Air Force Base, as noted in Sections 10.1 and 10.2, consists of a risk management, performance based, alternate corrective action approach using the development of corrective action objectives. Corrective action has been occurring at Tinker AFB since the early 1990s under the previous RCRA permit and many sites have remedies in place. Both basewide and site specific sampling is performed on a periodic basis in order to determine the effectiveness of contaminant reduction and containment efforts. Information relating to solid waste management units required in 40 CFR 270.14 (d) has been provided in Section 10.3 with further detail available in numerous site specific reports. In 2001, information regarding RCRA sites was summarized in the approved September 2001 Phase II RCRA Facility Investigation Addendum 3 report. As identified in the current Tinker AFB RCRA Permit, several SWMUs were approved for deletion from the Permit. Proposed new sites are discussed in Section 10.4 of this permit application.

Tinker AFB has installed and operated groundwater pump and treat systems (P&T) that treat volatile organic compounds at AF designated sites CG038 and CG040 (see Attachment A) as well as a number of vapor extraction pumping (VEP) systems (See Tables 10-1 and 10-2) at other sites. Most of these treatment systems have been shutdown to allow for groundwater rebound prior to initiation of an updated RFI. Treated water from the VEP and CG040 systems are discharged to the Tinker AFB Industrial Wastewater Treatment Plant for secondary treatment before going to the Oklahoma City Wastewater Treatment System; treated water from CG038 is discharged directly to the Oklahoma City system.

Current groundwater corrective action objectives for Tinker AFB are outlined below.

a. To ensure that in the future contaminants do not migrate off-site at levels above their respective drinking water MCL.

b. To monitor and provide sampling analytical data that reports the concentrations of COCs in groundwater collected from performance wells, as defined in Section 10.5.4.2, at each groundwater management unit or other named RCRA site.

c. To mitigate potential indoor air exposure in buildings located over existing groundwater plumes for which there is the potential for vapor intrusion and contamination of indoor air from volatile contaminants.

d. To remove or treat source material in groundwater to the extent practicable to reduce potential for future migration beyond the base perimeter and enhance the attainment of performance metrics. The goal includes removal or treatment of surface/subsurface sources in soils to the extent practicable since soil sources could subsequently migrate to groundwater.

e. To maintain existing on-site institutional and land use controls that protect workers from contact with contaminated groundwater and soils. Restricted access to the base by the general public, required digging permit approval for any excavation below six inches, and appropriate fencing are examples of existing institutional controls.

Current remediation activities and planned remedial actions are designed to meet the objectives listed above. Continuing efforts to remediate groundwater contamination satisfy the groundwater protection intent of regulations stated in 40 CFR 264.90 and 40 CFR 264.101. Tinker AFB will continue both the present groundwater monitoring program and the present groundwater remediation program and will submit to the ODEQ all status reports detailing progress and changes in the program.

10.5.2 Applicability

Former solid waste management units were identified and are being addressed through activities regulated under the RCRA permit and under §§ 264.90 and 264.101. The Tinker AFB corrective action program for SWMUs involves many of the same issues addressed under regulated unit requirements found in 40 CFR 264.91 through 264.100, though these provisions are not required for SWMUs that are not regulated units, as the term is defined. The following subsections provide relevant information for the SWMUs corrective action program. Other former spill sites are also being investigated and addressed through groundwater monitoring under CERCLA and NCP response programs as identified in previous subsections.

Groundwater sampling conducted since 1984 has identified chemical compounds in the groundwater beneath Tinker AFB. These compounds are the result of 70 years of industrial and Air Force flying operations. Identified compounds consist mainly of solvents associated with Tinker AFB aircraft repair and painting activities, hydrocarbons related to aircraft flying missions of the Tinker AFB and hexavalent chromium associated with chrome plating operations.

Most groundwater issues at Tinker AFB relating to fuels are regulated under the Oklahoma Corporation Commission (OCC) since most fuel contaminated groundwater stems from regulated fuel storage tanks. A number of these sites are also impacted by solvents and vapor extraction pumping systems (VEP) that have been installed to remediate these sites.

The Tinker AFB groundwater monitoring program aims at identifying and characterizing groundwater contamination in four aquifer zones of the Garber-Wellington Aquifer (described in Section 2.4.1, Local Hydrogeology), which underlies the facility. The program also is used to provide supporting information relative to effectiveness of active remedial systems and approved passive remedies.

10.5.3 Groundwater Monitoring

A summary of groundwater monitoring conducted at the facility can be found in reports titled as Basewide Sampling and Water Level Reports or Basewide Non-NPL Groundwater Phase II RCRA Facility Investigation Reports for Appendix I and II SWMUs; a copy of one or the other report has been submitted roughly annually to the ODEQ since 1998. These reports contain tabulated analytical and water level data collected from monitoring points during the indicated time frame. Data generated from the basewide groundwater monitoring program is used to create isopleths maps and potentiometric surface maps, and to monitor or evaluate plume changes on a basewide basis, as well as being used in site specific reporting. Potentiometric maps are used to evaluate groundwater flow rate and direction. Measured water levels are converted to elevations.

Data specific to each GWMU or contaminated site has been submitted to the ODEQ in individual site reports as needed to address specific solid waste management units, AOCs, or other sites. However, since 1995 Tinker AFB has taken a holistic approach to the base's groundwater monitoring program such that evaluating and mapping groundwater and contaminant data under RCRA for performance and compliance monitoring, is performed and reported under a basewide groundwater monitoring program in addition to any site specific investigation and site study documents that are submitted. This allows regulatory agencies to view at a glance the relationship between groundwater plumes within each aquifer zone and whether there is a change relative to the identified compliance points. Maps provided are broken down by the Hennessey Water Bearing Zone, the Upper Saturated Zone, the Lower Saturated Zone, the Lower-Lower Saturated Zone, and the Producing Zone, which are described in Section 2.4.1.

Aquifer Identification

The hydrogeology under Tinker AFB, including the uppermost aquifer and any hydraulically connected aquifer zones, is described in Attachment B. Further detailed descriptions of hydrogeologic conditions, along with site conceptual model discussions, have been provided in various submitted reports since the early 1990s. Because the hydrogeologic framework is complex at the base, and because new data is added periodically that causes understanding of the groundwater to be adjusted slightly, the conceptual model is constantly being updated, and will continue to be updated as needed to ensure the most accurate interpretations are generated to evaluate data under the RCRA Permit. A generalized Basewide Conceptual Site Model (CSM) is provided in Attachment B.

Over 100 hydrogeologic cross sections have been completed and are available in digital format. Cross sections were developed in 2007, and are included in the *2007 Basewide Groundwater Sampling and Water Level Measurement Report* (August 2009), submitted to the ODEQ on January 25, 2010. Cross sections depict a pseudo-three dimensional grid of subsurface geologic layers and aquifer zones and are used to help delineate plume extent and migration in the groundwater as well as planning appropriate screen intervals for future monitoring wells.

Plume Identification

Groundwater contaminant plumes at Tinker AFB are mainly from historical spills and leaks that occurred during past industrial practices. The key groundwater contaminants of concern are volatile organic compounds and metals, as demonstrated in RCRA Facility Investigation Reports and supported by data collected under the basewide sampling programs since 1995. Groundwater plumes have been characterized in numerous documents since the early 1990s. In general, solvent plumes are the most widespread in each aquifer zone, with Trichloroethene (TCE) showing the greatest extent and highest concentrations. Typically, where additional volatile organic compounds are found, the extent of non-TCE constituents falls within the mapped 5.0ug/L isoconcentration line for TCE. The extent of 2015 solvent contamination, as well as Hexavalent Chromium, in the three aquifer zones containing groundwater plumes (USZ, LSZ, LLSZ) are shown superimposed on base topographic maps in Appendix 1. The appendix contains seventeen plume overlays, including PCE, TCE, cis-1,2-DCE, 1,2-DCA, VC, and Cr+6. Additional plume descriptions and historical perspectives of the plumes at CG037, CG038, CG039, and CG040 are included in Attachment A to Section 10.

10.5.4 Monitoring Program

Tinker AFB has an active groundwater remediation program that is monitored using a series of monitoring points located both on base and off base. The program is described in the approved Basewide Non-NPL Groundwater Phase II RCRA Facility Investigation Report for Appendix I and II SWMUs Addendum 3 (September 2001) as well as described for individual sites in site specific RCRA documents submitted since the early 1990s. The most recent completed sampling data, plume maps and potentiometric maps are provided in the *2014-2015 (Event 4) Basewide Sampling and Water Level Measurements* report (VERSAR, 2017). Remedial action status updates are presented in individual site reports as they are prepared. Tinker AFB will continue to collect and evaluate data and provide updates to remediation activities.

Compliance Monitoring

According to the February 2015 CAS guidance, "For RCRA-regulated units, the point of compliance is described as the location closest to the waste management area (which can be one or more SWMUs) where the cleanup standard must be met. For risk-based corrective action, the POC is the point at which the risk-based cleanup standard must be met. In groundwater corrective action, the POC is often described as the point at which the facility must meet MCLs – which may be at the facility boundary or at another defined point of exposure. In these cases, an ACL (or other risk-based number) is met at the closest location to the waste management area." For Tinker, the point of compliance (POC) is the location where the groundwater protection standard applies. This location lies at the on-base "hydraulically down-gradient limit" of the waste management area, or down-gradient of a collection of waste management areas. The complex facility hydrogeology and 70-year history of site operations, waste management, and corrective action necessitate a POC approach where the POC consists of all those portions of the site boundary that are hydraulically down-gradient of identified waste management sites. Groundwater plumes are widespread across the facility, but only certain plumes have reached the base boundary, or are thought to potentially impact the boundary. There are no compliance point issues related to the Hennessey Water Bearing Zone or Producing Zone since any identified contamination in these zones is either below the MCL or is not anticipated to reach the Base boundary. Compliance points are shown, along with TCE groundwater plumes, on Figures 10-2 for the Upper Saturated Zone and on Figure 10-3 for the Lower Saturated Zone. Because groundwater contamination has reached the base fence line in some locations in these zones, compliance monitoring distinguishes two categories of monitoring points, including:

a. Uncontaminated monitoring points near the property boundary that are down-gradient of a groundwater plume and are reasonably anticipated to be impacted by a migrating plume within the next decade. The ten year time frame is thought to be reasonable for many sites based on results of groundwater and fate and transport modeling (modeling results are presented in individual site reports for Air Force designated sites CG037, CG038, CG039, and CG040 which have been previously submitted and approved by the ODEQ), as well as analysis via plume concentration graphs of actual plume migration over the last fifteen years. Current potentiometric maps that help demonstrate groundwater flow direction as well as contaminant plume maps can be found in the 2014-2015 (Event 4) Basewide Sampling and Water Level Measurements report.

b. Contaminated monitoring points that are located at the leading edge of a plume that has reached, or previously passed, the property boundary. A remedial strategy whether active or passive in nature, is in place at each of these sites.

Uncontaminated wells located off-base down gradient of contaminated wells described in paragraph b above are monitored as part of the base's general monitoring program discussed in Section 10.5.3. These wells are herein termed 'sentinel' wells and will be monitored on a regular basis. The monitoring schedule is discussed in Section 10.5.4.3.

From a practical standpoint, compliance wells are not actually located at the base boundary but have been placed as near as allowed by AF set backs and regulations. In instances where the closest on-base boundary wells have detected contamination, additional wells outside the boundary (sentinel wells) have been added to monitor for any groundwater contamination that might pass, or might have passed, the boundary. Except for specific instances at CG038 and CG040, sentinel wells are uncontaminated. At CG038 and CG040, contaminant detections that were once above respective MCLs have been mostly reduced to below this value by active remediation at the site. Site histories for these areas, with further description of ongoing remedial activities, are located in Attachment A.

Seventy compliance points and sentinel wells are identified in Table 10-6. On the table, compliance wells are identified by 'POC' and sentinel wells by an 'S' in the category column. Should the list of compliance and sentinel wells change, the ODEQ will be notified and a formal RCRA Permit modification requested. In addition, during each sampling event, some wells may not be accessible, or may not be sampled for other technical reasons. These wells will be re-evaluated as soon as practically possible. Upper Saturated Zone Compliance Wells are shown on Figure 10-2, which is contained in a pocket at the end of this document. Lower Saturated Zone and Lower-Lower Saturated Compliance Wells are presented on Figure 10-3, also included in a pocket at the end of this document.

Since the early 1990s Tinker AFB has taken a phased RCRA Facility Investigation (RFI) approach to characterizing and cleaning up contaminated non-NPL sites at the base. During the implementation of the initial (Phase I) RFIs at SWMUs and AOCs at Tinker, the base recognized the inefficiency of investigating groundwater impacts utilizing a unit by unit approach since 1) designated contaminated sites under the Air Force's Installation Restoration Program (IRP) have not always been recognized or included as SWMUs or AOCs under RCRA, 2) plumes from multiple sources were sometimes comingled and 2) discrete sources could not be identified for all plumes. In July 1994, Tinker AFB and the EPA agreed that the most efficient way to investigate groundwater impacts was to perform a Phase II RFI that focused on determining the full extent of groundwater contamination resulting from RCRA units across the base in a holistic approach. As a result, Tinker recommended that groundwater at the Base be treated and monitored as a separate unit.

Over the past two decades, various groundwater units or areas have been identified at Tinker AFB for use in managing groundwater contamination issues. Initially, plumes were individually identified under groundwater management units (GWMUs), with plumes identified as 'sub-units' and designated with modifiers which included the main GMWU number and a letter identifier (such as GWMU 2E). GWMUs were first formulated in 1994 and formalized in the *Final Basewide Non-NPL Groundwater Phase II RCRA Facility Investigation Report for Appendix I and II SWMUs Addendum 1*, which was completed June 1997 and accepted by the Oklahoma Department of Environmental Quality on October 14, 1998. In 1998, contaminated groundwater at the base was divided into four areas for formal designation as AF IRP sites, although GWMU sub-unit terminology has continued to be used when individual plumes are discussed. The four AF sites, known as Contaminated Groundwater Management Units (CGMUs), are labeled as CG037 (Northwest), CG038 (Southwest), CG039 (EAST) and CG040 (Gator). Note that contaminated groundwater management unit boundaries are not considered static and have been adjusted over time based on data from continuing investigations, and/orchanges to plume extent. For comparison purposes, Figure 10.4 and Figure 10.5 repectively show the boundaries of the multiple GWMUs with their subunits and the four CGMUs. These figures can be found in pockets at the end of this document.

The CGMUs noted above do not entirely coincide with either the GWMUs designated during the Phase II RFI or with individual SWMUs. The four CGMUs incorporate most of the base with just a few exceptiions such as Landfill 6. Three CGMUs contain multiple SWMUs and AOCs; only CG040 is comprised of a single contaminated site or plume. CGMUs may include multiple groundwater plumes and their sources that fall within areas where groundwater flow directions are generally similar. In addition, plumes within a CGMU may be comingled or have more than one source within the CGMU.

Active remedial actions are in place at several groundwater plumes at three of the contaminated groundwater management units: at CG038, also known as the Southwest CGMU (Air Force designated plumes 2D, 2E, and 2F); at CG040, also known as the Gator CGMU; and at one of two plumes at the Area A Service Station (AF Site ST033) within CG037, the Northwest CGMU. Original remedies consist mainly of pump and treat (P&T) or dual phase VEP systems installed in the 1990s designed either to contain further off-base migration, or prevent it. These have been reported in various individual site reports previously provided to the ODEQ. At CG038 and CG040, groundwater contamination above the constituent MCLs was noted to have migrated beyond the base boundary. To address this issue at CG038, a permeable reactive barrier was added at the base boundary across the north (2D) plume where the extraction wells did not appear to adequately contain migration of TCE. Analytical results at both CG038 and CG040 indicate that existing remedies have reduced off-site concentrations of solvents once above MCL to near or below the MCL, and that concentrations are continuing to decline at the compliance point, the base boundary. At the Area A Service Station location within CG037, solvent concentration at the compliance point appears to have remained stable at roughly two times the MCL (monitoring well 2-166B) since 2005, and non-detect at the sentinel well, 2-165B. However, within the last year, because concentrations at or above the MCL are recognized at compliance point wells, additional remedies aimed at hot spot reduction and furthering reduction of plume extent have been, or are being, added at the three sites.

Two sites where groundwater contamination has reached the base boundary, and therefore the compliance point, have no active remediation. A second (west) plume at the Northwest CGMU (CG037) has no active remediation since contaminant concentrations in a single well at the boundary are currently at the MCL, having decreased from around two times the MCL in 2005; this well will continue to be monitored for any changes, and contingency measures as noted below will go into effect if concentrations increase. At the fourth site, located within CG039 (also known as the East CGMU), migration off-site is prevented by the local hydrogeology; shallow (USZ) contamination that appears to be migrating off-base toward the east is actually migrating vertically downward to the next lower saturated zone (LSZ), which flows westward back under the base (see Figure 10-6). Monitoring wells, which have existed and been tested at this location since 1994, show that saturation in the USZ ends just east of the base boundar, while contamination is contained on base. The limited saturated extent within the USZ to the east precludes eastward migration.

Although the point of compliance is recognized as the base boundary, additional monitoring wells are located off-site just beyond the base fence line; some within 500 feet or closer. Originally installed to characterize areas where groundwater contamination was thought to have migrated off-site, these points are now monitored to either help evaluate the effectiveness of an existing active remedy where those have been installed, or where concentrations are at MCL or above near the boundary but monitored natural attenuation has been approved for the site, to ascertain whether contaminants have migrated off-site. These wells are labeled as ‘sentinel’ wells. Sentinel wells are those currently uncontaminated monitoring points or those with concentrations at or near the MCL that are located just outside the base fence line opposite of, and generally down gradient to, an on-base plume with concentrations above the MCL, but where either 1) the plume has not migrated off-base due to site hydrogeologic conditions or 2) remediation activities have reduced off-site concentrations to much lower levels. Sentinel wells at CG038 for example document that wells which once had solvent concentrations well above the MCL, are now either non-detect or have concentrations greatly reduced to just below the MCL. Clarification of compliance point and sentinel well rationale, site histories and an update of ongoing remedial activities, as well as corrective action objectives are provided in Attachment A.

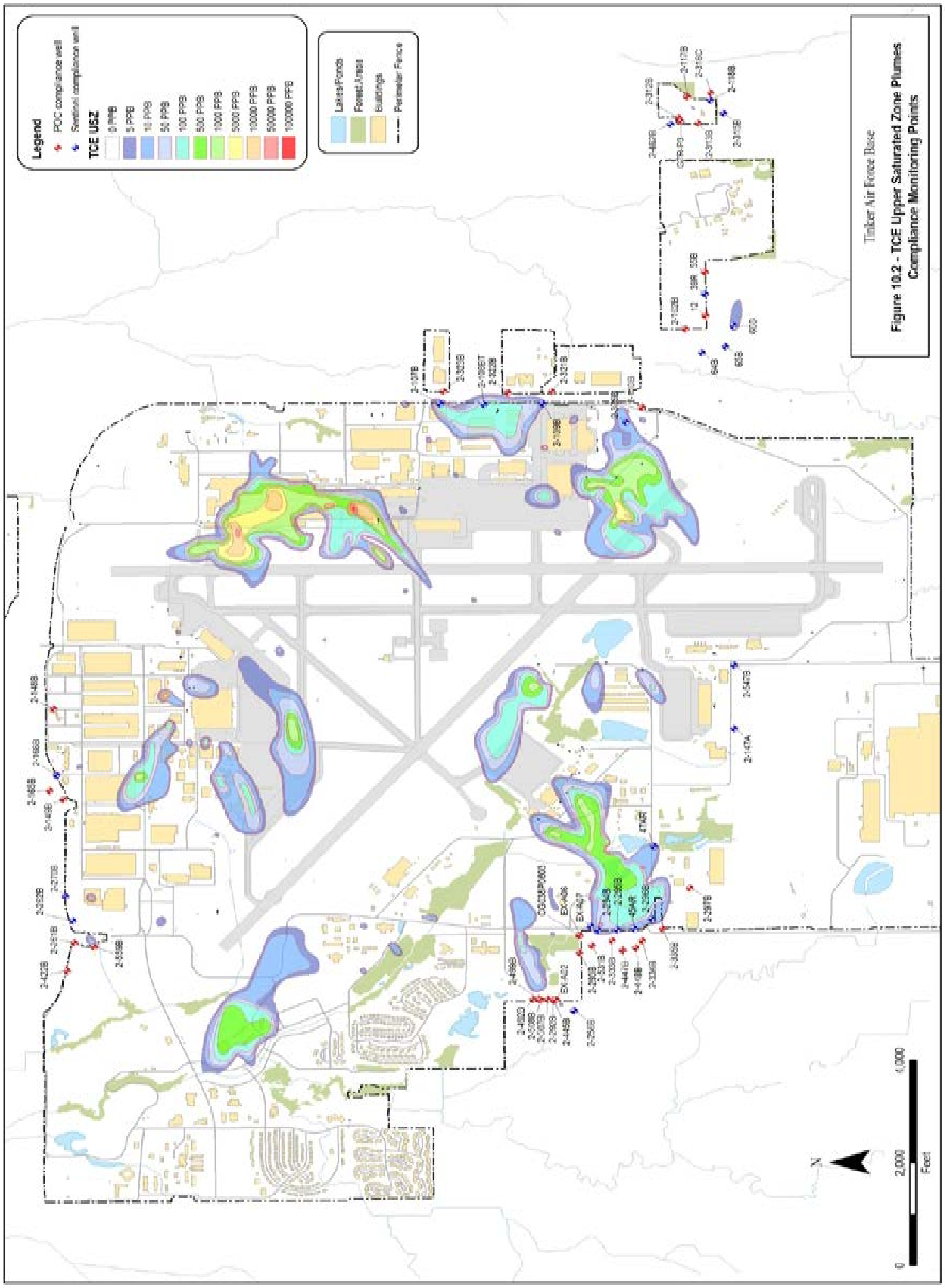

Figure 10-2: USZ Compliance Wells (larger size in pocket)

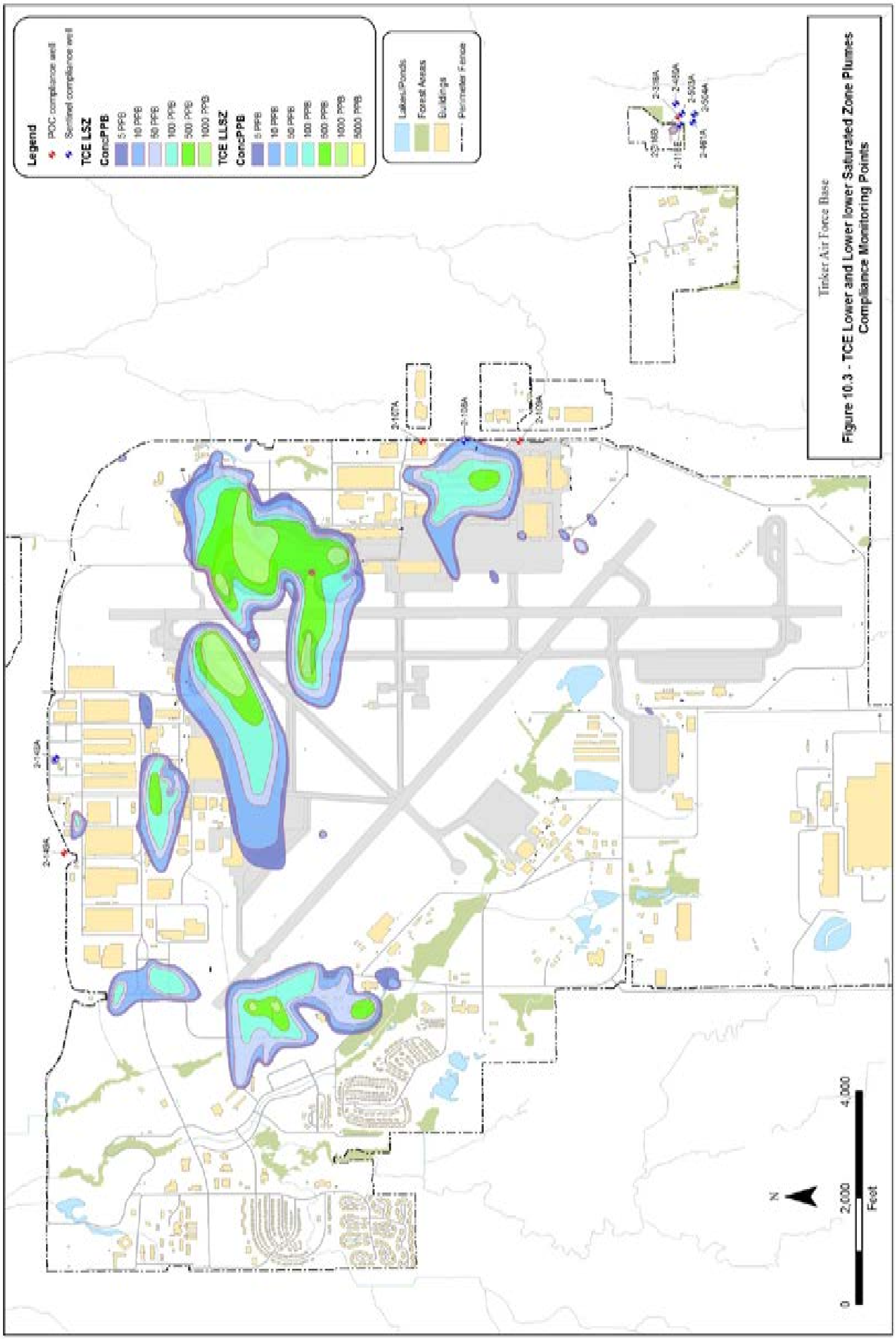

Figure 10-3: LSZ/LLSZ Compliance Wells (larger size in pocket)

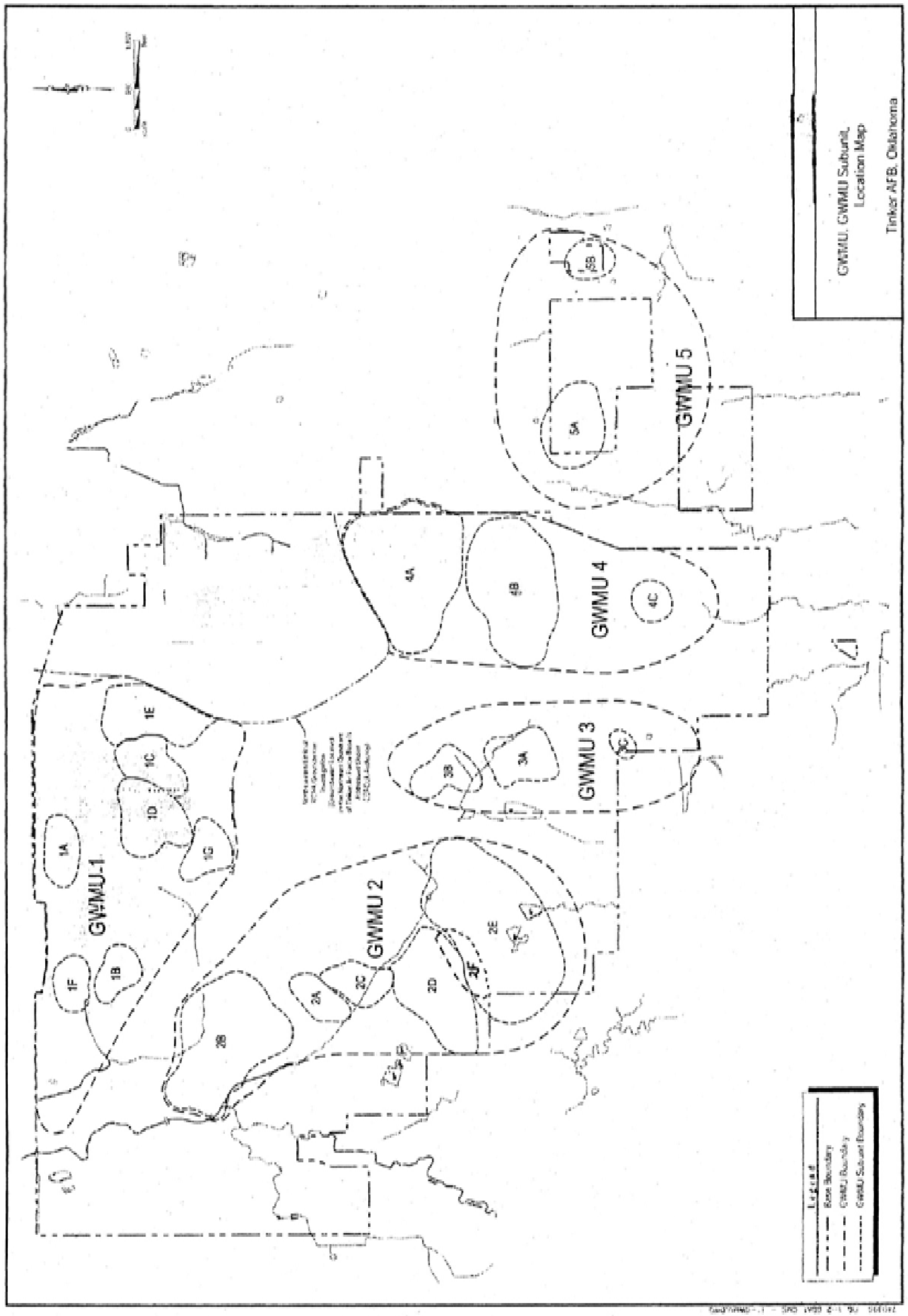

Figure 10-4: Groundwater Management Unit – Subunit Locations

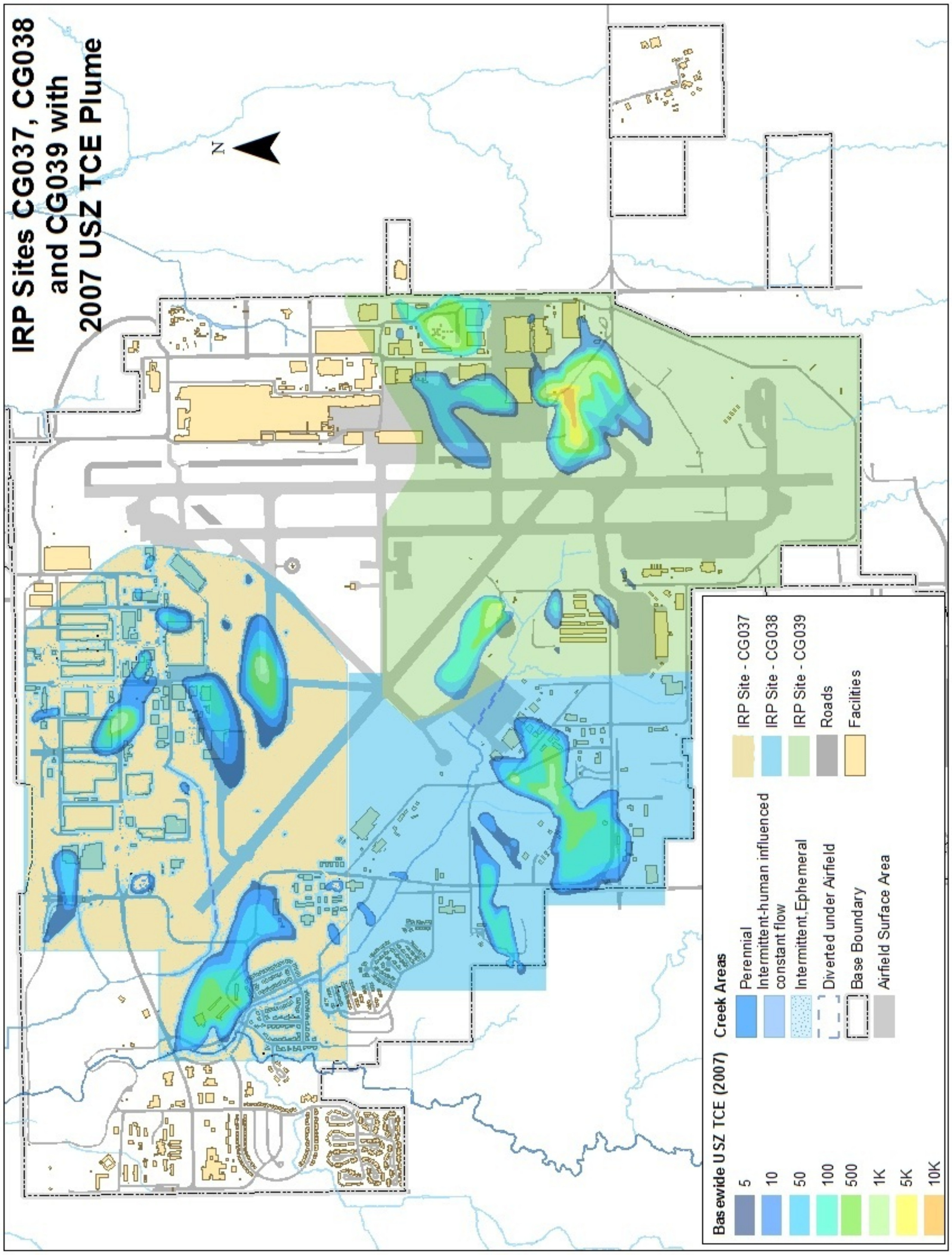

Figure 10-5: AF designated Contaminated Groundwater Management Units

Contingency Measures

Contingency measures will take effect if 1) the concentration of contaminants in compliance point wells at sites where these are currently at or below the MCL is found to exceed the MCL or 2) the concentration of contaminants surpasses MCLs in sentinel wells at sites where concentrations in compliance wells currently exceed the MCL. In these instances, additional samples will be taken 30 days after data have been received from the laboratory and verified by a data reviewer. If concentrations exceed the MCL on the ensuing analysis, a second verification sample will be taken and analyzed within 30 days of verification of final data results. The ODEQ will be notified of results within 30 days of the verification of the final results above the MCL. If results from the second validation sample round remain above the MCL, contingency measures consisting of additional investigation and/or a corrective action following RCRA will be implemented. As noted earlier and further described in Attachment A, sites where sentinel wells were found to be contaminated above the MCL are already undergoing additional remediation (primarily emulsified vegetable oil injection and/or installation of bioreactors) to more rapidly clean up the site.

Concentration Limits

The maximum concentration allowed at compliance wells for AF sites CG037, CG038, CG039, and CG040 will be the maximum contaminant limit (MCL). For all other plumes where performance monitoring is in effect, concentration limits will be determined on a site by site basis based on risk, potential for a completed pathway, and demonstration through groundwater modeling or other analysis that the plume is unlikely to reach the base boundary. For compliance wells with current contaminant concentrations above respective MCLs, the future maximum concentration will be the MCL beginning at such time as corrective actions have reduced levels to MCLs. Attachment A describes those sites and documents the existence of ongoing remedial activities taken as voluntary corrective actions by Tinker when it was recognized that contaminated groundwater had either reached or passed the fence line in those areas.

Detection Monitoring Program

In addition to the above compliance and sentinel wells, Tinker AFB maintains a monitoring network comprised of roughly 1175 wells used initially to characterize groundwater contamination and now used to monitor and evaluate changes to existing plumes. Under the current basewide monitoring program, a large percentage of these wells are both sampled and have water levels measured on a periodic basis. In this permit renewal application, Tinker proposes that 793 monitoring points be included in the active groundwater monitoring program. Seventy (70) of these are identified as compliance and sentinel wells in Section 10.5.4.1. The remaining 722 proposed monitoring points are designated as 'performance monitoring points'. These sampling points are part of a performance monitoring network which derives primarily from a 2005 in-house optimization of the monitoring well network supported by a geostatistical evaluation analysis performed by an Air Force contractor. The two methods, one performed in-house by Tinker AFB Restoration personnel using a traditional data evaluation approach and the other using a Geostatistical Temporal Spatial (GTS) algorithm, are briefly described below. Ultimately, very similar results regarding the number of wells to be retained in the proposed well sampling network were obtained, but the final list was based on the traditional method because it also accounts for groundwater pathways and potential receptors. Data from the list of performance wells will be submitted to the ODEQ for review approximately every 15 months with basewide groundwater sampling reports. During both

optimization analyses, the monitoring network was also evaluated for wells that might be dropped from sampling; approximately 482 wells were found that could be deleted from the network, but still allow for statistical confidence that plume evaluation and tracking would not be significantly reduced. The number of wells remaining to be deleted has been reduced to 184 as 298 wells have already been plugged in the interim. In this permit application, Tinker proposes that this subset of wells be deleted from sampling requirements based on the optimization performed in 2005. The ODEQ has approved plugging and abandonment of the 482 well list in a letter dated May 12, 2017 based on the discussion below and approval of the 2006 Class 2 permit modification.

Table 10-6: Compliance Wells

USZ Compliance/Sentinel Wells	
LOCID	Category
2-508B	POC
2-507B	POC
2-292B	POC
EX-A02	POC
2-445B	POC
2-256B	S
2-492B	POC
2-499B	POC
EX-A06	POC
CG038P0603	POC
2-293B	POC
EX-A07	S
2-294B	S
2-295B	S
45AR	S
2-296B	S
2-335B	POC
2-334B	POC
2-333B	POC
2-448BR	POC
2-447BR	POC
2-531B	POC
2-297B	POC
47AR	S
2-147A	S
2-547B	S
66B	S
65B	S
64B	S
2-102B	POC
12	POC
39R	S
55B	POC
2-422B	POC
2-261B	POC
2-262B	S
2-270B	S
2-149B	POC
2-165B	POC
2-166B	S
2-148B	POC

USZ Compliance/Sentinel Wells (Cont'd)	
LOCID	Category
2-316C	POC
2-118B	S
2-315B	S
2-462B	S
2-313B	POC
GTR-P3	POC
2-117B	POC
2-312B	POC
2-322B	POC
2-321B	POC
2-323B	POC
2-107B	S
2-108BT	S
2-109B	S
2-110B	POC
2-376B	S
2-559B	POC

LSZ/LLSZ Compliance/Sentinel Wells	
LOCID	**Category**
2-316A	S
2-316B	S
2-503A	S
2-504A	S
2-460A	S
2-461A	S
2-118E	S
2-149A	POC
2-148A	S
2-107A	POC
2-108A	S
2-109A	POC

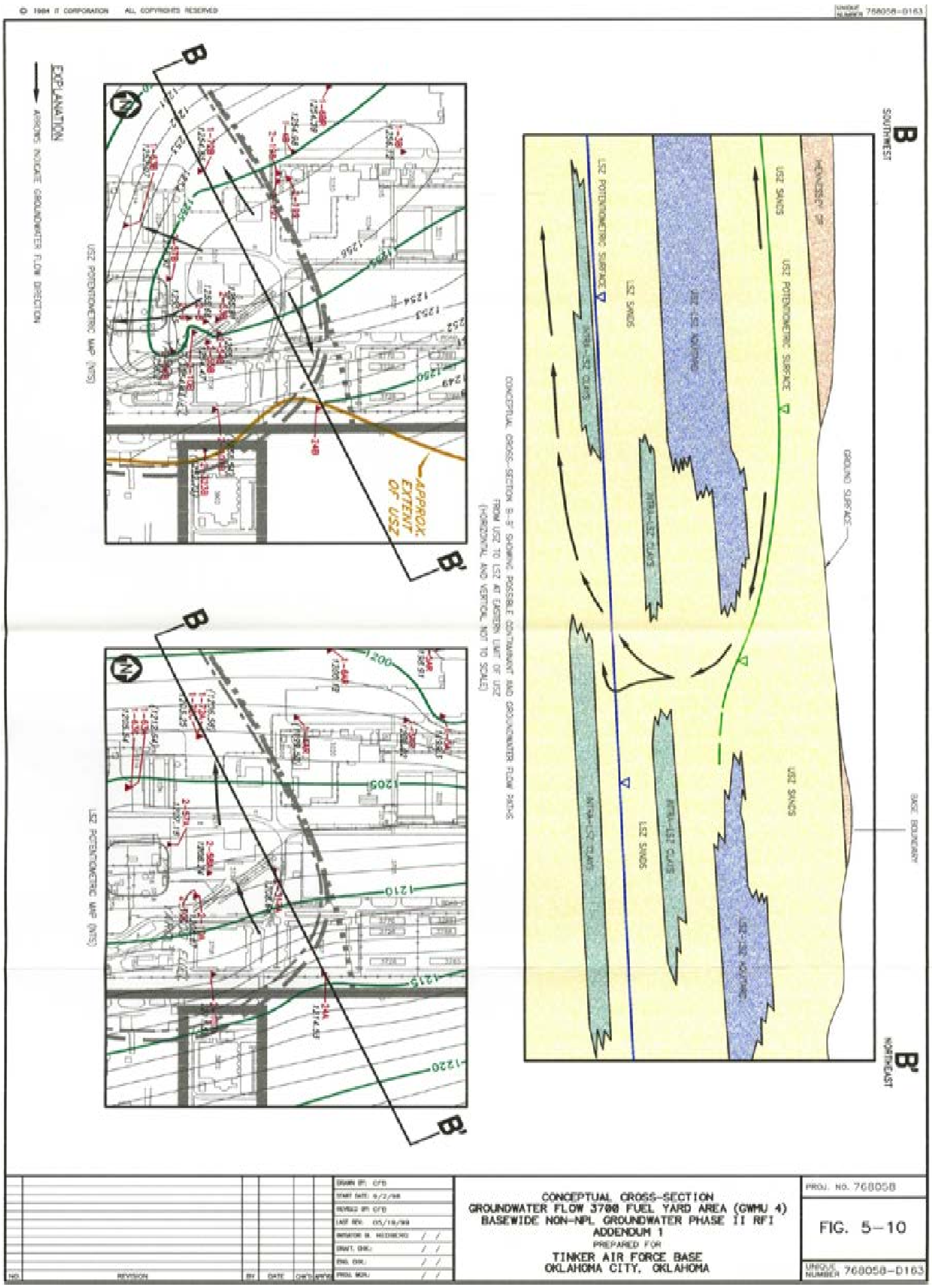

Figure 10-6: CG039 Groundwater Flow

An initial selection for monitoring wells to be retained for sampling and those to be dropped from further sampling was made in the Environmental Restoration Office at Tinker AFB in 2005 based on the 2002 Basewide Sampling project contaminant maps for trichloroethene (TCE), the most ubiquitous contaminant on the base. The well analysis is presented in the December 2005 internal optimization report titled *RCRA Permit Modification to Monitor Well Sampling Protocol Tinker Air Force Base, Oklahoma*. Contaminant isopleths maps for the upper saturated zone (USZ), lower saturated zone (LSZ) and lower-lower saturated zone (LLSZ) were used to determine wells that were non-detect (ND) as well as outside (up-gradient, side-gradient, or down-gradient) of a contaminant plume area as mapped. Because there are very few hits in the shallow Hennessey Water Bearing Zone of the Hennessey Group, and because analytical data from some Hennessey well screens that also fall within the USZ are attributed to the USZ, a wholesale deletion of the Hennessey wells was recommended. The Hennessey Water Bearing Zone covers roughly a third of the base along its western and southern margins as shown in previous basewide sampling reports.

Although the list of wells for continued sampling and reporting and those to be dropped was made based primarily on the TCE maps, examination of data for additional contaminants of concern was also completed. Data was also compared to background values. A database was used to research the historic contaminant levels; this database included sampling data from years 1999 to 2005. Both ‘time-vs-concentration’ graphs, hydrographs and Excel spreadsheets were used to evaluate contaminant and water level data. Identified contaminants that were kept as contaminants of concern (COCs) include: TCE, PCE, DCE, VC, BTEX, hexavalent chromium and total chromium. However, all volatile and semi-volatile organics were evaluated, as well as radiologicals and RCRA metals, including arsenic. To be statistically considered for deletion, a well had to have at least five years worth of sampling; wells that did not have at least five sample rounds were not considered for deletion. Contaminant plumes and well locations were also compared to potential exposure points using groundwater flow data and potential migration pathway information to evaluate potential risk over time and to derive the list of performance wells that address the CAOs.

In addition to, and concurrent with the above methodology, an alternate method to optimize the Basewide Sampling Program at Tinker AFB utilizing a statistical based software program was run. This optimization analysis is based on application of the Geostatistical Temporal/Spatial (GTS) algorithm, which was designed for the Air Force Civil Engineer Center (AFCEC) by MacStat Consulting, Ltd. The analysis and the algorithm consist of two basic parts: a temporal optimization component and a spatial optimization component. The primary goals of the study were to determine, based on the existing sampling data and sampling network, 1) to what extent sampling frequencies at the site can be optimized, and 2) to what extent locations within the sampling network can be optimized so that sampling information is not being collected at statistically redundant groundwater wells. However, the GTS method does not include any consideration for hydrogeologic parameters such as groundwater velocities and contaminant migration parameters. In addition, it combined Hennessey and Upper Saturated Zone wells as a single group and LSZ, LLSZ and PZ wells as a single group, which does not match the known hydrogeologic framework. The results were compared to the standard data analysis carried out by Tinker AFB personnel. The GTS analysis is mentioned because it provided general confirmation of the in-house evaluation in that many of the same wells were recommended to be deleted from further sampling. A copy of the September 2005 report, *Final Report Long-Term Monitoring Groundwater Optimization, Tinker AFB, Oklahoma Using the Geostatistical Temporal/Spatial Algorithm*, is available from the Tinker AFB Environmental Restoration Office.

The selection of performance network wells also reflects updates based on recent analytical and water level data, in particular the *2009 Basewide Sampling and Water Level Measurement Report*, June 2009, and reflects new wells and updates to the conceptual site model (CSM) that have occurred since 2005. Performance wells will be used to evaluate changes to plumes, to characterize background concentrations, and to evaluate remedial technologies at those sites, but are not specifically related to compliance monitoring. Analytical and water data from these wells will be reported in the basewide sampling reports, with data evaluation and analysis as described below. Additional wells have been added to the performance well network since the 2005 modification request. New wells may also be added, and existing wells may be deleted from sampling, in the future based required sampling and plume changes, so the number of performance wells may change over time. Wells sampled as performance wells are included with each new Basewide sampling and water level report submitted roughly every 15 months. This includes new monitoring wells installed since 2011 under the ongoing Performance Based Contract.

Basewide reports will include compliance and sentinel well information for completeness. Basewide reports will be styled on previous documents already submitted for past sample rounds such as the *2014-2015 (Event 4) Basewide Sampling and Water Level Measurements report*. Basewide Sampling and Water Level Measurement Reports. Future reports will contain, at a minimum, the same basic information. This information includes mapping of listed COCs (plume maps) as well as generating basewide potentiometric surface maps for listed COCs (plume maps) as well as generating basewide potentiometric surface maps for various aquifer zones. Additional information such as groundwater flow analysis, statistical data analysis, natural attenuation evaluation, and remedial technology performance characteristics may also be included in this report, or may be submitted in separate reports. Basewide reports will focus discussion/evaluation primarily on analytical parameters specified as COCs. Water levels will be measured in sampled wells at the time of sampling. All existing wells, including any from Table 10-6 that remain accessible during the Permit time frame, will also have water levels measured in them within a five-day window at 15 month intervals to allow for periodic ‘snapshots’ of water data that can be used to generate the potentiometric surface maps for the basewide reports.

Tinker AFB will continually evaluate and update the Conceptual Site Model (CSM) as well as the long-term monitoring program, and a new statistical well optimization effort is scheduled within the Permit period. Any statistical method will be submitted for review and approval before it is implemented. An updated report documenting CSM changes will be made to the ODEQ as part of the Basewide Sampling Program report to be submitted roughly every fifteen months. Changes to the long-term monitoring (LTM) program will require formal modification. Optimization of well locations and sampling parameters will be reviewed, approved, and implemented to increase the efficiency of determining from monitoring data that the CAOs are met. An additional available type of performance monitoring point not included in the above described monitoring network is primarily associated with existing VEP systems. There are roughly 80 wells in several VEP systems.

Analytical and water data from these points will typically be reported and evaluated in individual reports separate from the basewide report, with reporting frequency determined on a site by site basis. Like the performance wells, these wells are not directly associated with Permit compliance requirements. However, because many of these wells extract groundwater and may impact solvent plumes and the local potentiometric surface around them, it is important to include related data from VEP wells and/or nearby monitoring wells sampled as part of those systems on basewide maps with other monitoring wells. Therefore, analytical data and water level data closest in time of a given system will be integrated on maps produced for the basewide reports to help evaluate general plume changes and more accurately reflect existing conditions. Under an ongoing Operations and Maintenance contract, VEP system wells are currently sampled and have water levels measured semi-annually, and water levels are measured monthly. If or when, any of these systems are approved for closure during the course of this Permit, the need to include data from those wells will end with system shut down.

Evaluation of the well sampling network in 2005 also resulted in a list of monitoring wells recommended either for deletion from, or for minimized, future sampling. The original list has been modified based on intervening data review; primarily several wells initially dropped have been added back into the sampling program based on their location and wells on the list plugged in the interim have been deleted. The current list includes 392 wells, which are provided on Table 10-7. This table constitutes the wells remaining from the original list of 482 wells approved to be deleted from sampling requirements (Group 4 deleted well list) identified in the December 6, 2006 Class 2 Modification to the RCRA Permit. During the process of checking each well on the list to consider it for sampling, all of the wells were also evaluated for possible addition to a delete from sampling list. Along with checking the concentrations of the wells, information such as natural attenuation evidence and wells that appeared to be providing conduits to the lower zones and may possibly need to be plugged, were noted. Existing wells at Tinker AFB will continue to be optimized in the future, and the base will make recommendations for ODEQ approval of any additional wells that might be dropped from sampling.

The number of performance monitoring points is expected to change over time; sampling wells may be added or deleted as dictated by changing site information. In addition, wells listed on Table 10-7 may be plugged and abandoned in the future; those highlighted in red have already been plugged. Approval to plug these wells is included in the May 12, 2017 letter from the ODEQ and several pre-2017 approvals for specific wells. In addition, during each sampling event, some wells may not be accessible, or may not be sampled for other technical reasons. Tinker AFB will keep the ODEQ informed of these changes at a minimum on a 15 month basis conformable with basewide sampling reports. Tinker AFB will also notify the ODEQ of any wells that are proposed for plugging; notification will include a rationale for why the proposed wells are no longer needed. Well abandonment will adhere to requirements set out by the Oklahoma Water Resources Board.

General Groundwater Monitoring requirements

Tinker AFB has met, and will continue to meet, all appropriate requirements set out under 40 CFR 264.101 for corrective action at SWMUs. The current groundwater well monitoring network consists of around 1175 points installed at appropriate locations and depths to yield representative samples for contaminant plumes in all aquifer zones. Specific requirements of this section are described below. Under this permit renewal, the network is anticipated to be reduced by 482 wells over time as noted in Section 10.5.4. Background values for groundwater contamination have beendiscussed in several previous reports. Since no alternate compliance concentrations are proposed, these reports are not discussed in this permit application, but these documents are available from the Environmental Restoration Office.

Table 10-7: 2006 List of Wells for Deletion from Sampling Requirement

10B	1-73C	2-120A	2-143C	2-220B	2-329A	24CR	60A	9C	2-198	1-79A	2-210B
10C	1-73D	2-121A	2-144C	2-221D	2-329B	2-52C	60D	L2-15H1	2-275B	1-79B	2-211A
10D	1-74B	2-121B	2-145B	2-225	2-32B	2-62A	61B	L2-15H2	2-276B	1-79C	2-233
10E	1-74C	2-122A	2-147B	2-226	2-332A	2-63A	64A	L2-16H2	2-277B	1-83A	2-234
1-116A	1-74D	2-122C	2-148C	2-227	2-336B	2-64A	65A	L4-30H1	2-385B	1-83B	2-235
1-116B	1-75A	2-123A	2-149C	2-232	2-337B	2-65A	66AR	L4-30H2	2-394B	1-83C	2-236
1-116C	1-75C	2-123C	2-150A	2-237	2-338B	2-67A	66C	L4-30H3	2-395B	1-84C	2-275B
1-11BR	1-75D	2-124C	2-150C	2-238	2-339B	27B	67A	M-1BR	68A	1-85A	2-276B
11B	1-76C	2-124D	2-151A	2-23A	2-340B	27R	67BR	MW-119	69	1-85B	2-277B
1-29	1-82AT	2-125A	2-151B	2-241	2-341B	28B	68	TOB-10BR	6A	1-85C	16-1-1D
13	1-82B	2-125C	2-152B	2-242	2-344B	2-96B	70	TOB-12A	MF-15B	1-88A	16-1-1S
13A	1-84B	2-126C	2-153A	2-243	2-347B	2-97A	73R	TOB-12B	MF-15C	1-88B	16-1-2D
1-3AR	1-86A	2-127C	2-153B	2-246	2-351B	2-97B	74B	TOB-12CR	MF-1AR	1-88C	16-1-3D
13C	1-86B	2-128C	2-155A	2-247	2-35B	2-99B	75A	TOB-13A	2-21C	1-89A	MF-14
14P9701	1-86C	2-129B	2-155B	2-252	2-361B	2AR	76B	TOB-13BR	2-141C	1-89B	TOB-2B
14P9702	1-87A	2-129C	2-156B	2-256A	2-362B	2BR	76C	TOB-13C	2-121C	1-89C	TOB-2CR
14P9703	1-87B	2-13	2-160B	2-263B	2-365B	2C	76D	TOB-19A	2-103C	2-12	TOB-11A
14P9704	1-87C	2-130B	2-161B	2-267B	2-371B	36	77A	TOB-19B	65C	2-23A	TOB-11B
14P9705	18B	2-130C	2-163B	2-268A	2-375A	38	77C	TOB-19C	49D	2-98B	TOB-11CR
15	1-90B	2-131B	2-174B	2-27B	2-378	43B	77D	TOB-1B	49C	2-100A	TOB-14AR
16-1-2S	1-91B	2-131C	2-18	2-270B	2-379B	45B	78B	TOB-1C	2-152A	2-100B	TOB-14B
16-1-3S	1B	2-131D	2-180	2-271B	2-381	45CR	78C	TOB-20AR	74AR	2-101A	TOB-14CR
1-61D	1C	2-132C	2-181	2-274A	2-396C	45DR	79A	TOB-20B	2-328C	2-102C	TOB-16A
1-63D	20BR	2-132D	2-182	2-278A	2-398B	46B	79C	TOB-20CR	50AR	2-104C	TOB-16B
1-65C	20D	2-133B	2-183	2-280A	2-32B	46C	79D	TOB-2A	26	2-109A	TOB-16CR
1-66A	2-1	2-134C	2-184	2-282A	2-400B	46D	80	TOB-3BR	28	2-110B	TOB-21A
1-66B	2-102A	2-137B	2-185	2-282B	2-406B	47B	80B	TOB-3C	40	2-133A	TOB-21B
1-66C	2-104A	2-137C	2-192	2-285C	2-407B	47C	81	TOB-4A	41B	2-133C	TOB-21C
1-67A	2-104B	2-137D	2-195A	2-287AR	2-409A	47D	82	TOB-4BR	41D	2-133D	TOB-22A
1-67B	2-105A	2-138A	2-19A	2-287B	2-40A	49B	82B	TOB-5A	42D	2-137B	TOB-22B
1-67C	2-105B	2-138B	21BR	2-29C	2-40B	4BR	83A	TOB-5B	43C	2-139B	TOB-22C
1-68A	2-105C	2-138C	21C	22ER	2-411A	4C	83C	TOB-6B	43D	2-141C	
1-68B	2-106A	2-139A	21D	2-3	2-412A	51AR	84A	TOB-8A	50CR	2-147C	

1-68C	2-106C	2-139C	2-205B	2-300B	2-413A	51BR	84CR	TOB-8B	51C	2-147D	
1-6AR	2-110A	2-139D	2-20AR	2-307B	2-41A	52C	84D	TOB-9A	52AR	2-149A	
16R	2-111A	2-140A	2-216C	2-30C	2-429C	55C	85A	TOB-9BR	60C	2-203PT	
16RT	2-111C	2-140C	2-217C	2-310B	2-42A	57B	85B	TOB-9C	64C	2-204PT	
1-71A	2-112A	2-141A	2-21A	2-311B	2-98A	58AR	85D	1-73B	65B	2-206B	
1-71B	2-113A	2-141B	2-21B	2-318C	2-44B	59C	86A	2-139B	65C	2-207A	
1-71C	2-114A	2-142A	2-22	2-319A	2-45B	59D	86C	2-196	74C	2-208A	
1-73A	2-115A	2-142C	2-26C	2-325A	24A	5B	9A	2-197	1-73B	2-209C	

Note: Wells listed in Red Font have been plugged

Well Construction

Extraction/containment and monitoring well construction adheres to Oklahoma Water Resources Board (OWRB) Title 785, Chapter 35 requirements. Depending on the site, each well is located to detect or extract constituents that have migrated to the uppermost aquifer zone, or have migrated to a deeper aquifer zone. Each well is cased in a manner that maintains the integrity of the well borehole. Each well is screened, sand packed, and sealed to prevent contamination of groundwater and enable collection of representative groundwater samples. Construction drawings for existing wells are available from the Tinker AFB Environmental Restoration Office (AFCEC/CZO, 7701 Arnold Street, Suite 221, Tinker AFB OK, 73145-9100).

Tinker AFB will, if needed, construct and maintain additional and/or replacement monitoring wells in accordance with plans and specifications that meet, or exceed, requirements set out by the Oklahoma Water Resources Board. Tinker AFB will report to the ODEQ the surveyed locations and elevations of new monitoring wells with as-built drawings, and a map designating any change in the point of compliance.

Groundwater Collection Procedures

Groundwater collection procedures, specific data quality objectives (DQOs) as well as sampling and analysis procedures for the performance monitoring are presented in the *Basewide Work Plan Performance Based Remediation Tinker Air Force Base, Oklahoma,* formatted per the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) for Tinker AFB. The UFP-QAPP was formulated jointly and has been adopted for use by the Environmental Protection Agency, the Department of Defense, and the Department of Energy. QAPPs written in the UFP format integrate all technical and quality aspects of a project, including planning, implementation, and assessment. A QAPP written in the UFP format is not restricted to laboratory quality requirements and will contain information that may previously have been presented in a work plan or field sampling plan. The UFP-QAPP Manual states, “The QAPP document may be referred to by another name or incorporated into other project planning documents. The document for some programs or projects may be referred to as a Sampling and Analysis Plan (SAP), Work Plan, Field Sampling Plan, etc.” Although the title of the document may differ, a plan written following the UFP-QAPP contains all of the information required by the National Contingency Plan. All groundwater samples will be analyzed using an Oklahoma certified laboratory.

Monitoring Frequencies

[40 CFR 264.97(g)]

POC and sentinel wells will be sampled at a fifteen month frequency as determined under the 2005 optimization, and approved in December 2006 under a Class 2 Modification to the RCRA Permit. This frequency is the product of reviewing plume migration rates and groundwater flow velocities over a period of 20 years which indicates that groundwater flow in most instances is relatively slow and that many plumes are relatively stable. Plume stability was evaluated in 2006 using concentration trend data; trend maps are included in the *2006 Basewide Groundwater Sampling and Water Level Measurements Report, Tinker Air Force Base* (February 2008) submitted on to the ODEQ on December 10, 2008. Analysis includes all basewide wells under the holistic approach taken by Tinker AFB. Statistical trend analysis involved the Mann-Kendall trend test and Sen’s slope estimate for quantifying changes in groundwater concentrations in monitoring wells. Compliance monitoring frequency may be adjusted at certain sites due to specific needs, but the frequency will not exceed the fifteen month time frame except as specified in this permit application. The monitoring frequency for performance wells will also be fifteen months. As above, if the sampling frequency is adjusted for performance monitoring points, the frequency will not exceed the fifteen month time frame except as specified in this permit application.

Required Programs

Tinker AFB has met, and will continue to meet, requirements for a corrective action program under 264.91. All SWMUs listed in the the 2002 permit at the base currently have either an approved active or passive remedy in place with appropriate groundwater monitoring. Newly proposed units under this permit application will comply with requirements and standards outlined under the RCRA Corrective Action Program and this permit application.

Hazardous Constituents

During the initial phase of site investigation and characterization at Tinker AFB, a large suite of constituents was collected and analyzed for under EPA Methods SW-8260, SW-8270, RCRA metals, pesticides and polychlorinated biphenyls (PCBs), etc. As approved in the 2002 permit, the required list of constituents was reduced at that time. Principal changes included suspending monitoring for pesticides and PCBs. In 2005, a modification to the permit was requested which further reduced the list of analytes required for monitoring, reduced the number of wells to be monitored, and changed the monitoring frequency from annual to a fifteen month time frame. This approach was approved by the ODEQ on December 6, 2006. However, many of the changes addressed in the modification request have been included in this permit application. The current list of hazardous constituents is based on roughly 20 years of groundwater data collection and analysis, the previously approved reduction in 2002, as well as collaboration with the ODEQ in 2005 on a well optimization strategy. The final list of COCs was determined from a review of various approved documents for all contaminant sites at Tinker AFB; types of documents reviewed include decision documents, Corrective Measures Studies, and RCRA Facility Investigation Reports, subject and site specific reports, and the optimization effort that took place in 2005. The optimization process and results are outlined in the report included as Attachment 3. All other listed types of documents not already submitted to the ODEQ are available by contacting the Tinker AFB Environmental Restoration (AFCEC/CZO) office.

The selected chemicals of concern approved by the ODEQ in 2005 request include the chlorinated volatile organic compounds (CVOCs) tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), vinyl chloride (VC), 1,2-dichloroethane (DCA) analyzed under EPA Method SW-846 8260B and the metal hexavalent chromium (Cr[VI]), analyzed for under EPA Method SW-846 7196A. These chemicals of concern (COCs) will be analyzed for and reported on a basewide scale for the duration of this permit, as well as being included in any site specific reports. For a few specific wells, BTEX will also be included, particularly in areas where fuel is a concern along with solvents. Additional parameters that will be reported include total organic carbon, total dissolved solids and all field generated analytical data (including but not limited to temperature, turbidity, dissolved oxygen, pH, and conductivity). Monitored natural attenuation (MNA) parameters will be reported on a site by site basis whenever generated to evaluate anaerobic conditions or to demonstrate degradation of COCs by processes other than anaerobic degradation. Both filtered and unfiltered total chromium data (SW-846 6010B) will also be collected at each well where hexavalent chromium data is collected. Solid and liquid waste that is slated to be disposed off site at a permitted disposal facility will be characterized by a TCLP using approved methods. Groundwater sampling protocols, analytical methods/protocols, and quality assurance/quality control procedures are listed in the UFP-QAPP for Tinker AFB.

Other volatile organic compounds exist at Tinker AFB. Typically, the footprint of these compounds falls within the boundary of any TCE plume in the same aquifer zone. This information is used by Tinker AFB to locate compliance points based on the extent of TCE. As noted above, in addition to TCE, several other volatile organic constituents are recognized as COCs. However, the entire SW-846 8260B suite of volatile organic compounds will be analyzed in both compliance and performance monitoring points. Analytical results that are not compliance related will be provided in electronic format to the ODEQ as well as stored in the Air Force Environmental Restoration Program Information Management System (ERPIMS) database. ERPIMS is the Air Force system for validation and management of data from environmental projects at all Air Force bases. This data contains analytical chemistry samples, tests, and results as well as hydrogeological information, site/location descriptions, and monitoring well characteristics. Data in ERPIMS is available on request from the Tinker AFB Environmental Restoration Office.

10.6 REFERENCES

IT Corporation, June 1997. *Basewide Non-NPL Groundwater Phase II RCRA Facility Investigation Report for Appendix I and II SWMUs Addendum 1, Tinker Air Force Base, Oklahoma.*

IT Corporation, September 2001. *Basewide Non-NPL Groundwater Phase II RCRA Facility Investigation Report for Appendix I and II SWMUs Addendum 3, Tinker Air Force Base, Oklahoma.*

ODEQ 2002Tinker Permit Renewal Base Civil Engineer Master Plan CE…..

Science Applications International Corporation and Dr. Kirk Cameron/MacStat Consulting, Ltd., September 2005. *Long-Term Monitoring Groundwater Optimization Tinker AFB, Oklahoma Using The Geostatistical Temporal/Spatial (GTS) Algorithm.*

Science International Applications Corporation, February 2008. *Task Order Final Report 2006 Basewide Environmental Groundwater Sampling and Water Level Measurements Tinker Air Force Base, Oklahoma.*

Science Applications International Corporation, February 2011. *Contract Summary Report 2009 Basewide Environmental Sampling and Water Level Measurements Tinker Air Force Base, Oklahoma.*

USEPA Region 6, February 2015. Corrective Action Strategy (CAS).

VERSAR, Inc., August 2012. *Basewide Work Plan Performance Based Remediation Tinker Air Force Base, Oklahoma.*

VERSAR Inc., February 2017. *2014-2015 (Event 4) Basewide Sampling and Water Level Measurements.*

SECTION 10 - APPENDIX 1 - TOPOGRAPHIC MAPS WITH USZ, LSZ, LLSZ PLUME OVERLAYS (IN POCKETS)

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SECTION 10: ATTACHMENT A - CG037 through CG040 COMPLIANCE-SENTINEL WELL CLARIFICATION

A.1 INTRODUCTION

The following text provides additional detailed information and clarification for development of the compliance and sentinel well concept for Tinker AFB at specific plumes within the four Contaminated Groundwater Management Units (CGMUs) at the base known as AF sites CG037, CG038, CG039, and CG040. These areas have also been designated as Installation Restoration Program (IRP) sites by the Air Force (AF). At each unit, certain compliance wells located at or near the base fence line are showing current, or have shown past, groundwater contamination at levels above the MCL. This attachment also documents the existence of ongoing remedial activities taken as voluntary corrective actions by Tinker when it was recognized that contaminated groundwater had either reached or passed the fence line in those areas. These actions, including active and passive technologies, are listed below under the "Site History" description for each management unit. Included actions fulfill the requirement based on the contingency measures outlined in Section 10.5.4 of this application to evaluate and/or remediate contaminated groundwater that has reached the base point of compliance, the fence line. Specific corrective action goals noted for each site below fall within the purview of the general corrective action objectives listed in Section 10.5.1 of this application.

The four CGs do not fully cover all contaminated sites on Tinker AFB, but address issues at all significant sites outside of the CERCLA NPL area (Soldier Creek/B3001 NPL Site) located in the northeast quadrant of the Base. The only additional site not covered is Landfill 6 (GWMSU 5A), also designated as SWMU 01. Landfill 6 has been investigated and does not pose a significant threat to human health or the environment. Note that the CGs include most surface water bodies except Soldier Creek, which falls under CERCLA.

A.2 CONTAMINATED GROUNDWATER MANAGEMENT UNIT CG037

A.2.1 Background

CG037 is located in the northwestern and northcentral quadrant of Tinker AFB. This site was created to address groundwater in this vicinity by grouping an area with separate or commingled plumes into one administrative and regulatory unit. CG037 includes two groundwater management units (GWMUs), GWMUs 1 and 2, and multiple groundwater management subunits (GWMSUs). GWMU 1 includes GWMSUs 1A, 1B, 1C, 1D, 1E, 1F, and 1G; GWMSU 2 includes GWMSUs 2A, 2B, and 2C. CVOC contamination occurs to a significant extent at CG037 in only the upper saturated zone (USZ) and lower saturated zone (LSZ).

The chemicals of potential concern (COPCs) for CG037 that have the greatest impact are tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), vinyl chloride (VC), and 1,2-dichloroethane (DCA). These COPCs are present in groundwater at GWMSUs 1A, 1C, and 1D, and GWMSU 2B. Other VOCs (including CVOCs and/or fuel-related chemicals) are also found in groundwater at some of these areas, usually in smaller or isolated areas with concentrations above their respective MCLs. Furthermore, total petroleum hydrocarbons (TPH), diesel range organics (DRO), and gasoline range organics (GRO) were present at concentrations above the ODEQ (2012) Tier 1 cleanup levels in groundwater at ST033 (GWMSU 1A) and ST007 (GWMSU 1C). A brief, and very generalized, overview of the extent of the COPCs by aquifer zone is provided in the following paragraphs; please note that data is representative of early sampling and data do not necessarily reflect current plume status as this is changing as additional remediation is occurring.

USZ: Five CVOCs were identified as COPCs in the USZ at CG037: PCE, TCE, cis-1,2-DCE, VC, and 1,2-DCA. From 1999 through 2009, 2,319 groundwater samples collected from the USZ within CG037 had a detection of one or more COPCs, with 44.3 percent of these samples having a concentration that exceeded the MCL for one or more of the respective COPCs. The extent of TCE contamination in the USZ far exceeds the extent of other contamination identified at CG037. TCE contamination in the USZ far exceeds the extent of other contamination identified at CG037.

LSZ and LLSZ*:* TCE and cis-1,2-DCE were identified in 2004 as COPCs for the LSZ at CG037 (Parsons, 2004), and a review of historical data indicates that the 2004 list of COPCs is still appropriate for the site. From 1999 through 2009, 1,105 groundwater samples collected from the LSZ in CG037 had a detection of one or more COPCs, with 60.9 percent of these samples having concentrations that exceeded the MCL for one or more of the respective COPCs. TCE was the only contaminant identified as a COPC for the LLSZ. From 1999 to 2009, 243 samples from the LLSZ had a detection of TCE, with 23.4 percent of these samples having a concentration above the MCL.

Potential sources of chlorinated compounds include vehicle maintenance activities (GWMU 1B and 1F areas), the base laundry (GWMU 1B), a waste oil tank (GWMU 1B area), sludge drying beds (GWMU 2A), fire training activities (GWMU 2B and 2C), aircraft maintenance and storage (GWMU 2B), and vehicle maintenance (GWMU 2B) and potential leaks in sewer and storm sewer line. Locations of the chlorinated plumes generally correspond to the identified chlorinated compound source areas. The total chlorinated hydrocarbon maps depict the sum concentration of the following compounds: chloroform; carbon tetrachloride (CT); chloroethane; 1,1,1-trichloroethane (TCA); tetrachloroethene (PCE); 1,1,2,2,-tetrachloroethane; TCE; 1,1,2-TCA; 1,1-dichloroethane (DCA); VC; 1,1-DCE; *cis*-1,2-DCE; 1,2,-DCA; and *trans*-1,2-DCE.

Based on the results from early basewide monitoring events, the chlorinated compounds in groundwater with relatively wide areal distribution at GWMU 1 and GWMU 2 include TCE; *cis*-1,2-DCE; 1,2-DCA; PCE; CT; and VC. TCE is the chlorinated compound most frequently detected in groundwater samples from the USZ and LSZ.

BTEX plumes have been identified in both the USZ and the LSZ at GWMU 1, but in the USZ only in the GWMU 2 area. The highest total BTEX concentration [607 micrograms per liter (ug/L)] within the USZ at GWMU 1 was detected at well MW-15, located at the northern boundary of Site CG037. Within the GWMU 1B area plume, the maximum total BTEX concentration (367ug/L) in the USZ was detected at well 2-246. The highest total BTEX concentration (8,706 ug/L) in the LSZ in the GWMU 1 area was detected at well 2-251R, also located within GWMU 1B.

Within the USZ at the GWMU 2 area, the highest total BTEX concentration (81.4ug/L) was detected at well 2-67A located in the GWMU 2A area. BTEX compounds were detected at low or estimated concentrations in the USZ within the GWMU 2B and 2C areas. BTEX compounds were not detected in the LSZ within the GWMU 2 area.

GWMU 1 – USZ:

PCE was detected in samples collected from USZ wells (2-372 and 2-166B) in the GWMU 1 area at concentrations of 2.1 to 3.6µg/L. TCE was detected in samples collected from USZ wells at

GWMU 1 at concentrations ranging from 0.7J to 1,200µg/L. *Cis*-1,2-DCE was detected in groundwater samples collected from USZ wells in the GWMU 1 area at a maximum concentration of 350µg/L (well 2-370B). As noted above, the highest TCE concentration in GWMU 1 also was detected in this well. With this exception, the *cis*-1,2-DCE concentration in the USZ at GWMU 1 ranged from 3 to 10ug/L. The compound 1,2-DCA was detected in USZ wells and ranged in concentration from 1.1 to 28ug/L in the GWMU 1 area. The highest concentration was detected at well 2-245 located near the middle of GWMU 1B. Similar to TCE and *cis*-1,2-DCE, 1,2-DCA was not detected in USZ groundwater in GWMU 1F. Benzene was detected in USZ wells sampled as part of the basewide monitoring in the GWMU 1 area at concentrations ranging from 1 to 310 µg/L. Vinyl Chloride was detected at a concentration of 2.1ug/L in USZ well 2-370B. Carbon Tetrachloride (CT) was detected during the basewide monitoring in samples collected from USZ well in the GWMU 1 area, with concentrations ranging from 7.9 to 41µg/L. The highest CT concentration was detected west of the GWMU 1B area, and south of the GWMU 1F area.

GWMU 1 – LSZ/LLSZ:

PCE was detected in LSZ wells in the GWMU 1 area at concentrations ranging from 0.8J to 34 µg/L. PCE was detected in the GWMU 1B area only; PCE was not detected in LSZ wells in the GWMU 1F area.TCE was detected in samples collected LSZ wells at GWMU 1 at concentrations ranging from 1.6 to 1,100 µg/L. The highest concentration of TCE was detected in a sample collected from well 2-251R located within GWMU 1B. TCE was not detected in the LSZ at GWMU 1F. *Cis*-1,2-DCE was detected in samples collected from LSZ wells at GWMU 1 at concentrations ranging from 1 to 59 µg/L. VC was not detected in the LSZ in the GWMU 1 area. Benzene was detected in LSZ wells in the GWMU 1 area at a concentrations ranging from 1.5 to 8,600 µg/L. Benzene was detected in the LSZ in the GWMU 1B area only; with the highest benzene concentration detected at well 2-251R. The highest concentration of cis-1,2 DCE in the LSZ at GWMU 1 was also detected at this well. The compound 1,2-DCA was detected at concentrations ranging from 2.7 to 140ug/L in LSZ wells in the GWMU 1 area. The 1,2-DCA plume in the LSZ is within the GWMU 1B area; this compound was not detected at GWMU 1F.

GWMU 2 – USZ:

PCE was detected in samples collected from USZ wells at GWMU 2 at concentrations ranging from 0.5J to 96 µg/L. The highest PCE concentration was detected in a groundwater sample collected from well 62 located at GWMU 2C near the Supernatant Pond and Fire Training Area 1. TCE was detected in samples collected from USZ wells at GWMU 2 at concentrations ranging from 0.6J to 940 µg/L. The highest TCE concentrations (940 and 890 µg/L) were detected in samples collected from wells 2-348B and 2-280B, located within the northwest portion the GWMU 2B area. A relatively high TCE concentration (640ug/L) also was detected at GWMU 2B well 2-144B, located approximately 500 feet west and hydraulically downgradient of the Old Fire Training Area. TCE also was detected in the GWMU 2A and 2C areas near the Sludge Drying Beds, the AOC-Old Pesticide Storage Area, Fire Training Area 1, and the Supernatant Pond. *Cis*-1,2-DCE was detected in samples from USZ wells at GWMU 2 at concentrations ranging from 0.6J to 540 µg/L. The highest concentration of *cis*-1,2-DCE was detected at well 2-20B located within GWMU 2C. A relatively high *cis*-1,2-DCE concentration (270ug/L) also was detected at well 2-144B located east and downgradient of the Old Fire Training Area, within GWMU 2B. The analyte 1,2-DCA was detected in samples from USZ wells in the GMMU 2 area.

The highest 1,2-DCA concentrations were detected at wells 2-144B (840ug/L) and 2-409B (630ug/L), located within GWMU 2B west and southwest of the Old Fire Training Area. Carbon Tetrachloride was detected in sampled from USZ wells in GWMU 2. The highest CT concentration (450ug/L) was detected in a groundwater sample collected from GWMU 2A area. The maximum CT concentration detected in the GWMU 2B area was 38ug/L. CT was not detected in GWMU 2C. Benzene was detected in samples collected from USZ wells at GWMU 2 at concentrations ranging from 0.5J to 71µg/L. The highest benzene concentration was detected in a groundwater sample collected from well 2-67A. Vinyl Chloride was detected in USZ wells at GWMU 2. VC concentrations ranged from 0.7 J to 87ug/L, with the highest VC detected at wells 2-20B located within GWMU 2C. VC was also detected at relatively lower concentrations within the USZ at GWMU 2A and GWMU 2B. It is important to note that levels of VC do not appear to be migrating beyond the areas containing cis 1,2- DCE. This indicates that VC may be undergoing biological oxidation in the areas outside of anaerobic source areas.

GWMU 2 – LSZ/LLSZ:

Tetrachlroethene was detected in samples collected from LSZ wells at GWMU 2 at concentrations ranging from 0.7J to 7.2µg/L. This compound was detected in wells located within GWMU 2A and 2B. TCE was detected in samples collected from LSZ wells at GWMU 2 at concentrations ranging from 0.3 to 2,400µg/L. The highest concentrations of TCE were detected in groundwater samples collected from monitoring wells 2-328A (2,400ug/L), 2-144A (710ug/L), 2-351A (610ug/L), and 2-284A (580ug/L) located within GWMU 2B. C*is*-1,2-DCE was detected in samples collected from LSZ wells in the GWMU 2 area at concentrations ranging from 5.1 to 71µg/L. The highest concentration of *cis*-1,2-DCE was detected in a sample collected from well 2-328A located near the Old Fire Training area within GWMU 2B. *Cis*-1,2-DCE concentrations at other wells in the GWMU-2 area did not exceed 23ug/L and were concentrated in GWMU 2A area. 1,2-DCA was detected in samples from LSZ wells in the GMMU 2 area. The highest 1,2-DCA concentration (800ug/L) was detected at well 2-398A, located within GWMU 2A, approximately 400 feet north of the Sludge Drying Beds. Carbon Tetrachloride was detected in samples from LSZ wells at GWMU 2. The highest CT concentration (270ug/L) was detected in a groundwater sample collected from GWMU 2A area near the Sludge Drying Beds. The maximum CT concentration detected in the GWMU 2B area was 220 ug/L. CT was not detected in LSZ wells located in GWMU 2C. Benzene was detected in only a single LSZ well at GWMU 2 at an estimated concentration of 0.6ug/L.

The Area A Service Station site, also referred to as AF Site ST033, is located within Contaminated Groundwater Management Unit CG037, which covers much of the west-central part of the base. The boundary of CG037 was recently expanded to include VEP treatment systems used for groundwater and soil treatment, including the system at the Area A Service Station. Because many of the potential sources in CG037 are proximate, linking a contaminant plume to a specific source

is difficult. The CG037 management unit was created to address groundwater in this portion of the base as a whole because of the presence of commingled plumes and the proximity of sources. The area encompassed by CG037 was previously subdivided into two groundwater management units (GWMUs) and multiple groundwater management subunits (GWMSUs) generally representing individual plumes. The Area A Service Station groundwater plume for example is synonymous with GWMSU 1A. The relationship of CGMUs and GWMUs is more fully described in Section 10.5.4.

This former service station, which is one block east of the Eaker Gate at the intersection of 5th Street and Avenue E, is located in the north part of CG037 at the north end of the base. The site served as a military vehicle fueling and repair station from 1942 to 1990. Leaded and unleaded gasoline, along with diesel fuel, was stored in four underground storage tanks (USTs) on site, each of which was suspected of leaking at various times. Because solvents have also been noted at the site, it is suspected that one or more tanks may have stored solvents for some period of time. The USTs were removed in 1996.

A.2.2 Site History

The Area A site was originally designated as a UST fuel site (Facility No. 55-08120, OCC Case No. 064-VS/Area A) under the Oklahoma Corporation Commission (OCC). In 1992 a product recovery pump and treat system was installed to recover light non-aqueous phase liquids. This system was operated until January 1996, at which time it was replaced by a dual phase vapor extraction system (VEP). The VEP system, which began operation in June 1997, is connected to twelve VEP extraction wells in the USZ and two deeper eductor wells in the LSZ. The LSZ wells are designed to capture solvent contamination in that zone. The VEP wells were designed to remove soil vapor, contaminated USZ groundwater (solvents), and LNAPL in the USZ. The two LSZ pumping operated through September 2003, but have been off for the last decade. The VEP unit consists of a liquid ring vacuum pump, a knock-out tank, transfer pumps, and a six-tray air stripper. Treated groundwater is piped to a nearby sanitary sewer line.

Case Number 064-VS/Area A was closed by the OCC in a letter dated December 18, 2000 and fuel is no longer a concern at the site. However, TCE in the USZ at the fence line compliance well (2-166B) remains above the MCL at a concentration of 9.7ug/L in the latest sampling round and concentrations in the LSZ remain at up to 30 times the MCL, although this portion of the plume does not appear to have reached the base boundary at concentrations approaching the MCL. The most current analytical data shows that TCE in off-site sentinel wells is non-detect for the USZ (well 2-165B) and 0.25J ug/L in the LSZ (well 2-149A).

A.2.3 Ongoing Remedial Activities

Recent data suggest that the mass recovery rates of the VEP systems at CG037 have reached asymptotic levels, indicating that the systems are no longer effectively remediating contamination at the sites. Although the presence of cis-1,2-DCE and VC in the subsurface indicates that biodegradation is working to reduce TCE contamination, long term term monitoring (LTM) has shown that TCE concentrations are not being reduced effectively and may take longer than anticipated to degrade. At the Area A site, because the concentration of TCE remains above the MCL at the fence line in the USZ, further remedial action is needed. Optimizing the current remedy with enhanced in-situ bioremediation (EISB) treatment will support an increase in mass degradation rates in high conductivity and low conductivity sediments. The slow release of organic substrates also provides a mechanism for treating TCE that is diffusing from lower conductivity sediments.

Several enhanced in situ biroremediation (EISB) injection wells and a biobarrier have been installed at the Area A location within CG037. The biobarrier, consisting of six spaced injection wells, was installed in the USZ across the TCE plume at the base boundary to prevent off-base migration and to enable shutting down of the existing VEP system while still containing groundwater having contaminant concentrations above MCL on base. Two other injection wells were placed in the USZ closer to the plume axis to remediate higher concentrations there, and three injection wells were installed in the LSZ to attack higher concentrations of solvents in that portion of the plume. Current remedial activities will operate until corrective action objectives are met, at which time Tinker may petition the ODEQ to terminate remedial activities, including permanent shut down of active systems.

A.2.4 Corrective Action Objective

General corrective action objectives for Tinker are outlined in Section 10.5.1 of this application. The corrective action goal vis-à-vis ongoing remedial actions specific to this site is to reduce volatile organic compound concentrations to their respective MCLs in compliance point wells to ensure contaminants do not migrate off-base. Pursuent to Section 3004(v) of RCRA as amended by HSWA, corrective actions are required beyond the facility boundary where necessary to protect human health and the environment, unless it can be demonstrated that necessary permission to undertake such actions was unable to be obtained.

A.3 CONTAMINATED GROUNDWATER MANAGEMENT UNIT CG038

A.3.1 Background

Contaminated Groundwater Management Unit 38 (CG038), also known as AF Site CG038, is located in the southwest quadrant of Tinker AFB and contains Groundwater Management Subunits (GWMSUs) 2D, 2E, and 2F. The relationship of CG038 to GWMSUs is more fully described in Section 10.5.4.1. Analytical results from early investigations indicated the presence of two large plumes in the area consisting of VOCs [primarily trichloroethene (TCE); *cis*-1,2-dichloroethene (*cis*-1,2-DCE); and vinyl chloride (VC)] situated in the Upper Saturated Zone (USZ). The VOC plumes were designated as the 2D plume and the 2E plume because, at the time, only these two plumes had been identified within this portion of the newly designated GWMU 2. However, results from subsequent groundwater monitoring indicated the presence of a third plume of solvent-contaminated groundwater, referred to as the 2F plume, situated between the 2D and 2E plumes. In addition to chlorinated solvents, high concentrations of hexavalent chromium [Cr(VI)] were identified in USZ groundwater in GWMSUs 2E and 2F. The 2E chromium plume has not reached the point of compliance at CG038, but the hexavalent chromium plume and the VOC plume designated as 2F have reached the point of compliance. The solvent plumes2D and 2E were identified around 1996 as having migrated off-base at levels above the maximum contaminant level for drinking water (MCL) at the site. No contamination in deeper groundwater zones such as the LSZ/LLSZ or PZ has been found at CG038. A brief, and quite generalized, overview of the extent of the COPCs by aquifer zone is provided in the following paragraphs; please note that data is representative of early sampling and data do not necessarily reflect current plume status as this is changing as additional remediation is occurring.

Remedial actions at Site CG038 are focused on the USZ, which exists between the overlying Hennessey water-bearing zone (HWBZ) and the underlying lower saturated zone (LSZ). The HWBZ and the LSZ/lower lower saturated zone (LLSZ) are not targeted for active corrective measures due to low average groundwater flow velocities and no concentrations above action levels (in the HWBZ) and low concentrations and isolated occurrences of groundwater contaminants (in the

LSZ/LLSZ). The USZ demonstrates significant concentrations of chemicals of concern, with chlorinated volatile organic compounds (CVOCs) historically the most frequently detected compounds in USZ groundwater in GWMSUs 2D and 2E. Since the corrective measures study was prepared in 2004, hexavalent chromium [Cr(VI)] and CVOC plumes have been detected in the USZ in the area between GWMSUs 2D and 2E. These plumes were designated as GWMSU 2F in 2008.

The extent of trichloroethylene (TCE) contamination in the USZ within Site CG038 is generally representative of the extent of CVOC contamination in GWMSUs 2D, 2E, and 2F, with a few exceptions: cis-1,2-DCE has been detected at off-base monitoring well 2-333B above the maximum contaminant level (MCL) of 70 micrograms per liter (µg/L) in the past, and the concentration and extent of the USZ TCE plume does not reflect the elevated concentrations of cis-1,2-DCE and VC detected in the vicinity of well 2-259B or in the area downgradient from the permeable reactive barrier (PRB) within GWMSU 2D.

2D Plume:

TCE: The GWMSU 2D TCE plume extends from downgradient of well 2-485B on the northeastern end of the plume to the PRB located just inside the Base boundary on the southwestern end of the plume. The plume begins downgradient of Landfill 3 and appears to originate in the vicinity of the former sludge pit. In May 1988, the U.S. Corps of Emgineers (USACE) drilled a series of borings at Landfill 3 to help determine the boundary of the sludge pit. TCE was detected in soil samples collected from three borings located along the north-south axis of the sludge pit at concentrations ranging from 3,000 mg/kg to over 6,000 mg/kg. In addition, soil samples collected at boring L3-2 exhibited the highest concentrations of *trans*-1,2-DCE and VC detected in all soil samples. A groundwater sample collected from well 2-259B, installed in 2001 and located south of the sludge pit, showed a 2.7-µg/L concentration in 2007 but originally had a concentration of 97 µg/L in 2001. The GWMSU 2D TCE plume extends beneath and downgradient from Landfill 4, although due to the thickness of the Hennessey Group waste disposed in trenches in Landfill 4 probably do not contribute to the GWMSU 2D TCE plume. Higher TCE concentrations in groundwater upgradient from the Landfill 4 sludge landfarm area and sludge pit areas suggest that the sludge pit in Landfill 3 is the primary source of the 2D plume. Landfill 3 trenches may also be a source of VOCs.

***Cis*-1,2-DCE.:** Elevated concentrations of *cis*-1,2-DCE occur in GWMSU 2D groundwater and are currently mapped as a plume extending approximately 1,400 ft from monitoring well 2-485B (110 µg/L in January 2008) on the northern edge of Landfill 2 to well 11A (66 µg/L in January 2008), located west of Landfill 4. The highest concentration of *cis*-1,2-DCE recently observed in GWMSU 2D groundwater occurred in a sample collected from well 2-259B in January 2008 [51,000 µg/L (estimated)]. This well is located approximately 75 ft south of the Landfill 3 sludge pit.

VC: VC is mapped in GWMSU 2D as a plume extending approximately 2,000 ft from well 2-485 (100 µg/L in January 2008) southwest to extraction well EX-B02 [0.79 µg/L (estimated) in March 2008]. The core of the VC contamination is centered around well 2-259B, where it was detected at a concentration of 76,000 µg/L (estimated) in the sample collected in January 2008.

Cis-1,2-DCE and VC are believed to be daughter products of the degradation of TCE originally located in the Landfill 3 sludge pit. At the close of a low-temperature thermal desorption pilot test in 1989, the USACE placed all the treated and untreated soils back into the pit; the landfill was later covered by a RCRA cap. In taking these steps, a “bioreactor” was created mixing TCE and hydrocarbons and resulting in a decrease of TCE with a concomitant rise in *cis*-1,2-DCE and VC concentrations, which migrated from the pit area.

2E Plume:

TCE: The northeastern extent of the 2E plume is broad (roughly 1,350 ft wide) and partially underlies the Former Drum Storage Area. The plume narrows to approximately 550 ft in the vicinity of the Former Re-Drumming Area and then broadens again to as much as 2,100 ft across the southwestern portion of the plume. Thus, the plume is mapped in somewhat of a bow tie or hourglass shape. High concentrations of TCE occur in groundwater underlying the Former Re-Drumming Area (1,100 µg/L at well 2-512B in 2007) and Redbud Pond (940 µg/L at well 2-520B in 2007). The southwestern extent of the plume is well defined by a number of monitoring and extraction wells located near the Base boundary. The pinched appearance at the middle of the 2E plume may reflect the presence of preferred pathways and/or the presence of a slight groundwater high in the USZ caused by shallow groundwater seeping downward from the HWBZ (from Redbud Pond), which acts to divert the flow of contaminated USZ groundwater to the north. Original concentrations of up to 30,000 µg/L of TCE observed at the Former Re-Drumming Area (detected in monitoring well 2-466B on January 11, 2003) have been reduced to 210 µg/L (well 2-466B was last sampled on January 3, 2008) through injection of potassium permanganate during the ISCO pilot test completed in January 2003. Concentrations of 1,2-dichloroethane (DCA) were reduced from 810 µg/L to levels below the detection limit (1 µg/L). PCE; *cis*-1,2-DCE; and VC were generally detected at low levels prior to the injection and are currently detected at concentrations below the maximum contaminant levels (MCLs).

***Cis*-1,2-DCE:** There are two primary areas of *cis*-1,2-DCE contamination present in GWMSU 2E. One area is located east of Landfill 2 and extends to the southwest beneath the landfill cap. The southwestern portion of the plume partially underlies the Former Re-Drumming Area. The maximum concentration of *cis*-1,2-DCE most recently detected in this area of contamination occurred in monitoring well 2-443B (270 µg/L in January 2009). A broad front of *cis*-1,2-DCE contamination is present west of Redbud Pond, extending further west to the Base boundary. The downgradient portion of the plume extends from well 2-294B (*cis*-1,2-DCE detected at a concentration of 150 µg/L in October 2008) to extraction well EX-A10 (110 µg/L in December 2008). Smaller areas of *cis*-1,2-DCE contamination are present around monitoring wells 2-521B and 59B. The *cis*-1,2-DCE plume currently extends off-Base at concentrations below the MCL (70 µg/L). The *cis*-1,2- DCE concentration at well 2-333B was 210 µg/L in 2001, but has shown a steady decline since approximately 2002, with the most recent sample collected at 2-333B (2008) having a concentration of 55 µg/L. These results indicate plume containment by the existing extraction well network.

VC: As mapped, VC is present in GWMSU 2E as a continuous plume extending southwest from monitoring well 2-131A (5.3 µg/L in December 2008) to the Base boundary (approximately 2,700 ft) (Figure 2-7). The highest concentration of VC is seen in wells 2-214A (34 µg/L) and 2-215A [34 µg/L (estimated)]. Both wells were sampled in November 2008. An elevated concentration of VC in groundwater was also observed in the sample collected from well 2-443B in January 2009 (32µg/L). VC was also detected at a concentration of 4µg/L (estimated) in a groundwater sample collected from well 60B in November 2005. The existing remedial system appears to be continuing to prevent migration of VC above MCLs (2 µg/L) to off-Base areas.

The northeastern (i.e., upgradient) extent of the GWMSU 2E TCE plume partially underlies a former drum storage area. The plume narrows downgradient (in the vicinity of the former re-drumming area) and then broadens again across the southwestern portion of the plume. The southwestern edge of the GWMSU 2E TCE plume is well defined by a number of monitoring and extraction wells located near the Base boundary. The pinched appearance in the middle of the historical GWMSU 2E TCE plume may reflect the presence of preferred pathways and/or the presence of a slight groundwater high in the USZ caused by shallow groundwater seeping downward from the HWBZ (from Redbud Pond), which acts to divert the flow of contaminated USZ groundwater to the north, as documented in the 2010 *Contract Summary Report CG038 Remedial Process Optimization Upper Saturated Zone Volatile Organic Compound Plumes*.

2F Plume:

The GWMSU 2F TCE plume is smaller than the others and extends from the north-central portion of Landfill 2 to just beyond the southern boundary of Landfill 4. The highest TCE concentrations within GWMSU 2F have been detected in the north-central portion of Landfill 2. The 2F TCE plume extends from the north-central portion of Landfill 2 to just beyond the southern boundary of Landfill 4. This plume shows a more northeast-southwest alignment than the 2D plume and extends roughly 1,280 ft from upgradient piezometer L2-16U (TCE was detected at 17 µg/L in 2007) on the northeastern end of the plume to well 10A (TCE was detected at 4 µg/L in 2007) at its southwestern extent. The highest plume concentrations occur in the north-central portion of Landfill 2. *Cis*-1,2-DCE is detected at concentrations well below the MCL in GWMSU 2F. VC is currently mapped at a single location, piezometer L2-16U, where it was detected at a concentration of 2.8 µg/L (estimated) in March 2008.

Hexavalent Chromium Plumes:

Two Cr[VI] plumes have been observed in CG038. One plume exists at GWMSU 2F and extends from well 2-523B on the northeastern end of the plume to well 2-534B and extraction well EX-A06 at its southwestern (downgradient) extent. The second Cr(VI) plume exists in the south-central portion of GWMSU 2E and extends from the southern portion of Landfill 2 (at well 2-512B) to south of Beaver Pond (well 2-517B). A third area where Cr(VI) has been detected in groundwater is in the area of GWMSU 2E near monitoring wells 2-464B, 2-465B, 2-466B, 2-467B, 2-468B, and 79BR. This area of elevated Cr(VI) was related to an injection of potassium permanganate during a pilot study conducted in 2002 and 2003 that oxidized existing Cr(III) to Cr(VI). Concentrations rapidly reduced back to Cr(III) after the pilot study was completed.

A.3.2 Site History

Interim remedial actions at CG038 since the early 1990s include capping of four landfills (Landfills 1 through 4), installation of a groundwater pump and treatment (P&T) system in 1998, and construction of an iron permeable reactive barrier (PRB) in 2004 across Plume 2D. Other activities include demonstration of a low-temperature thermal desorption treatment process for soils at the Landfill 3 sludge pit in 1989, a pilot test to demonstrate effectiveness of potassium permanganate to degrade volatile organics in groundwater at the south end of Landfill 2 in 2004, and a project to evaluate the effectiveness of calcium polysulfide in reducing hexavalent chromium in groundwater to trivalent chromium in 2008. Each of the 'tests' was located in an area of higher concentration of contaminants; all were effective in reducing contaminant mass at those sites in addition to allowing for evaluation of different technologies.

The landfill caps have effectively prevented precipitation from recharging landfill trenches, thus helping to lower water levels in the trenches and reducing leachate generation. The P&T system was installed as an interim corrective measure (ICM) to address high concentrations of chlorinated solvents (primarily TCE) occurring within GWMSUs 2D and 2E within CG038, with the primary goal of preventing further off-base migration as well as drawing back contamination from off-site wells and, to a lesser extent, beginning to remediate higher concentrations of solvents within the two plumes nearer the source areas. The passive permeable reactive barrier across Plume 2D and the pump and treat system had been the primary remedial technologies used to directly address groundwater contamination at CG038; recently, EISB has also been instituted. The extraction system consists of 20 wells identified as EX-A01 through EX-A12 and EX-B01 through EX-B08. The "A-series" extraction wells are located to contain the plumes. The "B-series" wells are generally located to remediate the higher concentration areas of the plumes.

This system has been fully operational since March 1999, although certain wells are now turned off. Components of the various interim corrective measures applied at CG038 and how these relate to compliance points and sentinel wells are described briefly below by individual groundwater plume. The 2004 PRB, located across the down gradient end of Plume 2D, was installed specifically to address contamination in two private water wells just west of the base fence line in the Tinker View Acres subdivision, contamination not reached by the capture zone of several extraction wells already installed in 1998 at the fence line in that area. Data from 2009-2010 from monitoring points down gradient of the PRB demonstrate that concentrations of solvents near the PRB have been reduced to below the MCL. In addition, wells currently designated as fence line compliance wells in this area have seen solvent concentrations drop from as high as 250ug/L in 2004 to mainly non-detect in 2009/2010; all were non-detect or below the MCL in 2015. The highest recorded TCE concentration in an on-base down gradient monitoring well in the latest sample round was 1.5ug/L in well 2-493B. It should be noted that the two previously contaminated private water wells were last sampled in 2006, at which time the highest concentration was 5.3ug/L. The property owners have not allowed Tinker or the ODEQ to sample the wells in the interim. There is one sentinel well 2-256B) located outside the fence identified for this plume. This well has consistently been non-detect for VOCs since it was installed in 2001.

2E Solvent Plume: The combination of groundwater pumping and landfill caps has lowered the USZ water table near the center of the site by as much as six feet, thus locally reversing the southwestward gradient and creating a hydraulic barrier to further off-base flow. The result is that a low magnitude groundwater divide was generated across plume 2E along the base fence line, which continues to contain the plume on base and prevent further migration off site. Although compliance point wells at the fence line still contain solvent concentrations above the MCL, the concentration of cis-1,2 DCE, once greater than twice the MCL in a single well identified as a sentinel well located down gradient to the west, has dropped to below the MCL. No other VOCs have exceeded their respective MCL in any of the six off-base sentinel wells related to this plume.

2F Solvent Plume: The 2F Plume, located between the 2D and 2E plumes, was not identified until after the P&T system was installed, and therefore no extraction wells were located specifically to address this plume. The fence line compliance points for this plume consist of extraction well EX-A06, by chance located at the down gradient end of the plume, and companion piezometer CG038P0603 (used for sampling also); EX-A06 had a detected VOC concentration of 2.6ug/L in 2009/2010 sampling and the other well is non-detect. The nearest sentinel well (2-531B) located off-site associated with this plume is non-detect for VOCs.

Hexavalent Chromium plumes: The two hexavalent chromium plumes located within CG038 were not identified and characterized until after the P&T system was installed. The smaller plume with lower concentrations falls within the footprint of the 2E solvent plume and by chance has one extraction well (EX-B06) located within it. This chromium plume has not yet reached the base boundary. The second plume, larger and with higher concentrations, generally overlaps the 2F solvent plume, but extends farther down gradient. The concentration in the compliance well EX-A06 exceeded the chromium MCL of 100ug/L in the latest sampling round (2009/2010). EX-A06, an extraction well, is by chance located at the tip of this plume where it nears the base fence line and thus prevents the plume from migrating off-base. In the latest sample in 2009/2010, the off-site sentinel well for this plume (well 2-531B) continues to test negative for hexavalent chromium.

A.3.3 Ongoing Remedial Activities

The PRB at Plume 2D appears to be effective while the existing P&T system provides both hydraulic containment for the 2E solvent plume and hexavalent chromium at the base boundary and has been effective at reducing off-base solvent concentrations to below the MCL in that area. However, a secondary effect of pumping is that extraction wells near the base boundary are mobilizing higher levels of groundwater contamination from the up gradient hot spots toward the base boundary (even though several extraction wells are located upgradient along the 2E plume), which is not allowing for a sufficient reduction in the overall extent of contamination at the fence line. Groundwater modeling of both the solvent and chromium plume at the site documents achievement of hydraulic control of TCE in groundwater in the 2E GWMSU but predicts that the P&T system alone would take over 150 years to fully remediate the site to required MCLs. A 2E Plume transport and fate model is in the *Remedial Technology Report Installation Restoration Program Site CG038 Groundwater Management Unit 2, Subunit 2E Tinker AFB, Oklahoma* May 2005 report; note that this reports also contains a discussion of DNAPL migration and dispersal at Tinker AFB. Because of the projected logt time span to fully address groundwater contamination at the site, remedial measures using enhanced in-situ bioremediation (EISB) have been implemented to expedite cleanup. Installation of 105 emulsified vegetable oil injection points in several transects across the plumes and at individual hot spots has been completed. These will remediate higher concentrations within each plume with the aim of both reducing the overall treatment time frame and to eventually phase out operation of the P&T system as well as continue to reduce concentrations near the compliance point, the base boundary. The primary objective of the optimized remedial action is to reduce the total molar concentrations of chlorinated volatile organic compounds (CVOCs) in groundwater management unit (GWMU) 2D, west of S. Air Depot Blvd. and near the Landfill 3 sludge pit, as well as near the base boundary and in 'hot spots' for the GWMU 2E plume, and to promote reduction of hexavalent chromium to the less mobile and less toxic trivalent chromium. The specific areas selected for EISB optimization were chosen to allow for a significant reduction in contaminant mass near the base boundary (and thus reduce concentrations in compliance wells) and to more effectively treat contaminant mass at the high concentration areas near the landfills.

The optimized remedy includes installation of EISB biobarriers and enhanced attenuation treatment transects to contain and reduce the mass of dissolved-phase CVOCs and hexavalent chromium (Cr[VI]) at the base boundary and down gradient from select hot spot areas. EISB was selected as the most appropriate optimization technology based on a successful 2005-2006 pilot study using EISB at Fire Training Area 2. Emulsified vegetable oil (EVO) injections reduced concentrations of trichloroethene (TCE) by 99 percent during the first year of treatment. The optimized remedial action should reduce CVOC and Cr(VI) concentrations approaching the base boundary, which will further reduce the potential risk for off-base contaminant migration. Current remedial activities shall operate until corrective action objectives are met, at which time Tinker may petition the ODEQ to terminate remedial activities, including shut down of active systems.

A.3.4 Corrective Action Objective

General corrective actions for Tinker are outlined in Section 10.5.1 of this application. The corrective action goal vis-à-vis ongoing remedial actions specific to this site is to reduce volatile organic compound concentrations and hexavalent chromium to their respective MCLs in compliance point wells to ensure that there is no further migration off-base. The chromium MCL of 100ug/L shall be used for hexavalent chromium. Pursuent to Section 3004(v) of RCRA as amended by HSWA, corrective actions are required beyond the facility boundary where necessary to protect human health and the environment, unless it can be demonstrated that necessary permission to undertake such actions was unable to be obtained.

A.4 CONTAMINATED GROUNDWATER MANAGEMENT UNIT CG039

A.4.1 Background

Contaminated Groundwater Management Unit 39 (also known as the East CGMU and AF Site CG039), is located in the southeastern quadrant of Tinker AFB. Groundwater contamination was previously separated into two general areas of contamination designated as GWMU 3 and 4. The particular subunits of interest in this attachment are GWMSU 4A, 4B and 3A. Note that GWMSU 3C and 4C are no longer of concern; GWMSU 3C represents a vehicle refueling site at which soil and groundwater contaminated with fuel was discovered and GWMSU 4C, consisting of Waste Pit 2, has been determined to have had no impact to soil or groundwater. Waste Pit 2 (SWMU 13) was approved for NFA in an ODEQ letter dated February 20, 2004. UST Site 7 within GWMSU 3C was investigated as a Category II site under Oklahoma Corporation Commission regulation OAC 165:25-3-76. Facility and case number are Facility #55-08120 and Case #064-1103. The OCC approved site closure in a letter dated June 7, 1996 when it was found that final fuel concentrations in soil and trace amounts of toluene and xylene in groundwater were below OCC cleanup levels for a Catergory II site. Because shallow groundwater at the site is in the HWBZ, and no deeper USZ wells were found to be contaminated, it is presumed that there has been no migration to an aquifer zone where horizontal transport might be likely, and therefore there is little risk from this site.

In addition, applying CAS principles, limited and low level soil or groundwater contamination related to Landfill 5 (SWMU 02, located in GWMSU 4B) is not currently considered as a significant risk and is not slated for remediation at this time. GWMSU 4A includes a number of individual source locations such as an industrial evaporation basin, a fuel yard (AF Site 3700 Fuel Yard), engine test cells, and various other industrial buildings. The fuel yard, the primary source of LNAPL at this subunit, was designated as Case No. 064-DP by the OCC. The case was closed in September 1999. However, groundwater contaminated by solvents from several other sources remains at the site. GWMSU 4B consists of Waste Pit 1, undocumented areas of dumping, and several buildings such as Hangars 2121 and 2122, Building 2101, and the Fuel Truck Maintenance Facility with associated oil-water separator.

CG039 was formed by Tinker AFB in 1996 to address contaminated groundwater in the southeastern quadrant of the Base. Groundwater contamination encompassed by CG039 has been separated into two areas designated as Groundwater Management Units (GWMUs) 3 and 4 based on hydrogeologic conditions and the location of potential source areas. The GWMUs are further divided into Groundwater Management Subunits (GWMSUs) 3A, 3B, 3C, 4A, 4B, and 4C based upon particular plumes and source areas. A brief, and quite generalized, overview of the extent of the COPCs by aquifer zone is provided in the following paragraphs; please note that data is representative of early sampling and data do not necessarily reflect current plume status, as this is changing as additional remediation is occurring.

Contaminated groundwater at CG039 is present in the USZ, LSZ, and lower, lower saturated zone (LLSZ) in the form of several isolated plumes. The main sources of impacted groundwater in CG039 generally originate from Fire Training Area (FTA) 2, IWP1, and ST032; however, plumes are comingled from multiple sources in this area. There are approximately 6 plumes in the USZ, 2 plumes in the LSZ, and 1 small plume in the LLSZ. The saturated extent of the USZ pinches out a short distance to the east of the base boundary near ST032, which limits the potential for significant migration away from the site in this direction. The maximum concentrations based on the 2009 data include PCE at 947ug/L in the USZ near ST032, and in the USZ near WP018, concentrations of TCE at 6,500 ug/L, cis-1,2-DCE at 3,200 ug/L, and 1,2- dichloroethane (DCA) at 32,000ug/L.

USZ: Five VOCs were identified as primary COPCs for the USZ at Site CG039: 1,2-DCA, cis-1,2-DCE, PCE, TCE, and VC. From 1999 through 2004, 787 samples were collected, with 10.2% of 1,2-

DCA, 14.5% of cis-1,2-DCE, 13.5% of PCE, 50.2% of TCE, and 4.7% of VC samples above respective MCLs. 1,2-DCA was identified above the screening criteria in two distinct areas: GWMSUs 3B and 4B.

The smaller area of 1,2-DCA contamination appears in GWMSU 3B adjacent to monitoring well 2-62B, immediately east of FTA 2, and extends northwest from the monitoring well. Monitoring well 2-62B contained the highest concentration (250 micrograms per liter [µg/L]) in 2004. A 1,2-DCA detection also occurred in monitoring well 2-168B (5.4 µg/L) south of FTAs 2 and 3. The second area of contamination was observed in GWMSU 4B extending beneath the Fuel Purge Facility (FPF), UST Site 33, and Waste Pit 1. Within the plume, monitoring well 2-176, located south of UST Site 33, was identified with the highest concentration of 1,2-DCA (27,000 µg/L). Detections also occurred in monitoring well 2-369B (5.5µg/L), located southwest of the FTMF, and in monitoring well 2-364B (7.6 µg/L), located near the corner of Building 2121 in GWMSU 4A.

PCE contamination was identified in GWMSUs 3A, 3B, 4A, and 4B. One small plume appeared northeast of FTA 2 (GWMSU 3B) at monitoring well 2-65B, with a concentration of 45µg/L. Two plumes were located in GWMSU 3A to the northwest and southwest of Landfill 5. The highest detections were in monitoring wells 2-302B and 2-114B, with concentrations of 17 and 6.5 µg/L, respectively.

Several PCE plumes were identified in GWMSUs 4A and 4B. Two small plumes were located north of the GWMSU 4A boundary, and one large plume extended from the 3700 Fuel Yard through the Former Industrial Waste Evaporation Basin toward the northwestern edge of Sector B of the Southeast Quadrant Industrial Wastewater Collection Area. The area is described in the *Southeast Quadrant Wastewater Collection System Site Investigation Report*, completed March 2001. The highest detection of PCE (610 µg/L) was identified at monitoring well 2-9, located southwest of the 3700 Fuel Yard. Two smaller plumes were located in GWMSU 4B, one extending from the FTMF and the other, slightly larger, plume extending south from UST Site 33 and the FPF toward Waste Pit 1. The highest detections in the two plumes were from monitoring well 2-60 (32 µg/L), located west of the FTMF, and from monitoring well 2-87B (79 µg/L), located south of the FPF and UST Site 33 and northeast of Waste Pit 1.

Two plumes were identified in GWMSU 3A, one to the northwest and one to the southwest of Landfill 5. Monitoring wells 2-302B and 2-357B had concentrations of 190 and 84 µg/L, respectively. The larger TCE plume, located near FTAs 2 and 3 in GWMSU 3B and extending to the northwest, had a TCE concentration of 8,300 µg/L at monitoring well 2-62B. A fourth plume was identified near UST 8; the highest concentration of TCE occurred at monitoring well 2-155B (8.1 µg/L), located north of UST 8.

One large TCE plume was identified in GWMSU 4A, extending from the 3700 Fuel Yard through the Former Industrial Waste Evaporation Basin and Sector B of the Southeast Quadrant Industrial Wastewater Collection Area. The highest detection of TCE (2,000 µg/L) was identified at monitoring well 2-363B, located south of the Former Industrial Waste Evaporation Basin and north of the Southeast Quadrant Industrial Wastewater Collection Area. One smaller plume is located to the northeast of the 3700 Fuel Yard, with the highest concentration of TCE (200 µg/L) detected in monitoring well 2-107B.

TCE was also detected at Site 38 north of GWMSU 4A in monitoring well 2-199 at a concentration of 27 µg/L. Within GWMSU 4B, four areas of TCE contamination were identified. The largest area extends south from the FPF, UST Site 33, and Waste Pit 1. The highest detection in the plume was from monitoring well 2-176 (15,000 µg/L) located at UST Site 33. One smaller plume was identified extending from the FTMF. The highest detection occurred in monitoring well 2-60 (30 µg/L). Concentrations of TCE were also detected at two locations in the Southeast Quadrant Industrial Wastewater Collection Area (Sector A) between Buildings 2122 and 2136 at monitoring wells 2-366B (9.3 µg/L) and 2-367B (13 µg/L).

Several cis-1,2-DCE plumes were identified at Site CG039 in GWMSUs 3A, 3B, 4A, and 4B. Two plumes were identified in GWMSU 3A, one to the northwest and one to the southwest of Landfill 5. Monitoring wells 6 and 2-357B had concentrations of 32 and 17 µg/L, respectively. The larger TCE plume, located near FTAs 2 and 3 and extending to the northwest, had a cis-1,2-DCE concentration of 880 µg/L at monitoring well 2-62B.

One cis-1,2-DCE plume was identified in GWMSU 4A extending south of the 3700 Fuel Yard, through the Former Industrial Waste Evaporation Basin and JETC Building 3234, and southward into Sector B of the Southeast Quadrant Industrial Wastewater Collection Area. The highest detection was identified at monitoring well 2-363B (370 µg/L), located south of the Former Industrial Waste Evaporation Basin and north of the Southeast Quadrant Industrial Wastewater Collection Area. Within GWMSU 4B, three cis-1,2-DCE plumes were identified near the FPF, UST Site 33, and Waste Pit 1. The highest detections in the plumes were from monitoring well 2-308B (1,200 µg/L), located at UST Site 33; monitoring well 2-119B (820 µg/L), located at Waste Pit 1; and monitoring well 2-369B (430 µg/L), located south of the FPF and UST Site 33. One smaller plume was identified extending from the FTMF. The highest concentration occurred at monitoring well 2-376B (24 µg/L).

VC was identified in two areas in GWMSU 3A and in one area in GWMSU 3B. Monitoring wells 6 and 58BR, located northwest and southwest of Landfill 5, had VC concentrations of 3.4 and 2.4 µg/L respectively. Monitoring well 2-65B, located northeast of FTA 2, had a concentration of 2.1 µg/L. One VC plume was also identified northwest of the JETC Building 3234 and south of UST Site 38. The highest concentration in the plume occurred at monitoring well 1-72B (21 µg/L). The presence of cis-1,2-DCE and VC in the groundwater indicates that biodegradation of TCE is occurring. The extent of TCE contamination in the USZ far exceeds the extent of other volatile organic constituents identified at Site CG039.

LSZ: TCE and cis-1,2-DCE were identified as primary COPCs for the LSZ. From 1999 through 2004, 323 samples were collected, with 25.1% of the TCE samples above the MCL, and 6.5% of the cis-1,2-DCE samples above the MCL.

Several large TCE plumes have been identified at Site CG039 in the LSZ. Monitoring well 2-115A, located west of UST Site 8, had a concentration of 9.2 µg/L of TCE. A larger TCE plume was identified in GWMSU 4A and extends from the 3700 Fuel Yard through the Former Industrial Waste Evaporation Basin, Sector B of the Southeast Quadrant Industrial Wastewater Collection Area, and the JETC buildings. The highest detection of TCE (610 µg/L) was identified at monitoring well 2-363B, located south of the Former Industrial Waste Evaporation Basin and north of the Southeast Quadrant Industrial Wastewater Collection Area. Within GWMSU 4B, two areas of TCE contamination were identified, one located south of the FPF and one located southeast of UST Site 33. The highest detections were from monitoring well 2-70 (12 µg/L), located south of the FPF, and from monitoring well 2-308A (12 µg/L), located southeast of UST Site 33.

Several areas of PCE, cis-1,2-DCE, and VC contamination were identified in GWMSU 4A within Site CG039. The highest detection of PCE (13 µg/L) was identified at monitoring well 2-10A, located north of the 3700 Fuel Yard. The cis-1,2-DCE plume extends from the 3700 Fuel Yard, the Former Industrial Waste Evaporation Basin, and the JETC buildings. The highest concentration of cis-1,2-DCE was identified at monitoring well 2-10A (310 µg/L), located north of the 3700 Fuel Yard. The VC plume was identified northwest of the JETC (Building 3234) and south of UST Site 38. The highest concentration in the plume occurred at monitoring well 1-72B (13 µg/L). The presence of cis-1,2-DCE and VC in the groundwater indicates that biodegradation of TCE is occurring.

LLSZ: TCE was the only contaminant identified as a COPC for the LLSZ. From 1999 through 2004, 116 samples were collected, with 5.2% of the TCE samples above the MCL. A small TCE plume was identified in GWMSU 4A. Monitoring well 2-108C, located southeast of the Former

Industrial Waste Evaporation Basin and north of the Southeast Quadrant Industrial Wastewater Collection Area, had the highest concentration of TCE at 30 µg/L.

A.4.2 Site History

Various active remedies have been installed and operated at CG039. A biovent system designed to remove soil fuel contamination at the 3700 Fuel Yard installed in 1995 was dismantled; the site was closed under OCC Case #064-DP on September 22, 1999. A positive differential displacement (PDD) extraction system installed to mitigate contamination along fuel transfer lines between the fuel yard and fueling stations located on the airfield ramp area. The PDD was installed early 2003, but was shut down on May 4, 2012.

Solvent plumes are found in both the USZ and the LSZ at GWMSU 4A of CG039; migration of these contaminants is primarily to the southwest. However, a groundwater divide exists in the USZ that creates a semi-radial flow pattern in that zone which results in some eastward contaminant movement. Because contamination in the easternmost solvent plume was noted in the 1990s to have reached the base boundary, data was reviewed to evaluate whether off-site migration was occurring. No active remedial technologies were implemented because it was discovered that migration off-site is prevented by the local hydrogeology; shallow (USZ) contamination that appears to be migrating off-base toward the east is actually migrating vertically downward to the next lower saturated zone (LSZ), and flows to the southwest back under the base (see Figure 10-6). Monitoring wells, which have existed and been tested at this location since 1994, show that saturation in the USZ ends less than 500 feet east of the base boundary, while contamination is contained on base. The limited saturated extent, and the presence of downward vertical migration pathways, appears to preclude eastward migration. The current corrective action therefore includes compliance and sentinel well monitoring, which has continued over the last nearly two decades.

A.4.3 Ongoing Remedial Activities

Although significant remedial activities (both as interim actions and pilot test programs) have already occurred within various groundwater management units at CG039, additional remedial activities are underway. GWMUs where remediation is active include GWMSU 3B, GWMSU 4A, and GWMSU 4B. At GWMSU 3B (Fire Training Area 2), both a bioreactor and a number of EVO injection wells have been constructed. Injections into these wells began in May 2013 and the bioreactor began operation in May 2013. The primary purpose is to reduce hot spot concentrations of solvents in groundwater, thus decreasing source potential, and by doing so reduce the time and cost for long term remediation. Sampling has shown that no continuing soil sources remain, and NFA for FTA 2 soils and removal from the Permit requested. An additional benefit is that by reducing higher concentrations, migrating contaminants will be at lower concentrations. A similar concept has been applied at GWMSU 4B (Waste Pit 1 area), where several sets of EVO injection wells have been installed in areas of higher solvent concentration. Although the soils at the waste pit have been deemed to no longer act as a source, groundwater contamination has persisted. Based on groundwater flow and transport modeling afforts at CG039 as outlined in the *Corrective Measures Study Report Installation Restoration Program Site CG039 Tinker AFB Oklahoma (February 2006)*, ODEQ agreed to MNA as the remedy. The report demonstrates that groundwater at CG039 will most likely not migrate to the Base boundary due to groundwater flow direction and distance downgradient to the Base property line. However, by reducing the hot spots the likelihood is even further reduced. Several of the injection wells are also located in areas where no previous remediation had occurred, although several clean up activities have taken place at the waste pit itself. Additional proposed future remediation at GWMSU 4B within CG039, includes soil excavation at sites such as Site OT067 (Building 2101) and Site OT066 (Building 2110 OWS).

A.4.4 Corrective Action Objective

General corrective action objectives for Tinker are outlined in Section 10.5.1 of this application. The corrective action goal vis-à-vis monitored natural attenuation specific to this site is to allow natural attenuation to reduce volatile organic compound concentrations to their respective MCLs and to continue to monitor compliance wells to ensure contaminants do not migrate off-base. Pursuent to Section 3004(v) of RCRA as amended by HSWA, corrective actions are required beyond the facility boundary where necessary to protect human health and the environment, unless it can be demonstrated that necessary permission to undertake such actions was unable to be obtained.

A.5 CONTAMINATED GROUNDWATER MANAGEMENT UNIT CG040

A.5.1 Background

Contaminated Groundwater Management Unit 40, also known as AF Site CG040, the Gator Site, or CHOT Site, is located approximately 1 mile east-southeast of the main installation of Tinker AFB and south and east of the intersection of Southeast 59th Street and Post Road. The site encompasses an area of approximately 15 acres, with private property bounding it on all sides. The facility includes parking areas, an office and maintenance building (Building 4031), and a septic system. The Air Force purchased the CG040 site in the early 1950s. The site has been used for storage and maintenance of mobile communications equipment and monitoring equipment support units and is currently used as a satellite training site by the 3rd Combat Communication Squadron. The types of equipment stored, operated, and maintained at the site have included transport vehicles, electrical generators and transformers, and mission-related electronic equipment. Building maintenance supplies were probably also stored at the site. Potential contaminants resulting from these activities include vehicle and generator fuel and lubricants, dielectric oils (i.e., polychlorinated biphenyls) used in electric transformers and generators, and materials related to maintenance of electrical equipment such as solvents and metals from soldering materials. Unlike the other CGMUs which contain multiple plumes, CG040 has a single groundwater plume. Volatile organic contamination, primarily trichloroethene, is found in both the Upper Saturated Zone and the Lower Saturated Zone at the site. CG040 has also been referred to as GWMSU 5B; the relationship of CG040 to the GWMSU is more fully described in Section 10.5.4.1. A brief, and quite generalized, overview of the extent of the COPCs by aquifer zone is provided in the following paragraphs; please note that data is representative of early sampling and data do not necessarily reflect current plume status, which is changing as additional remediation is occurring.

TCE has historically been the only contaminant detected above its MCL in site monitoring wells although low levels (well below the MCL) of cis-1,2-dichloroethene (DCE) were detected in a few wells during early sampling, it has been detected above its MCL in three injection wells during more recent 2015 sampling, probably as a secondary effect of EISB. A specific source of TCE cannot be attributed to this site, and several attempts to find the source have proven unsuccessful.

USZ: The horizontal extent of TCE contamination in the USZ is bounded based on non-detect values in groundwater samples, with the southern and eastern extent of contamination defined by the edge of the USZ. Although the source of TCE contamination at CG040 has not been identified during previous investigations, persistent concentrations at certain locations over time provide an indication of specific areas where spills or dumping occurred, which may be acting as historical source areas. Historical data indicate that TCE concentrations are generally decreasing near the plume boundaries, including the area near the Matlock well, which is the closest private off-Base domestic well. However, TCE concentrations were generally stable near the area surrounding well the now abandoned GTR-P6 well prior to optimization, indicating this well is near the likely historical source of the remaining USZ TCE plume.

Under static conditions (non-pumping), groundwater in the USZ beneath the Gator Facility flows in a semi-radial pattern off a northwest-southeast trending groundwater high that bisects the site. The area of highest concentrations of TCE in the USZ coincides with the axis of the groundwater high around monitoring well cluster 2-116 and the piezometer GTR-P7, up gradient of the septic tank and leach field. If the TCE plume were not contained by pumping, it would migrate primarily northwest and southeast. Under "pumping" conditions with the french drain sumps operational, drawdown is developed around the drains, altering the groundwater flow pattern and helping to contain and extract contamination. The southeastern extent of contamination in the USZ coincides with the terminal edge of the USZ; the remaining horizontal extent of TCE contamination is delineated by wells and therefore has been defined in the USZ.

Only TCE was detected above the maximum contaminant level (MCL) in groundwater based on data collected in 2011 during the basewide monitoring event. The maximum historical detection of TCE was 1,200 micrograms per liter (µg/L) in 2001 at former USZ well GTR-P6; this well can no longer be used as a monitoring well since it was replaced during the RA-C and the location is currently within the north bioreactor recently installed at the site. The new well is designated as GTR-P6R. The TCE concentration in former well GTR-P6 was 720ug/L in 2011, according to the most recent data available prior to RA-C design and construction (Versar, 2012a). The maximum historical detection of cis-1,2-dichloroethene (cis-DCE or DCE) was 38ug/L at well 2-118B in 1995; however, concentrations of cis-1,2-DCE in site monitoring wells are currently below the MCL of 70µg/L, but has appeared in several injection wells. While cis-1,2-DCE and vinyl chloride were not present at the site in excess of their respective MCLs prior to the RA-C, short-term accumulation of these TCE degradation products is expected to occur as a result of enhanced in situ bioremediation (EISB) treatment.

The horizontal extent of TCE contamination above regulatory limits in the USZ was defined based on the extent of values above the MCL in groundwater samples. The USZ pinches out in the area north of Southeast 59th Street and in areas to the south and east of Tinker AFB property, where creeks have eroded away the sediments or where the USZ/LSZ aquitard sediments are too thin to support a saturated zone. Although the source of TCE contamination at CG040 has not been identified during previous investigations, persistent concentrations at certain locations over time provide an indication of specific areas that may be acting as historical source areas. Historical data indicate that TCE concentrations are generally decreasing near the plume boundaries, including the area towards the northern limit of extent near the Matlock well, which is the closest private off-base domestic well.

Between 2002 and 2010, the TCE concentration in former well GTR-P6 fluctuated between 80 and 743ug/L, indicating natural attenuation and the existing French drains in the USZ alone were not sufficient to achieve the cleanup goals. Optimized remedial activity includes EISB via injection wells and two bioreactors.

LSZ: Under static conditions, groundwater in the LSZ flows off an east-west trending groundwater high located in the southern portion of the site. Groundwater flow in the area of the site where

TCE concentrations are the greatest (around monitoring well 2-118) is generally to the east-southeast. Under pumping conditions generated by extraction well GTR-EX, screened across the entire LSZ, a large capture zone developed that extended past wells 2-118A and 2-118E, eventually reaching beyond monitoring wells 2-460A and 2-461A to the south and east, and extended past 2-116 to the north; GTR-EX therefore captures the entire LSZ TCE plume. The extent of contamination in the LSZ is fairly well defined except possibly just west of the extraction well; the highest concentration of TCE was originally at boundary well 2-118A, but once pumping began the LSZ water table dropped below the screen of the well. A deeper well, 2-118E, was therefor installed to allow monitoring of the down gradient LSZ at this fence line location. However, the LSZ wells to the south are widely spaced (400 feet apart or more) and the closest well to the north originally was 2-116A. New monitoring wells 2-460A and 2-461A installed in late 2002 helped to define the extent of TCE to the south and east, and well 2-505A, currently showing the highest LSZ TCE concentration, was installed to help characterize the upgradient extent to the northwest. Unfortunately, remediation based soley on the extraction well was slow, and additional remedial activity via EISB is now underway at the LSZ.

LLSZ: The impact of dissolved chlorinated hydrocarbons in the LLSZ appears to be limited to low concentrations in the southeastern corner of the site in the area of well 2-118C and the extraction well, GTR-EX, which is partially screened in the upper portion of the LLSZ. The concentration in 2-118C had been constant or rising slightly over the last four years but was expected to be contained by the extraction well. The vertical extent of contamination appears to be defined, with no TCE detected in any of the deepest monitoring wells on site (2-116C, 2-118D, 2-315C, 2-316D).

A.5.2 Site History

A groundwater stabilization system (GWSS) was installed at CG040 in 1999 as an interim corrective measure to minimize further migration of contamination off-site while long-term corrective action remedies were evaluated and implemented. The system consists of two French drains in the USZ, including a North Drain Line (NDL) and a South Drain Line (SDL), a single extraction well installed in the LSZ, and an air stripper groundwater treatment system. The system was installed to: (1) prevent further migration of contaminated groundwater while long-term remedies were evaluated, and (2) evaluate the effectiveness of the French drains in collecting and extracting USZ groundwater at the site. To monitor the effective radius of the NDL/SDL French drain system, ten piezometers (P1 through P10) were installed in the USZ. Other groundwater monitoring wells also exist at the site, both inside and outside of the fence line.

Because the site consists of a single plume, remedial activities are described by groundwater zone, including the USZ and the LSZ/LLSZ. The upper zone is essentially treated as the source for the lower zone. No clear past or ongoing soil source has been identified at this site.

USZ: Because the saturated edge of the USZ is approximately coincident with the eastern site boundary, lateral migration to the east is limited within the USZ to about 250 feet; the current compliance point well 2-118B has a TCE concentration below the MCL and the down gradient sentinel well, 2-316C, located roughly 100 feet to the east off-site is non-detect for volatile organic compounds.

There are no human receptors within the area of USZ saturation in that direction. The single private well exposure point for the USZ is a private water supply well located just off the northwest corner of the site; based on early annual sampling and current sampling at a 15-month interval, this well has historically been non-detect for site contaminants. Monitoring wells located between the north French drain and the private well indicate that volatile organics have decreased in that area since the system became operational. Compliance and sentinel wells are located around the plume since the natural groundwater flow is semi-radial, including monitoring points near the private water supply well, although the French drains have generated a temporary flow pattern that directs contaminated water inward toward the drains while the system is operational, thus preventing further flow off-site. The pattern of compliance wells is designed to reflect long-term monitoring once the system has been approved for shut down.

LSZ/LLSZ: Volatile organic compounds, primarily trichloroethene, have migrated vertically to the LSZ from the USZ, and then traveled off site to the southeast. Compliance and sentinel wells consist of an array of both on site and off site monitoring points located to the southeast where the down gradient end of the plume is found. Potential receptors are private water supply wells in a housing addition located just under 1,000 ft east and southeast of the on-Base plume along Raintree Drive. Analytical results from groundwater samples previously collected by the Oklahoma Department of Environmental Quality from a number of the private water wells in that subdivision indicate that wells have not been impacted by groundwater contamination associated with CG040. Although no records exist, these water wells are believed to be screened in the LSZ and/or LLSZ. In addition, the concentration of TCE has generally declined over time in monitoring wells located off-site and down gradient within the LSZ, indicating that the single extraction well has been effective in preventing further migration of TCE to the southeast. Based on the decline in TCE concentrations in monitoring wells located beyond the fence line, the extraction well also appeared to be pulling TCE back toward the base due to locally reversing the hydraulic gradient. TCE concentrations off-site are now below the MCL based on the latest (2016) sampling (CH2M Hill, pers. communication).

A.5.3 Ongoing Remedial Activities

Mass removal rates suggest that the existing extraction system alone will not achieve the objectives for site cleanup to MCLs within a reasonable time frame. However, the 2006 statement of basis allows for optimization of the existing remedy. Optimization approaches such as adding additional extraction wells to the P&T system or employing in situ treatment via ISCO were evaluated, but neither remedy was expected to achieve the objectives for site cleanup as effectively as enhanced in situ bioremediation (EISB). EISB has been successfully demonstrated at other locations at Tinker AFB. Additionally, no significant technical implementation issues are associated with EISB, and this approach will greatly reduce the toxicity, mobility, and volume of contaminant mass, having both short-term and long-term benefits for the site. Therefore, EISB has been implemented to complement the existing extraction system to increase contaminant mass degradation rates. The EISB treatment includes injection of an electron donor substrate via new injection wells. EVO injections and two bioreactors have been completed at the site, with additional injection planned at future intervals. The bioreactors and a number of injection wells have been placed in the USZ, along with injection wells in the LSZ, in areas where TCE concentrations are greatest. Excavation of the two bioreactors, the north one located at GTR-P6, is believed to have also removed some potential soil source material, although excavated soil was not characterized. The existing extraction system will be operated in a pulsed mode to enhance distribution of bioamendments and to ensure that down gradient hydraulic control is maintained. However, the system is currently turned off to help evaluate rebound and to evaluate what effect there is on distribution of injected materials.

Pulsed operation of the system, excavation of source areas, and significant enhancement of mass degradation rates with EISB are expected to accelerate cleanup. This approach is also expected to accelerate mass transfer of TCE from the low permeability sediments at the site, which are currently inaccessible to treatment by the P&T system. The overall optimization approach and the expected increase in the mass degradation rates will be evaluated further as part of performance monitoring. Once the bioamendments were distributed through the target treatment zone and hydraulic containment of the plumes no longer appeared necessary, the extraction system was shut down. Components will remain in place temporarily however during the ensuing monitoring period so that it the can be restarted in case of an unexpected future need for hydraulic control. Current remedial activities will operate until corrective action objectives are met, at which time Tinker may petition the ODEQ to terminate remedial activities, including shut down of active systems.

A.5.4 Corrective Action Objective

General corrective action objectives for Tinker are outlined in Section 10.5.1 of this application. The corrective action goal vis-à-vis ongoing remedial actions specific to this site is to reduce volatile organic compound concentrations to their respective MCLs in compliance point wells and in contaminated off-base wells down gradient of this site. Pursuent to Section 3004(v) of RCRA as amended by HSWA, corrective actions are required beyond the facility boundary where necessary to protect human health and the environment, unless it can be demonstrated that necessary permission to undertake such actions was unable to be obtained.

A.6 REFERENCES

Parsons Engineering Science, March 2001. *Site Investigation Report Southeast Quadrant Wastewater Collection System Tinker Air Force Base, Volume I.*

Science Applications International Corporation, May 2005. *Remedial Technology Report Installation Restoration Program Site CG038 Groundwater Management Unit 2, Subunit 2E Tinker Air Force Base, Oklahoma.*

Science Applications International Corporation, February 2006. *Corrective Measures Study Report Installation Restoration Program Site CG039 Tinker Air Force Base, Oklahoma (CG039 Modeling).*

Science Applications International Corporation, April 2010. *Contract Summary Report CG038 Remedial Process Optimization Upper Saturated Zone Volatile Organic Compound Plumes*.

SECTION 10: ATTACHMENT B - Tinker Conceptual Site Model/Facility Overview

B.1 INTRODUCTION

Tinker AFB is located in central Oklahoma, approximately five miles southeast of downtown Oklahoma City. The Base is bounded on the west by Sooner Road, on the east by Douglas Boulevard, on the north by Interstate 40, and on the south by Southeast 74th Street (Figure 1-1). The surrounding area is a mixture of commercial and residential properties. Communities located in the immediate vicinity of the Base include Midwest City to the north, Del City to the west, and Oklahoma City to the south and east.

Tinker AFB's mission is dedicated to providing worldwide technical logistics support to Air Force aerospace weapon systems, equipment, and commodity items, and encompasses a myriad of responsibilities. The logistics center manages or maintains the B-1B, B-2, B-52, E-3, and the C/KC-135 series aircraft. It performs annual depot-level maintenance on more than 120 aircraft and overhauls and maintains more than 1,100 engines from 11 major commands, as well as the Army, Navy, and numerous foreign countries. The center also manages various missile systems. Tinker AFB also accommodates a large family of associate organizations representing several major commands. Two large Air Combat Command support units add to the complex mission of the Base. Tinker AFB is the home operating base for the 552nd Air Control Wing flying the E-3 Sentry, and the Air Force Reserve's 507th Air Refueling Wing. Tinker AFB is also home of the Navy's E-6A Strategic Communications Wing One.

Tinker AFB has been and remains a major industrial complex for overhauling, modifying, and repairing military aircraft, aircraft engines, and accessory items. Base operations began in 1942 and certain activities employing hazardous materials resulted in the generation of hazardous wastes. These wastes have included spent organic solvents, waste oils, waste paint strippers and sludge, electroplating wastewater and sludge, alkaline cleaners, acids, jet fuels, and radium paints. Wastes that currently are generated are managed at two permitted hazardous waste storage facilities. However, prior to enactment of the Resource Conservation and Recovery Act of 1976 (RCRA), industrial wastes were discharged into unlined landfills and waste pits, streams, sewers, and ponds. Past releases from these areas and from underground storage tanks (USTs) have occurred, resulting in soil, groundwater, and surface water contamination.

Due to the large size of the Base, multiple contaminant sites, and comple hydrogeology, no single conceptual site diagram would be able to encompass specific site information. Therefore, a CSM diagram for each of the four Groundwater Contaminated Units has been included; these four units cover the majority of the Base investigated and remediated under RCRA authority. The four diagrams include CG037, CG038, CG039, and CG040. Groundwater Management units and associated contamination are described in detail in Attachment A. Note that the CSM diagram for CG037 is a draft version as it is currently undergoing an update.

B.2 GEOLOGIC FRAMEWORK

Tinker AFB is situated atop a sedimentary rock column composed of marine and terrestrial strata ranging in age from Cambrian to Permian, which overlies a Precambrian igneous basement Outcropping units consist of Quaternary-age very poorly sorted and unconsolidated-to-partially consolidated alluvium and terrace deposits locally present in and near present-day stream valleys, and Permian-age fluvial-deltaic strata consisting of layered and consolidated to partially consolidated rock material. Permian units, the primary water-bearing strata, tend to be lenticular in nature; interfingering sandstones and mudstones form complex pathways for groundwater movement. The major lithologic units in the area of the Base are relatively flat lying and have a dip of about 0.0076 ft/ft (or 40 ft/mile) to the west-southwest.

Tinker AFB is located within a moderately active tectonic area. A major fault zone, along the eastern flank of the Oklahoma Anticline is located west of the Base. Recent investigations have suggested that a limited expression of this fault zone may lie immediately west of the Base boundary and likely extends onto the western-most portions of the Base. Note that recent increased seismic activity (faulting) has been occurring in the surrounding area, possibly due to injection of fluid drilling wastes in nearby injection wells, although no impacts have been detected at Tinker AFB.

B.2.1 Stratigraphy

Quaternary-age deposits near Tinker AFB consist of unconsolidated weathered bedrock, fill material, windblown sand, and interfingering lenses of sand, slit, clay, and gravel of fluvial origin (SAIC 2011). Terrace deposits are exposed where stream valleys have downcut through older strata and have left the terraces topographically above present-day deposits. Alluvial sediment ranges in thickness from less than 1 ft to nearly 20 ft.

Subsurface (bedrock) geologic units that crop out at Tinker AFB include the Hennessey Group and the Garber Sandstone. These are identified on the two hydrogeologic cross-sections included with this permit renewal application, IT Extension B-B' and IT RFI C-C', discussed later. The Wellington Formation, which does not outcrop at Tinker AFB, underlies the Garber Sandstone at the site. These bedrock units were deposited during the Permian age (230 to 280 million years ago) and are typical redbed deposits formed during that period. The units are composed of a conformable sequence of sandstones, siltstones, and mudstones. The Hennessey Group includes reddish-brown mudstone, with a few lenticular beds of very fine grained sandstone or siltstone. Individual beds are lenticular and vary in thickness over short horizontal distances. The Hennessey Group is absent in the northern and the northeasteastern portions of the Base due to erosion but is present at the surface across a large part of the Base as a thin veneer. It thickens to around 70 ft thick in the southwestern portion of the Base. The updip edge of the Hennessey Group is shown, and labeled, on the March 2015 HWBZ potentiometric surface map (Figure 2) by an orange hatched line trending east of and across the northeast corner the Base.

The Garber Sandstone and the Wellington Formation have similar lithologies. In central Oklahoma, these units consist of lenticular beds of fine-grained, cross-bedded sandstone interbedded with siltstone and mudstone. Both of these formations were deposited in a fluvial- deltaic environment at the margin of a broad Permian basin located to the west. A Permian delta is reported to have existed generally in the vicinity of Oklahoma County. Because the units are lithologically similar and devoid of fossils or key beds, the Garber Sandstone and the Wellington Formation are difficult to distinguish; informally they are known as the Garber-Wellington. Together, these two units are approximately 1,000 to 1,200 ft thick at Tinker AFB.

Correlation of geologic units is difficult due to the discontinuous nature of the sandstone and shale beds. However, cross-sections demonstrate that two stratigraphic intervals can be correlated over large sections of the base in the conceptual model. These intervals are represented on geologic cross-sections IT Extension B-B' and IT RFI C-C', included as Figures 10-8 and 10-9 respectively. The first correlatable interval (USZ/LSZ aquitard) is marked by the base of the Hennessey Group and the first sandstone at the top of the Garber Sandstone. This interval is mappable over the entire Base. The second interval (LSZ/PZ aquitard) consists of a shale zone within the Garber Sandstone which in places is comprised of a single shale layer and in other places of multiple shale layers. This interval is more continuous than other shale intervals and in cross-sections appears mappable over a large part of the base. It is extrapolated under the central portion of Tinker where little well control exists. Stratigraphic correlations were also supported, and tested, by incorporating water level data. A set of nearly 100 cross sections was generated over time, hydrogeologically 'tied', and correlations tested each time new wells are installed. A map presenting the location of these digitized sections is included in the *Task Order Final Report 2007 Basewide Environmental Groundwater Sampling and Water Level Measurements* Report, August 2009. The report includes all cross sections in a .pdf format.

The surficial geology of the north section of the Base is dominated by the Garber Sandstone, which crops out across a broad area of Oklahoma County. Generally, a thin layer of soil and/or alluvium up to 20 ft thick covers the Garber Sandstone. To the south, the Garber Sandstone is overlain by outcropping strata of the Hennessey Group, including the Kingman Siltstone and the Fairmont Shale. Subsurface data acquired during geotechnical investigations and monitoring well installations confirm the presence of these units. A generalized geologic column is provided as Figure 10-7. Two hydrogeologic cross sections (Figures 10-8 and 10-9) are included with this renewal application; these provide base-wide subsurface views of geologic strata and aquifer zones and how they interrelate. The two included cross sections are located in pockets at the end of this document.

B.2.2 Depositional Environment

The Permian-age strata presently exposed at the surface in central Oklahoma were deposited along a low-lying, north-south oriented coastline. Land features included meandering to braided, sediment-laden streams that flowed generally westward from highlands to the east (ancestral Ozarks). Sand dunes were common, as were cut-off stream segments that rapidly evaporated. The climate was arid and the vegetation was sparse. Offshore, the sea was shallow and deepened very gradually to the west, and the shoreline position varied over a wide range. Isolated evaporitic basins frequently formed as the shoreline shifted. This depositional environment resulted in an interfingering collage of fluvial and windblown sands, clays, shallow marine mudstones, and evaporite deposits. The overloaded streams and evaporitic basins acted as sumps for heavy metals such as iron, chromium, lead, and barium. Oxidation of iron in the arid climate resulted in the reddish color now seen in many of the sediments. Erosion and chemical weathering of granitic rocks from the highlands resulted in extensive clay deposits. Evaporite minerals, such as anhydrite ($CaSO4$), barite ($BaSO4$), and gypsum ($CaSO4 \bullet 2H2O$), are common.

Around Tinker AFB, the Hennessey Group consists predominately of red mudstones with thin (i.e., less than 10 ft in thickness) lenticular beds of very fine-grained sandstone and siltstone. The contact between the Hennessey Group and the underlying Garber Sandstone is often difficult to distinguish; thin remnants of the Hennessey Group appear to be present in the central, eastern, and northeastern parts of the Base. The Hennessey Group was deposited in a tidal flat environment cut by shallow, narrow channels. In outcrops, “mudball” conglomerates, burrow surfaces, and desiccation cracks are recognizable. By contrast, the Garber Sandstone and much of the Wellington Formation at Tinker AFB consist mostly of an irregularly interbedded system of lenticular sandstones, siltstones, and mudstones deposited either in meandering streams in the upper reaches of a delta or in a braided stream environment. Correlation of individual units and identification of the contact between the two formations are difficult due to the lack of key marker beds. As a result, the units are commonly referred to as the Garber-Wellington. Garber-Wellington outcrop units north of the Base exhibit many small to medium channels with cut-and-fill geometries consistent with a stream setting. Sandstones are typically cross-bedded.

Individual beds range in thickness from a few inches to approximately 50 ft and appear massive, but thicker units are often formed from a series of “stacked” thinner beds. Geophysical and lithologic well logs indicate that from 65 to 75% of the Garber Sandstone unit at Tinker AFB well is composed of sandstone. The percentage of sandstone decreases to the north, south, and west of the Base.

These sandstones are typically fine to very fine-grained, friable, and poorly cemented. However, where sandstone is cemented by red muds or by secondary carbonate or iron cements, local thin “hard” intervals exist along disconformities at the base of sandstone beds. Mudstones are described as ranging from clayey to sandy, are generally discontinuous, and range in thickness from a few inches to approximately 40 ft. The regional and local hydrogeology for Tinker AFB has been described in previous investigations for the northeast quadrant of the Base and in numerous reports completed by federal and state agencies. Regional hydrogeologic conditions are summarized below, followed by a more detailed description of local hydrogeologic conditions.

B.3 HYDROGEOLOGY

B.3.1 Regional Hydrogeology

Ground water hydrology of the Tinker Air Force Base - Oklahoma City area has been reported by various authors, including Jacobsen and Reed (1949), Wood and Burton (1968), Bingham and Moore (1975), Bedinger and Sniegocki (1976) and Wickersham (1979). Additional information has been obtained from interviews with officials of the Oklahoma Water Resources Board, the District Office, U.S. Geological Survey Water Resources Division, and the Association of Central Oklahoma Governments (ACOG).

The most important source of potable groundwater in the Oklahoma City metropolitan area is the Central Oklahoma Aquifer (COA) System. Two of the primary water-bearing units of this system include the Garber Sandstone and the Wellington Formation. Together, they are commonly referred to as the Garber-Wellington Aquifer and are considered to form a single aquifer because the units were deposited under similar conditions and because many of the best producing wells are completed in this zone. Tinker AFB obtains much of its water from this source while local municipalities (Oklahoma City, Del City, Midwest City) have switched primarily to surface water sources. The Base water supply wells (WSWs) are screened or perforated at depths of 200 to 750 ft below ground surface (BGS).

Regional groundwater flow in the Central Oklahoma Aquifer is generally west to east. Structural features, such as the Oklahoma City Anticline located roughly 1.5 miles west of the Base, and regional dip, control regional groundwater flow. In addition, regional groundwater flow is influenced by discharge points such as the Deep Fork River, the Canadian River, and water supply wells.

Recharge of the Garber-Wellington Aquifer is accomplished principally by percolation of surface waters crossing the area of outcrop and by rainfall infiltration in this same area. Because most of Tinker Air Force Base is located in an aquifer outcrop area the base is considered to be situated in a recharge zone (Havens, 1981); the Garber Sandstone outcrops across a significant portion of Tinker AFB, or is overlain by only a thin veneer of the Hennessey Group, and therefore much of Tinker AFB occurs within the recharge area.

According to Wood and Burton (1968) and Wickersham (1979), the quality of ground water derived from the Garber-Wellington Aquifer is generally good, although wide variations in the concentrations of some constituents are known to occur. Wells drilled to excessive depths may encounter a saline zone, generally greater than 900 feet below ground surface. Wells drilled to such depths or those accidentally encountering the saline zone are either grouted over the lowest screens or may be abandoned.

B.3.2 Local Hydrogeology

Current (March 2015) potentiometric surface maps of the HWBZ, the USZ, the LSZ, and the LLSZ have been generated using over 1,200 existing monitoring wells and piezometers on Tinker AFB. Maps are presented as Figures 2 through 5; these maps are included in pockets at the end of this application document. These maps are revised each time that a Basewide Sampling and Water Level Measurements event is completed; maps can be compared over the years to help understand annual (and in some cases seasonal) variations in water levels in the different saturated zones. A PZ potentiometric map is not included since available well coverage in that zone is limited. The following text discusses each of these zones, including the PZ. The USZ, LSZ, and LLSZ potentiometric maps include isopleth contours for TCE in each zone. No plumes are included on the HWBZ figure since there is no mapped contamination in that zone.

The Hennessey Group at Tinker AFB does not have a recognized aquifer but some saturation, identified as the Hennessey Water Bearing Zone (HWBZ) does exist. The HWBZ is absent in the northeastern portion of the Base where the Hennessey starta are thin. Three aquifer zones (in descending order) have been identified for the Garber Sandstone and Wellington Formation (Garber-Wellington Aquifer) under Tinker AFB; these zones are part of the regional Garber-Wellington Aquifer. The zones include the Upper Saturated Zone (USZ), the Lower Saturated Zone (LSZ), and the Producing Zone (PZ). The LSZ has been subdivided into an upper and lower (Lower-Lower Satutated Zone) to address a significant downward component of groundwater flow in the

LSZ, which is noted within the aquifer under Tinker AFB. The magnitude of this vertical flow component varies across the Base and is much less under the western one-third of Tinker AFB where the overlying Hennessey Group is thicker. The HWBZ is present in the southwestern portion of Tinker AFB where the Hennessey Group thickens and becomes locally saturated with groundwater. The hydraulic conductivity is low; hydraulic conductivity (slug) test data indicate it is generally less that 0.5 ft/day. The HWBZ is not considered a significant source of drinking water. The unit receives recharge from precipitation where it is exposed at the surface, at localized areas where sandstone outcrops at the surface, and in locations of desiccation cracks with higher conductivity.

Generally, groundwater in this unit flows toward lower topographical elevations. In some areas, potentiometric lows mapped in the HWBZ are coincident with potentiometric highs on the USZ surface and suggest that vertical downward flow paths exist between the two zones. Downward vertical flow (and possibly lateral flow) and communication with the USZ are enhanced by the presence of desiccation cracks where the Hennessey Group is 30 ft or less in thickness. The estimated 20 foot isopach thickness is presented by a red dashed line on the Hennessey Group potentiometric map, Figure 2; this line represents the approximate limit of saturation (HWBZ) within this geologic unit. Locally however, where the Hennessey is less than 20 feet thick, some thin, perched saturated zones may exist.

The USZ is the uppermost saturated zone of the Garber-Wellington Aquifer and is delineated from the LSZ by a basal aquitard. The USZ is approximately 50 ft thick, measured from the base of the overlying Hennessey Group to the base of the underlying aquitard, except where portions have been removed by erosion along down-cutting streams such as Crutcho Creek. The saturated portion typically ranges from less than 1 ft to 20 ft thick, and truncates along a line extending from near the Base boundary and the westward toward Douglas Boulevard to just west of West Soldier Creek in the northeast part of the Base, looping through the old Kimsey Addition located north of Building 3001, and turning northwestward around the north end of Runway 17/35. Truncation of the saturated zone is primarily due to westward geologic dip and stream erosion. Desiccation cracks are also present in the USZ where it is exposed at the surface. Vertical contaminant transport from surface spills may impact deeper portions of the USZ more quickly due to the presence of desiccation cracks. Open desiccation cracks would provide relatively little resistance to water and contaminant infiltration, and movement through the desiccation cracks in the unsaturated USZ could be rapid.

The USZ has a large areal extent and occurs throughout Tinker AFB except in a small part of the northeast quadrant and east of the Base where Soldier Creek has eroded the Garber Sandstone to a point below the basal aquitard. Over much of the Base, the USZ occurs under unconfined conditions. In some areas, such as where fractures in the overlying Hennessey Group extend at depth, it may also be semi-confined. An orange line on the USZ potentiometric surface map, Figure 3, reflects the approximate updip extent of saturation in this zone. The extent of saturation has been confirmed by monitor well drilling as well as by comparing the elevation of several surface water bodies east of the Base to groundwater elevations in USZ wells located near them.

The USZ becomes confined in the farthest southwestern corner of the Base and to the west of the Base where it is locally confined by the overlying Hennessey Group. The depth to the top of the USZ potentiometric surface ranges from near the land surface in the northeastern portion of the Base where streams have cut deep enough (portions of Crutcho Creek and Kuhlman Creek) to 70 ft BGS in the southwestern portion of the Base. Hydraulic conductivity test data yield values that range from 0.04 to 6.7 ft/day.

Groundwater flow in the USZ under Tinker AFB is generally to the west or southwest due to geologic dip. However, local variations in flow direction exist on the western part of the Base, due either to structural features related to the Oklahoma City Anticline or to the presence of Crutcho Creek, and on the eastern part of the Base due to a leaky aquitard at the base of the USZ or man-made features. Locally, surface discharge of USZ groundwater occurs where creeks have eroded into the top of the Garber Sandstone, such as to Crutcho and Kuhlman Creeks in the northwest part of the Base, but most shallow groundwater leaves Tinker AFB as groundwater in the aquifer flowing southwestward. Eastward shallow groundwater flow off of the Oklahoma City Anticline is identified west of Crutcho Creek and locally at the eastern edge of the Base due to local groundwater mounding under Building 3001.

Numerous mudstone layers, which act as local aquitards, exist within the Garber-Wellington Aquifer saturated units. Most do not extend over great distances. However, two mudstone layers occur on a semi-regional basis under Tinker AFB; these are more laterally continuous and actually function as semi-regional aquitards. The uppermost aquitard occurs between the USZ and LSZ and is referred to as the USZ/LSZ aquitard. The second aquitard occurs between the LSZ and PZ and is referred to as the PZ aquitard. These aquitards, however, do not consist of a single continuous mudstone unit. Instead, they are zones composed of interbedded mudstones and fine sandstones and siltstones with a higher proportion of clay relative to sand. They are recognized by significant groundwater pressure head differences (up to 70 ft of head difference across the PZ aquitard for example) at a well cluster location where wells are screened above and below the layers.

The USZ/LSZ aquitard is composed of overlapping discontinuous mudstone lenses with interbedded thin sand lenses. The aquitard interval varies in thickness from less than 10 ft to greater than 25 ft. A vadose zone exists under the eastern third of Tinker AFB between the base of the USZ/LSZ aquitard and the saturated portion of the LSZ. This vadose zone is roughly 10 to 20 ft thick in the northeastern portion of the Base, but thins to the west and is no longer present west of north- south runway (Runway 17/35) where the LSZ potentiometric surface intersects the aquitard. Head differences of up to 6 ft occur between the USZ and LSZ at the western Base boundary and up to 40 ft on the east side of the Base. The USZ/LSZ aquitard outcrops between 15 and 20 ft above the creek along the west bank of Soldier Creek just south of the IWTP. Based on the distribution of chemical contaminants, the USZ/LSZ aquitard is believed locally to allow some hydraulic communication between the USZ and the LSZ through natural and man-made discontinuities.

System	Series	Unit	Thickness (ft)	Description and Distribution	Water-Bearing Properties
QUATERNARY	PLEISTOCENE AND RECENT	Alluvium	0–70	Unconsolidated and interfingering lenses of sand, silt, clay, and gravel in the floodplains and channels of streams	Moderately permeable. Yields small to moderate quantities of water in valleys of larger streams. Water is very hard, but suitable for most uses, unless contaminated by industrial wastes or oil field brines
		Terrace deposits	0–100	Unconsolidated and interfingering lenses of sand, silt, and clay that occur at one or more levels above the floodplains of the principal streams	Moderately permeable. Locally above the water table and not saturated. Where deposits have sufficient saturated thickness, they are capable of yielding moderate quantities of water to wells. Water is moderately hard but less mineralized than water in other aquifers. Suitable for most uses unless contaminated by oil field brines
PERMIAN	LOWER PERMIAN	Hennessey Group (includes Kingman Siltstone and Fairmont Shale)	700	Deep-red clay shale containing thin beds of red sandstone and white or greenish bands of sandy or limey shale. Forms relatively flat to gently rolling, grass-covered prairie	Poorly permeable. Yields meager quantities of very hard, moderately to highly mineralized water to shallow domestic and stock wells. In places, water contains large amounts of sulfate
		Garber Sandstone	500?	Deep-red clay to reddish-orange, massive and cross-bedded fine-grained sandstone interbedded and interfingered with red shale and siltstone	Poorly to moderately permeable. Important source of groundwater in Cleveland and Oklahoma counties. Yields small to moderate quantities of water to deep wells; heavily pumped for industrial and municipal uses in the Norman and Midwest City areas. Water from shallow wells is hard to very hard; water from deep wells is moderately hard to soft. Lower part contains water too salty for domestic and most industrial uses
		Wellington Formation	500?	Deep-red to reddish-orange massive and cross-bedded fine-grained sandstone interbedded with red, purple, maroon, and gray shale. Base of formation not exposed in the area	

Figure 10-7: Major Geologic Units in the Vicinity of Tinker AFB, Oklahoma

(SAIC 2011, MODIFIED FROM WOOD AND BURTON 1968, PROJECT MANAGEMENT PLAN FOR 2011 BRIDGE BASEWIDE ENVIRONMENTAL SAMPLING AND WATER LEVEL MEASUREMENTS, TINKER AIR FORCE BASE, OKLAHOMA)

The next deeper zone in the Garber-Wellington Aquifer is the LSZ. This saturated interval is approximately 150 ft thick. However, as previously noted, this zone is sub-divided into the LSZ and the LLSZ for modeling and discussion purposes based on the recognition of a vertical component of the flow gradient. Generally, the LSZ consists of the upper third of the section, while the LLSZ is considered, when included, as the lower two-thirds. The LSZ directly underlies the USZ/LSZ aquitard and exists under all of Tinker AFB. Hydraulic conductivity test data show the hydraulic conductivity of the LSZ ranges from 0.25 to 8.7 ft/day. Flow is generally to the west and southwest under the Base but, as with the USZ, local variations exist under the west portion of Tinker AFB due to structural features related to the Oklahoma City Anticline. Just east and north of Tinker AFB, changes in recharge and interaction with Soldier Creek create variable flow directions. Recharge to the LSZ occurs primarily by precipitation where units outcrop just east of the Base and locally by the downward movement of groundwater through the USZ/LSZ aquitard where the USZ overlies it and discontinuities in the aquitard occur.

Groundwater in the LLSZ generally flows in the same direction as groundwater in the LSZ at any given location on Tinker AFB. Recharge to the LLSZ is by downward leakage from the LSZ and by lateral inflow of groundwater from the area east of the Base. A pumping test was conducted at well cluster 1-91PW in the northeastern corner of the Base in November 1994 as part of the IWTP/Soldier Creek Groundwater OUs RI. The hydraulic conductivity values calculated from the pumping test ranged from 0.78 to 15.6 ft/day. The results from the pumping test indicate that the LLSZ is interconnected with the LSZ.

The PZ aquitard occurs at the base of the LSZ (LLSZ) and hydraulically separates the LSZ from the underlying PZ. The isolation of the PZ from the LLSZ is demonstrated by head differences of up to 70 ft across the unit. This aquitard appears to be similar to the USZ/LSZ aquitard, being formed by a series of overlapping mudstones with interbedded more permeable sandstone/siltstone lenses. Well log data suggest that the PZ aquitard is present beneath the entire Base. The aquitard appears to be at least 30 ft thick; however, studies suggest that this aquitard may be up to 80 ft thick locally.

The PZ lies below the PZ aquitard and extends downward approximately another 500 to 600 ft. At around 700 to 800 ft BGS, the PZ grades progressively into saline water, which forms the lower limit of potable water. A physical boundary between the PZ and underlying units (i.e., the Chase, Council Grove, and Admire Formations) occurs somewhat deeper. The natural flow direction in the PZ is difficult to identify due to the influence of water supply wells (WSW) and limited data coverage but is most likely to the west. Data supplied by Wood and Burton (1968) from the Nichols Hills area to the west of the Base and results of the U. S. Army Corps of Engineers pump test involving Tinker WSW-14, WSW-15, and WSW-16, originally located just east of Building 3001, suggest that there is little vertical communication between the PZ and shallower zones. Several shallow wells in the LSZ were monitored during the pump test and none of the wells exhibited any measurable drawdown. An average hydraulic conductivity of approximately 5 ft/day has been calculated for the Garber-Wellington sandstones and from production well data in the Oklahoma City area. A total of 34 Tinker AFB WSWs have been completed in the PZ; twelve have since been plugged, and one new well (#34) was recently placed in operation. Twenty-one of the wells are currently operational, although this number varies over time. A map of existing and plugged Base water supply wells is presented in Figure 7.

Shallow aquifers exist temporarily in zones of alluvium that border streams, or where sandy residual soils overly bedrock at shallow depths. Soil aquifers are typically recharged directly by precipitation; gradually running dry seasonally as base flow to local streams and recharging of underlying rock aquifers deplete limited supplies. The significance of shallow aquifers is that they may facilitate the contamination of important lower aquifers or surface waters by generation and mobilization of wastes. Shallow aquifers may not facilitate the detection of developing ground-water contamination problems because of their localized nature and ephemeral character.

The hydrogeologic conceptual model of Tinker Air Force Base integrates geologic and hydrologic data from across the base. Such a conceptual model involves a comprehensive review of available data, including those from direct measurement sources (borings, water level measurements, pump/slug tests, stream studies) as well as indirect sources (aerial photographs, topographic maps, published reports). The hydrogeologic system at Tinker is complex, but the model provides both an approximation of depth to water and an estimated direction of groundwater movement and is therefore useful as a basis for designing field investigations. As information is derived from investigations the model is continually updated and refined.

The aquifer zones in the conceptual model are hydraulically connected, although sometimes only to a very local extent, either directly as in the west part of the base or indirectly through leakage and/or recharge/discharge patterns related to local streams. Because Tinker is located in a recharge zone for the the Central Oklahoma Aquifer both horizontal and vertical (downward) components of groundwater flow exist. Measured potentiometric levels from well clusters with screens and filter packs placed at varying depths within the lower saturated zone show that hydraulic heads decrease with depth and that the magnitude of the vertical component of flow varies with location. This is particularly important to recognize where data from these wells is being used to generate potentiometric contour maps.

Although the variability in the geology and the recharge system at Tinker makes it difficult to predict local flow paths, Central Oklahoma Aquifer water table data taken from the 1992 U.S.G.S. Hydrologic Atlas shows that regional groundwater flow under Tinker varies from west/northwest to southwest depending on location. This is supported by contoured potentiometric data from base monitoring wells that show groundwater movement in the upper aquifer zones to generally follow regional dip. Potentiometric surface maps using 2005 water level data for the four saturated zones above the PZ, the HWBZ, the USZ, the LSZ, and the LLSZ are included as Figures 2 through 5; a PZ map is not included since available well coverage in that zone is limited. On a simplified basis, evaluation of flow in each zone measured normal to potentiometric contours suggests that flow gradients range from 10 to 30 feet per mile. However, because flow in the near surface portions of the aquifer at Tinker are strongly influenced by topography, local stream base-levels, complex subsurface geology, location in a recharge area, and proximity to water supply wells, both direction and magnitude of groundwater movement is highly variable. The interaction of these factors not only influences regional flow but gives rise to complicated local, often transient, flow patterns at individual sites. Several examples demonstrate this variability. Historical water level data around Crutcho Creek indicates that groundwater flow in that area is predominantly to the southwest. However, during high flow conditions bank recharge occurs and shallow local flow patterns close to the creek may be reversed. This pattern is probably in effect at other streams as well. In the northeast quadrant of the base several factors contribute to groundwater "mounding" in the USZ and to formation of a groundwater high in the LSZ. This leads to radial or semi-radial groundwater flow at shallow depths. Finally, in the northeast part of the base where sufficient data exists, comparison of potentiometric contours from successively deeper levels in the LSZ suggests that groundwater flow directions may change with depth, gradually turning from west/southwest to northwest. This change in regional flow is attributed either to effects of pumping from deep water supply wells in the area and/or to the presence of the Deep Fork River located to the north. This river, along with the Canadian River south of Tinker, has been demonstrated by the U.S.G.S. to act as a major discharge point for regional ground water in Central Oklahoma.

B.4 SURFACE WATER BODIES

B.4.1 Streams/Creeks

The northern half of Tinker AFB is dissected by several tributaries of the North Canadian River; similarly, the southeastern part of the Base is dissected by tributaries of the Little River. A drainage divide crosses the southern part of the Base, separating these two drainage basins. Crutcho Creek, whose main branch originates off base to the southwest, is joined by two tributaries as it flows northward to the North Canadian River. Kuhlman Creek, which originates on Tinker, joins Crutcho Creek just north of the Tinker AFB property boundary, whereas Soldier Creek joins Crutcho Creek several miles north of the Base. Elm Creek and its tributaries is in the southeastern corner of Tinker AFB and drains south to Stanley Draper Lake and eventually to the Little River. Portions of Crutcho Creek and Kuhlman Creek are gaining streams and are perennial due to recharge from ground water. Surface water runoff channeled through ditches and diversion structures is the principal source of water to the numerous unnamed ephemeral streams that drain other portions of the Base. The main branch of Soldier Creek is an important surface water feature located east of Tinker AFB. The creek drains northward and has two main tributaries that drain from the Base: East Soldier Creek and West Soldier Creek. East Soldier Creek originates north of Building 3705 and flows northward on the east side of Building 3001 to the main branch of Soldier Creek. West Soldier Creek originates west of Building 3001 and flows northward toward the main branch of Soldier Creek. Base streams were surveyed in 2002 to provide both water elevation and base channel elevation data so that groundwater elevations could be directly compared to stream data.

The interaction of surface water with groundwater is an important factor in predicting local groundwater flow patterns at Tinker, and thus potential migration pathways for contaminated groundwater. Although no technical stream study data is presently available to determine what degree of interaction occurs between streams and groundwater, some qualitative observations provide clues to the importance of this system. The direction of stream flow on Tinker appears to be controlled largely by a topographic divide which extends from southwest to northeast across the south part of the base. Streams which originate on the north side of the divide flow to the north; these include Soldier Creek, Crutcho Creek, and Kuhlman Creek. Elm Creek which has its origin on the southeast side flows to the south. The four stream systems are labeled on Figure 2-1 of Section 2, General Information, as well as on Figures 2 through 5 of this attachment. Streams which flow northward become perennial before leaving the base. Crutcho and Kuhlman Creeks are considered to be recharged by the aquifer (gaining streams). East Soldier Creek probably gains much of its water from discharge from the wastewater treatment plant and from outfalls on base. Some data indicates however that these streams may become losing streams north of the base and may lose water to the aquifer. Information from wells and piezometers near the ponded section of Soldier Creek at the Industrial Waste Treatment Plant also suggests that the pond contributes to the groundwater (a losing stream) in the LSZ at that location. The elevation above mean sea level of the bottom of a portion of Soldier Creek tributaries near their headwaters off-base is higher than the groundwater. These stream segments flow only intermittantly and probably recharge the aquifer through infiltration during periods of higher precipitation. Finally, where groundwater and stream elevations are the same, the observed direction of groundwater flow may be affected by transient factors such as bank storage from periods of increased precipitation.

Interaction between groundwater and surface water bodies occurs in several places, thus creating potential contaminant migration pathways. Locally, Crutcho Creek is recharged by HWBZ and USZ groundwater. Because of the low lateral mobility of groundwater within the HWBZ, discharge to surface water is small relative to the discharge in areas where creeks have eroded into the Garber Sandstone. Some surface discharge of the USZ groundwater into Crutcho Creek occurs where creeks have eroded into the top of the Garber Sandstone. Groundwater in the LSZ only discharges to one surface water body, Soldier Creek, and only after it has exited the Base to the northeast.

Although water quality has degraded since presettlement times, the current quality of TAFB's surface waters is considered fair overall based on in-house biological diversity observations and weekly water quality monitoring. Tinker collects and analyzes water samples from all base creeks on a weekly basis. These samples are taken in order to monitor compliance with Oklahoma Water Quality Standards assigned to each creek. In addition to analytical monitoring, other conditions are noted at each creek outfall during each field visit including clarity, algaegrowth, odors, presence of foam, and presence of an oil sheen. All of these results and visual indicators are used to locate and eliminate illicit or harmful discharges.

Based on over a decade of creek sampling, and the lack of any contamination in Base ponds, it appears that the groundwater to surface water migration pathway for contaminated groundwater is either very limited or incomplete. All three primary perennial stream systems, Soldier Creek, Crutcho Creek, and Kuhlman Creek, as well as the ephemeral Elm Creek system, have been regulary monitored for COCs in the past, Crutcho Creek, Kuhlman Creek, and tributaries of Elm Creek under RCRA authority, and Soldier Creek under CERCLA (Operable Unit 2). On January 12, 2006, the ODEQ concurred with Tinker that no further water and sediment sampling at Crutcho, Kuhlman, and the tributaries of Elm Creek was warrented and that stream conditions at the Base boundaries can be determined by the National Pollutant Discharge Elimination System permit sampling program.

Soldier Creek has been regulated under OU-2 and OU-3. OU-2 deals with sediment and surface water. In a letter dated August 9, 2004, EPA stated that there is no unacceptable risk to human health at Operable Unit 2 (Soldier Creek) sediment and surface water and that sampling could be discontinued. A Certficate for Remedial Action Complete was signed by the USEPA on January 19,

2006. The ODEQ also concurred with EPA's finding in a letter dated September 14, 2004. OU-3 deals with groundwater under the creek, mainly located north and east of the Base. No contaminants attributable to Tinker AFB were identified in groundwater during investigations between 1993 and 2007; No Further Action was the selected alternative, which was approved by the USEPA on January 9, 2008.

B.4.2 Ponds

There are 16 small man-made retention ponds and two detention basins located on TAFB. Named small surface water bodies on Tinker AFB include Beaver Pond, Redbud Pond, Prairie Pond, Primrose Pond, Woodduck Pond, Golf Course East Pond, Golf Course Central Pond, and Golf Course West Pond. Ponds are primarily maintained via precipitation and surface runoff. However, a comparison of potentiometric surface maps with bathymetric maps of these ponds suggests that six of them are probably fed, in part, by seepage from the HWBZ, which is not contaminated at Tinker. The six ponds include the westernmost Golf Course Pond as well as Prairie Pond, Woodduck Pond, Primrose Pond, Redbud Pond, and Beaver Pond. The Golf Course Central and East Ponds receive groundwater from the USZ, but these are located west of Crutcho Creek where groundwater in all zones is not contaminated. In the absence of seep and flow testing, it is not possible to quantify the extent to which groundwater feeds these ponds. Several ponds are used for recreational purposes, but this is restricted to fishing. Several ponds are stocked annually by the Base Natural Resources Management Office and the water is tested on a regular basis to ensure these waters are not contaminated.

B.5 MAN-MADE STRUCTURES

In the conceptual model of Tinker it is recognized that man-made features such as buried utilities (storm drains, waste lines) may further complicate the shallow groundwater picture. An additional problem encountered in generating the model involves improper monitoring well construction practices which not only may contribute preferred pathways for groundwater (and contaminant) movement where wells have multiple screens or overly long filter packs, but often provide non-representative, biased groundwater and sample data.

B.6 TOPOGRAPHY/SURFACE GEOLOGY

The topography of Oklahoma City and surrounding area varies from generally level to gently rolling in appearance. Local relief is primarily the result of dissection by erosional activity or stream channel development. At Oklahoma City, surface elevations are typically in the range of 1,070 to 1,400 feet MSL. Topography plays a role with respect to shallow groundwater flow patterns; the primary driver for groundwater flow direction is determined by geologic dip (generally westward) but there is an overprint related to topography, particularly as it relates to the HWBZ. Topography also controls creek geometry and flow as well as overland flow. A topographic map of the Base is included as Figure 1. Ground surface elevations range from 1,190 feet amsl near the northwest corner of Tinker AFB, where Crutcho Creek intersects the Base boundary, to approximately 1,320 feet amsl at site CG040, located roughly one mile east of the main base area at the intersection of S.E. 59th Street and Post Road.

Understanding the surface geology at the Base is also important as it provides clues to the location of more permeable geologic strata at ground surface, which can indicate areas where spills might migrate vertically downward more rapidly. At Tinker, this is somewhat modified by the presence of desiccation features that can provide temporary migration pathways even in finer grained geologic strata often assumed to act as a barrier to vertical migration, as described above under Local Hydrogeology. A generalized surface geologic map is provided as Figure 6.

B.7 MONITOR PROGRAM/WELLS

Tinker AFB was issued a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Permit on July 1, 1991 by the U. S. Environmental Protection Agency (EPA). The permit specified a list of solid waste management units (SWMU) and Areas of Concern (AOC). Tinker AFB was required to perform RCRA Facility Investigations (RFI) at each of these sites to determine whether releases had occurred, and if corrective actions were warranted. In addition to investigating individual SWMUs and AOCs, Tinker performed a series of facility wide RCRA Facility Investigations between 1996 and 2000, each one building on the previous report. The reports, submitted previously, are titled *Basewide Non-NPL Groundwater Phase II RFI for Appendix I and II SWMUs, Addendum I, Addendum II, and Addendum III.* Note that although Basewide data were collected, and recorded in the reports, including both analytical and water level data for the sites under CERCLA authority, only the RCRA portion of the Base was evaluated in these reports since Operable Units are investigated separately.

As part of this effort, groundwater monitoring wells have been installed on and around Tinker AFB (Figure 10-15). This figure, along with associated Table 10-8, present active Tinker wells and piezometers through August 2017. However, it should be noted that as additional wells are completed the table and figure will be updated in the future. Wells have generally been installed in clusters or groups that intercept a prescribed portion of the four principal hydrostratigraphic or water-bearing zones (WBZs) of a portion of the Central Oklahoma Aquifer system commonly referred to as the Garber- Wellington Aquifer and a shallow WBZ in the Hennessey Group. These WBZs are designated as the upper saturated zone (USZ), lower saturated zone (LSZ), lower-lower saturated zone (LLSZ) and producing zone (PZ) in the Garber-Wellington Aquifer and the Hennessey water-bearing zone (HWBZ) in the overlying Hennessey Group. Individual wells and groups of wells are spread over the entire Base and some outlying areas. They are identified by their depth and respective aquifer and their surface locations within a particular sampling zone. Table 10-8 documents existing well locations by the following: Air Force ID, site ID, well number, horizontal and vertical (top of casing) coordinates, datum, installation date, aquifer zone, and whether the well is a compliance or sentinel well. A horizontal coordinate grid is located around the edge of the well location map (Figure 10-15), allowing for rapid location of the wells. The table, and associated figure, include monitoring wells, extraction wells, injection wells, and piezometers as each may be sampled during a given sampling event. All monitoring wells, piezometers and most extraction wells have water levels measured during each Basewide sampling event and during site specific sampling episodes.

All wells constructed by the Air Force on and around the Base and surface completions are designed to collect representative and unbiased groundwater samples and to provide accurate groundwater elevations for long-term monitoring from discrete aquifer zones in each GWMU.

Well design criteria such as well type, total depth, surface casing depth and screen interval were developed based upon a review of existing cross sections, well data, topographic maps, etc.

Wells are constructed to minimize the potential for migration of any substance between the surface and subsurface and/or geologic formations. Each new monitoring well borehole was geophysically logged prior to well installation. The logs were reviewed in the field and used to determine surface casing depths, well completion depths, and screen intervals. Proposed well designs were verified or altered in the field based upon the actual conditions encountered at each site. All wells installed on or around Tinker AFB by the Air Force are constructed to meet OWRB Title 785, Chapter 35 requirements.

Basewide groundwater monitoring is an essential part of the environmental restoration program conducted by the Environmental Restoration Office at Tinker AFB. The data collected under this program are used in conjunction with other data at specific sites to meet regulatory requirements for long-term monitoring, site characterization, and site close-out. The long-term goal of the monitoring program is to help complete environmental restoration of contaminated groundwater sites.

The basewide groundwater monitoring program began primarily as an annual event (1994) that evolved into a 15-month program via a 2005 modification to the Tinker AFB 2002 Resource Conservation and Recovery Act Part B Renewal Permit. In addition, more frequent site-specific sampling has been included during site specific investigations throughout the years on an as-needed basis. The basewide program includes the collection of water level measurements and groundwater samples from a network of monitoring wells, piezometers, extraction and recovery wells, landfill sumps, and private off-base wells. A detailed discussion of the groundwater monitoring program at Tinker AFB is contained in Section 10.5 of this permit renewal application.

B.8 ECOLOGICAL PROFILE

Details regarding the natural resources (flora and fauna, soil and water) at Tinker AFB are available in the 2007 Tinker Air Force Base *Integrated Natural Resources Management Plan*. The following figures are taken from the report: Figure 10-10 presents land use categories for the Base; Figure 10-11 presents soil classifications; Figure 10-12a presents ponds and watersheds, and includes text describing potential non-point source impacts to surface water features, while Figure 10-12b documents creeks and associated watersheds; Figure 10-13 provides an overview of vegetative communities on Base; Figure 10-14 provides the location of Base wetlands.

The surface soils have been studied by the U.S. Department of Agriculture (USDA) Soil Conservation Service (1969) and by several soil boring projects conducted for geotechnical (foundation construction) investigations at Tinker AFB. A more detailed Basewide soil survey was conducted by the USDA Soil Conservation Service in 1983 and updated in 1991. This survey identified 46 soil types within the Base's boundary. Surface soils of the installation area are predominantly of two basic types: residual and alluvial.

The four major soil associations mapped within the Base limits are Darnell- Stephenville, Renfrow-Vernon-Bethany, Dale-Canadian-Port, and Dougherty-Norge-Teller. The residual soils associations Darnell-Stephenville, Renfrow-Vernon-Bethany, and Dougherty-Norge-Teller, are products of the weathering of underlying ancient bedrock. The alluvial materials of the Dale-Canadian-Port are developed on younger silts and sands, which are typically restricted to floodplains of area streams.

B.9 POTENTIAL RECEPTORS

This subsection provides general information on potential human and ecological receptors of groundwater contamination at Tinker AFB.

B.9.1 Human Receptors

Tinker AFB is situated on a relatively flat expense of grassland. Prior to the development of the Base, the area was characterized by large tracts of private agricultural land. The Base currently occupies approximately 4,277 acres of semi-improved and unimproved grounds that are used for the airfield, golf course, housing area, offices, shops, and other uses characteristic of military installations. Property surrounding the Base includes residential, industrial and non-industrial businesses, and agricultural areas. Potential receptor populations include those related to residences with private water wells, industrial facilities and other businesses with private wells where potable water might be available, and potentially wells used for agricultural purposes such that crops may become contaminated. All of these wells tap into a portion of the Garber-Wellington Aquifer. Lake Stanley Draper, a local surface water supply reservoir with a small portion of its drainage basin in the southeast part of Tinker AFB, is also used for recreational purposes. Local streams, such as Soldier Creek and Crutcho Creek, which either transect the Base or have tributaries that extend onto the Base, may be used for recreation and fishing downstream.

The Garber-Wellington Aquifer, which underlies Tinker AFB and the surrounding area, is the single most important source of potable groundwater in the Oklahoma City area. Currently, the main part of the Base's water supply is obtained from production wells pumping from this aquifer; however, the newly acquired Tinker Aerospace Complex (TAC) (formerly the General Motors plant) obtains its water from local city water supplies. Industrial operations, individual homes, farm irrigation, and small communities not served by municipal distribution systems also depend on the Garber-Wellington Aquifer. Communities such as Oklahoma City, Midwest City and Del City depend on surface water supplies but at least one local municipality also maintains a well system that taps this aquifer as a standby source of water in the event of drought.

Tinker AFB employs approximately 27,000 military and civilian personnel. Of these personnel, approximately 2,800 personnel occupy on-Base housing, which consists of around 530 family housing units and seven dormitories. Of base housed families, roughly 1,300 residents are children. Military personnel and their families who reside on Base represent the nearest receptors to releases from Tinker AFB. However, access to areas impacted by Base activities is restricted in most cases, and direct contact by Base residents is not likely. The current land use at and near the Base is not expected to change because the facilities have decades of useful life remaining and the Base has an important and continuing mission. To date, no soil or groundwater contamination requiring active remediation has been detected beneath Base housing areas, although some low level soil screening vapor hits have been detected.

The closest human receptor populations include on-Base residents, government personnel working at the Base, and contract workers since these (other than those working at the TAC facility) depend on Base water supply wells for drinking water and water for industrial activities. Because Tinker water wells are not contaminated, and it is unlikely that they will become contaminated in the future, this receptor scenario is considered incomplete. Non-industrial Tinker facilities such as day cares, hospitals, schools, and restaurants all rely on this same water system. Because Base surface water bodies have been determined to be uncontaminated, this pathway is also considered incomplete for all on-Base entities. Vapor intrusion is limited to specific industrial buildings, and therefore non-workers, including sensitive populations, are unlikely to be exposed to any air contamination. The existence of LUCs, presented in Section 10.2.4, also tends to limit exposure to soil, groundwater, or vapor contamination.

However, workers on base, whether they are government or contract, can potentially be exposed to soil, groundwater, and air contamination. Activities such as trenching, cutting through building slabs, excavating foundations for buildings or removing a lift station, drilling wells, or other ground intrusive activities, have the potential to have workers encounter either soil or groundwater contamination, depending on the depth to which they go and the depth to groundwater. In addition, exposure to vapor intrusion is also a possibility where either soil or groundwater contamination is present. Because the Base has robust, and active, land use controls (both institutional and engineering), soil and groundwater exposure is generally mitigated. Because vapor intrusion is limited to a few industrial sites, where air monitoring can occur, vapor intrusion has also not been a major issue. In all cases the potential for exposure exists, but is generally incomplete since contaminated sites are well documented and construction type activities on Base are governed by LUCs. The potential for exposure to contamination is provided in more detail in individual site reports, such as an RFI or CMS.

As discussed below in the section on migration pathways, several groundwater solvent plumes once extended off-Site. However, since these plumes no longer extend past the fence line above MCLs due to mitigation by years of remediation, the risk of exposure to off-Base populations is currently considered to be incomplete. In addition, groundwater contamination once thought to have migrated off Tinker to the northeast from near Building 3001, is now known to be contained on Base due to a groundwater divide which extends across the northeast corner of the Base. Although this is related to NPL Site OU-1 (Building 3001 Soil and Groundwater), it demonstrates how groundwater migration pathways may be controlled by aquifer hydraulic properties; evaluation of RCRA sites should include this type of information. Monitoring of compliance and sentinel wells continues as part of the Basewide Sampling Program; data is used to evaluate plume stability, including the extent of groundwater plumes as well as the rate of migration.

B.9.1 Ecological Receptors

Tinker AFB lies within a grassland ecosystem, which is typically composed of grasses and riparian (trees, shrubs, and vines associated with water courses) vegetation. This ecosystem has generally experienced fragmentation and disturbance as a result of urbanization and industrialization at and near the Base. While no threatened or endangered plant species occur on the Base, the Oklahoma penstemon (Penstemon oklahomensis), identified as a rare plant under the Oklahoma Natural Heritage Inventory Program, thrives in several locations on Base. Tinker AFB policy (AFR 126-1) is to treat rare species as if they were threatened or endangered and provide equivalent protection for these species.

In general, wildlife on the Base is tolerant of human activities and urban environments. No federal threatened or endangered species have been reported at the Base. The Oklahoma Department of Wildlife Conservation also lists several species within the state as Species of Special Concern. Information on these species suggests declining populations but information is inadequate to support listing, and additional monitoring of populations is needed to determine the species status. These species also receive protection by Tinker AFB as if they were threatened or endangered. Of these species, the Swainson's hawk (Buteo swainsoni) and the burrowing owl (Athene cunicularia) have been sighted on Tinker AFB. Swainson's hawk, a summer visitor and prairie/meadow inhabitant, has been encountered Basewide. The burrowing owl has been known to inhabit the airfield at the Base.

B.10 RISK MANAGEMENT PROFILE

Sections 10.1, 10.2 and 10.3 of this permit renewal application outline both interim and final corrective measures that have been undertaken at each contaminated site at Tinker and provide the current status for each active SWMU and AOC, as well as an update of all sites that require no further remediation. The information presented provides objectives of the measures taken as well as providing insight into how the potential threat to human health and the environment is being, or has been, mitigated. This information is periodically updated to remain as current as possible. Please note that risk assessments are generated during evaluation of individual sites and there is no overall risk evaluation for the entire facility as a whole.

B.11 CONTAMINATION OVERVIEW

Contamination is present at Tinker AFB in several media, including soil, groundwater and air. The general sampling history, and location for data for each medium, is given below. It should be noted that when investigations began at Tinker in the late 1980s, groundwater sampling included sample collection and analysis of an extensive array of analytes including VOCs and SVOCs, as well as RCRA metals, pesticides and PCBs and general chemistry parameters. Groundwater sampling has taken place via both the Basewide Sampling and Water Level Measurement program, ongoing since about 1994, and via specific site assessments and investigations. Additional specific sampling for radiological materials (Radium-226 and -228, Gross Alpha, Gross Beta) also occurred at sites where these materials were believed to have been disposed. Soil sampling also included the above constituents, although specific soil analytical methods were employed in their evaluation. Soil sampling generally has been performed on a site specific basis, although some general core soil data exists not related to a specific site evaluation.

Investigation of potential vapor issues was somewhat sporadic early on, mainly limited to certain buildings where either soil or groundwater contamination was found, but from 2009 through 2011 vapor intrusion potential was investigated at many buildings on Tinker where industrial practices have occurred or where other contamination has been detected, as well as in areas of housing. Two comprehensive RCRA Facility Assessment Reports were generated, each report focused on a separate portion of the Base. The reports are *RCRA Facility Assessment Vapor Intrusion in Areas A and B on Tinker Air Force Base, Oklahoma (Parsons Engineering Science, Jan. 2011)* and *Final RCRA Facilities Assessment Report Phase I Soil Vapor Intrusion for Areas "C" and "D" Tinker Air Force Base, Oklahoma (CH2M HILL, Aug. 2010).*

The list of analytes required for sampling has undergone several alterations since sampling began. Pesticides and PCBs were dropped from required sampling in 2002. In the Groundwater Monitoring Schedule portion of the RCRA Facility Renewal Permit, dated Aug. 15, 2002, the ODEQ concurs with the Air Force's observations that PCB analysis may be suspended and that pesticide analyses may be reduced; there are no known historical sources for PCBs and there are no known recurring point sources for pesticides. Eventually, based on ODEQ concurrence with results from the Tinker Basewide sampling program, all sampling for pesticides and PCBs was curtailed. In addition, Permit language also indicated that radiological parameters, sampled in all Basewide wells in the past, could be restricted to wells associated with GWMU 2, CG038. However, since that time, no radiological hits have been detected and further sampling for these constituents has been dropped. Sampling for metals was also reduced based on the report *Draft Background Metals Concentrations in Groundwater, Tinker Air Force Base, Oklahoma (Jan. 1999)* as well as *Identification of the Sources of Elevated Chromium and Nickel Concentrations in Groundwater at Tinker Air Force Base (Feb. 2000).* For example, a number of metals such as Barium, trivalent Chromium, and Arsenic have been found to be naturally occurring at high concentrations in local soils and are not attributable to Base industrial activities. Other metals species have been identified, but these are typically limited in concentration and extent. The result is that the current Basewide sampling program only evaluates total Chromium and hexavalent Chromium, as approved by the ODEQ via acceptance of ten years of Basewide sampling and report approvals.

B.11.1 Groundwater Contamination: The historical distribution, types, and concentrations of contaminants in groundwater are described in previous sections and in Attachment A of this permit renewal application. Note that Basewide contaminant isopleth maps for COCs are generated within each Basewide Sampling and Water Levels Report, which are regularly submitted to the ODEQ and the EPA. These maps are generally used to evaluate changes in plume extent or concentration across all GWMUs. They are not designed to fully characterize individual SWMUs or

AOCs (accomplished via site specific investigations) but provide a template for ongoing and future evaluation of specific contaminated sites by providing a starting point to decide where data gaps may exist as well as a generic overview of possible COCs and concentrations of analytes. Basewide maps also provide a better understanding between sites being investigated, such as whether plumes from different areas are comingled.

B.11.2 Soil Contamination: Soil contamination is present at a number of sites and is outlined in site specific reports but is not normally included as part of the Basewide program. A constituent or analyte profile similar to that for groundwater is present, although some additional analytes not found in groundwater also exist in soil. Soil contamination above screening levels has been found at a number of sites. On the other hand, at several sites where high concentrations of VOCs or fuel are found in the groundwater, little or no soil contamination is present. This includes Fire Training

Area 2 for example, where TCE has been present in groundwater at part per million concentrations, but the ODEQ concurred on October 23, 2000, that further corrective action for soild at Fire Training Area 2 is not warrented since no concentrations above action levels had been detected during Phase I and Phase II site RFIs. From a conceptual site standpoint, it must be remembered that shallow soils (down to about 30 feet) can be impacted by desiccation cracks, particularly during summer months; these are widespread at Tinker. These features can allow rapid migration of liquid contaminants to deeper zones, can help 'aerate' shallow soils, thus degrading volatile organics, or can help flush contaminants to deeper zones during heavy rainfall events. It is speculated that these process have, over time, eliminated much near surface soil contamination since most source events probably occurred prior to the mid-1970s before waste and clean-up regulations were instituted.

B.11.3 Vapor Contamination (Air): The primary sources of potential VI are the shallow vadose zone and the underlying uppermost saturated zone. USZ groundwater data collected under the BWGW program are used as one of the criteria for the investigation of shallow soil gas contaminants at occupied buildings. The USZ groundwater data are useful in characterizing the subsurface conditions beneath and near a building. Chlorinated hydrocarbons and petroleum hydrocarbon chemicals are the primary groundwater plumes investigated and monitored. Because of the shallow depths (approximately 5 – 20 ft bgs) of the USZ in many areas, groundwater could contribute to potential VI into overlying buildings. Therefore, chlorinated hydrocarbons and petroleum hydrocarbons are considered COPCs for vapor investigations.

Vadose zone chemicals are not as well defined beneath and near some of the buildings. Impacts to the vadose zone may have occurred due to undocumented or unknown releases from 1) industrial operations and/or processes, and 2) hazardous waste storage and disposal systems in the subsurface. Due to tight shallow lithologies preventing downward migration under buildings where desiccation cracks are unlikely, and where shallow more permeable sandstone units are not present, groundwater impacts beneath or near buildings may be minor or insignificant. As a result of these tight lithologies, contaminants may be "trapped" in the vadose zone and contributing to potential VI into overlying buildings.

The types and concentrations of vapor contamination are presented in in the above two listed RCRA Facility Assessment Reports. Vapor constituents are generally reflective of soil and groundwater contamination, and therefore the types of analytes expected are the same with some additions. As of 2010, the ODEQ, the State environmental regulatory authority had deferred to USEPA's (2002) draft guidance on VI while ODEQ staff continue to work on draft VI guidance; no release date for the ODEQ draft guidance has been provided (Dr. Evelina Morales, ODEQ, personal communication). For Areas A and B, site-specific sampling results provide a comparison of the data with soil gas-to-indoor air screening levels derived from USEPA's RSLs for indoor air (USEPA 2010). The screening level assessment of the sampling data was performed to eliminate those sites from further response action where the data indicates there is no potential threat to human health, and to identify and prioritize sites that should be considered for further response action. The near-slab and sub-slab soil gas sample results were combined and used to complete a screening level assessment for all 86 sites in Areas A and B where samples could be obtained. Either industrial or residential screening values were used as appropriate. For areas C and D the initial screening phase was used to prioritize buildings for additional sampling and assessment. Soil gas VI SLs were used when evaluating exterior soil gas results. Soil gas SLs were calculated for USEPA TO-15 target analytes using USEPA 2009 Regional Screening Levels (RSLs) for air adjusted by the USEPA (2002) default attenuation factor (AF) of 1e-01 for shallow soil gas-to-indoor air. SLs were calculated for industrial and residential receptors. For this project, industrial receptor values were used at all of the buildings which had detected chemical concentrations in the shallow soil gas samples. The child care facility at the north end of Area "C" would have used residential screening levels; however, VOCs were not detected in soil gas samples collected at this building.

The majority of the analytical data are measurements of soil gas concentrations; however, groundwater was also sampled and analyzed as an additional line of evidence.The following summarizes findings from the two soil vapor assessment reports and indicates whether industrial or residential screening levels were applied:

- Area A (Industrial): Of 31 VOCs detected in Area A, only Benzene, Chloroform, and Tetrachloroethene exceeded industrial screening levels.
- Area B (Non-Residential): Of 28 VOCs and methane detected in near-slab soil gas samples, only Benzene, Chloroform, and Ethylbenzene exceeded induatrial screening levels.
- Area B (Residential): Of 30 VOCs and methane detected, the following exceeded residential screening values – Benzene, Chloroform,, chloromethane, 1,2-Dibromoethane, Ethylbenzene, Tetrachloroethene, and Trichloroethene.
- Area C (Industrial) and Area D (Industrial): Included nine distinct sampling areas. Primary chemicals detected above industrial screening levels include Tetrachloroethene, Trichloroethene, Vinyl Chloride, Benzene, Ethylbenzene, Xylene, and Chloroform. Additional chemicals were detected but at fewer locations.

B.12 MIGRATION PATHWAYS/SOURCE POTENTIAL

Soil to groundwater migration is widespread, as documented by the multiple groundwater plumes that have been identified on Base. Therefore, a migration pathway between soil and groundwater has been documented; site investigation reports (RFIs) document potential pathways at individual sites. Most groundwater solvent plumes, such as TCE, PCE, cis-1,2-DCE and VC are primarily sourced from soil via surface spills; undocumented indiscriminate dumping that appears to have occurred prior to the 1970s is a likely source for groundwater solvent contamination, although plumes also stem from leaks related to landfills, waste water transfer lines, lift stations, or waste disposal pits. Fuel in groundwater is sourced both by surface spills as well as leaks from USTs or associated fuel lines. In some areas, both solvent and fuel are found comingled. Metals sources, specifically for hexavalent Chromium, are located at Building 3001 (NPL), and Landfill 4 in CG038; trivalent Chromium has been found to be naturally occurring at high concentrations in local redbed strata. However, total Chromium continues to be evaluated primarily to allow comparison with hexavalent Chromium. Release areas for all types of contaminants are discussed in Section 10.1.3 and listed in Table 10-1 of this permit renewal application.

Groundwater contamination, particularly since it is found in deeper aquifer zones, indicates that vertical migration is occurring. In fact, hydrologic data from many monitoring wells demonstrates that a significant vertical component of groundwater flow (in addition to horizontal flow) is present at Tinker, primarily in the eastern part of the Base, which increases the likelihood of contamination from soils migrating deeper into the aquifer. In addition, desiccation cracks, discussed earlier, can act as pathways where generally tighter (more fine grained, less permeable) soils would seem to prevent downward migration. Locally, interbedded fine grained geologic layers do impede flow, thus creating complex migration pathways, but over much of the Base these do not prevent, only hinder, contaminant movement through the groundwater. It should be noted that the identified aquitards, the USZ/LSZ aquitard and the LSZ/PZ aquitard, are both probably leaky features. However, groundwater data obtained near Building 3001 from a series of 2009 Westbay wells (see *Focused RI Report for the Building 3001 and IWTP Groundwater OUs, SAIC, 2010)*, seems to show that the LSZ/PZ aquitard is relatively more competent than the USZ/LSZ aquitard. These multilevel monitoring wells were used to help determine the degree of hydraulic separation between the LSZ and the first several sandy zones in the PZ. The data demonstrated that it is unlikely that shallow groundwater contamination could naturally migrate to the PZ, or that migration is extremely slow. The PZ continues to be used on Base (and was previously the primary source for nearby municipalities) for obtaining potable water. The distribution of groundwater contamination in the USZ and the LSZ/LLSZ indicates that the USZ/LSZ aquitard is apparently more competent over roughly the south half of the Base since little or no LSZ groundwater contamination occurs there, whereas significant LSZ contamination exists to the north.

Several groundwater plumes (solvent plumes in GWMU 2D and 2E at CG038 and the solvent plume at CG040) once extended beyond the Base fence line; the 2D plume impacted several private wells in a subdivision adjacent to the southwest quadrant of Tinker, which is known as the Tinker View Acres (TVA). Remedial activities such as installing an interim pump and treat system at CG038 and an iron permeable reactive barrier across the toe of the 2D plume, have mitigated the off-site portions of the CG038 plumes however, and an interim extraction system including French drains and an extraction well at CG040, along with recent vegetable injections, has decreased off-site contaminants to below MCLs there. However, off-site groundwater contaminated above MCLs demonstrates the potential for migration of contaminated groundwater beyond the Base boundary; therefore, plumes continue to be monitored in all areas of the Base.

Vapor intrusion (VI) potential has been recently evaluated over the entire Base. The potential for soil and groundwater to air migration of vapor has been identified at a number of industrial buildings on Tinker. Tinker is continuing to evaluate the likelihood for vapor intrusion into buildings, and the CSM will be updated when further information is forthcoming. Dual phase Vapor Enhanced Pumping systems were installed at several sites on Base where there were early indications of indoor air contaminant issues (prior to the comprehensive vapor intrusion investigations), but these have recently been taken off-line as sampling indicates that recovery rates have become asymptotic (see Attchment A, Sections 10-3 and 10-4) for additional details regarding VEP systems). These systems operated for years, but are no longer viable due to low recovery; the Area “C” VI investigation included three sites with VEP systems. The presence of air quality issues however documents that at least locally a completed migration pathway to air from soil and/or groundwater sources can, and does, exist.

B.13 HISTORY OF REMEDIATION

Sections 10.1 through 10.4, including Tables 10-1, 10-2, and 1-3, as well as Table 10-5 in Section 10.5 of this permit renewal application, provide information regarding contaminated sites at Tinker AFB. This data includes an overview of any remedial activities that have occurred or are being planned, as well as areas where additional work may be needed. Information presented in those sections should be incorporated into the Conceptual Site Model and will not be discussed further here. Additional details of remediation activities are available in various site specific reports. Remediation is ongoing. Previous activities include pilot tests, interim actions, and final actions, depending on the site.

B.14 REFERENCES

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Table 10-8: Active Wells and Piezometers

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
105-MW11	USZ	155693.4	2153561.6	12-Aug-91	1275.93	1276.17	OT001
105-MW12	USZ	155679.19	2153478.49	29-Jul-92	1275.91	1276.19	OT001
105-MW13	USZ	155780.42	2153497.45	28-Jul-92	1275.91	1276.15	OT001
105-MW14	USZ	155763.74	2153543.88	28-Jul-92	1275.88	1276.16	OT001
10A	USZ	150205.15	2146061.03	15-Nov-83	1255.63	1253.52	LF014
10B	HWBZ	150204.49	2146070.5	11-Dec-87	1255.9	1253.23	LF014
10C	LSZ	150202.59	2146082.02	11-Dec-87	1255.55	1252.91	LF014
10D	LLSZ	150207.7	2146047.4	20-Mar-95	1255.87	1253.25	LF014
10E	HWBZ	150210.32	2146036.37	31-Mar-95	1255.81	1253.15	LF014
1-10AR	LSZ	156350.19	2153815.47	18-Oct-93	1268.87	1269.02	OT001
1-10BR	USZ	156353.03	2153822.54	03-Nov-93	1268.52	1268.72	ST003
1-10CR	LLSZ	156350.54	2153800.23	01-Nov-93	1268.89	1268.89	OT001
1-116A	LSZ	157032.18	2154744.18	28-Nov-94	1270.79	1267.84	OF059
1-116B	LSZ	157033.45	2154755.12	17-Dec-94	1270.9	1268.09	OF059
1-116C	LLSZ	157032.62	2154733.83	22-Dec-94	1270.72	1267.8	OF059
1-11A	LSZ	156156.15	2154891.6	11-Apr-86	1270.52	1268.2	OT001
1-11BR	USZ	156182.58	2154890.82	16-Sep-93	1268.81	1269.11	OT001
1-11C	LLSZ	156134.41	2154894.23	09-Mar-87	1268.17	1268.2	OT001
1-12AR	LSZ	155919.84	2152927.4	10-Sep-93	1262.58	1263.1	OT001
1-12BR	USZ	155929.8	2152929.12	13-Aug-93	1262.87	1263	OT001
1-12CR	LLSZ	155902.92	2152926.46	09-Sep-93	1262.89	1262.99	OT001
1-12D	PZ	155893.58	2152926.63	08-Sep-93	1263.06	1263.1	OT001
1-13AR	LSZ	155088.85	2152918.6	14-Sep-93	1265.02	1265.39	OT001
1-13B	USZ	155098.43	2152902.5	26-Aug-86	1265.01	1265.4	OT001
1-13CR	LLSZ	155077.92	2152923.84	15-Sep-93	1265.27	1265.52	OT001
1-13D	PZ	155067.28	2152923.5	10-Sep-93	1265.18	1265.52	OT001
1-14AR	LSZ	154409.18	2152917.97	13-Sep-93	1266.55	1266.57	OT001
1-14B	USZ	154426.43	2152908.51	10-Jul-86	1266.13	1266.7	OT001
1-14CR	LLSZ	154396.2	2152927.52	16-Sep-93	1266.84	1266.89	OT001
1-14D	PZ	154386.39	2152926.54	14-Sep-93	1266.87	1266.78	OT001
1-15AR	LSZ	155106.96	2154426.23	19-Oct-93	1275.59	1275.65	OT001
1-15BR	USZ	155096.02	2154423.48	28-May-96	1275.93	1276	OT001
1-15CR	LLSZ	155116.28	2154426.87	18-Oct-93	1275.36	1275.55	OT001
1-15D	PZ	155122.8	2154427	15-Oct-93	1275.56	1275.55	OT001
1-16	USZ	153091.07	2153191.83	17-Nov-86	1270.18	1270.75	ST006
1-17	USZ	153607.63	2153182.62	18-Nov-86	1268.68	1269.19	ST006

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
1-18	USZ	153711.17	2153319.92	27-Oct-86	1275.07	1275.58	ST006
11A	USZ	150800.81	2145457.4	17-Nov-83	1242.49	1238.76	LF014
1-1A	LSZ	155990.95	2154414.9	28-Mar-86	1273.3	1273.3	OT001
11B	LSZ	150791.88	2145459.01	10-Nov-87	1241.03	1238.44	LF014
1-1BR	USZ	155992.56	2154425.62	27-Oct-93	1273.28	1273.49	OT001
11C	HWBZ	150779.59	2145462.29	03-Aug-88	1240.43	1237.8	LF014
12	USZ	147658.19	2157585	17-Nov-83	1297.7	1304.11	LF016
123RW-1A	LSZ	156886.02	2177498.1	12-Dec-97		1224.37	ST123
123RW-2A	LSZ	157010.23	2145714.4	12-Dec-97		1224.03	ST123
123RW-3A	LSZ	157154	2146099.3	17-Dec-97		1223.93	ST123
123RW-4A	LSZ	157335.26	2145973.81	12-Dec-97		1222.72	ST123
1-27	USZ	156138.44	2153620.5	24-Oct-86	1273	1273	ST003
1-28AR	LSZ	155881.38	2152209.46	10-Nov-93	1259.43	1259.55	OT001
1-28B	USZ	155893.24	2152207.8	08-Jan-86	1259.28	1259.43	OT001
1-29	USZ	156220.98	2152277.16	08-Jan-86	1258.54	1257.9	OT001
1-2A	LSZ	154086.62	2154201.55	17-Apr-86	1275.67	1275.5	OT001
1-2B	USZ	154085.14	2154212.42	18-Apr-86	1275.94	1275.7	OT001
1-2D	PZ	154082.44	2154210.52	05-Nov-93	1275.4	1275.77	OT001
13	USZ	148746.55	2150884	20-Nov-83	1257.6	1261.71	LF015
1-36	LSZ	155224.45	2154997.51	21-May-87	1270.7	1267.7	OT001
1-38	LSZ	155225.46	2155227.51	21-May-87	1253.24	1252.8	OT001
13A	LSZ	148748.74	2150872.41	16-Oct-86	1262.54	1262.8	LF015
1-3AR	LSZ	153255.67	2154235.15	04-Nov-93	1275.8	1275.91	OT001
1-3B	USZ	153240.84	2154215.72	22-Apr-86	1275.79	1276.6	OT001
1-40	LSZ	155226.46	2155487.51	21-May-87	1237.5	1234.5	OT001
1-41	LSZ	155228.21	2155567.5	21-May-87	1247.6	1244.6	OT001
1-42	LSZ	155227.46	2155667.51	21-May-87	1252.9	1249.9	OT001
1-45AR	LSZ	153158.67	2152931.84	16-Aug-93	1268.45	1268.6	OT001
1-45B	USZ	153167.24	2152922.73	16-Oct-87	1267.95	1268.34	OT001
1-45CR	LLSZ	153148.44	2152931.88	17-Aug-93	1268.65	1268.71	OT001
1-49AR	LSZ	155927.71	2155207.59	12-Nov-93	1256.74	1254.21	OT005
1-49B	LSZ	155953.53	2155204.84	26-Feb-88	1257.5	1254.7	OT005
1-49C	LLSZ	155938.85	2155206.27	09-Aug-89	1257.45	1254.6	OT005
1-4AR	LLSZ	152626.19	2154218.07	28-Oct-93	1275.4	1275.69	OT001
1-4B	USZ	152614.64	2154217.33	26-Apr-86	1275.48	1275.7	OT001
14P9701		150912.93	2145747.38	29-Sep-97	1236.01	1236.31	LF014
14P9702	HWBZ	150674.41	2145761.33	28-Sep-97	1247.65	1247.95	LF014
14P9703	HWBZ	150333.83	2145820.05	28-Sep-97	1255.02	1255.32	LF014
14P9704	HWBZ	150856.79	2146149.93	28-Sep-97	1246.57	1246.87	LF014

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
14P9705	HWBZ	150371.48	2146097.68	28-Sep-97	1258.45	1258.75	LF014
15	HWBZ	146502.55	2154273.5	29-Nov-83	1309.89	1310.46	VI084
1-50AR	LSZ	155587.91	2155307.42	17-Dec-93	1248.15	1245.68	OT005
1-50BR	LSZ	155586.82	2155317.59	02-Dec-93	1247.63	1245.16	OT005
1-50CR	LLSZ	155586.89	2155297.17	11-Jan-94	1248.99	1246.16	OT005
1-50DR	PZ	155582.18	2155357.19	16-Dec-94	1246.71	1244.1	OT005
1-51AR	LSZ	155781.61	2155587.31	11-Jan-94	1242.54	1239.71	OT005
1-51B	LSZ	155804.62	2155587.38	18-Feb-88	1242.6	1239.97	OT005
1-51C	LLSZ	155812.7	2155587.68	17-Aug-89	1243.16	1240.03	OT005
1-52A	LSZ	156021.2	2155843.52	23-Feb-88	1236.4	1233.78	OT005
1-52B	LSZ	156012.06	2155845.75	23-Feb-88	1237	1233.98	OT005
1-52C	LLSZ	156032.87	2155845.39	05-Jul-90	1237	1234.06	OT005
1-53A		156341.7	2155599.57	09-Mar-88	1250.2	1247.57	OT005
1-53B	LSZ	156341.96	2155582.3	09-Mar-88	1251.5	1248.51	OT005
1-53C	LLSZ	156341.4	2155591.06	09-Mar-88	1249.24	1249.27	OT005
1-59AR	LSZ	156338.93	2155156.09	18-Jan-94	1265.72	1265.72	OT001
1-59B	USZ	156339.46	2155048	18-Jan-95	1267.34	1267.73	OT001
1-59CR	LLSZ	156339.21	2155142.54	14-Jan-94	1266.09	1266.14	OT001
1-5AR	LSZ	153436.61	2154024.27	06-Dec-93	1274.75	1274.98	OT001
1-5BR	USZ	153435.63	2153995.31	29-Jul-10	1275.16	1275.72	OT001
1-5C	LLSZ	153436.65	2154014.97	08-Dec-93	1274.59	1274.81	OT001
1-60A	LSZ	156340.93	2154567.77	21-Mar-90	1270.31	1270.48	OT001
1-60B	USZ	156340.22	2154550.31	15-Mar-90	1270.59	1270.78	OT001
1-60CR	LLSZ	156335.11	2154588.69	13-Jan-94	1270.37	1270.56	OT001
1-61A		151542.95	2153316.73	12-May-93	1274.73	1275.02	OT001
1-61BR	USZ	151544.85	2153332.61	29-Jun-98	1274.77	1274.96	OT001
1-61C	LSZ	151543.59	2153303.28	11-May-93	1274.43	1274.71	OT001
1-61D	LLSZ	151544.24	2153290.06	10-May-93	1274.32	1274.58	OT001
1-62A	LSZ	156382.67	2151019.25	05-May-93	1253.13	1253.44	ST007
1-62B	USZ	156394.36	2151023.34	05-May-93	1253.3	1253.6	ST007
1-62C	LSZ	156378.41	2151002.93	06-May-93	1253.04	1253.35	OT001
1-63A	LSZ	151655.56	2154668.98	14-May-93	1279.18	1279.79	OT001
1-63B	USZ	151654.12	2154680.31	28-Apr-93	1279.53	1279.72	
1-63C	LSZ	151656.35	2154658.98	14-May-93	1279.63	1279.83	OT001
1-63D	LLSZ	151657.99	2154649.28	15-Jul-96	1279.38	1279.71	OT001
1-64A	LSZ	154329.41	2154220.12	21-May-93	1275.65	1275.69	OT001
1-64B	USZ	154355.39	2154218.49	28-May-93	1275.97	1276.23	OT001
1-64C	LLSZ	154321.14	2154219.71	22-May-93	1275.72	1275.87	OT001
1-64D	LLSZ	154311.38	2154219.45	22-May-93	1275.67	1275.9	OT001

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
1-65A	LSZ	154886.28	2151058	21-May-93	1253.37	1253.72	OT001
1-65B	USZ	154894.89	2151069.78	20-May-93	1253.6	1253.9	OT001
1-65C	LLSZ	154877.59	2151047.9	21-May-93	1253.37	1253.72	OT001
1-66A	LSZ	153347.38	2150401.63	04-Jun-93	1244.28	1244.61	OT001
1-66C	LLSZ	153337.47	2150392.79	04-Jun-93	1244.26	1244.62	OT001
1-67A	LSZ	151562.5	2152068.28	28-May-93	1264.75	1264.98	OT001
1-67B	USZ	151573.47	2152068.75	27-May-93	1264.82	1264.52	OT001
1-67C	LSZ	151551.99	2152067.92	02-Jun-93	1264.77	1264.48	OT001
1-68B	LSZ	154470.24	2155444.41	09-Sep-93	1247.75	1248.01	OT001
1-68C	LLSZ	154450.75	2155443.96	20-Sep-93	1247.84	1247.9	OT001
1-69A	LSZ	154128.2	2153387.65	22-Nov-93	1273.94	1273.96	OT001
1-69B	USZ	154137.95	2153387.22	09-Nov-93	1274.08	1273.95	ST216
1-69C	LLSZ	154118.2	2153387.95	02-Dec-93	1273.96	1273.85	OT001
1-69D	LLSZ	154106.53	2153387.8	06-Dec-93	1274.06	1274.4	OT001
1-69E	PZ	154094.46	2153386.72	11-Jun-09	1274.43	1274.92	OT001
1-6AR	LSZ	152815.14	2153793.27	27-Oct-93	1274.72	1275.01	OT001
1-6BR	USZ	152815.64	2153801.6	22-Oct-93	1274.61	1274.93	OT001
1-6C	LLSZ	152815.17	2153784.15	29-Oct-93	1274.86	1275.1	OT001
16R	HWBZ	146461.95	2154219.29	15-Aug-96	1311.13	1309	VI084
16RT	HWBZ	146454.35	2154229.89	16-Sep-02	1308.45	1309	VI084
1-70A	LSZ	155588.53	2153375.4	07-Oct-93	1273.02	1272.85	OT001
1-70B	USZ	155598.89	2153375.83	04-Oct-93	1273	1272.69	OT001
1-70C	LLSZ	155577.74	2153374.48	11-Oct-93	1272.98	1273.3	OT001
1-70D	PZ	155568.4	2153374.12	13-Oct-93	1273.3	1273.27	OT001
1-70E	PZ	155550.22	2153374.6	19-Jun-95	1273.04	1273.63	OT001
1-71D	PZ	157669.87	2153822.54	22-Sep-93	1256.4	1256.46	OT001
1-72A	LSZ	152073.39	2154337.59	23-Nov-93	1274.34	1274.66	OT001
1-72B	USZ	152080.11	2154337.6	11-Nov-93	1274.35	1274.65	
1-72C	LSZ	152067.43	2154337.56	19-Nov-93	1274.39	1274.66	OT001
1-72D	PZ	152061.45	2154337.47	18-Nov-93	1274.44	1274.71	OT001
1-73A	LSZ	158677.3	2151924.95	01-Nov-93	1256.03	1256.39	OT001
1-73D	PZ	158678.2	2151908.8	05-Nov-93	1256.27	1256.49	OT001
1-74A	LSZ	157231.59	2152100.65	18-Aug-93	1258.65	1259.01	OT001
1-74B	USZ	157230.96	2152112.01	02-Aug-93	1258.66	1258.84	OT001
1-74C	LLSZ	157231.98	2152090.49	30-Aug-93	1258.74	1259.03	OT001
1-74D	LLSZ	157232.64	2152079.85	31-Aug-93	1258.92	1259.04	OT001
1-75A	LSZ	156491.39	2152922.04	27-Aug-93	1261.51	1261.43	OT001
1-75B	USZ	156503.59	2152922.06	16-Aug-93	1261.27	1261.29	CG037
1-75C	LLSZ	156480.6	2152921.87	27-Aug-93	1261.3	1261.5	OT001

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
1-75D	PZ	156469.12	2152922.48	26-Aug-93	1261.4	1261.53	OT001
1-76A	LSZ	157088.57	2152925.43	06-Aug-93	1258.99	1259.26	OT001
1-76B	USZ	157098.76	2152924.93	26-Aug-93	1259.01	1259.16	OT001
1-76C	LLSZ	157075.44	2152927.47	25-Aug-93	1258.98	1259.06	OT001
1-7AR	LSZ	154623.35	2153312.26	16-Sep-93	1275.14	1272.69	OT001
1-7BR	USZ	154623.03	2153321.55	03-Sep-93	1275.15	1272.85	OT001
1-7C	LLSZ	154663.03	2153300.89	16-Apr-87	1275.08	1272.4	OT001
1-7D	LLSZ	154622.58	2153301.78	20-Sep-93	1275.04	1272.46	OT001
1-81A	LLSZ	157552.28	2155539.2	03-Nov-94	1271.26	1271.69	OT002
1-81B	LSZ	157542.15	2155540.07	15-Nov-94	1271.64	1271.86	OT002
1-81C	LLSZ	157561.84	2155537.35	03-Nov-94	1271.25	1271.64	OT002
1-85A		156811.29	2156071.68	08-Nov-94	1260.38	1260.7	OT002
1-85B		156813.39	2156084.49	21-Oct-94	1260.55	1260.7	OT002
1-85C		156810.02	2156062.88	09-Nov-94	1260.34	1260.58	OT002
1-86B	LSZ	157380.97	2154372.9	09-Nov-94	1250.17	1250.56	OT002
1-8A	LLSZ	155088.34	2153364.21	09-Jan-86	1273.03	1273.6	OT001
18B	HWBZ	149038	2153567.84	10-Feb-84	1278	1275.99	WP018
1-8BR	USZ	155078.84	2153367.21	15-Dec-93	1276.12	1273.56	OT001
1-90A	LSZ	156556.66	2155092.55	24-Oct-94	1272.62	1272.67	OT002
1-90B	USZ	156569.43	2155091.19	22-Oct-94	1273.07	1273.2	OT002
1-90C	LLSZ	156547.35	2155096.39	25-Oct-94	1272.51	1272.83	OT002
1-91A	LSZ	156546.04	2155045.66	01-Nov-94	1272.84	1272.46	OT002
1-91C	LLSZ	156555.63	2155039.61	11-Nov-94	1272.49	1272.92	OT002
1-92		153561.75	2153409.04	21-Oct-93	1276.49	1276.6	ST006
1-94		153507.15	2153395.12	21-Oct-93	1276.2	1276.47	ST006
1-95		153479.77	2153415.77	21-Oct-93	1275.87	1276.16	ST006
1-97B	USZ	156801.8	2152938.51	15-Jun-01	1260.5	1260.88	OT001
19AR	LSZ	155331.02	2154889.34	27-Jul-00	1268.04	1268.53	OT001
1-9AR	LSZ	156039.33	2153348.61	20-Sep-93	1274.35	1271.71	ST003
19BR	USZ	155371.11	2154891.77	08-Oct-93	1267.09	1267.49	OT001
1-9BR		156048.22	2153349.12	08-Sep-93	1274.21	1271.68	ST003
1-9C	LLSZ	156031.44	2153347.79	16-Sep-93	1274.33	1271.71	OT001
19CR	LLSZ	155379.9	2154890.89	06-Oct-93	1267.45	1267.59	OT001
D	PZ	155388.95	2154890.81	07-Oct-93	1267.23	1267.59	OT001
1-9D	LLSZ	156022.1	2153346.71	21-Sep-93	1274.21	1271.56	OT001
1AR	USZ	152188.37	2145787.34	19-May-95	1218.56	1216.01	LF011
1B	HWBZ	152189.5	2145762.12	15-Nov-83	1256.03	1216.74	LF011
1C	LSZ	152183.65	2145741.42	02-May-95	1220.47	1217.91	LF011
20A		154453.95	2154892.02	27-Jun-84	1271.58	1268.6	OT001

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20BR		154423.93	2154898.14	12-Oct-93	1267.86	1268.26	OT001
20C		154412.31	2154897.89	13-Oct-93	1267.98	1268.24	OT001
20D		154401.29	2154897.75	05-Oct-93	1267.85	1268.24	OT001
2-1	HWBZ	148832.08	2153889.5	18-Dec-86	1276.39	1276.88	WP018
2-101B	USZ	146692.12	2157646.08	30-Dec-94	1284.14	1281.05	LF016
2-102A	LSZ	147988.56	2157326.53	21-Dec-94	1301.95	1299.21	LF016
2-102B	USZ	147997.33	2157326.51	19-Dec-94	1302.04	1298.96	LF016
2-104B	USZ	148101.44	2159111.5	17-Oct-94	1311.83	1309.43	LF016
2-105A	LSZ	149017.36	2158656.94	08-Nov-94	1291.19	1288.89	LF016
2-106B	USZ	148061.45	2152192.68	14-Apr-95	1263.63	1264.28	CG039
2-107A	LSZ	152151.24	2155852.2	12-Dec-94	1286.88	1284.31	CG039
2-107B	USZ	152161.91	2155852.59	11-Nov-94	1286.3	1284.46	
2-108A	LSZ	151390.91	2155851.75	07-Dec-94	1287.58	1285.15	CG039
2-108B	USZ	151403.33	2155850.48	11-Nov-94	1287.29	1284.79	CG039
2-108BT	USZ	151414.87	2155847.89	06-Sep-02	1287.54	1285.15	CG039
2-108C	LLSZ	151379.43	2155854.35	08-Dec-94	1287.37	1285.5	CG039
2-109A	LSZ	150411.09	2155859.52	10-Dec-94	1294.03	1294.49	CG039
2-109B	USZ	150421.15	2155859.26	01-Dec-94	1293.92	1294.26	CG039
2-10AR	LSZ	152081.1	2155424.25	24-Mar-06	1271.18	1271.18	ST032
2-10BR	USZ	152089	2155417.81	21-Mar-06	1270.97	1270.97	ST032
2-10CR	LLSZ	152072.83	2155430.02	22-Mar-06	1271.39	1271.39	ST032
2-11	USZ	152433.1	2145777.37	21-Oct-92	1221.78	1219.47	WP017
2-110A	LSZ	148722.19	2155785.9	07-Dec-94	1298.98	1296.24	CG039
2-110B	USZ	148733.2	2155794.97	03-Nov-94	1298.28	1295.77	CG039
2-111A	LSZ	148998.77	2152130.87	28-Mar-95	1258.59	1259.11	CG039
2-111B	USZ	148998.91	2152144.56	29-Mar-95	1258.48	1258.87	CG039
2-112A	LSZ	149422.53	2150150.69	23-Jan-95	1251.41	1248.03	LF015
2-112B	USZ	149433.52	2150150.53	20-Jan-95	1250.89	1247.65	LF015
2-113A	LSZ	148956.53	2150112.79	26-Jan-95	1256.52	1253.45	LF015
2-113B	USZ	148969.64	2150112.74	25-Jan-95	1256.57	1253.31	LF015
2-114A	LSZ	148549.82	2150318.12	03-Feb-95	1266.39	1263.49	LF015
2-114B	USZ	148549.5	2150330.99	31-Jan-95	1266.77	1263.47	LF015
2-115A	LSZ	148111.26	2150812.68	21-Jan-95	1264.59	1262.23	LF015
2-115B	USZ	148124.47	2150812.46	14-Jan-95	1264.37	1262.05	LF015
2-116A	LSZ	147893.5	2161492.45	28-Oct-94	1305.45	1303.18	CG040
2-116B	USZ	147902.56	2161492.71	31-Oct-94	1305.69	1303.24	CG040
2-116C	LLSZ	147883.68	2161492.46	01-Aug-96	1305.56	1302.74	CG040
2-117A	LSZ	147975.43	2161863.36	27-Oct-94	1294.88	1292.52	CG040
2-117B	USZ	147968.61	2161857.97	27-Oct-94	1295.04	1292.6	CG040

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-118A	LSZ	147563.9	2161785.93	26-Oct-94	1284.8	1282.28	CG040
2-118B	USZ	147572.69	2161786.06	26-Oct-94	1284.88	1282.44	CG040
2-118C	LLSZ	147554.13	2161785.71	01-Aug-96	1283.96	1281.82	CG040
2-118D	LLSZ	147546.69	2161783.54	04-Sep-97	1283.98	1281.74	CG040
2-118E	LSZ	147532.49	2161783.21	26-Sep-02	1283.77	1281.32	CG040
2-119B	USZ	149141.65	2153377.04	13-Feb-95	1277.97	1275.14	CG039
2-12	LSZ	152551.2	2145792.57	22-Oct-92	1223.08	1220.75	WP017
2-120A	LSZ	148128.02	2156737.25	15-Dec-94	1280.03	1277.23	LF016
2-120B	USZ	148138.22	2156738.52	14-Dec-94	1279.91	1277.31	LF016
2-122C	LSZ	152977.54	2145861.06	07-Apr-95	1232.06	1229.47	WP017
2-123A	USZ	152221.17	2145295.6	31-Mar-95	1222.76	1220.37	FT021
2-123B	HWBZ	152220.87	2145308.51	31-Mar-95	1222.63	1220.13	FT021
2-124A	USZ	151141.98	2144914.47	16-Mar-95	1264.54	1261.89	LF014
2-126A	USZ	150001.84	2146336.13	24-Mar-95	1246.55	1244.39	LF012
2-126C	LSZ	149996.14	2146345.75	30-Mar-95	1246.48	1244.07	LF012
2-127A		149310.8	2146009.35	22-Mar-95	1252.79	1250.63	LF012
2-127C		149298.71	2146008.93	22-Mar-95	1252.92	1250.62	LF012
2-128A	USZ	149513.95	2146897.03	01-Mar-95	1237.47	1235.92	LF012
2-128C	LSZ	149506.65	2146904.13	27-Feb-95	1237.58	1235.88	LF012
2-129A	USZ	149019.52	2147810.19	22-Feb-95	1256.39	1253.65	LF012
2-129B	HWBZ	149009.39	2147817.28	06-Mar-95	1256.86	1253.86	LF012
2-129C	LSZ	149028.89	2147802.48	01-Mar-95	1256.24	1253.23	LF012
2-13	LSZ	152599.05	2145885.17	23-Oct-92	1224.22	1221.8	WP017
2-130A	USZ	149237.8	2148457.68	30-Mar-95	1268.7	1266.04	LF012
2-130B	HWBZ	149249.56	2148457.99	31-Mar-95	1268.53	1266.14	LF012
2-130C	LSZ	149226.19	2148457.75	03-Apr-95	1269.06	1266.41	LF012
2-131A	USZ	150099.64	2147893.68	18-Feb-95	1246.36	1243.67	LF012
2-131B	HWBZ	150094.61	2147899.25	23-Feb-95	1246.27	1243.94	LF012
2-131D	LLSZ	150114.59	2147885.04	27-Feb-95	1245.8	1243.48	LF012
2-132A	USZ	148947.41	2146831.88	18-Feb-95	1253.43	1253.78	LF012
2-132C	LSZ	148936.62	2146825.06	11-Mar-95	1254.4	1254.71	LF012
2-132D	LLSZ	148926.91	2146818.46	10-Mar-95	1254.91	1255.21	LF012
2-134A	LSZ	153460.74	2145544.15	20-Apr-95	1227.14	1227.55	OT050
2-134B	USZ	153474.51	2145543.4	06-Apr-95	1226.95	1227.52	OT050
2-135A	LSZ	153298.35	2145544.57	21-Apr-95	1227.39	1227.77	OT050
2-135B	USZ	153274.21	2145545.67	06-Apr-95	1227.84	1228.15	OT050
2-135C		153297.43	2145543.46	11-Jul-97	1227.25	1227.69	OT050
2-136A	LSZ	152988.21	2145270.05	24-Apr-95	1218	1216.11	OT050
2-136B	USZ	152975.95	2145279.58	06-Apr-95	1218.32	1215.99	OT050

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-136C	LSZ	152997.84	2145262.49	24-Jul-96	1218.87	1216.19	OT050
2-137A	LSZ	156153.5	2145451.01	21-Apr-95	1230.47	1228.01	CG037
2-137C	LSZ	156141.14	2145451.11	20-Apr-95	1230.26	1227.79	CG037
2-137D	PZ	156128.95	2145451.27	24-Apr-95	1229.82	1227.47	CG037
2-138A	LSZ	155113.2	2147093.76	12-May-95	1226.36	1226.83	OF060
2-138B	USZ	155102.35	2147101.43	12-May-95	1226.39	1226.73	OF060
2-138BL	USZ	155131.02	2147079.8	13-Mar-13	1226.66	1227.15	OF060
2-138C	LLSZ	155123.32	2147086.12	10-May-95	1226.18	1226.65	OF060
2-139A	LSZ	153925.37	2148476.11	05-May-95	1235.34	1235.83	OF060
2-139B	USZ	153917.14	2148485.85	05-May-95	1235.49	1235.99	OF060
2-139C	LLSZ	153933.67	2148466.6	04-May-95	1235.39	1235.83	OF060
2-139D	PZ	153941.62	2148456.24	03-May-95	1235.43	1235.87	OF060
2-14	USZ	149603.18	2154061.44	18-Dec-92	1288.26	1288.49	WP036
2-140A	LSZ	155635.88	2148669.42	01-Jun-95	1240.51	1237.95	OF060
2-140B	USZ	155643.58	2148669.16	24-May-95	1240.69	1238.09	OF060
2-140BU	USZ	155648.67	2148668.85	16-Jan-13	1238.66	1239.07	OF060
2-140C	LLSZ	155626.87	2148669.17	30-May-95	1240.27	1237.8	OF060
2-142B	USZ	151591.81	2149218.17	19-May-95	1242.09	1242.45	CG038
2-143A	LSZ	155389.46	2143806.79	07-Apr-95	1223.1	1220.61	CG037
2-143B	USZ	155386.5	2143820.09	12-Apr-95	1223.23	1220.91	CG037
2-143C	LSZ	155392.07	2143793.96	12-Apr-95	1223.01	1220.64	CG037
2-144A	LSZ	154752.19	2145278	04-Apr-95	1223	1220.52	CG037
2-144B	USZ	154743.73	2145287.99	03-Apr-95	1222.86	1220.4	CG037
2-144C	LSZ	154760.16	2145268.78	19-Jul-96	1222.9	1220.28	CG037
2-145B	USZ	158602.58	2148943.88	14-Jun-95	1242.75	1243.28	ST033
2-146B	USZ	158205.45	2148856.89	13-Jun-95	1240.7	1241.16	ST033
2-147A	USZ	147160.92	2149518.87	01-Feb-95	1271.51	1268.58	OF059
2-148A	LSZ	158710.64	2149910.8	11-May-95	1250.11	1247.45	OF059
2-148B	USZ	158722.57	2149910.89	20-May-95	1250.12	1247.46	OF059
2-149A	LSZ	158560.72	2148128.29	05-Jun-95	1236.72	1237.39	OF059
2-149B	USZ	158561.58	2148139.81	07-Jun-95	1236.55	1237.08	OF059
2-149C	LLSZ	158560.47	2148117.86	06-Jun-95	1237.23	1237.75	OF059
2-14A	LSZ	149603.26	2154089.14	15-Oct-93	1288.44	1288.38	WP036
2-15	USZ	149468.63	2153980.73	18-Dec-92	1285.97	1286.09	WP036
2-150A	LSZ	158521.82	2146800.34	17-May-95	1233.78	1231.28	CG037
2-150B	USZ	158522.04	2146813.13	10-May-95	1234.05	1231.4	CG037
2-151A	LSZ	157255.05	2147447.61	17-May-95	1235.89	1233.26	OF060
2-151B	USZ	157254.78	2147459.57	16-May-95	1235.99	1233.49	OF060
2-152A		157730.62	2149135.38	18-May-95	1246.36	1243.63	OF060

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-153A	LSZ	157769.77	2150503.11	09-May-95	1251.21	1248.52	OF060
2-154A	LSZ	156166.34	2151519.65	23-May-95	1256.04	1256.39	ST007
2-154B	USZ	156175.27	2151511.16	22-May-95	1256	1256.34	ST007
2-154C	LLSZ	156157.49	2151521.63	30-Sep-99	1256.39	1257.04	OF060
2-155A	LSZ	156172.18	2148457.85	02-Jun-95	1244.45	1241.75	ST008
2-155B	USZ	156186.96	2148458.03	03-Jun-95	1244.34	1241.43	ST008
2-155BL	USZ	156200.7	2148466.46	11-Jan-13	1240.87	1241.23	ST008
2-156A	LSZ	156399.09	2149275.23	12-Jun-95	1246.3	1243.73	ST008
2-156B	USZ	156399.6	2149287.5	06-Jun-95	1246.17	1243.37	ST008
2-156BL	USZ	156410.06	2149275.52	17-Jan-13	1243.49	1244.02	ST008
2-157AR	LSZ	157151.55	2150131.07	20-Aug-99	1248.02	1248.67	ST007
2-157BR	USZ	157151.06	2150140.41	13-Aug-99	1248.2	1248.76	ST007
2-158B	USZ	156335.53	2150323.26	23-May-95	1247.77	1248.04	ST008
2-159B	USZ	156338.86	2150512.61	31-May-95	1251.04	1249.56	ST007
2-16	USZ	149441.58	2153981.24	18-Dec-92	1285.57	1285.7	WP036
2-160B	USZ	156406.15	2150791.02	05-Jun-95	1253.8	1251.23	ST007
2-161B	USZ	156523.7	2151169.04	30-May-95	1252.77	1253.26	ST007
2-162B	USZ	156604.17	2151391.55	02-Jun-95	1254.62	1255.04	ST007
2-163B	USZ	158373.5	2148244.92	01-Jun-95	1237.1	1237.5	ST033
2-164B	USZ	158195.2	2148174.28	02-Jun-95	1239.9	1236.22	ST033
2-165B	USZ	158789.56	2148306.14	07-Jun-95	1223.6	1225.95	ST033
2-166B	USZ	158667.52	2148609.7	07-Jun-95	1244.97	1242.38	CG037
2-167B	USZ	150566.3	2150810.4	07-Aug-95	1250.71	1247.92	FT022
2-168B	USZ	150275.37	2150379.22	08-Aug-95	1243	1240.1	FT022
2-17	USZ	149436.53	2154026.77	18-Dec-92	1286.05	1286.28	WP036
2-171		156132.69	2153436.25	13-Dec-94		1272.16	ST003
2-172		156119.56	2153436.75	10-Jan-95		1272.44	ST003
2-173B	USZ	158088.6	2148589.37	14-Jun-95	1240.41	1237.94	ST033
2-174B	USZ	157150.98	2150353.19	15-Jun-95	1251.13	1248.52	ST007
2-175	USZ	149422.97	2154283.92	16-Jun-95	1288.16	1286.1	ST133
2-176	USZ	149394.98	2154191.99	19-Jun-95	1286.19	1284.89	ST133
2-177	USZ	149627.33	2154292.33	19-Jun-95	1288.44	1288.91	ST133
2-178	USZ	156264.48	2150891.14	21-Jun-95	1251.46	1251.84	ST121
2-179	USZ	156257.65	2150760.27	22-Jun-95	1250.62	1250.92	ST121
2-18	LSZ	152646.16	2145661.01	20-Apr-93	1219.12	1217.36	FT021
2-181	USZ	156045.28	2147364.09	06-Jul-95	1223.34	1223.59	ST122
2-182	USZ	155963	2147276.02	06-Jul-95	1221.65	1221.95	ST122
2-183	USZ	155877.02	2147334.5	06-Jul-95	1224.73	1222.33	ST122
2-184	USZ	156082.8	2147533.41	11-Jul-95	1225.62	1225.65	ST122

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-185	USZ	156299.35	2147560.63	11-Jul-95	1226.48	1226.68	ST122
2-186	HWBZ	147050.56	2151153.65	15-Jul-95	1275.55	1275.83	ST107
2-187	HWBZ	147053.51	2151086.85	14-Jul-95	1275.4	1275.73	ST107
2-188	HWBZ	147112.44	2151059.8	18-Jul-95	1275.15	1275.42	ST107
2-189	HWBZ	147118.98	2151179.97	18-Jul-95	1275.3	1275.61	ST107
2-190	USZ	157325.89	2145974.37	24-Aug-95	1222.58	1222.64	ST123
2-191R	USZ	157318.23	2146074.55	26-May-99	1222.87	1223.16	ST123
2-193	USZ	157111.37	2146095.34	25-Aug-95	1223.79	1224.14	ST123
2-194	USZ	157169.3	2145991.25	25-Aug-95	1223.18	1223.47	ST123
2-195	USZ	157023.95	2146258.97	25-Aug-95	1224.26	1224.49	ST123
2-195A	LSZ	157010.82	2146259.02	20-Aug-97	1223.98	1224.46	ST123
2-197	USZ	152524.59	2154402.72	25-Oct-95	1273.33	1273.7	ST138
2-198	USZ	152525.84	2154352.44	25-Oct-95	1273.63	1274.15	ST138
2-199	USZ	152587.15	2154386.8	26-Oct-95	1273.24	1273.67	ST138
2-19A	LSZ	152431.55	2145652.53	19-Apr-93	1218.83	1216.5	FT021
2-19B	USZ	152431.64	2145662.48	20-Apr-93	1218.2	1216.44	FT021
21AR	LSZ	153868.78	2155047.38	22-Oct-93	1267.95	1268.22	OT001
21BR	USZ	153873.88	2155047.57	15-Oct-93	1268.16	1268.26	OT001
21C	LLSZ	153860.17	2155047.59	27-Oct-93	1268.02	1268.2	OT001
2-2	USZ	158283.8	2148768.8	18-Dec-86	1241.99	1240.18	CG037
2-200	USZ	156406.35	2149003.41	02-Nov-95	1242.27	1242.57	ST120
2-20AR	LSZ	152453.77	2145539.42	04-Aug-00	1216.03	1216.63	FT021
2-20B	USZ	152466.83	2145539.49	21-Apr-93	1218.21	1216.68	FT021
2-212PT	USZ	149490.71	2146181.94	22-Aug-95	1246.64	1244.37	CG038
2-213PT	LSZ	149484.56	2146189.69	24-Aug-95	1246.24	1244.09	CG038
2-214A	USZ	149551.58	2146224.74	24-Aug-95	1247.12	1244.95	LF012
2-215A	USZ	149498.66	2146187.52	28-Aug-95	1246.61	1244.39	CG038
2-216C	LSZ	149492.23	2146195.57	30-Aug-95	1246.56	1244	CG038
2-217C	LSZ	149543.46	2146235.6	30-Aug-95	1246.45	1244.09	LF012
2-218A	USZ	149471.86	2146205.16	29-Aug-95	1246.14	1243.72	CG038
2-219C	LSZ	149466.26	2146213.25	30-Aug-95	1245.96	1243.55	CG038
2-21D	PZ	149514.58	2151236.33	27-Jan-95	1247.65	1244.33	LF015
2-22	LSZ	152433.3	2145787.97	22-Apr-93	1222.32	1219.47	WP017
2-220B	HWBZ	149496.84	2146174.15	24-Aug-95	1246.9	1244.74	CG038
2-225	USZ	156306.33	2149003.31	02-Nov-95	1241.9	1242.15	ST120
2-225BL	USZ	156307.56	2149000.5	14-Jan-13	1242.23	1242.61	ST120
2-226	USZ	156297.25	2148743.87	06-Dec-95	1240.83	1241.31	ST120
2-227	USZ	156081.15	2148911.41	07-Dec-95	1242.93	1243.51	ST120
2-228		148323.09	2151108.19	08-Nov-95	1255.44	1255.72	ST108

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-229		148272.7	2150972.92	21-Dec-95	1255.16	1255.8	ST108
2-230		148344.42	2151025.8	01-Dec-95	1255.39	1255.54	ST108
2-231	USZ	148242.29	2151003.11	01-Dec-95	1255.09	1255.5	ST108
2-232	HWBZ	148267.57	2150971.2	02-Jan-95	1255.46	1255.92	ST108
2-237	USZ	155964.29	2148833.28	09-Oct-96	1242.63	1243.14	ST120
2-238	USZ	156471.58	2148504.27	10-Oct-96	1237.36	1237.82	ST120
2-239	USZ	156144.38	2149053.69	15-Oct-96	1244.37	1244.92	ST120
2-23A	LSZ	156564.73	2149275.74	28-Dec-93	1243.35	1243.48	ST008
2-23B	USZ	156558.87	2149275.33	03-Jan-94	1243.41	1243.48	ST008
2-240	USZ	156118.14	2149297.03	21-Oct-96	1243.31	1243.83	OT062
2-240BL	USZ	156120.79	2149303.51	24-Jan-13	1244.05	1244.47	ST120
2-241	USZ	157413.1	2146060.9	04-Nov-96	1222.38	1222.88	ST123
2-242	USZ	157440.83	2145842.79	05-Nov-96	1220.38	1220.84	ST123
2-242A	LSZ	157441.48	2145834.76	19-May-99	1220.53	1220.81	ST123
2-243	USZ	157151.59	2145817.03	05-Nov-96	1221.94	1222.48	ST123
2-244	USZ	157006.2	2145838.52	08-Nov-96	1222.76	1223.25	ST123
2-245	USZ	156902.4	2145901.9	07-Nov-96	1224.14	1224.5	ST123
2-245A	LSZ	156891.61	2145902.03	20-Aug-97	1223.99	1224.54	ST123
2-246	USZ	157010.34	2146036.79	06-Nov-96	1223.57	1224.04	ST123
2-247	USZ	156854.81	2146299.07	18-Nov-96	1224.49	1227.29	ST123
2-248	LSZ	157336.44	2145959.35	18-Nov-96	1221.84	1222.3	ST123
2-249	LSZ	157107.44	2145807.1	19-Nov-96	1221.64	1222.15	ST123
2-24B	USZ	156635.69	2149274.53	28-Dec-93	1243.75	1243.94	ST008
2-250	LSZ	157138.01	2146086.76	20-Nov-96	1223.38	1223.99	ST123
2-251R	LSZ	156997.69	2146032.03	18-Aug-97	1223.44	1224.08	ST123
2-253B	USZ	150668.27	2143964.89	24-May-01	1265.68	1266.02	CG038
2-254B	USZ	150128.93	2143517.89	06-Jun-01	1249.69	1250	CG038
2-255B	USZ	149884.44	2143768.91	11-Jun-01	1263.48	1263.54	CG038
2-256A	LSZ	149886.39	2144007.09	11-Jun-01	1269.82	1270.32	CG038
2-256B	USZ	149886.12	2144017.63	13-Jun-01	1270.07	1270.46	CG038
2-257B	USZ	149228.8	2143524.92	05-Jun-01	1255.66	1256.09	CG038
2-258A	LSZ	149154.43	2143970.82	23-May-01	1263.24	1263.69	CG038
2-259B	USZ	151048.05	2146468.14	15-Jun-01	1231.52	1231.84	CG038
2-25B	USZ	156714.3	2149354.95	29-Dec-93	1246.11	1246.31	ST008
2-260B	USZ	150996.06	2145218.66	14-May-01	1255.51	1256	CG038
2-261B	USZ	158368.43	2145340.17	03-Jun-96	1218.97	1216.37	CG037
2-262B		158396.3	2145765.53	04-Jun-96	1224.74	1222.14	CG037
2-263B	USZ	157937.19	2144925.44	03-Jun-96	1208.73	1209.02	CG037
2-264B	USZ	158494.24	2147830.36	12-Jun-96	1234.86	1235.08	ST033

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-265B	USZ	158317.89	2147775.84	12-Jun-96	1236.63	1234.13	ST033
2-266A	LSZ	156886.65	2148859.54	08-Jul-96	1244.86	1242.35	ST008
2-266B	USZ	156896.64	2148860.3	09-Jul-96	1244.83	1242.28	ST008
2-267A	LSZ	156617.19	2148707.51	12-Jul-96	1239.24	1239.63	ST008
2-267B	USZ	156626.83	2148704.12	10-Jul-96	1239.2	1239.65	ST008
2-268A	LSZ	156054.59	2148874.82	30-Jul-96	1243.53	1243.96	ST008
2-269B		158084.6	2146214.1	12-Jul-96	1223.04	1223.4	CG037
2-26A	LSZ	156761.88	2149609.56	30-May-95	1243.78	1246.13	ST008
2-26B	USZ	156762	2149617.42	21-Dec-93	1245.9	1246.02	ST008
2-26C	LLSZ	156758.45	2149601.2	24-May-95	1243.57	1245.9	ST008
2-270B	USZ	158522.87	2146251.46	09-Jul-96	1229.44	1226.91	CG037
2-272B	USZ	150811.08	2149984.27	09-Aug-96	1248.91	1249.38	FT022
2-273B		150376.5	2149978.29	18-Jun-96	1238.42	1238.92	FT022
2-274A	LSZ	151142.26	2150034.47	17-Jul-97	1248.75	1249.1	FT022
2-274B	USZ	151151.6	2150027.89	25-Jul-96	1248.32	1248.77	FT022
2-277A	LSZ	155606.74	2151636.38	13-Jul-00	1255.59	1256.17	OF060
2-277B	USZ	155594.97	2151636.1	08-Aug-96	1255.62	1256.15	OF060
2-278A	LSZ	156066.54	2143378.83	17-Jul-97	1216.53	1217.14	CG037
2-278B	USZ	156056.8	2143385	19-Jun-96	1216.69	1217.11	CG037
2-279B	USZ	155610.36	2143130.99	11-Jun-96	1209.06	1209.59	CG037
2-27B	USZ	156596.49	2149526.53	27-Dec-93	1243.52	1245.76	ST008
2-280A	LSZ	155047.13	2143613.59	21-Aug-97	1207.45	1207.99	CG037
2-280B	USZ	155037.77	2143621.63	21-Jun-96	1207.28	1207.64	CG037
2-281A	LSZ	155586.5	2144351.97	08-Jul-97	1214.95	1212.42	CG037
2-281B	USZ	155574.94	2144351.2	22-Jul-96	1215.34	1212.59	CG037
2-282A	LSZ	154781.81	2145920.86	23-Jul-96	1226.27	1226.63	CG037
2-282B	USZ	154789.54	2145919.72	19-Jun-96	1226.41	1226.68	CG037
2-283A	LSZ	155025.61	2144556.41	28-Jun-96	1222.28	1219.69	CG037
2-284A	LSZ	154526.03	2144786.08	02-May-96	1224.49	1222.06	OF060
2-285A	LSZ	154077.07	2144695.35	21-Jun-96	1222.8	1220.26	CG037
2-285B	USZ	154086.77	2144694.42	20-Jun-96	1222.72	1220.13	CG037
2-285C	LSZ	154068.2	2144696.37	10-Jul-97	1222.51	1220.11	CG037
2-286A	LSZ	153224.91	2145121.88	26-Jun-96	1223.96	1224.4	OT050
2-286C	LSZ	153220.08	2145116.28	11-Jul-97	1223.51	1224.01	OT050
2-287AR	LSZ	152859.23	2144637.51	08-Aug-96	1223.08	1220.44	OT050
2-287B	USZ	153025.02	2144681	03-Sep-96	1212.8	1213.24	OT050
2-288A	LSZ	152470.92	2144798.58	29-Jul-96	1227.91	1224.91	OT050
2-288B		152776.52	2145018.23	21-Aug-96	1212.18	1212.51	OT050
2-289A	LSZ	154097.1	2145949.54	02-Jul-96	1225.25	1225.53	OT050

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-28B	USZ	156667.24	2149821.32	20-Dec-93	1247.9	1248.03	ST008
2-290B	USZ	150837.45	2144223.08	30-May-96	1261.6	1259.01	LF014
2-291B	USZ	149782.33	2144701.29	20-May-96	1268.91	1266.31	LF014
2-292B	USZ	150239.87	2144234.72	18-Jun-96	1270.6	1268.32	LF014
2-293B	USZ	149791.27	2145149.41	25-Jun-96	1260.42	1257.62	LF012
2-294B	USZ	149469.05	2145593.18	16-Jul-96	1264.68	1262.21	LF012
2-295B	USZ	149152.01	2145596.04	17-Jul-96	1267.39	1264.74	LF012
2-296B	USZ	148565.18	2145806.99	18-Jul-96	1271.18	1268.55	LF012
2-297B	USZ	147917.09	2146414.85	16-Jul-96	1270.19	1267.52	LF012
2-298B	USZ	149604.2	2148490.45	13-Jun-96	1261.62	1258.95	LF012
2-299B	USZ	150526.7	2144475.16	23-Jul-96	1265.71	1263.19	LF014
2-29A	LSZ	156566.38	2149569.71	06-Dec-93	1245.69	1245.77	ST008
2-29B	USZ	156576.37	2149573.39	20-Dec-93	1245.74	1245.8	ST008
2-29C	LLSZ	156554.45	2149568.98	20-May-95	1244.05	1244.56	ST008
22A	LSZ	155286.16	2155787.31	19-Jun-84	1256.15	1252.5	OF059
2-2A	LSZ	158285.62	2148758.61	09-Nov-93	1240.5	1240.51	ST033
22B	LSZ	155282.2	2155766.42	04-Apr-86	1254.9	1252.5	OF059
22DR	LSZ	155245.69	2155766.89	21-Sep-93	1253.15	1253.4	OF059
22ER	LLSZ	155333.33	2155770.13	29-Sep-93	1250.23	1250.52	OF059
2-3	USZ	158405.08	2148582.75	06-Jan-87	1242.34	1240.96	ST033
2-300B	USZ	151152.63	2147760.96	17-Jun-96	1233.79	1231.23	LF012
2-301B	USZ	149729.21	2150987.76	17-Jun-96	1244	1241.56	LF015
2-302B	USZ	149518.18	2150509.33	24-Jul-96	1249.15	1246.46	LF015
2-303B	USZ	150161.85	2153362.72	01-Aug-96	1284.06	1284.48	WP018
2-304B	USZ	150131.51	2144677.07	07-Aug-96	1263.49	1260.51	LF014
2-305B	USZ	147844.83	2153133.65	12-Aug-96	1281.36	1278.76	WP018
2-306B	USZ	148009.37	2153740.67	09-Aug-96	1276.89	1274.28	WP018
2-307B	USZ	148385.09	2155047.79	01-Aug-96	1300.18	1297.57	OT055
2-308A	LSZ	149146.69	2154399.45	02-Aug-96	1290.35	1287.9	WP018
2-308B	USZ	149137.48	2154394.75	16-Jul-96	1288.42	1287.59	WP018
2-309B	USZ	149663.94	2154682.24	01-Aug-96	1289.84	1290.31	WP018
2-30A	LSZ	156677.88	2149231.05	07-Dec-93	1243.83	1243.94	ST008
2-30B	USZ	156670.72	2149230.84	28-Dec-93	1243.95	1244	ST008
2-30C	LLSZ	156663.87	2149230.96	23-May-95	1243.21	1243.74	ST008
2-312B	USZ	148118.37	2161449.54	30-Jul-96	1307.19	1304.64	CG040
2-313B	USZ	147781.16	2161341.13	30-Jul-96	1305.91	1303.36	CG040
2-314A	LSZ	147475.48	2161334.39	06-Aug-96	1296.69	1294.07	CG040
2-315A	LSZ	147349.39	2161520.5	06-Aug-96	1293.05	1293.31	CG040
2-315B	USZ	147349.35	2161532.37	07-Aug-96	1292.51	1292.88	CG040

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-315C	LLSZ	147350.11	2161509.17	29-Aug-97	1293.43	1293.99	CG040
2-316A	LSZ	147565.68	2161945.28	07-Aug-96	1274.98	1275.34	CG040
2-316B	LSZ	147560	2161938.44	05-Aug-96	1275.36	1275.74	CG040
2-316C	USZ	147569.37	2161930.4	27-Aug-96	1276.17	1276.74	CG040
2-316D	LLSZ	147577.98	2161923.4	29-Aug-97	1276.52	1277	CG040
2-317A	LSZ	152503.64	2155185.99	30-Jul-96	1270.82	1271.28	CG039
2-318A	LSZ	151294.91	2154395	01-Aug-96	1277.84	1278.09	CG039
2-318C	LLSZ	151298.03	2154407.54	28-Sep-99	1277.52	1278.03	CG039
2-319A	LSZ	150881.94	2153336.59	02-Aug-96	1279.78	1280.1	CG039
2-31B	USZ	156853.26	2149606.47	21-Dec-93	1246.26	1246.4	ST008
2-320A	LSZ	150634.47	2155230.38	10-Jul-96	1295.81	1296.13	CG039
2-320B	USZ	150634.37	2155240.16	05-Sep-96	1295.87	1296.22	CG039
2-320C	LSZ	150636.23	2155222.61	22-Jul-98	1295.27	1296.1	CG039
2-321B	USZ	150261.34	2156103.07	31-Jul-96	1286.9	1287.14	OF060
2-322B	USZ	151013.85	2156080.25	09-Aug-96	1294.36	1294.73	OF060
2-323B		152106.26	2156109.9	13-Aug-96	1284.37	1284.37	OF060
2-324B	USZ	149641.84	2153151.4	09-Aug-96	1275.02	1275.29	WP018
2-324BT	USZ	149636.75	2153162.4	23-Sep-02	1274.94	1275.5	WP018
2-325A	LSZ	155356.92	2142956.62	08-Jul-97	1204.64	1202.42	CG037
2-325B	USZ	155340.03	2142966.15	20-Jun-96	1204.98	1202.39	CG037
2-326B	USZ	155646.73	2149578.25	06-Aug-96	1247.31	1247.76	ST008
2-326BL	USZ	155647.13	2149582.93	25-Mar-13	1247.99	1248.39	ST008
2-327B	USZ	148673.99	2155246.82	09-May-96	1298	1298	ST215
2-328A	LSZ	155191.84	2145228.28	23-Jul-97	1214.41	1214.86	CG037
2-328B	USZ	155189.96	2145237.64	27-Jun-96	1214.54	1214.88	CG037
2-328C	LLSZ	155193.89	2145220.76	10-Jul-98	1214.74	1214.98	CG037
2-329A	LSZ	154633.33	2144380.41	18-Jun-97	1223.84	1221.32	CG037
2-329B	USZ	154641.85	2144378.36	15-Jul-96	1224.04	1221.61	CG037
2-32A	LSZ	156842.75	2149840.13	03-Dec-93	1249.06	1249.2	ST008
2-32B	USZ	156851.18	2149840.13	20-Dec-93	1249.04	1249.24	ST008
2-330A	LSZ	155615.8	2150985.84	24-Aug-99	1255.05	1255.58	OF060
2-330B	USZ	155618.1	2150993.89	01-Jul-96	1255.51	1255.86	OF060
2-331B	USZ	148142.59	2161702.11	07-Aug-96	1305.67	1302.93	CG040
2-332A	LSZ	151098.67	2156799.25	02-Aug-96	1295.52	1292.9	OF060
2-333B	USZ	149241	2145389.2	02-Aug-96	1258.64	1259.08	LF012
2-334B	USZ	148732.39	2145384.85	24-Jul-96	1262.12	1262.57	LF012
2-335B	USZ	148384.45	2145619.36	31-Jul-96	1266.24	1266.68	LF012
2-336B	USZ	158821.37	2145377.77	05-Jun-97	1224.28	1224.92	CG037
2-337B	USZ	158790.16	2145701.93	22-Jul-97	1224.92	1225.29	CG037

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-338B	USZ	158741.18	2146005.05	22-Jul-97	1226.91	1227.43	CG037
2-339B	USZ	157795.46	2145233.48	06-Jun-97	1212.06	1212.61	CG037
2-33B	USZ	156686.94	2150383.84	17-Dec-93	1247.82	1247.92	ST008
2-341B	USZ	157852.32	2146603.98	19-Jun-97	1227.53	1228	CG037
2-342B	USZ	156199.86	2143430.88	07-Jul-97	1217.13	1217.61	CG037
2-343B	USZ	155910.49	2144149.61	12-Jun-97	1209.32	1206.91	CG037
2-344B	USZ	155831.09	2142638.89	08-Jul-97	1200.61	1201.02	CG037
2-346B	USZ	156421.45	2142762.26	22-Jul-97	1197.77	1198.1	CG037
2-347B	USZ	154738.17	2143668.24	11-Jun-97	1204.29	1204.71	CG037
2-348B	USZ	155669.24	2143994.11	12-Jun-97	1216.18	1216.71	CG037
2-349A	LSZ	154956.64	2144214.76	17-Jun-97	1222.55	1223.02	CG037
2-349B	USZ	154967.68	2144209.16	27-Jun-97	1222.23	1222.78	CG037
2-349C	LSZ	154947.3	2144219.15	10-Jul-97	1222.52	1222.93	CG037
2-34B	USZ	156642.29	2150518.38	16-Dec-93	1249.62	1249.71	ST008
2-350B	USZ	155236.85	2144834.82	14-Jul-97	1219.96	1220.31	CG037
2-351A	LSZ	155359.5	2145372.75	18-Jul-97	1215.21	1215.58	CG037
2-351B	USZ	155359.31	2145381.1	14-Jul-97	1215.35	1215.91	CG037
2-351C	LSZ	155359.39	2145363.53	16-Jul-97	1214.67	1215.23	CG037
2-352B	USZ	153651.38	2144130.27	14-Jul-97	1208.87	1209.3	CG037
2-353B	USZ	150893.09	2148298.41	25-Jun-97	1238.21	1238.72	CG037
2-354B	USZ	150259.75	2149080.4	27-Jun-97	1237.66	1238.13	CG038
2-355B	USZ	151259.84	2149803.18	09-Jul-97	1245.92	1246.61	CG039
2-356B	USZ	151488.67	2149950.52	10-Jul-97	1249.3	1249.75	CG039
2-357B	USZ	148717.44	2150552.47	08-Jul-97	1264.96	1262.44	CG039
2-358B	USZ	149500.23	2149748.56	27-Jun-97	1245.57	1243.46	CG039
2-359B	USZ	149701.77	2150321.97	26-Jun-97	1245.43	1243.52	CG039
2-35B	USZ	156823.28	2150594.66	14-Dec-93	1250.04	1250.22	ST008
2-360B	USZ	152276.56	2153020.47	14-Jul-97	1270.3	1270.79	CG039
2-361B	USZ	152660.38	2155393.62	21-Jul-97	1271.99	1272.37	
2-362B	USZ	150713.14	2153029.52	17-Jul-97	1274.69	1275.17	CG039
2-363A	LSZ	151277.98	2155153.68	23-Jul-98	1285.88	1286.28	CG039
2-363B	USZ	151287.67	2155153.55	25-Jun-97	1285.56	1286.2	CG039
2-364B	USZ	150371.42	2154058.68	17-Jul-97	1290.48	1290.9	CG039
2-365B	USZ	147734.2	2154153.49	25-Aug-97	1280.67	1281.1	CG039
2-366B	USZ	149884.14	2154963.8	09-Sep-97	1293.34	1293.82	CG039
2-367B	USZ	149890.53	2155560.76	17-Jul-97	1293.74	1294.21	CG039
2-368B	USZ	151446.09	2154016.54	06-Aug-97	1275.87	1276.36	CG039
2-369B	USZ	148390.26	2154346.89	15-Jul-97	1288.5	1288.88	CG039
2-36B	USZ	156664.24	2150605.59	11-Nov-93	1250.44	1250.54	ST008

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-370A	LSZ	156960.66	2148543.11	09-Jul-97	1237.93	1238.36	OF060
2-370B	USZ	156960.61	2148556.43	19-Jun-97	1238	1238.45	OF060
2-371A	LSZ	156842.73	2148271.78	09-Jul-97	1234.38	1234.9	OF060
2-371B	USZ	156852.24	2148271.08	17-Jun-97	1234.33	1234.95	OF060
2-372A	LSZ	155889.42	2148087.21	22-Jan-13	1236.6	1236.88	OF060
2-372B	USZ	155897.73	2148073.59	13-Jun-97	1234.98	1235.43	OF060
2-373B	USZ	155160.31	2148394.26	08-Aug-97	1234.22	1234.59	OF060
2-374A	LSZ	153955.82	2144410.48	08-Jul-97	1209.31	1209.76	CG037
2-375A	LSZ	156819.33	2146095.21	20-Aug-97	1224.66	1225.1	ST123
2-376B	USZ	149009.43	2155503.68	02-Aug-97	1294.94	1295.2	ST214
2-377B	USZ	148573.67	2155230.8	15-Aug-97	1297.7	1298.09	ST215
2-378	HWBZ	148590.38	2155209.85	18-Aug-97	1298.07	1298.5	ST215
2-379B	USZ	148709.24	2155543.31	11-Aug-97	1302.84	1303.34	VI084
2-37B	USZ	156571.32	2150598.03	14-Dec-93	1250.15	1250.26	ST008
2-380B	USZ	148832.35	2155505.29	03-Aug-97	1294.59	1294.78	VI084
2-381	HWBZ	148713.08	2155271.16	26-Aug-97	1295.47	1295.92	VI084
2-382B	USZ	149021.84	2155369.01	01-Aug-97	1294.72	1294.98	ST214
2-383B	USZ	148977.74	2155258.17	04-Aug-97	1294	1294.48	ST214
2-384B	USZ	149006.67	2155082.6	17-Aug-97	1293.88	1294.29	ST214
2-386B	USZ	157513.6	2147890.95	21-May-01	1232.23	1232.52	ST008
2-387A	LSZ	154969.39	2149053.95	27-Mar-13	1238.34	1238.67	OF060
2-387B	USZ	154977.1	2149038.07	10-May-01	1237.75	1238.07	OF060
2-387BU	USZ	154968.73	2149065.04	27-Mar-13	1238.35	1238.74	OF060
2-388A	LSZ	154481.73	2148883.62	14-Oct-02	1237.6	1238.41	OF060
2-388B	USZ	154491.04	2148883.66	14-Jun-01	1237.98	1238.34	OF060
2-388BU	USZ	154467.78	2148888.92	15-Feb-13	1238.42	1238.9	OF060
2-389A	LSZ	154194.45	2149533.88	07-Mar-13	1242.12	1242.41	OF060
2-389B	USZ	154182.34	2149523.65	16-May-01	1241.77	1242.07	OF060
2-38B	USZ	156616.56	2150830.33	15-Dec-93	1254.41	1254.41	ST008
2-390B	USZ	152302.97	2152242.35	15-May-01	1263.3	1263.57	OT001
2-391A	LSZ	154202.38	2150213.64	27-Mar-07	1246.23	1246.23	OT001
2-391B	USZ	154214.74	2150213.75	25-Sep-02	1246.56	1246.87	OF060
2-392B	USZ	150722.65	2149833.42	29-Jul-97	1244.99	1245.3	FT022
2-393B	USZ	151460.46	2149683.39	30-Jul-97	1245.97	1246.19	FT022
2-394B		154309.52	2144904.63	03-Jun-98	1222.78	1223.39	CG037
2-395A	LSZ	153735.83	2145130.79	17-Jul-98	1225.54	1223.6	CG037
2-395B	USZ	153736.09	2145144.37	02-Jun-98	1226.08	1224.28	CG037
2-396A	LSZ	154151.58	2145413.65	25-Jun-98	1225.63	1226.05	CG037
2-396B	USZ	154151.47	2145422.18	27-May-98	1225.4	1226	CG037

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-396C	LLSZ	154152.02	2145404.19	30-Jun-98	1225.62	1226.19	CG037
2-397A	LSZ	153681.64	2145772.86	18-Jun-98	1228.6	1229.08	CG037
2-397B	USZ	153681.14	2145781.74	29-May-98	1228.73	1229.21	CG037
2-398A	LSZ	153955.77	2145634.21	15-Jul-98	1227.35	1227.76	CG037
2-399A	LSZ	154409.51	2145643.36	03-Jun-98	1222.42	1222.85	CG037
2-399B	USZ	154401.55	2145652.21	05-Jun-98	1222.51	1222.85	CG037
2-39A	LSZ	156823.14	2150829.24	30-Nov-93	1253.78	1253.8	ST008
2-39B	USZ	156834.94	2150828.73	13-Dec-93	1253.83	1253.81	ST008
23A	LLSZ	153962.42	2155796.38	19-Jun-84	1270.22	1268.5	OF059
23BR	USZ	153959.97	2155874.76	11-Nov-93	1269.85	1269.85	OF059
2-4	USZ	158394.44	2148761.38	11-Feb-87	1243.16	1241.49	CG037
2-400A	LSZ	154748.79	2147870.19	15-Mar-13	1229.19	1229.54	CG037
2-400B	USZ	154736.46	2147887.25	12-Jun-98	1228.74	1229.23	CG037
2-400BU	USZ	154743.25	2147876.57	15-Mar-13	1229.19	1229.65	CG037
2-401B	USZ	156023.24	2150325.02	09-Jun-98	1247.74	1248.33	ST007
2-402A	LSZ	156832.86	2147818.73	10-Jul-98	1231.48	1231.61	ST008
2-402B	USZ	156832.22	2147829.94	16-Jun-98	1231.73	1231.85	ST008
2-403A	LSZ	157252.33	2148590.21	09-Jun-98	1237.92	1238.27	ST008
2-403B	USZ	157261.09	2148589.73	13-Aug-99	1237.85	1238.44	ST008
2-404A	LSZ	157055.68	2149214.62	28-Jul-98	1245.16	1245.57	ST008
2-404B	USZ	157064.99	2149215.66	19-May-98	1245.1	1245.65	ST008
2-405B	USZ	151737.78	2149554.39	15-Jun-98	1246.28	1246.63	CG039
2-406B	USZ	152303.2	2146477.09	21-May-98	1232.81	1233.26	CG037
2-407B	USZ	157575.54	2144998.05	01-Jun-98	1217.24	1217.82	CG037
2-408B	USZ	158007.61	2146416.15	18-May-98	1224	1220.12	CG037
2-409A		154366.98	2145238.43	12-Jun-98	1224.29	1224.83	CG037
2-409B		154367.12	2145250.63	05-Jun-98	1224.15	1224.76	CG037
2-40A	LSZ	156560.17	2150479.83	01-Dec-93	1250.06	1250.18	ST008
2-40B	USZ	156567.06	2150479.97	17-Dec-93	1250.01	1250.24	ST008
2-410B	USZ	150974.77	2149477.22	22-Jun-98	1241.84	1242.31	CG039
2-411A	LSZ	155615.48	2146050.65	15-Jul-98	1222.55	1223.11	CG037
2-412A	LSZ	153597.34	2146400.47	07-Jul-98	1229.39	1229.87	CG037
2-413A	LSZ	156425.33	2148001.35	01-Jun-98	1233.95	1234.42	ST008
2-414A	LSZ	157009.93	2145672.03	13-May-98	1221.66	1221.96	ST123
2-415A	LSZ	156721.53	2145675.63	15-May-98	1224.5	1225.05	ST123
2-416A	LSZ	157123.63	2149719.62	21-May-98	1245.81	1246.33	ST007
2-417A	LSZ	156400.6	2149568.42	17-Jul-98	1244.34	1244.68	ST007
2-418B	USZ	151271.91	2149131.53	23-Jun-98	1239.32	1239.93	OF060
2-419A	LSZ	155597.7	2149183.24	13-Feb-13	1241.24	1241.5	OF060

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-419B	USZ	155594.58	2149167.86	09-Jun-98	1240.65	1241.12	OT062
2-419BU	USZ	155600.46	2149190.64	13-Feb-13	1241.23	1241.65	OF060
2-41A	LSZ	156458.73	2150462.64	02-Dec-93	1248.04	1248.2	ST008
2-41B	USZ	156459.11	2150455.83	30-Dec-93	1248.11	1248.22	ST008
2-420B	USZ	155935.81	2147448.17	17-Mar-98	1224.57	1224.89	ST122
2-421B		155318.27	2150261.63	11-Jun-98	1244.06	1244.73	OF060
2-421BU	USZ	155326.56	2150251.72	11-Feb-13	1244.81	1245.15	OF060
2-422B	USZ	158492.72	2144783.39	12-Aug-99	1218.2	1218.84	CG037
2-423A	LSZ	154704.05	2149581.45	26-Jul-00	1242.47	1242.99	OF060
2-423B	USZ	154708.02	2149592.67	16-Sep-99	1242.45	1243.03	OF060
2-424B	USZ	148402.83	2150065.53	10-Sep-99	1262.74	1263.34	CG039
2-425B	USZ	154709.35	2149908.3	16-Sep-99	1245.9	1246.57	OF060
2-426A	LSZ	157422.81	2151427.33	19-Aug-99	1253.72	1254.36	OF060
2-426B	USZ	157422.94	2151434.07	20-Aug-99	1253.77	1254.4	OF060
2-427B	USZ	153958.17	2152976.85	31-Aug-99	1268.76	1269.31	OT001
2-428B	USZ	152814.96	2152955.49	31-Aug-99	1269.11	1269.7	OT001
2-429A	LSZ	154267.35	2151501.83	02-Sep-99	1253.33	1253.91	OT001
2-429C	LLSZ	154267.55	2151490.37	09-Sep-99	1253.31	1253.83	OT001
2-42A	LSZ	156493.65	2150603.43	29-Nov-93	1252.75	1250.5	ST008
2-42B	USZ	156501.97	2150603.74	15-Dec-93	1252.64	1250.38	ST008
2-430A	LSZ	150685.24	2154501.26	20-Sep-99	1289.41	1289.86	CG039
2-431B	USZ	157622.16	2151176.67	16-Aug-99	1255.02	1255.64	OF060
2-432A	LSZ	157573.25	2145603.47	23-May-99	1218.78	1219.03	ST123
2-433A	LSZ	157014.46	2145400.52	24-May-99	1221.42	1221.81	ST123
2-434A	LSZ	156607.5	2145549.07	21-May-99	1224.4	1224.4	ST123
2-435B	USZ	157463.6	2145977.4	18-May-99	1222.18	1222.43	ST123
2-436B	USZ	156895.87	2146150.14	19-May-99	1223.95	1224.34	ST123
2-437B	USZ	152742.35	2152244.65	17-Jul-00	1262.94	1263.58	OT001
2-438B	USZ	157534.67	2148612.47	14-Jul-00	1239.58	1240.22	ST008
2-439B	USZ	157314.52	2148118.21	06-Jul-00	1235.17	1235.84	ST008
2-43B	USZ	157313.88	2150802.11	03-Nov-93	1252.93	1252.93	ST007
2-440B	USZ	155225.98	2144152.77	29-Jun-00	1220.47	1221.09	CG037
2-441B	USZ	153457.01	2144802.85	12-Jul-00	1217.08	1217.86	CG037
2-442B	USZ	150551.96	2147383.75	11-Jul-00	1235.91	1236.53	CG038
2-443B	USZ	149890.16	2147615.98	07-Jul-00	1245.47	1246.1	CG038
2-444A	LSZ	153858.82	2150921.57	17-Jul-00	1248.2	1248.81	OT001
2-445B	USZ	150219.31	2144208.77	26-Jun-00	1271.94	1268.95	CG038
2-446B	USZ	149983.09	2144214.74	22-Jun-00	1272.58	1270.08	CG038
2-446BU	USZ	149995.36	2144215.66	04-Sep-02	1272.08	1270.04	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-447B	USZ	149058.29	2145200.14	02-Aug-00	1264.2	1264.72	CG038
2-448B	USZ	148835.44	2145245.32	02-Aug-00	1264.62	1265.17	CG038
2-449B	USZ	149408.92	2145134.87	07-Nov-01	1262.01	1262.56	CG038
2-453A	LSZ	154393.01	2148109.94	19-Mar-13	1232.26	1232.59	OF060
2-453B	USZ	154402.14	2148101.58	24-Sep-02	1231.45	1232.04	OF060
2-453BU	USZ	154409.59	2148093.4	19-Mar-13	1231.89	1232.45	OF060
2-454B	USZ	154711.2	2150318.77	11-Oct-02	1250.3	1250.77	OF060
2-455A	LSZ	155329.23	2147871.65	28-Feb-13	1230.51	1230.92	OF060
2-455B	USZ	155340.67	2147865.13	09-Oct-02	1230.22	1230.51	OF060
2-456A	LSZ	156346.26	2155843.7	21-Aug-02	1242.65	1240.54	OT005
2-457A	LSZ	156575.32	2155251.47	27-Aug-02	1273.43	1271.21	OT002
2-458C	LLSZ	157054.29	2155101.2	21-Nov-02	1275.71	1276.11	OT002
2-460A	LSZ	147616.68	2162182.86	28-Aug-02	1270.46	1270.96	CG040
2-461A	LSZ	147304.63	2161831.37	05-Sep-02	1275.28	1275.76	CG040
2-462B	USZ	148247.11	2161312.95	17-Sep-02	1302.83	1303.22	CG040
2-463B	USZ	153992.16	2149518.99	25-Sep-02	1242.5	1242.88	OF060
2-464B	USZ	149399.89	2147257.65	11-Dec-02	1240.94	1238.62	CG038
2-465B	USZ	149332.75	2147164.37	13-Dec-02	1238.69	1235.2	CG038
2-466B	USZ	149385.57	2147220.27	18-Dec-02	1240.03	1237.23	CG038
2-467B	USZ	149342.86	2147216.13	19-Dec-02	1239.33	1237.18	CG038
2-468B	USZ	149300.22	2147246.3	09-Jan-03	1240.49	1237.73	CG038
2-469B	USZ	155363.04	2144358.32	03-Dec-02	1217.47	1217.64	CG037
2-46B	USZ	156947.57	2150661.2	02-Nov-93	1251.31	1251.31	ST007
2-470A	LSZ	155239.21	2144141.3	05-Dec-02	1221.12	1221.38	CG037
2-471B	USZ	153644.73	2145442.5	05-Dec-02	1226.84	1227.1	CG037
2-472B	USZ	155203.5	2143297.63	06-Dec-02	1205.63	1205.72	CG037
2-473B	USZ	155744.85	2143089.92	06-Dec-02	1209.27	1209.44	CG037
2-474B	USZ	156078.56	2142865.99	07-Dec-02	1201.59	1201.85	CG037
2-475A	LSZ	156460.93	2145261.61	07-Dec-02	1230.13	1230.46	CG037
2-476B	USZ	151895.33	2145482.03	09-Dec-02	1222.06	1222.55	CG037
2-477A	LSZ	157653.28	2145235.87	09-Dec-02	1216.99	1217.08	CG037
2-478B	USZ	156593.56	2145558.36	09-Dec-02	1223.88	1224.31	CG037
2-479A	LSZ	156484.58	2145912.1	10-Dec-02	1227.78	1228.14	CG037
2-47B		156905.06	2151093.8	04-Nov-93	1255.64	1255.64	ST007
2-480B	USZ	156799.33	2145787.81	10-Dec-02	1224.69	1224.95	CG037
2-481B	USZ	156914.82	2145784.54	10-Dec-02	1223.58	1223.78	CG037
2-482B	USZ	152208	2145091.07	11-Dec-02	1222.6	1222.9	CG037
2-483A	LSZ	153602.32	2144628.16	11-Dec-02	1213.67	1213.94	CG037
2-484A	LSZ	153697.81	2144907.03	16-Dec-02	1217.3	1217.47	CG037

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-485B	USZ	151053.89	2146707.81	14-Aug-03	1228.29	1228	CG038
2-486B	USZ	151054.07	2146082.3	18-Aug-03	1227.68	1227.4	CG038
2-487B	USZ	151039.25	2145751.15	14-Aug-03	1229.68	1230.08	CG038
2-488B	USZ	150911.64	2145507.48	18-Aug-03	1236.43	1236.75	CG038
2-489B	USZ	149277.39	2147915.72	12-Aug-03	1258.65	1259.01	CG038
2-48B	USZ	156812.77	2151030.82	16-Dec-93	1254.93	1254.93	ST007
2-490B	USZ	149810.47	2148127.51	15-Aug-03	1244.27	1244.84	CG038
2-491B	USZ	149761.46	2147453.45	11-Aug-03	1244.48	1244.66	CG038
2-492B	USZ	150584.82	2144237.02	17-Dec-03	1266.24	1263.8	CG038
2-493B	USZ	150406.68	2144261.42	20-Dec-03	1268.12	1265.66	CG038
2-494B	USZ	150188.63	2144289.4	20-Dec-03	1270.6	1268.3	CG038
2-495B	USZ	150186.22	2144350.66	09-Jan-04	1269.35	1267.12	CG038
2-496B	USZ	150404.03	2144325.17	11-Jan-04	1267.97	1265.52	CG038
2-497B	USZ	150584.33	2144303.4	12-Jan-04	1262.91	1260.37	CG038
2-498B	USZ	150292.98	2144277.47	13-Jan-04	1269.76	1267.15	CG038
2-499B	USZ	150485.22	2144245.73	14-Jan-04	1268.77	1265.91	CG038
2-49B	USZ	156840.74	2150975.68	16-Dec-93	1253.85	1253.85	ST007
24A	LSZ	152784.38	2155845.27	20-Jun-84	1287.29	1285	CG039
24B		152752.12	2155845.96	10-Apr-86	1285.35	1282.27	CG039
24CR	LLSZ	152760.33	2155821.58	01-Dec-93	1283.54	1279.95	CG039
2-5	HWBZ	147063.93	2151129	10-Mar-95	1275.4	1275.6	ST107
2-500B	USZ	149477.35	2147299.45	08-Nov-04	1243.76	1244.08	LF012
2-501A	LSZ	151936.2	2154654	20-Oct-04	1277.88	1278.39	CG039
2-501B	USZ	151936.07	2154644.42	13-Oct-04	1277.76	1278.27	CG039
2-502A	LSZ	151892.97	2154474.3	20-Oct-04	1276.47	1277.02	CG039
2-502B	USZ	151891.98	2154482.49	13-Oct-04	1276.86	1277.34	CG039
2-503A	LSZ	147506.08	2161997.11	17-Sep-04	1268.86	1269.4	CG040
2-504A	LSZ	147279.45	2161979.06	21-Sep-04	1268.62	1269.02	CG040
2-504C	LSZ	147295.32	2161979.51	27-Sep-04	1267.62	1267.94	CG040
2-505A	LSZ	147671.93	2161670.76	01-Oct-04	1290.36	1290.77	CG040
2-506B	USZ	150055.62	2144229.8	18-May-04	1269.35	1269.93	CG038
2-507B	USZ	150337.19	2144235.32	18-May-04	1266.71	1266.98	CG038
2-508B	USZ	150446.56	2144223.3	18-May-04	1265.25	1265.64	CG038
2-509B	HWBZ	151132.93	2146460.78	11-Nov-04	1235.5	1236.07	LF013
2-50B	USZ	158488.18	2148603.56	25-Oct-93	1241.38	1241.38	ST033
2-510B	USZ	151904.5	2155155.95	25-Nov-03	1271.53	1271.81	
2-511B	USZ	152088.57	2155477.75	18-Sep-03	1271.83	1272.27	
2-512B	USZ	149658.68	2147155.94	09-Dec-04	1241.24	1241.6	CG038
2-513B	USZ	150259.22	2146179.82	06-Dec-04	1252.75	1253.2	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-514B	USZ	149885.55	2145939.77	03-Dec-04	1257.73	1258.23	CG038
2-515B	USZ	150022.97	2145808.34	02-Dec-04	1256.83	1257.36	CG038
2-516B	USZ	150384.25	2146218.76	20-Jan-05	1256.8	1257.22	CG038
2-517B	USZ	148618.62	2146541.23	16-Feb-05	1268.09	1268.45	CG038
2-518B	USZ	150190.57	2145729.86	03-Feb-05	1250.43	1250.9	CG038
2-519B	USZ	150276.84	2146388.32	08-Feb-05	1248.39	1248.98	CG038
2-51A	LSZ	158343.4	2148830.13	08-Nov-93	1241.65	1241.77	ST033
2-51B	USZ	158327.5	2148829.99	21-Oct-93	1241.45	1241.45	ST033
2-520B	USZ	149096.18	2146740.71	10-Feb-05	1250.13	1250.38	CG038
2-521B	USZ	149794.39	2147065.63	11-Feb-05	1239.85	1240.31	CG038
2-522B	USZ	150389.41	2146330.37	14-Feb-05	1254.73	1255.18	CG038
2-523B	USZ	150551.5	2146698.4	16-Apr-05	1245.78	1246.13	CG038
2-524B	USZ	150717.76	2147159.24	19-Apr-05	1233.43	1233.78	CG038
2-525B	USZ	148975.66	2154423.47	01-Aug-05	1288.63	1288.81	WP018
2-526B	HWBZ	148185.86	2154342.85	02-Aug-05	1284.5	1284.49	WP018
2-527B	USZ	148804.12	2154041.54	02-Aug-05	1277.92	1278.09	WP018
2-528B	USZ	149194.44	2154547.3	03-Aug-05	1290.45	1290.62	WP018
2-529B	USZ	149390.91	2154538.62	04-Aug-05	1285.22	1285.5	WP018
2-52A	LSZ	158309.97	2148650.38	03-Nov-93	1239.83	1239.83	ST033
2-52B	USZ	158318.86	2148650.15	22-Oct-93	1239.95	1239.95	ST033
2-52C	LLSZ	158330.49	2148650.14	15-Sep-99	1239.46	1240.11	ST033
2-530B	USZ	149895.31	2154398.42	05-Aug-05	1290.7	1291.09	WP018
2-531B	USZ	149583.47	2145290.92	09-Oct-06	1252.64	1252.9	CG038
2-534B	USZ	149891.91	2145255.88	03-Nov-06	1251.32	1251.79	CG038
2-535B	USZ	150579.89	2145913.13	17-Nov-06	1254.87	1255.17	CG038
2-536B	USZ	150872.44	2146043.14	14-Nov-06	1243.87	1244.25	CG038
2-537B	USZ	150085.07	2147403.11	27-Nov-06	1240.36	1240.92	CG038
2-538B	USZ	149467.91	2147684.31	24-Oct-06	1251.71	1252.05	CG038
2-539B	USZ	150270.43	2148570.81	26-Oct-06	1240.8	1241.31	CG038
2-53B	USZ	152179.05	2155280.53	11-Nov-93	1274.4	1270.07	
2-540B	USZ	151761.43	2148986.32	07-Feb-07	1240.8	1241.1	CG039
2-541B	USZ	151320.23	2148579.83	07-Feb-07	1233.42	1233.6	CG039
2-542B	USZ	150948.43	2148877.28	30-Jan-07	1242.47	1243.05	CG039
2-543B	USZ	151213.39	2153001.04	10-Apr-07	1269.25	1269.5	CG039
2-544B	USZ	148066.39	2149477.01	17-Feb-07	1262.73	1263.05	CG039
2-545B	USZ	151038.51	2154893.23	14-Mar-07	1300.73	1300.8	CG039
2-546B	USZ	150258.52	2152322.83	19-Mar-07	1262.79	1263	CG039
2-547B	USZ	147160.65	2150761.98	20-Mar-07	1269.78	1269.95	CG039
2-548B	USZ	150706.81	2154017.31	20-Mar-07	1287.12	1287.25	CG039

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-549B	USZ	150323.4	2145947.13	01-Dec-08	1257.68	1257.95	CG038
2-54B	USZ	152186.26	2155368.96	10-Nov-93	1275.88	1271.51	
2-550H	HWBZ	150475.47	2146494.59	24-Nov-08	1250.32	1250.62	CG038
2-551H	HWBZ	150403.4	2146403.08	24-Nov-08	1253.24	1253.56	CG038
2-552H	HWBZ	150502.33	2146287.13	24-Nov-08	1257.63	1257.99	CG038
2-553H	HWBZ	150416.48	2146278.01	25-Nov-08	1256.53	1256.83	CG038
2-554WB	LSZ	153767.37	2154223.54	26-Jun-09	1275.88	1276.25	OT001
2-555B	USZ	158221.57	2146082.22	01-Jul-09	1223.26	1223.61	
2-556WB	LSZ	155549.71	2153347.78	02-Jul-09	1273	1273.35	OT001
2-557B	USZ	148942.15	2153659.43	30-Jun-09	1276.42	1276.85	WP018
2-558B	USZ	149095.99	2153487.59	30-Jun-09	1275.41	1275.88	CG039
2-559B	USZ	158032.7	2145261.02	01-Jul-08	1211.13	1211.59	CG037
2-55B	USZ	152121.1	2155424.24	10-Nov-93	1276.03	1271.84	
2-560B	USZ	155704.49	2153543.65	03-Feb-10	1275.82	1276.17	OT001
2-561B	USZ	155745.85	2153586.15	04-Feb-10	1275.93	1276.17	OT001
2-562B	USZ	155585.38	2153476.39	04-Feb-10	1275.97	1276.17	OT001
2-563B	USZ	154103.04	2153861.49	06-Feb-10	1275.82	1276.24	OT001
2-564B	USZ	153621.63	2153793.8	10-Feb-10	1275.8	1276.24	OT001
2-565B	USZ	155051.62	2154015.3	10-Feb-10	1275.79	1276.24	OT001
2-566B	USZ	150626.39	2150350.56	01-Jan-15	1250.01	1250	OT001
2-567B	USZ	150857.29	2150281.12	01-Jan-15	1254.01	1254	OT001
2-568B	USZ	153360.97	2153717.25	04-Apr-12	1274.95	1275.38	OT001
2-569A	LSZ	153529.81	2153714.7	02-Apr-12	1275.05	1275.76	OT001
2-569B	USZ	153522.21	2153714.64	02-Apr-12	1275.31	1275.82	OT001
2-56B	USZ	151920.75	2155479.68	11-Nov-93	1277.01	1273.25	
2-570B	USZ	153982.02	2153881.56	09-Apr-12	1275.72	1276.23	OT001
2-571B	USZ	154847.68	2153805.68	10-Apr-12	1275.94	1276.28	OT001
2-572B	USZ	155394.67	2153869.68	11-Apr-12	1275.93	1276.26	OT001
2-573B	USZ	149099.22	2155257.03	04-Oct-12	1296.28	1296.7	OT067
2-574B	USZ	149315.85	2155807.63	25-Oct-12	1295.01	1295.56	OT067
2-575B	USZ	149260.86	2155186.29	29-Oct-12	1295.21	1295.47	OT067
2-576B	USZ	149082.08	2155714.2	25-Oct-12	1295.25	1295.61	OT067
2-577A	LSZ	150375.63	2154073.73	03-Dec-12	1290.75	1290.96	OT069
2-577B	Not Available	150391.65	2154108.66	06-Nov-12	1290.16	1290.69	OT069
2-578B	Not Available	149898.76	2154031.58	09-Nov-12	1290.46	1290.86	OT069
2-579B	USZ	150387.16	2155007.62	13-Nov-12	1293.55	1293.91	OT069
2-57A	LSZ	151897.1	2155025.78	09-Dec-93	1279.75	1272.74	ST032

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-57B	USZ	151897.6	2155020.71	06-Jan-94	1279.56	1272.88	
2-580B	USZ	150385.23	2155533.97	12-Nov-12	1293.73	1294.09	OT069
2-581BU	USZ	156343.05	2148582.05	23-Jan-13	1239.01	1239.34	CG41
2-582BL	USZ	156205.54	2148138.73	10-Jan-13	1238.78	1239.15	CG41
2-582BU	USZ	156208.5	2148138.88	11-Jan-13	1238.9	1239.14	CG41
2-583BL	USZ	155881.66	2148389.94	16-Jan-13	1240.13	1240.62	CG41
2-583BU	USZ	155889.73	2148390.36	16-Jan-13	1240.29	1240.76	CG41
2-584BL	USZ	155784.73	2149122.9	28-Jan-13	1242.82	1243.36	CG41
2-584BU	USZ	155784.66	2149118.45	28-Jan-13	1242.88	1243.39	CG41
2-585A	LSZ	155614.39	2148331.72	19-Feb-13	1235.07	1235.46	CG41
2-585BL	USZ	155614.3	2148335.16	15-Jan-13	1235.14	1235.48	CG41
2-585BU	USZ	155614.19	2148339.02	15-Jan-13	1235.07	1235.49	CG41
2-586BL	USZ	155763.43	2148811.54	25-Jan-13	1242.17	1242.55	CG41
2-586BU	USZ	155768.41	2148811.26	25-Jan-13	1242.03	1242.54	CG41
2-587BU	USZ	155503.89	2147583.69	11-Mar-13	1228.47	1228.85	CG41
2-588BU	USZ	155447.11	2149406.85	07-Feb-13	1243.5	1243.89	CG41
2-589A	LSZ	154906.27	2148347.43	05-Mar-13	1232.96	1233.37	CG41
2-589BL	USZ	154898.15	2148354.45	04-Mar-13	1232.86	1233.27	CG41
2-58A	LSZ	152126.72	2155206.49	10-Dec-93	1275	1270.84	ST032
2-58C	LLSZ	152135.38	2155206.15	23-Sep-99	1270.15	1270.75	ST032
2-59	USZ	148773.6	2155283.8	15-Nov-93	1297.78	1295.44	VI084
2-590BU	USZ	155229.34	2148996	07-Feb-13	1238.97	1239.37	CG41
2-591BU	USZ	155221.27	2149564.78	01-Feb-13	1241.81	1242.27	CG41
2-592BU	USZ	154945.98	2149451.11	11-Feb-13	1239.6	1240.11	CG41
2-593BU	USZ	155124.07	2147787.25	12-Mar-13	1229.26	1229.69	CG41
2-594A	LSZ	154922.83	2150299.3	30-Jan-13	1248.34	1248.92	CG41
2-595BL	USZ	154774.91	2150666.64	14-Mar-13	1252.35	1252.82	CG41
2-595BU	USZ	154769.69	2150662.05	14-Mar-13	1252.38	1252.83	CG41
2-596BL	USZ	154372.58	2149394.3	12-Mar-13	1240.83	1241.26	CG41
2-596BU	USZ	154367.08	2149393.97	12-Mar-13	1241.2	1241.56	CG41
2-597BL	USZ	155910.84	2148580.08	21-Mar-13	1241.92	1242.33	CG41
2-597BU	USZ	155906.87	2148579.73	21-Mar-13	1241.9	1242.3	CG41
2-598BL	USZ	155986	2149154.09	24-Jan-13	1242.58	1242.95	CG41
2-598BU	USZ	155986.11	2149148.96	24-Jan-13	1242.7	1243.02	CG41
2-599BU	USZ	155204.66	2149832.39	05-Feb-13	1242.01	1242.52	CG41
25AR	LSZ	153514.98	2153302.52	19-Nov-93	1278.47	1276.12	ST006
25CR	LLSZ	153502.2	2153299.43	23-Nov-93	1278.33	1276.12	ST006
2-6	HWBZ	147087.22	2151104.87	11-Feb-87	1275.5	1275.75	ST107
2-60	USZ	148743.29	2155093.57	23-Nov-93	1295.59	1295.79	OT055

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-600BU	USZ	155478.72	2148773.95	05-Feb-13	1238.08	1238.57	CG41
2-601BU	USZ	156282.66	2149170.67	17-Jan-13	1243.16	1243.65	CG41
2-602BU	USZ	154969.88	2149757.57	05-Feb-13	1242.01	1242.46	CG41
2-603B	USZ	157011.08	2146196.48	11-Mar-13	1223.45	1223.94	CG042
2-604BU	USZ	155603.64	2147196.03	17-Apr-13	1223.81	1224.24	CG41
2-605B	USZ	153979.53	2153824.69	21-Nov-13	1276.02	1276.16	OT001
2-606B	USZ	153761.89	2153788.4	18-Nov-13	1275.79	1276.22	OT001
2-607B	USZ	153644.6	2153864.41	20-Nov-13	1275.84	1276.24	OT001
2-608B	USZ	153538.32	2153825.6	19-Nov-13	1275.74	1276.25	OT001
2-609B	USZ	153588.91	2153657.14	22-Jan-14	1275.04	1275.64	OT001
2-61	USZ	148679.4	2155135.27	22-Nov-93	1297.67	1295.5	OT055
2-610B	USZ	153249.99	2153676.14	22-Oct-14	1275.16	1275.53	OT001
2-611B	USZ	153424.91	2153846.62	23-Oct-14	1275.66	1275.22	OT001
2-612B	USZ	150495.34	2150527.52	12-May-15	1245.56	1245.97	CG039
2-613A	LSZ	156555.34	2149999.47	09-Jun-14	1247.71	1248.1	OT064
2-613B	USZ	156562.07	2149999.74	09-Jun-14	1247.79	1248.19	OT064
2-614A	LSZ	156835.47	2150166.05	10-Jun-14	1248.12	1248.62	OT064
2-614B	USZ	156827.75	2150165.93	09-Jun-14	1248.3	1248.62	OT064
2-615B	USZ	149076.38	2145604.61	30-Jan-15	1265.83	1266.51	CG038
2-616B	USZ	149249.59	2145601.69	29-Jan-15	1263.56	1264.08	CG038
2-617B	USZ	158632.98	2148538.78	14-May-15	1241.63	1241.96	CG037
2-618B	USZ	158611.7	2148487.81	11-May-15	1241.09	1241.42	CG037
2-619BL	USZ	156162.46	2153310.99	09-Sep-15	1268.94	1269.46	ST003
2-62A	LSZ	150474.28	2150554.69	22-Nov-93	1246.21	1246.41	FT022
2-62BR	Not Available	150467.46	2150542.8	20-Feb-13	1246.35	1246.72	CG039
2-63A	LSZ	150416.35	2150445.54	19-Nov-93	1243.39	1243.63	FT022
2-63B	USZ	150412.49	2150437.88	08-Nov-93	1243.28	1243.36	FT022
2-64A	LSZ	150496.59	2150361.9	18-Nov-93	1246.05	1246.12	FT022
2-64B	USZ	150493.78	2150370.28	09-Nov-93	1245.59	1245.75	CG039
2-65A	LSZ	150724.67	2150592.41	15-Nov-93	1250.98	1251.12	FT022
2-65B	USZ	150739.27	2150585.73	05-Nov-93	1250.81	1250.94	FT022
2-66A	USZ	153510.7	2145894.27	02-Nov-93	1228.21	1228.46	OT050
2-66B	USZ	153501.83	2145894.21	26-Oct-93	1228.42	1228.57	OT050
2-66C	LSZ	153522.82	2145893.3	16-Jul-97	1227.99	1228.4	OT050
2-67A	USZ	153325.66	2145662.91	03-Nov-93	1227.88	1227.99	OT050
2-67B	USZ	153333.11	2145662.43	28-Oct-93	1227.75	1227.94	OT050
2-68A	USZ	153483.32	2145670.3	04-Nov-93	1227.64	1227.77	OT050
2-68B	USZ	153496.79	2145669.99	29-Oct-93	1227.5	1227.74	OT050

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-68C	LSZ	153467.35	2145669.82	16-Jul-97	1227.34	1227.74	OT050
2-69	LSZ	149425.96	2153861.38	20-Oct-93	1287.57	1285.67	WP036
2-7	HWBZ	147100.05	2151153.52	11-Feb-87	1275.33	1275.7	ST107
2-70	LSZ	149353.35	2153898.42	07-Dec-93	1286.67	1284.84	WP036
2-71	LSZ	149320.01	2153995.26	10-Dec-93	1286.2	1284.34	WP036
2-73BL	USZ	156331.23	2153613.75	25-Oct-93	1269.84	1269.84	CG037
2-73BU	USZ	156331.72	2153605.75	25-Oct-93	1270.06	1270.36	ST003
2-74BL	USZ	156221.31	2153346.35	09-Sep-15	1270.36	1270.95	ST003
2-74BU	USZ	156227.7	2153346.29	05-Nov-93	1270.79	1271.12	ST003
2-75BL	USZ	156228.73	2153484.8	28-Oct-93	1271.21	1271.39	ST003
2-75BU	USZ	156228.72	2153454.8	26-Oct-93	1271.2	1271.46	ST003
2-76	USZ	156217.18	2153545.52	03-Nov-93	1271.64	1272.04	ST003
2-77BL	USZ	156169.53	2153701.21	06-Nov-93	1273.49	1273.79	ST003
2-77BU	USZ	156169.79	2153707.51	28-Oct-93	1273.61	1273.77	ST003
2-78	USZ	156166.72	2153546.99	28-Oct-93	1271.93	1271.93	ST003
2-78	USZ	156166.72	2153546.99	28-Oct-93	1271.93	1271.93	ST003
2-79BL	USZ	156115.24	2153436.26	04-Nov-93	1271.99	1272.29	ST003
2-79BU	USZ	156121.61	2153436.51	05-Nov-93	1271.98	1272.23	ST003
2-8	USZ	152107.09	2155293.34	12-Feb-86	1272.68	1271.1	ST032
2-80	USZ	156113.36	2153586.09	10-Nov-93	1272.19	1272.19	ST003
2-80	USZ	156113.36	2153586.09	10-Nov-93	1272.19	1272.19	ST003
2-81	LSZ	156140.79	2153554.33	04-Nov-93	1275.63	1272.19	ST003
2-82BL	USZ	156090.48	2153662.74	06-Nov-93	1274.06	1274.16	ST003
2-83BL	USZ	156044.69	2153624.04	05-Nov-93	1273.8	1274.33	ST003
2-84BL	USZ	156001.76	2153591.7	04-Nov-93	1272.23	1272.23	ST003
2-84BU	USZ	156001.75	2153600.06	27-Oct-93	1272.36	1272.36	ST003
2-85B	USZ	156002.76	2153667	04-Nov-93	1274.11	1274.11	ST003
2-86B	USZ	149276.62	2153752.81	15-Feb-95	1285.86	1282.72	WP018
2-87B	USZ	149150.51	2153887.06	15-Feb-95	1282.86	1279.1	WP018
2-88B	USZ	148993.52	2153946.44	14-Feb-95	1282.42	1279.09	WP018
2-89B	USZ	148948.84	2154073.91	08-Feb-95	1282.16	1278.84	WP018
28B	LSZ	148856.17	2157906.31	24-Apr-95	1272.46	1272.84	LF016
2-9	USZ	152014.92	2155271.88	17-Feb-86	1273.49	1271.6	
2-91A	LSZ	148821.33	2152949.69	14-Feb-95	1263.69	1263.9	WP018
2-91B	USZ	148813.25	2152959.78	14-Feb-95	1263.97	1264.21	WP018
2-92A	LSZ	148599.67	2153207.94	14-Feb-95	1271.44	1268.12	WP018
2-92B	USZ	148590.96	2153218.38	04-Feb-95	1271.39	1268.53	WP018
2-93A	LSZ	148442.09	2153606.55	13-Feb-95	1276.3	1273.68	WP018
2-93B	USZ	148433.16	2153615.78	06-Feb-95	1275.78	1272.99	WP018

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
2-97A	LSZ	148711.59	2157045.76	08-Feb-95	1288.45	1285	LF016
2-99B	USZ	147403.74	2156506.26	28-Dec-94	1273.85	1271.69	LF016
2AR	USZ	151770.52	2146054.67	29-Mar-95	1222.26	1219.9	LF013
2-S449B	USZ	154729.02	2145300.48	09-Dec-11	1220.33	1220.4	CG037
30	USZ	148438.95	2157782	22-Jun-84	1282.55	1282.96	LF016
3100-MW02	USZ	154423.25	2153381.63	17-Jun-92	1273.01	1273.36	ST216
3100-MW03	USZ	154228.88	2153280.52	17-Jun-92	1272.84	1273.19	ST216
3100-MW04	USZ	154228.01	2153273.78	17-Jun-92	1272.71	1272.97	ST216
33EW-1	LSZ	158451.21	2148667.06	18-Aug-97	1239.12	1241.72	ST033
33EW-2	LSZ	158310.43	2148675.06	18-Aug-97	1238.91	1241.36	ST033
33VEP-01	USZ	158479.25	2148604.16	07-Feb-96	1238.62	1238.62	ST033
33VEP-02	USZ	158441.64	2148601.6	06-Feb-96	1238.39	1238.39	ST033
33VEP-03	USZ	158439.79	2148656.29	06-Feb-96	1236.69	1236.69	ST033
33VEP-04	USZ	158398.28	2148707.97	05-Feb-96	1237.36	1237.69	ST033
33VEP-05	USZ	158367.37	2148697.38	30-Jan-96	1236.77	1236.77	ST033
33VEP-06	USZ	158336.24	2148808.69	01-Jan-01	1239.56	1239.56	ST033
33VEP-07	USZ	158397.49	2148751.27	01-Jan-01	1238.76	1238.76	ST033
33VEP-08	USZ	158321.09	2148727.29	23-Jan-96	1236.87	1236.87	ST033
33VEP-09	USZ	158559.05	2148429.63	26-Mar-97	1240.33	1245.35	ST033
33VEP-10	USZ	158420.43	2148209.46	27-Mar-97	1236.55	1238.54	ST033
33VEP-11	USZ	158360.35	2148341.59	25-Mar-97	1235.96	1238.21	ST033
33VEP-12	USZ	158361.92	2148469.97	02-Apr-97	1236.4	1239.02	ST033
34A	USZ	155017.68	2154179.73	16-Aug-85	1275.36	1274.8	OT001
34B	LSZ	155023	2154180	19-Aug-85	1273.99	1274.83	OT001
34CR	LLSZ	155028.49	2154179.83	29-Jan-94	1275.91	1276.23	OT001
34DR	PZ	155091.13	2154014.91	26-Feb-94	1275.95	1276.24	OT001
35A	USZ	155442.02	2154177.65	22-Aug-85	1275.08	1275.92	OT001
35BR	LSZ	155447.73	2154177.7	11-Nov-93	1275.76	1276.25	OT001
35C	LLSZ	155451.91	2154177.6	27-Aug-85	1275.04	1275.91	OT001
35D	PZ	155404.16	2154166.03	18-Dec-93	1276	1276.29	OT001
36	LSZ	148322.3	2157320	01-Jan-85	1296.2	1293.86	LF016
38	LSZ	147656.34	2157677.25	01-Jan-85	1302.89	1300.58	LF016
39R	USZ	147662.42	2158004.83	03-May-95	1291.68	1291.13	LF016
3A	USZ	151480.59	2146615.42	21-Nov-83	1226.35	1223.79	LF013
3B	LSZ	151463.21	2146624.49	22-Nov-83	1226.62	1224.42	LF013
45AR	USZ	148862.81	2145616.85	27-Mar-95	1269.18	1266.64	CG038
45B	HWBZ	148859.82	2145630.74	07-May-86	1268.88	1266.33	CG038
45CR	LSZ	148848.91	2145617.69	23-Mar-95	1268.91	1266.63	CG038
46AR	USZ	149896.23	2145596.17	20-Mar-95	1258.95	1255.99	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
46B	HWBZ	149905.64	2145595.64	08-May-86	1258.21	1255.7	CG038
46C	LSZ	149881.28	2145596.88	28-Mar-95	1258.88	1256.43	CG038
47AR	USZ	148529.81	2147217.7	17-Feb-95	1252.76	1249.92	CG038
47B	HWBZ	148529.35	2147204.71	12-May-86	1251.49	1249.59	CG038
49AR	USZ	146202.02	2150866.22	02-Feb-95	1282.67	1280.04	OF059
49B	HWBZ	146216.07	2150866.45	13-May-86	1282.84	1279.96	OF059
49C	LSZ	146189.89	2150866.92	01-Feb-95	1282.98	1280.29	OF059
49D	LLSZ	146177.81	2150869.22	31-Jan-95	1283.2	1280.55	OF059
4AR	USZ	151145.33	2147008.76	11-Mar-95	1224.39	1222.07	LF013
4BR	HWBZ	151142.95	2147020.35	11-Mar-95	1224.45	1222.14	LF013
4C	LSZ	151148.12	2146997.66	10-Jul-92	1224.37	1222.09	LF013
55A		147668.21	2158417.31	13-May-87	1295.43	1293.2	LF016
55B	USZ	147667.34	2158432.02	25-Nov-86	1296	1293.63	LF016
55C	LSZ	147668.25	2158408.67	13-May-87	1294.85	1293.12	LF016
56A	LSZ	147676.09	2158603.89	19-Sep-86	1301.53	1299.27	LF016
56B	USZ	147679.12	2158612.83	22-Sep-86	1301.66	1299.66	LF016
57A	LSZ	148012.75	2158639.27	21-Aug-86	1301.01	1298.85	LF016
57B	USZ	148025.9	2158639.63	22-Aug-86	1301.28	1298.72	LF016
58AR	LSZ	148909.33	2150740.6	29-Jul-98	1259.4	1256.42	OT005
58BR	USZ	148899.71	2150730.46	18-Jun-98	1259.68	1257.16	OT005
59AR	LSZ	150253.01	2147480.88	23-Feb-95	1243.25	1240.35	LF012
59B	USZ	150267.55	2147474.47	16-Dec-86	1242.92	1240.21	LF012
59C	HWBZ	150277.76	2147469.94	15-Jan-87	1242.62	1240.02	LF012
59D	LLSZ	150241.59	2147486.14	22-Feb-95	1243.43	1240.5	LF012
5AR	USZ	151017.03	2147456.44	09-Mar-95	1226.29	1223.23	LF012
5C	USZ	151003.59	2147451.61	09-Mar-95	1226.99	1223.9	LF012
6	USZ	149535.98	2150856	04-Jun-86	1241.69	1241.06	LF015
60A	HWBZ	149827	2146607.57	23-Dec-86	1244.69	1242.51	LF012
60B	USZ	149840.59	2146591.02	13-Jan-87	1244.83	1242.63	LF012
61A	USZ	152378.95	2145603.91	20-Feb-87	1219.44	1216.36	FT021
61B	LSZ	152374.35	2145614.88	18-Nov-87	1219.52	1216.78	FT021
61PDD1-1	USZ	152243.94	2155023.15	16-Nov-01	1269.48	1271.35	
61PDD1-2	USZ	152244.56	2155155.07	14-Nov-01	1270.31	1271.44	
61PDD1-3	USZ	152340.21	2155144.74	08-Nov-01	1269.76	1270.75	
61PDD1-4	USZ	152186.45	2155303.94	06-Nov-01	1269.67	1271.25	
61PDD1-5	USZ	152106.66	2155260.28	19-Nov-01	1269.31	1270.71	
61PDD1-6	USZ	152021.66	2155259.34	19-Nov-01	1269.19	1270.9	
61PDD2-1	USZ	151889.66	2154804.4	09-Nov-01	1277.3	1278.33	
61PDD2-2	USZ	151827.1	2154814.33	07-Nov-01	1278.17	1279.35	

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
61PDD2-3	USZ	151937.15	2154634.4	05-Nov-01	1277.18	1278.25	
61PDD3-1	USZ	151842.27	2154351.44	10-Nov-01	1273.68	1275	
61PDD3-2	USZ	152004.63	2154355.38	10-Nov-01	1273.1	1275.14	
62	USZ	152655.63	2145813.5	03-Aug-88	1224.53	1221.62	FT021
62VEP1-1	USZ	156102.42	2149475.6	08-Mar-04	1246.41	1247.78	OT062
62VEP1-2	USZ	156272.13	2149391.24	15-Mar-04	1244.53	1245.95	OT062
62VEP1-3	USZ	156379.03	2149576.11	02-Mar-04	1245.23	1246.76	OT062
62VEP2-1	USZ	156411.17	2149824.19	05-Mar-04	1244.29	1245.71	OT062
62VEP2-2	USZ	156414.18	2149916.87	01-Mar-04	1244.83	1246.25	OT062
62VEP2-3	USZ	156412.62	2149999.43	26-Feb-04	1244.94	1246.58	OT062
62VEP2-4	USZ	156403.97	2150077.4	25-Feb-04	1245.41	1246.74	OT062
64A	LSZ	147699.1	2156857.68	25-Apr-88	1288	1285.11	LF016
64B	USZ	147714.94	2156856.17	26-Apr-88	1287.89	1284.92	LF016
65A	LSZ	147317.68	2156966.36	28-Apr-88	1296.22	1292.68	LF016
65B	USZ	147316.38	2156980.1	29-Apr-88	1296.16	1293.47	LF016
66B	USZ	147174.28	2157384.13	05-May-88	1293	1293.88	LF016
67A	LSZ	147069.23	2157880.25	09-May-88	1296.67	1293.78	LF016
67BR	USZ	147070.99	2157892.05	03-Jan-95	1297.21	1294.31	LF016
69	USZ	158823.56	2143197	22-Oct-87	1198.52	1196.5	OF059
6A	LSZ	149538.3	2150846.47	04-Dec-86	1243.56	1240.95	LF015
7	USZ	149208.55	2151050.75	04-Jun-87	1248.28	1245.65	LF015
70	USZ	158511.52	2149212	29-Oct-87	1246.23	1243.58	OF059
73R	USZ	149529.91	2155787.55	18-Oct-95	1298.5	1295.82	CG039
740-MW1	USZ	157209.36	2146203.98	02-Jun-92	1224.06	1224.26	ST123
740-MW2	USZ	157171.4	2146353.47	02-Jun-92	1225.41	1225.47	ST123
75A	HWBZ	150686.44	2145321.14	03-Aug-88	1246.61	1244.03	LF014
75B	USZ	150674.39	2145323	03-Aug-88	1246.2	1243.56	LF014
76A	USZ	151132.91	2146043.05	09-Aug-88	1230.85	1228.15	LF013
76B	LSZ	151109.46	2146042.12	17-May-88	1230.04	1227.73	LF013
76C	HWBZ	151121.71	2146042.45	15-Mar-95	1230.44	1227.72	LF013
76D	LSZ	151109.89	2146027.22	14-Mar-95	1230.03	1227.4	LF013
77A	USZ	151459.65	2146771.81	19-May-88	1221.74	1219.19	LF013
77C	LSZ	151450.48	2146786.15	05-Apr-95	1221.81	1219.13	LF013
77D	LSZ	151466.69	2146761.69	04-Apr-95	1221.66	1219	LF013
78A	USZ	150680.33	2147788.42	08-Dec-87	1233.33	1231.07	LF012
78B	LSZ	150686.75	2147795.86	08-Dec-87	1233.43	1230.57	LF012
78C	HWBZ	150702.83	2147791.08	16-Mar-95	1233	1230.24	LF012
79A	HWBZ	149350.88	2147259.52	03-Aug-88	1240.18	1237.6	CG038
79BR	USZ	149367.25	2147236.62	17-Feb-95	1239.48	1236.69	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
79C	LSZ	149370.15	2147249.65	03-Aug-88	1239.85	1237.09	CG038
79D	LLSZ	149348.44	2147246	06-Mar-95	1240	1237.3	CG038
7RW-1	LSZ	156550.59	2149544.79	28-Nov-00	1244.29	1245.41	ST007
7RW-2	LSZ	156782.01	2149663.09	20-Dec-00	1245.75	1246.83	ST007
7RW-3	LSZ	156752.14	2150839.8	01-Dec-00	1252.92	1253.92	ST007
7RW-4	LSZ	156161.75	2151500.19	02-Dec-00	1256.84	1256.92	ST007
7RW-5	LSZ	156543.67	2151335.98	20-Dec-00	1253.85	1254.84	ST007
7VEP-1	USZ	156519.62	2150620.82	30-Jun-98	1259.23	1251.67	ST007
7VEP1-1	USZ	165556.23	2150833.62	16-Sep-99	1251.9	1253.7	ST007
7VEP-12	USZ	156525.32	2150280.79	09-Jul-98		1248.03	ST007
7VEP1-2	USZ	156632.93	2150833.64	16-Sep-99	1252.09	1253.79	ST007
7VEP1-3	USZ	158715.6	2150833.09	14-Sep-99	1252.32	1253.92	ST007
7VEP-15	USZ	157139.54	2150738.8	19-Sep-99	1248.59	1250.78	ST007
7VEP-16	USZ	157140.12	2150802.35	19-Sep-99	1248.82	1251.2	ST007
7VEP-17	USZ	157140.47	2150928.04	18-Sep-99	1250.32	1262.54	ST007
7VEP-18	USZ	156846.61	2150448.86	23-Aug-07		1248	ST007
7VEP-2	USZ	156602.77	2150622.41	02-Jul-98	1250.34	1251.89	ST007
7VEP2-1	USZ	156689.09	2150888.48	28-Sep-99	1252.34	1253.87	ST007
7VEP2-2	USZ	156778.97	2150887.31	28-Sep-99	1252.15	1253.94	ST007
7VEP2-3	USZ	156914.18	2150958.98	29-Sep-99	1253.69	1254.91	ST007
7VEP2-4	USZ	156861.43	2150889.67	29-Sep-99	1252.07	1253.95	ST007
7VEP-3	USZ	156679.47	2150617.25	01-Jul-98	1250.34	1251.99	ST007
7VEP3-1	USZ	156942.08	2150842.15	23-Sep-99	1253.02	1254.88	ST007
7VEP3-1-2	USZ	156881.73	2150832.44	23-Sep-99	1252.42	1253.96	ST007
7VEP3-2	USZ	156978.08	2150767.64	30-Sep-99	1252.2	1253.79	ST007
7VEP3-3	USZ	157011.07	2150711.36	30-Sep-99	1248.47	1250.66	ST007
7VEP3-4	USZ	156941.05	2150639.78	01-Oct-99	1250.24	1251.71	ST007
7VEP-4	USZ	156756.61	2150641.87	02-Jul-98	1250.71	1252.81	ST007
7VEP4-1	USZ	156649.57	2151287.34	15-Sep-99	1252.84	1254.4	ST007
7VEP4-2	USZ	156741.3	2151275.67	14-Sep-99	1252.67	1254.26	ST007
7VEP4-3	USZ	156658.75	2151493.63	20-Sep-99	1252.56	1254.58	ST007
7VEP-5	USZ	156826.16	2150644.26	06-Jul-98	1251.01	1252.67	ST007
7VEP5-1	USZ	156598.47	2151347.86	21-Sep-99	1252.87	1254.86	ST007
7VEP5-2	USZ	156516.17	2161342.9	22-Sep-99	1252.95	1254.93	ST007
7VEP5-3	USZ	156357.13	2151309.3	21-Sep-99	1254.55	1255.57	ST007
7VEP-6	USZ	156886.13	2150519.69	06-Jul-98	1247.92	1250.22	ST007
7VEP-7	USZ	156792.15	2150539.8	07-Jul-98	1247.79	1250.19	ST007
7VEP-8	USZ	156702.83	2150540.06	08-Jul-98	1247.96	1250.3	ST007
7VEP-9	USZ	156631.89	2150533.43	08-Jul-98	1247.98	1250.32	ST007

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
80	USZ	146230.11	2154107	10-Mar-89	1292.86	1293.52	WP019
80B	HWBZ	146214.98	2154099.96	24-Mar-95	1296.71	1293.74	VI084
83A	HWBZ	150630.88	2145092.91	16-Jun-89	1254.92	1252.36	LF014
83BR	USZ	150613.55	2145092.15	21-Mar-95	1254.37	1251.95	LF014
83C	LSZ	150599.08	2145091.41	21-Mar-95	1253.91	1251.29	LF014
84A	HWBZ	149592.33	2147818.18	14-Jun-89	1257.74	1254.37	LF012
84B	USZ	149584.56	2147822.8	14-Jun-89	1257.79	1254.63	LF012
84CR	LSZ	149578.9	2147825.97	11-Oct-02	1257.36	1254.8	LF012
84D	LLSZ	149566.45	2147831.8	27-Feb-95	1257.88	1255.01	LF012
85A	USZ	152367.42	2145794.96	23-Aug-89	1220.48	1217.93	WP017
85B	LSZ	152367.71	2145809.31	30-Aug-89	1220.86	1217.86	WP017
85C	USZ	152367.72	2145821.43	29-Mar-95	1220.08	1217.5	WP017
85D	LLSZ	152366.72	2145782.2	28-Apr-95	1220.1	1217.48	WP017
86A	HWBZ	150906.43	2147261.42	10-May-90	1225.52	1222.75	LF012
86B	USZ	150911.36	2147249.55	09-Mar-95	1225.18	1222.6	LF012
9A	USZ	151892.21	2145630.85	14-Nov-83	1223.09	1216.38	LF011
B3001-E105-IW01	USZ	155639.57	2153353.33	04-Aug-14	1272.61	1273.18	OT001
B3001-E105-IW02	USZ	155578.44	2153354.83	06-Aug-14	1272.84	1273.29	OT001
B3001-E105-IW03	USZ	155605.31	2153313.8	02-Oct-14	1272.51	1272.91	OT001
B3001-E105-IW04	USZ	155554.4	2153324.18	01-Oct-14	1273	1273.42	OT001
B3001-E105-IW05	USZ	155621.69	2153280.8	18-Aug-14	1271.76	1272.42	OT001
B3001-E105-IW06	USZ	155578.43	2153279.7	06-Aug-14	1271.74	1272.28	OT001
B3001-E105-IW07	USZ	155616.08	2153220.51	04-Aug-14	1269	1269.71	OT001
B3001-E105-IW08	USZ	155575	2153219.23	12-Aug-14	1269.29	1269.95	OT001
B3001-E105-IW09	USZ	155611.36	2153123.67	12-Aug-14	1264.76	1265.39	OT001
B3001-E105-IW10	USZ	155571.3	2153121.63	29-Jul-14	1265.06	1265.67	OT001
B3001-E105-IW11	USZ	155540.64	2153353.86	13-Aug-14	1272.81	1273.45	OT001

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
B3001-E105-IW12	USZ	155652.39	2153222.37	14-Aug-14	1268.93	1269.55	OT001
B3001-E105-IW13	USZ	155531.8	2153125	14-Aug-14	1265.11	1265.73	OT001
B3001-E105-IW14	USZ	155508.29	2153337.34	01-Oct-14	1273.12	1273.56	OT001
B3001-E105-IW15	USZ	155516.74	2153278.8	30-Sep-14	1272.08	1272.63	OT001
B3001-E105-IW16	USZ	155667.77	2153278.38	08-Oct-14	1272.33	1272.7	OT001
B3001-E105-IW17	USZ	155515.67	2153221.18	30-Sep-14	1270.09	1270.62	OT001
B3001-E105-IW18	USZ	155481.32	2153117.32	06-Oct-14	1266.35	1266.84	OT001
B3001-E105-IW19	USZ	155529.28	2153060.91	07-Oct-14	1265.78	1266.1	OT001
B3001-E105-IW20	USZ	155617.92	2153061.11	07-Oct-14	1265.48	1265.82	OT001
B3001-E105-IW21	USZ	155664.94	2153112.63	06-Oct-14	1265.14	1265.55	OT001
B3001-E105-IW22	USZ	155348.91	2153325.67	12-Nov-14	1272.48	1273.14	OT001
B3001-E105-IW23	USZ	155447.51	2153280.28	11-Nov-14	1272.19	1272.75	OT001
B3001-E105-IW24	USZ	155443.17	2153345.75	11-Nov-14	1273.14	1273.52	OT001
B3001-E105-IW25	USZ	155671.33	2153043.92	11-Sep-15	1265.46	1265.72	OT001
B3001-E105-IW26	USZ	155522.85	2153023.65	11-Sep-15	1265.57	1265.93	OT001
B3001-E105-IW27	USZ	155685.35	2153007.41	14-Mar-16	1264.8	1265.21	OT001
B3001-E105-IW28	USZ	155497.62	2153046.9	27-Apr-16	1265.77	1266.24	OT001
B3001-E105-IW29	USZ	155725.57	2153022.68	07-Jun-16	1264.79	1265.23	OT001
B3001-H-3	USZ	154025.06	2153358.24	21-Aug-14	1275.55	1276.05	OT001
B3001-H-4	USZ	153549.98	2153366.56	15-Aug-14	1276.06	1276.56	OT001
B3001-H-5	USZ	153337.06	2153714.93	08-Aug-14	1275.29	1275.79	OT001

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
B3001-Q51-IW01	USZ	154096.85	2153871.67	03-Nov-14	1275.8	1276.24	OT001
B3001-Q51-IW02	USZ	154115	2153840.5	04-Nov-14	1275.85	1276.28	OT001
B3001-Q51-IW03	USZ	154084.5	2153835.77	05-Nov-14	1275.78	1276.27	OT001
B3001-Q51-IW04	USZ	154040.7	2153861.93	06-Nov-14	1275.79	1276.25	OT001
B3001-Q51-IW05	USZ	154010.65	2153843.12	07-Nov-14	1275.68	1276.24	OT001
CG037-IW01	USZ	156909.11	2148602.76	02-Mar-13	1238.85	1238.91	CG037
CG037-IW02	USZ	156948.07	2148602	01-Mar-13	1239.5	1239.26	CG037
CG037-IW03	USZ	156989.43	2148602.04	01-Mar-13	1239.41	1239.31	CG037
CG037-IW04	USZ	157028.05	2148601.59	28-Feb-13	1239.66	1239.43	CG037
CG037-IW05	USZ	157068.38	2148596.14	27-Feb-13	1239.58	1239.76	CG037
CG037-IW06	USZ	157107.7	2148601.2	02-Mar-13	1239	1238.96	CG037
CG037-IW07	USZ	157144.98	2148583.2	02-Mar-13	1238.93	1238.69	CG037
CG037-IW08	USZ	157239.29	2148679.29	05-Mar-13	1239.64	1239.73	CG037
CG037-IW09	USZ	157280.18	2148680.68	05-Mar-13	1239.92	1240.11	CG037
CG037-IW10	USZ	157317.3	2148680.92	27-Feb-13	1240.83	1240.39	CG037
CG037-IW11	USZ	156986.39	2148662.69	03-Mar-13	1240.04	1240.15	CG037
CG037-IW12	USZ	157026.49	2148663.18	16-Mar-13	1240	1240.11	CG037
CG037-IW13	USZ	157065.72	2148662.63	16-Mar-13	1239.89	1239.94	CG037
CG037-IW14	USZ	157113.41	2148665.84	04-Mar-13	1240.37	1240.11	CG037
CG037-IW15	USZ	157142.82	2148660.54	04-Mar-13	1239.88	1239.63	CG037

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG037-IW16	USZ	157244.94	2148589.53	08-Aug-16	1238.15	1238.5	CG037
CG037-IW17	USZ	157261.73	2148610.99	08-Aug-16	1238.42	1239.05	CG037
CG037-IW18	USZ	157273.96	2148593.79	10-Aug-16	1238.1	1238.41	CG037
CG037-IW20	USZ	158320.44	2148802.88	01-Mar-13	1240.7	1240.93	CG037
CG037-IW21	USZ	158359.5	2148795.23	02-Mar-13	1240.4	1240.56	CG037
CG037-IW22	USZ	158389.17	2148785.99	01-Mar-13	1240.23	1240.28	CG037
CG037-IW23	USZ	158442.08	2148693.64	03-Mar-13	1241.56	1241.34	CG037
CG037-IW24	USZ	158482.21	2148697.09	01-Mar-13	1242.16	1242	CG037
CG037-IW30	LSZ	154760.89	2145334.6	04-Mar-13	1219.83	1219.58	CG037
CG037-IW31	LSZ	154786.92	2145270.39	03-Mar-13	1219.87	1219.64	CG037
CG037-IW32	LSZ	154702.15	2145331.28	17-Mar-13	1221.06	1220.83	CG037
CG037-IW38	USZ	158615.43	2148558.63	09-Dec-14	1241.94	1242.24	CG037
CG037-IW39	USZ	158620.32	2148583.06	11-Dec-14	1242.23	1242.67	CG037
CG037-IW40	USZ	158619.98	2148607.57	01-Mar-13	1242.42	1242.3	CG037
CG037-IW41	USZ	158635.76	2148623.66	01-Mar-13	1242.36	1242.48	CG037
CG037-IW42	USZ	158645.54	2148637.94	28-Feb-13	1242.45	1242.68	CG037
CG037-IW43	USZ	158654.7	2148659.08	28-Feb-13	1242.43	1242.57	CG037
CG037-IW44	USZ	158662.24	2148675.5	27-Feb-13	1242.29	1242.52	CG037
CG037-IW45	USZ	158670.31	2148693.54	27-Feb-13	1242.52	1242.58	CG037
CG037-IW46	USZ	158654.42	2148578.2	11-Dec-14	1242.27	1242.66	CG037

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG037-IW47	USZ	158662.43	2148592.8	09-Dec-14	1242.28	1242.65	CG037
CG037-IW48	USZ	158673.98	2148624.46	10-Dec-14	1242.06	1242.63	CG037
CG038-IW001	USZ	150619.43	2144819.4	14-Feb-13	1261.13	1261.2	CG038
CG038-IW002	USZ	150578.6	2144822.11	15-Feb-13	1259.82	1259.7	CG038
CG038-IW003	USZ	150539.86	2144830.61	14-Feb-13	1258.54	1258.37	CG038
CG038-IW004	USZ	150500.42	2144835.82	16-Feb-13	1257.24	1257.05	CG038
CG038-IW005	USZ	150467.88	2144846.17	17-Feb-13	1255.98	1255.88	CG038
CG038-IW006	USZ	150436.48	2144861.51	13-Feb-13	1254.93	1254.86	CG038
CG038-IW007	USZ	150686.9	2145092.41	18-Feb-13	1253.95	1253.82	CG038
CG038-IW008	USZ	150650.23	2145106.56	19-Feb-13	1252.26	1252.17	CG038
CG038-IW009	USZ	150612.44	2145123.22	18-Feb-13	1250.11	1250.11	CG038
CG038-IW010	USZ	150586.14	2145141.17	12-Feb-13	1248.88	1248.76	CG038
CG038-IW011	USZ	150936.72	2145556.02	18-Dec-12	1235.96	1236.2	CG038
CG038-IW012	USZ	150901.17	2145557.77	19-Dec-12	1235.04	1235.4	CG038
CG038-IW013R	USZ	150865.32	2145546.8	06-Nov-12	1235.34	1235.47	CG038
CG038-IW014R	USZ	150828.09	2145547.85	08-Nov-12	1235.27	1235.41	CG038
CG038-IW015R	USZ	150802.46	2145548.85	10-Nov-12	1235.16	1235.25	CG038
CG038-IW016	USZ	150777.53	2145557	04-Jan-13	1234.44	1234.72	CG038
CG038-IW017	USZ	150752.58	2145558.08	05-Jan-13	1234.7	1234.75	CG038
CG038-IW018	USZ	150728.17	2145558.21	06-Jan-13	1234.81	1235.02	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG038-IW019	USZ	150703.21	2145559.06	07-Jan-13	1234.98	1235.21	CG038
CG038-IW020	USZ	150677.47	2145559.81	09-Jan-13	1235.11	1235.38	CG038
CG038-IW021	USZ	150650.49	2145559.58	09-Jan-13	1234.89	1235.14	CG038
CG038-IW022	USZ	150616.03	2145560.77	15-Jan-13	1235.25	1235.42	CG038
CG038-IW023	USZ	150579.13	2145562.3	15-Jan-13	1236.04	1236.15	CG038
CG038-IW024	USZ	150542.13	2145563.48	16-Jan-13	1236.91	1236.84	CG038
CG038-IW025	USZ	151049	2146408.9	20-Feb-13	1232.01	1231.77	CG038
CG038-IW026	USZ	151050.86	2146504.24	20-Feb-13	1230.82	1230.67	CG038
CG038-IW027	USZ	150213.66	2145819.27	09-Jan-13	1251.4	1251.63	CG038
CG038-IW028	USZ	150183.89	2145844.63	16-Jan-13	1252.73	1252.86	CG038
CG038-IW029	USZ	150153.6	2145870.18	17-Jan-13	1254	1253.83	CG038
CG038-IW030	USZ	150121.63	2145896.79	18-Jan-13	1254.4	1254.63	CG038
CG038-IW031	USZ	150090.47	2145922.26	16-Jan-13	1255.41	1255.52	CG038
CG038-IW032	USZ	150048.03	2145955.75	17-Jan-13	1255.24	1255.45	CG038
CG038-IW033	USZ	150166.94	2145693.77	18-Dec-12	1250.59	1250.94	CG038
CG038-IW034	USZ	150130.37	2145692.87	19-Dec-12	1251.55	1251.73	CG038
CG038-IW035	USZ	150090.84	2145691.83	25-Oct-12	1253.18	1253.12	CG038
CG038-IW036	USZ	150054.71	2145693.2	25-Oct-12	1255.26	1255.36	CG038
CG038-IW037	USZ	150034.3	2145693.54	30-Oct-12	1256.29	1256.29	CG038
CG038-IW038	USZ	150015.91	2145695.09	20-Dec-12	1256.35	1256.39	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG038-IW042	USZ	149967.12	2145710.32	21-Dec-12	1256.18	1256.42	CG038
CG038-IW043	USZ	149912.89	2145710.88	19-Jan-13	1258.19	1258.23	CG038
CG038-IW044	USZ	149863.68	2145709.65	18-Jan-13	1260.12	1260.24	CG038
CG038-IW045	USZ	149829.37	2145694.13	19-Jan-13	1260.29	1260.67	CG038
CG038-IW046	USZ	149795.62	2145671.31	09-Jan-13	1260.32	1260.37	CG038
CG038-IW047	USZ	149760.04	2145670.7	21-Dec-12	1261.06	1261.36	CG038
CG038-IW048	USZ	149720.42	2145670.55	19-Dec-12	1261.42	1261.52	CG038
CG038-IW049	USZ	149677.84	2145669.31	19-Dec-12	1261.67	1261.84	CG038
CG038-IW050	USZ	149639.27	2145673.27	02-Feb-13	1262.71	1262.49	CG038
CG038-IW051	USZ	149585.73	2145681.88	15-Jan-13	1264.21	1264.44	CG038
CG038-IW052	USZ	149545.14	2145681.23	16-Jan-13	1264.41	1264.44	CG038
CG038-IW053	USZ	149509.79	2145681.37	14-Jan-13	1264.39	1264.57	CG038
CG038-IW054	USZ	149468.49	2145688.31	16-Jan-13	1264.99	1265.1	CG038
CG038-IW055	USZ	149433.96	2145688.46	14-Dec-12	1265.21	1265.28	CG038
CG038-IW056R	USZ	149406.28	2145688.07	19-Jan-13	1265.44	1265.55	CG038
CG038-IW057	USZ	149355.84	2145688.83	15-Dec-12	1265.98	1265.81	CG038
CG038-IW058	USZ	149316.08	2145687.94	15-Dec-12	1266.16	1266.11	CG038
CG038-IW059	USZ	149276.07	2145688.26	13-Dec-12	1266.29	1266.28	CG038
CG038-IW060	USZ	149235.62	2145687.55	14-Dec-12	1266.77	1266.63	CG038
CG038-IW061	USZ	149202.06	2145688.35	14-Dec-12	1266.86	1266.82	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG038-IW062	USZ	149140.76	2145677.01	05-Jan-13	1266.39	1266.5	CG038
CG038-IW063	USZ	149104.64	2145689.12	03-Jan-13	1266.73	1266.84	CG038
CG038-IW064	USZ	149064.7	2145692.24	06-Jan-13	1266.82	1266.86	CG038
CG038-IW065	USZ	149023.21	2145702.05	04-Jan-13	1266.85	1267.03	CG038
CG038-IW066	USZ	148984.02	2145716.09	05-Jan-13	1267.11	1267.29	CG038
CG038-IW067	USZ	148946.19	2145732.63	03-Jan-13	1267.27	1267.35	CG038
CG038-IW068	USZ	148911.19	2145752.97	04-Jan-13	1267.3	1267.44	CG038
CG038-IW069	USZ	148870.84	2145782.5	17-Dec-12	1267.3	1267.64	CG038
CG038-IW070	USZ	148840.83	2145809.56	15-Dec-12	1267.9	1267.9	CG038
CG038-IW071	USZ	148812.06	2145826.92	16-Dec-12	1268.21	1268.24	CG038
CG038-IW072	USZ	148786.66	2145857.6	15-Dec-12	1268.53	1268.46	CG038
CG038-IW073	USZ	148760.23	2145881.35	15-Dec-12	1268.62	1268.75	CG038
CG038-IW074	USZ	148734.11	2145905.01	18-Dec-12	1269.32	1269.34	CG038
CG038-IW075	USZ	148671.17	2145987.22	07-Jan-13	1270.14	1270.34	CG038
CG038-IW076	USZ	148655.37	2146018.87	06-Jan-13	1269.67	1269.77	CG038
CG038-IW077	USZ	148634.77	2146059.08	08-Jan-13	1269.99	1270.06	CG038
CG038-IW078	USZ	148634.83	2146099.95	07-Jan-13	1270.08	1270.19	CG038
CG038-IW079	USZ	148634.53	2146147.2	08-Jan-13	1270.17	1270.35	CG038
CG038-IW093	USZ	148771.73	2146742.33	29-Jan-13	1263.01	1262.91	CG038
CG038-IW094	USZ	148739.69	2146783.1	30-Jan-13	1262.22	1262.32	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG038-IW095	USZ	148711.92	2146819.86	31-Jan-13	1261.64	1261.87	CG038
CG038-IW096	USZ	148680.86	2146864.28	31-Jan-13	1260.64	1260.93	CG038
CG038-IW097	USZ	148649.68	2146901.81	30-Jan-13	1260.73	1260.91	CG038
CG038-IW098	USZ	148620.12	2146943.99	29-Jan-13	1258.78	1258.85	CG038
CG038-IW099	USZ	149616.36	2146822.69	22-Jan-13	1237.61	1237.8	CG038
CG038-IW100	USZ	149602.33	2146856.27	21-Jan-13	1237.12	1237.37	CG038
CG038-IW101	USZ	149570.22	2146877.96	20-Jan-13	1237.08	1236.82	CG038
CG038-IW102	USZ	149529.89	2146892.99	29-Nov-12	1236.15	1236.39	CG038
CG038-IW103	USZ	149493.67	2146885.68	29-Nov-12	1236.44	1236.42	CG038
CG038-IW104	USZ	149474.01	2146889.18	29-Nov-12	1236.63	1236.93	CG038
CG038-IW105	USZ	149416.3	2146906.95	20-Jan-13	1238.33	1238.31	CG038
CG038-IW106	USZ	149400.24	2146935.47	20-Jan-13	1239	1238.93	CG038
CG038-IW107	USZ	149388.63	2146969.15	21-Jan-13	1239.05	1239.12	CG038
CG038-IW108	USZ	149377.61	2147008.72	22-Jan-13	1238.18	1237.91	CG038
CG038-IW109	USZ	149359.64	2147043.23	22-Jan-13	1236.86	1236.86	CG038
CG038-IW110	USZ	149346.91	2147083.4	23-Jan-13	1236.33	1236.3	CG038
CG038-IW111	USZ	149347.69	2147133.25	01-Feb-13	1236.33	1236.26	CG038
CG038-IW112	USZ	149296.85	2147157.14	05-Feb-13	1236.73	1236.71	CG038
CG038-IW113	USZ	149284.45	2147195.25	01-Feb-13	1238	1237.71	CG038
CG038-IW114R	USZ	149284.82	2147229.06	06-Feb-13	1238.05	1237.88	CG038

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG038-IW115	USZ	149262.03	2147267.36	05-Feb-13	1239.14	1238.88	CG038
CG038-IW116	USZ	149253.28	2147307.85	03-Feb-13	1239.65	1239.47	CG038
CG038-IW117	USZ	149238.24	2147346.14	01-Feb-13	1240.73	1240.51	CG038
CG038-IW118	USZ	149225.74	2147384.68	23-Jan-13	1241.72	1241.12	CG038
CG038-IW119	USZ	149210.99	2147413.29	23-Jan-13	1242.63	1242.51	CG038
CG038-IW121	USZ	150274.86	2147510.53	20-Feb-13	1239.07	1238.75	CG038
CG038-IW122	USZ	149648.98	2147799.41	19-Feb-13	1253.09	1253.02	CG038
CG038P0601	USZ	149130.29	2146991.75	20-Oct-06	1243.13	1243.12	CG038
CG038P0602	USZ	149449.42	2146680.17	16-Oct-06	1241.24	1241.73	CG038
CG038P0603	USZ	149809.67	2145492.81	17-Oct-06	1254.86	1255.02	CG038
CG039-EX01	Not Available	150464.48	2150492.44	06-Mar-13	1244.22	1244.75	CG039
CG039-IW01	USZ	149457.14	2154182.14	20-Mar-13	1286.84	1286.65	CG039
CG039-IW02	USZ	149419.1	2154178.92	20-Mar-13	1286.14	1286.07	CG039
CG039-IW03	USZ	149448.7	2154232.97	19-Mar-13	1286.4	1286.14	CG039
CG039-IW04	USZ	149401.5	2154238.93	19-Mar-13	1286.13	1285.93	CG039
CG039-IW05	USZ	149116.83	2154448.12	13-Mar-13	1291.18	1291.03	CG039
CG039-IW06	USZ	149087.02	2154484.09	14-Mar-13	1292	1292.01	CG039
CG039-IW07	USZ	149061.28	2154515.4	14-Mar-13	1292.81	1292.89	CG039
CG039-IW08	USZ	149037.83	2154545.32	15-Mar-13	1293.42	1293.53	CG039
CG039-IW09	USZ	149012.23	2154577.47	18-Mar-13	1293.58	1293.52	CG039

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
CG039-IW10	USZ	148986.02	2154607.53	18-Mar-13	1293.51	1293.37	CG039
CG039-IW11	USZ	148959.91	2154638.61	18-Mar-13	1293.3	1293.24	CG039
CG039-IW12	USZ	148934.83	2154668.72	13-Mar-13	1293.45	1293.22	CG039
CG039-IW13	USZ	150474.17	2150455.45	23-Jan-13	1244.33	1244.48	CG039
CG039-IW14	USZ	150503.85	2150450.97	23-Jan-13	1244.64	1245.03	CG039
CG039-IW15	USZ	150477.38	2150396.31	23-Jan-13	1244.74	1245.07	CG039
CG039-IW16	USZ	150507.14	2150401.25	23-Jan-13	1245.19	1245.28	CG039
CG039-IW17	USZ	150512.43	2150578.28	12-Mar-13	1247.37	1247.24	CG039
CG039-IW18	USZ	150481.13	2150573.8	13-Mar-13	1246.94	1246.77	CG039
CG039-IW20	USZ	149089.09	2153508.69	18-May-13	1275.38	1276.02	CG039
CG039-IW21	USZ	149102.91	2153468.31	17-May-13	1276.05	1276.26	CG039
CG039-IW22	USZ	149133.34	2153395.04	14-May-13	1276.06	1276.57	CG039
CG039-IW23	USZ	149151.75	2153355.83	14-May-13	1273.26	1273.85	CG039
CG039-IW24	USZ	149125.86	2153521.81	18-May-13	1277.02	1277.37	CG039
CG039-IW25	USZ	149141.97	2153478.75	17-May-13	1276.55	1276.84	CG039
CG039-IW26	USZ	149154.31	2153447.07	17-May-13	1276.77	1277.01	CG039
CG039-IW27	USZ	149170.61	2153410.78	17-May-13	1276.86	1277.18	CG039
CG39B9741		149890.94	2155182.99	28-Aug-97	1245.2	1245.57	CG039
CG39B9743D	USZ	150893.32	2150179.57	29-Jul-97	1252.54	1252.56	CG039
CG39B9743S	USZ	150887.9	2150172.61	30-Jul-97	1252.42	1252.72	CG039
CG39B9745	USZ	151111.98	2149570.15	31-Jul-97	1241.82	1242.24	CG039

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
EX-A01	USZ	150509.74	2144246.89	22-Jul-97	1259.09	1266.21	CG038
EX-A02	USZ	150191.9	2144232.15	30-Jul-97	1263.23	1270.4	CG038
EX-A03	USZ	150061.81	2144449.2	21-Aug-97	1262	1268.33	CG038
EX-A04	USZ	150188.99	2145143	28-Aug-97	1248.33	1255.51	CG038
EX-A05	USZ	150251.74	2145526.84	13-Aug-97	1235	1242.11	CG038
EX-A06	USZ	149785.5	2145486.19	27-Aug-97	1247.93	1255.1	CG038
EX-A07	USZ	149604.81	2145667.1	15-Aug-97	1257.57	1264.63	CG038
EX-A08	USZ	149204.48	2145673.01	02-Aug-97	1259.68	1266.71	CG038
EX-A09	USZ	148816.58	2145665.86	02-Sep-97	1261.8	1268.88	CG038
EX-A10	USZ	148491.56	2145759.9	29-Aug-97	1263.02	1270.04	CG038
EX-A11	USZ	148473.25	2146064.98	29-Aug-97	1265.74	1272.86	CG038
EX-A12	USZ	148393.31	2146444.47	02-Sep-97	1263.02	1270.24	CG038
EX-B01	USZ	150661.01	2144596.52	25-Aug-97	1257.24	1264.24	CG038
EX-B02	USZ	150423.65	2144839.25	18-Aug-97	1248.85	1256.1	CG038
EX-B03	USZ	150457.53	2145162.11	18-Aug-97	1237.18	1244.2	CG038
EX-B04	USZ	150720.87	2145523.31	28-Aug-97	1230.61	1237.7	CG038
EX-B05	USZ	149302.08	2146559.35	09-Sep-97	1238.94	1246.02	CG038
EX-B06	USZ	148879.32	2146552.91	04-Sep-97	1258	1264.19	CG038
EX-B07	USZ	148788.2	2146933.17	05-Sep-97	1251.37	1258.43	CG038
EX-B08	USZ	149367.26	2147325.77	03-Sep-97	1235.24	1242.45	CG038
F1-12	USZ	152644.06	2145612.85	26-Jun-89	1218.83	1216.11	FT021
F1-20	USZ	152634.22	2145705.1	27-Jun-89	1220.15	1217.62	FT021
F1-24	USZ	152526.94	2145711.24	22-Aug-89	1220.57	1217.84	FT021
F1-9	USZ	152567.03	2145593.29	26-Jun-89	1219.02	1216.46	FT021
GTR-EX	LSZ	147523.47	2161676.84	26-Aug-99	1283.21	1286.59	CG040
GTR-IW01	USZ	148156.58	2161607.45	28-Nov-12	1302	1303	CG040
GTR-IW02	USZ	148117.21	2161607.36	27-Nov-12	1302.5	1303	CG040
GTR-IW03	USZ	148074.47	2161604.31	27-Nov-12	1301.5	1302	CG040
GTR-IW04	USZ	148034.72	2161605.24	27-Nov-12	1301.5	1302	CG040
GTR-IW05	USZ	148006.45	2161646.36	18-Oct-12	1299	1300	CG040
GTR-IW06	USZ	148043.29	2161643.11	29-Nov-12	1300.5	1301	CG040
GTR-IW07	USZ	147975.26	2161600.71	10-Dec-12	1299.5	1300	CG040
GTR-IW08	USZ	147976.91	2161633.38	29-Nov-12	1299.5	1300	CG040
GTR-IW09	USZ	147949.52	2161597.81	12-Dec-12	1299.5	1300	CG040
GTR-IW10	USZ	147944.11	2161634.7	10-Dec-12	1297.5	1298	CG040
GTR-IW11	USZ	147910.27	2161561.17	15-Dec-12	1298.5	1299	CG040
GTR-IW12	USZ	147904.67	2161598.62	11-Dec-12	1296.5	1297	CG040
GTR-IW13	USZ	147878.22	2161570.13	01-Dec-12	1297	1298	CG040
GTR-IW14	USZ	147862.37	2161540.52	17-Oct-12	1297	1298	CG040

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
GTR-IW15	USZ	147809.59	2161530.06	15-Dec-12	1296.5	1297	CG040
GTR-IW16	USZ	147820.67	2161565.28	01-Dec-12	1295	1296	CG040
GTR-IW17	USZ	147854.02	2161607.81	11-Dec-12	1296.5	1297	CG040
GTR-IW18	USZ	147879.96	2161630.51	11-Dec-12	1296.5	1297	CG040
GTR-IW19	USZ	147857.57	2161656.37	01-Dec-12	1294	1295	CG040
GTR-IW20	USZ	147813.79	2161659.15	12-Aug-12	1292.5	1293	CG040
GTR-IW21	USZ	147806.3	2161613.66	16-Dec-12	1294.5	1295	CG040
GTR-IW22	USZ	147789.3	2161577.4	16-Dec-12	1294.5	1295	CG040
GTR-IW23	USZ	147764.34	2161589.24	16-Dec-12	1293.5	1294	CG040
GTR-IW24	USZ	147760.68	2161706.72	19-Dec-12	1288.5	1289	CG040
GTR-IW25	USZ	147697.02	2161763.3	11-Aug-16	1288.12	1288.39	CG040
GTR-IW26	USZ	147664.83	2161781.27	11-Aug-16	1286.06	1286.38	CG040
GTR-IW30R	LSZ	147694.5	2161682.4	17-Feb-13	1286.5	1287	CG040
GTR-IW31	LSZ	147668.77	2161718.7	13-Feb-13	1283	1284	CG040
GTR-IW32	LSZ	147642.19	2161751.05	04-Feb-13	1280.5	1281	CG040
GTR-IW33	LSZ	147610.77	2161783.35	03-Feb-13	1277.5	1278	CG040
GTR-IW34	LSZ	147576.32	2161802.44	23-Jan-13	1276	1277	CG040
GTR-IW35	LSZ	147548.26	2161764.92	15-Oct-12	1276	1277	CG040
GTR-IW36	LSZ	147549.59	2161821.64	20-Jan-13	1274.5	1275	CG040
GTR-IW37	LSZ	147479.63	2161805.18	17-Jan-13	1274.5	1275	CG040
GTR-IW38	LSZ	147509.23	2161801.05	15-Jan-13	1275	1276	CG040
GTR-IW39	LSZ	147532.46	2161774.56	03-Oct-13	1281.58	1281.68	CG040
GTR-IW40	LSZ	147519.08	2161784.97	04-Oct-13	1280.7	1280.85	CG040
GTR-IW41	LSZ	147684.01	2161658.19	22-Aug-16	1292.7	1292.96	CG040
GTR-IW42	LSZ	147685.49	2161685.57	17-Aug-16	1290.53	1290.88	CG040
GTR-IW43	LSZ	147654.19	2161680.27	18-Aug-16	1289.6	1289.9	CG040
GTR-IW44R	LSZ	147654.03	2161655.4	24-Aug-16	1291.06	1291.51	CG040
GTR-NSUMP	USZ	148076.22	2161486.07	01-Aug-98		1306.15	CG040
GTR-P1	USZ	148258.85	2161490.71	17-Aug-99	1307.58	1305.77	CG040
GTR-P10	USZ	147681.64	2161773.33	18-Aug-99	1289.13	1287.26	CG040
GTR-P2	USZ	148147.64	2161586.18	17-Aug-99	1309.7	1307.31	CG040
GTR-P3	USZ	148068.87	2161373.24	17-Aug-99	1305.7	1303.78	CG040
GTR-P4	USZ	147974.75	2161424.48	04-Oct-99	1306.34	1304.41	CG040
GTR-P5	USZ	147996.76	2161533.36	04-Oct-99	1307.03	1305.1	CG040
GTR-P6R	USZ	148002.37	2161598.53	08-Oct-12	1303.5	1304	CG040
GTR-P7	USZ	147832.35	2161541.9	17-Aug-99	1302.09	1300.08	CG040
GTR-P8	USZ	147862.12	2161634.9	18-Aug-99	1301.58	1299.64	CG040
GTR-P9	USZ	147579.94	2161666.13	27-Apr-00	1288.83	1289.25	CG040

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
GTR-SSUMP	USZ	147567.26	2161768.96	01-Aug-98		1282.94	CG040
I-55	USZ	154599.19	2153592.67	08-Mar-90	1275.44	1275.9	OT001
I-56		154154.98	2153600.09	08-Mar-90	1275.71	1275.99	OT001
I-57	USZ	154332.55	2153807.5	20-Mar-90	1275.9	1276.24	OT001
L2-15H1		150548.46	2146708.23	17-Jun-95	1246.68	1246.38	LF012
L2-15H2	HWBZ	150548.79	2146708.25	17-Jun-95	1246.43	1246.38	LF012
L2-15U	USZ	150545.56	2146715.06	17-Jun-95	1245.66	1246.38	LF012
L2-16H1	HWBZ	150819.59	2146827.27	24-May-95	1237.46	1238.23	LF012
L2-16H2	HWBZ	150819.24	2146826.96	24-May-95	1237.27	1238.23	LF012
L2-16U	USZ	150822.33	2146816.09	23-May-95	1237.04	1238.62	LF012
L2-18H	USZ	151140.6	2147494.65	02-Jun-95	1225.03	1223.2	LF012
L3-14H	USZ	151629.55	2147224.85	02-Jun-95	1225	1225	LF013
L3-14U	USZ	151614.9	2147222.62	01-Jun-95	1227.57	1225.07	LF013
L3-15H	USZ	151268.73	2147083.77	23-May-95	1223.94	1221.55	LF013
L3-15U	USZ	151261.67	2147080.08	23-May-95	1224.11	1221.61	LF013
L4-30H1	HWBZ	150597.21	2146164.4	03-Jun-95	1258.61	1259.34	LF014
L4-30H2	HWBZ	150597.14	2146164.13	03-Jun-95	1258.54	1259.34	LF014
L4-30H3	HWBZ	150596.77	2146164.1	03-Jun-95	1258.45	1259.34	LF014
L4-30U	USZ	150598.7	2146172.33	07-Jun-95	1259.01	1259.34	LF014
LF2-SUMP		150977.06	2146979.69	01-Dec-98			CG038
LF4-SUMP		150957.63	2145713.21	01-Dec-98			CG038
M-1AR	LSZ	156182.38	2152116.59	30-Dec-93	1257.3	1257.46	OT001
M-1BR	USZ	156181.71	2152105.73	23-Dec-93	1257.19	1257.24	OT001
M-1CR	LLSZ	156184.6	2152124.88	28-Dec-93	1257.65	1257.66	OT001
M-2AR	LSZ	155185.63	2152191.13	06-Jan-94	1259.9	1260.11	OT001
M-2BR	USZ	155183.88	2152178.36	29-Dec-93	1260.01	1260.1	OT001
M-2C	LLSZ	155184.92	2152198.88	10-Jul-92	1260.18	1260.15	OT001
M-2D	PZ	155184.13	2152166.29	21-Jun-94	1259.71	1259.96	OT001
M-2R	USZ	153304.07	2153192.27	15-Jun-95	1268.75	1269.14	ST006
M-3	USZ	153392.85	2153276.12	25-Oct-85	1275.28	1275.72	ST006
M-3A	LSZ	154185.03	2152191.8	27-Apr-92	1261.74	1261.95	OT001
M-3BR	USZ	154184.76	2152181.9	29-Dec-93	1261.63	1261.84	OT001
M-3CR	LLSZ	154185.37	2152201.75	05-Jan-94	1261.91	1262.06	OT001
M-4AR	LSZ	153444.3	2152194.38	06-Jan-94	1261.8	1261.95	OT001
M-4B	USZ	153444.66	2152183.81	10-Jan-92	1261.83	1261.75	OT001
M-4CR	LLSZ	153445.25	2152204.23	10-Jan-94	1261.86	1261.93	OT001
MATLOCK-WELL	LSZ	148258.04	2161373.72	05-Dec-02			CG040
MF-12	USZ	157117.78	2150932.48	05-Nov-85	1256.66	1252.51	ST007

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
MF-15AR	LSZ	157249.42	2151017.14	07-Jun-95	1255.93	1253.56	ST007
MF-15B	USZ	157257.39	2151020.58	05-Jun-86	1253.1	1253.47	ST007
MF-15C	USZ	157256.96	2151015.1	11-Jun-86	1255.1	1253.43	ST007
MF-16AR	USZ	157037.53	2151123.07	05-Jun-95	1253.41	1253.84	ST007
MF-16BR	USZ	157049.45	2151123.11	05-Jun-95	1253.32	1253.76	ST007
MF-16CR	LSZ	157027.61	2151123.17	03-Jun-95	1253.43	1253.93	ST007
MF-17AR	LSZ	156942.64	2150813.29	08-Dec-93	1255.27	1255.27	ST007
MF-17B	USZ	156941.57	2150788.89	19-Jun-86	1254.06	1246.43	ST007
MF-1AR	LSZ	157059.92	2150527.22	27-Oct-93	1250.7	1250.7	ST007
MF-1BR	USZ	157070.49	2150527.09	06-Jun-95	1252.16	1249.77	ST007
MF-1C	USZ	157081.27	2150532.49	02-Nov-85	1251.98	1249.44	ST007
MF-4	USZ	157119.43	2150803.62	05-Nov-85	1254.56	1250.7	ST007
MW-118	LSZ	155702.05	2155405.06	07-May-95	1242.03	1242.13	OT005
OT034-VEP1-1	LSZ	155644.5	2155337.99	16-Dec-99	999.5	1000	OT034
OT034-VEP1-2	LSZ	155707.55	2155432.64	16-Dec-99	999.5	1000	OT034
OT034-VEP1-3	LSZ	155640.31	2155531.24	16-Dec-99	999.5	1000	OT034
OT034-VEP2-1	LSZ	155659.87	2155250.21	16-Dec-99	999.5	1000	OT034
OT034-VEP2-2	LSZ	155751.21	2155249.94	16-Dec-99	999.5	1000	OT034
OT034-VEP-6	USZ	156061.87	2155251.4	12-Nov-01	1258.83	1259.9	OT005
OT034-VEP-7	USZ	156114.66	2155249.87	12-Nov-01	1259.65	1261.03	OT005
OT034-VEP-8	LSZ	155843.66	2155291.2	23-Oct-02	1246.72	1248.12	OT005
OT034-VEP-9	LSZ	155931.23	2155283.82	23-Oct-02	1250.12	1251.67	OT005
P0901	HWBZ	149148.66	2153570.29	29-Jun-09	1278.55	1278.97	CG039
P0902	HWBZ	149149.65	2153559.27	30-Jun-09	1278.38	1278.78	CG039
P-1	USZ	156000.43	2152973.5	10-Jun-92	1259.18	1263.66	OT001
P-10	USZ	153927.43	2153248.51	17-Apr-92	1269.92	1274.97	OT001
P-11	USZ	153451.43	2153246.52	07-Apr-92	1270.35	1275.33	OT001
P-12	USZ	152953.43	2153220.52	23-Apr-92	1269.38	1274.38	OT001
P-13	USZ	155530.94	2153207	08-Mar-93		1273.57	OT001
P-14R	USZ	155416.45	2154864.51	29-Sep-94	1262.98	1267.82	OT001

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
P-15		155135.94	2153310	08-Mar-93		1273.76	OT001
P-16R	USZ	154941.45	2154863.51	30-Sep-94	1264.65	1269.92	OT001
P-17		154724.44	2153296.83	08-Mar-93		1272.55	OT001
P-18	USZ	154278.44	2154214.51	14-May-92	1271.47	1275.7	OT001
P-19	USZ	153784.44	2154209.52	14-May-92	1271.01	1276.1	OT001
P-2	USZ	155827.43	2153234.5	06-Apr-92	1265.58	1270.53	OT001
P-3	USZ	155593.43	2152972.5	16-Apr-92	1260.27	1265.09	OT001
P-4	USZ	155356.43	2153234.5	06-Apr-92	1266.99	1271.92	OT001
P-5	USZ	155116.43	2152973.5	01-Apr-92	1261.82	1266.86	OT001
P-6	USZ	154877.43	2153248.51	21-Apr-92	1267.47	1272.41	OT001
P-7	USZ	154640.43	2152972.51	01-Apr-92	1263.38	1267.77	OT001
P-8	USZ	154408.43	2153251.51	16-Apr-92	1267.41	1272.19	OT001
P-9	USZ	154167.43	2152972.51	01-Apr-92	1263.6	1268.62	OT001
PN-01	USZ	148136.99	2161486.71	04-Oct-99	1308.69	1305.99	CG040
PN-02	USZ	148076.25	2161455.94	04-Oct-99	1306.96	1304.57	CG040
PN-03	USZ	148020.64	2161484.62	04-Oct-99	1307.57	1305.07	CG040
PR1-7	LSZ	156356.61	2154777.53	01-Jul-03	1269.62	1271.98	OT001
PR2-7	LSZ	156098.23	2155018.72	06-Jun-03	1259.81	1264.47	OT005
PR3-7	LSZ	155589	2155161.69	02-Jul-03	1251.07	1256.07	OT005
PS-01	USZ	147614.03	2161711.42	04-Oct-99	1290.51	1288.07	CG040
R-1	LLSZ	155806.43	2153234.5	30-Apr-92	1265.88	1270.89	OT001
R-2	LLSZ	155333.43	2153235.5	29-Apr-92	1267.17	1272.01	OT001
R-3	LLSZ	154856.43	2153254.27	13-Apr-92	1267.43	1272.24	OT001
R-4	LLSZ	154384.43	2153247.51	07-Apr-92	1267.68	1272.77	OT001
R-5	LLSZ	153908.43	2153248.51	08-Apr-92	1270.64	1275.4	OT001
R-6	LLSZ	153433.43	2153246.52	07-Apr-92	1270.62	1275.44	OT001
R-7	LSZ	155095	2153309.75	08-Mar-93		1273.65	OT001
RC-3	USZ	156111.02	2153548	12-Sep-92	1274.31	1271.91	ST003
RC-4	USZ	156148.55	2153599.75	14-Sep-92	1275.61	1272.61	ST003
RC-5	USZ	156058.14	2153624.5	11-Sep-92	1271	1271.65	ST003
RC-6	USZ	156205.31	2153549.75	11-Sep-92	1274	1274.09	ST003
SP-1	USZ	152420.14	2145768.69	24-Aug-89	1222.05	1219.22	WP017
SP-11	USZ	152490.45	2145771.79	28-Aug-89	1222.29	1219.53	WP017
SP-12	USZ	152450.8	2145878.2	30-Aug-89	1222.34	1219.5	WP017
SP-5	USZ	152513.59	2145881.64	24-Aug-89	1222.2	1219.46	WP017
SP-6	USZ	152534.24	2145785.96	24-Aug-89	1222.93	1220.24	WP017
TOB-10AR	LSZ	156502.39	2155047.03	13-Mar-95	1271.66	1272.11	OF060
TOB-10BR	USZ	156499.67	2155056.32	11-Mar-95	1271.49	1271.82	OF060
TOB-10CR	LLSZ	156498.48	2155076	14-Jun-94	1271.65	1271.78	OF060

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
TOB-1AR	LSZ	156767.11	2153962.84	26-Oct-93	1265.01	1262.14	OF060
TOB-1B	USZ	156766.96	2153936.7	11-Jan-91	1264.62	1261.6	OF060
TOB-1C	LLSZ	156768.07	2153917.93	14-Jan-91	1265	1261.99	OF060
TOB-3BR	LSZ	157079.05	2154052.45	02-Jul-09	1254.33	1254.83	OF060
TOB-4A	LSZ	156660.62	2154471.9	06-Feb-91	1266.76	1267.05	OF060
TOB-4C	LLSZ	156668.84	2154472.52	04-Feb-91	1266.4	1266.77	OF060
TOB-5A	LSZ	156493.66	2154162.78	16-Jan-91	1265.74	1266.27	OF060
TOB-5B	USZ	156493.69	2154149.91	15-Jan-91	1265.89	1266.35	OF060
TOB-5CR	LLSZ	156493.8	2154174.53	01-Dec-93	1266.17	1266.6	OF060
TOB-6A	LSZ	156610.74	2154876.25	05-Feb-91	1271.12	1271.37	OF060
TOB-6C	LLSZ	156602.86	2154874.82	02-Feb-91	1271.01	1271.29	OF060
TOB-8A	LSZ	157501.92	2155121.15	19-Jan-91	1274.15	1271.66	OF060
TOB-8B	USZ	157511.47	2155121.88	16-Jan-91	1274.25	1271.68	OF060
TOB-8CR	LLSZ	157511.25	2155122.05	17-Jun-94	1274.39	1271.78	OF060
TOB-9A	LSZ	157045.94	2155734	01-Feb-91	1269.63	1270.5	OF060
TOB-9BR	USZ	157064.55	2155733.53	02-Nov-93	1270.39	1270.66	OF060
TOB-9C	LLSZ	157043.97	2155732.7	30-Jan-91	1269.23	1269.8	OF060
TOR-1	LSZ	155817.43	2153234.5	21-Apr-92	1265.86	1270.72	OT001
TOR-2	LSZ	155344.43	2153234.5	14-Apr-92	1266.93	1271.94	OT001
TOR-3	LSZ	154867.43	2153247.51	29-Apr-92	1267.35	1272.33	OT001
TOR-4	LSZ	154395.43	2153246.51	24-Jun-92	1267.5	1272.5	OT001
TOR-5	LSZ	153917.43	2153248.51	01-May-92	1270.12	1275.28	OT001
TOR-6	LSZ	153441.43	2153246.52	07-Apr-92	1270.79	1275.45	OT001
TOR-7	LLSZ	155139.73	2153311	08-Mar-93		1273.86	OT001
UI380801	USZ	150259.15	2146158.24	13-Nov-08	1252.8	1253.14	CG038
UI380802	USZ	150241.1	2146166.05	14-Nov-08	1251.25	1251.6	CG038
UI380803	USZ	150241.11	2146142.48	02-Dec-08	1252.04	1252.3	CG038
UI380804	USZ	150202.14	2146038.02	18-Nov-08	1253.29	1253.53	CG038
UI380805	USZ	150184.22	2146046.13	17-Nov-08	1253.36	1253.59	CG038
UI380806	USZ	150186	2146023.31	20-Nov-08	1253.73	1253.89	CG038
UM380801	USZ	150246.2	2146150.88	21-Nov-08	1252.11	1252.5	CG038
UM380802	USZ	150236.27	2146132.94	03-Dec-08	1251.86	1252.1	CG038
UM380803	USZ	150189	2146032.26	19-Nov-08	1253.41	1253.68	CG038
UM380804	USZ	150181.81	2146014.4	04-Dec-08	1253.5	1253.7	CG038
WS-1	PZ	158731.64	2145592.75	01-Aug-41	1217.59	1222.52	OF060
WS-11	PZ	151127.96	2154896.29	01-Sep-42		1246.34	OF060
WS-12	PZ	152135.6	2154890.44	05-Sep-42		1271.89	OF060
WS-13	PZ	153151.13	2154885.75	01-May-42		1268.81	OF060
WS-2	PZ	157735.52	2145598.63	04-Dec-41		1221.91	OF060

LOCID	AQUIFER ZONE	NCOORD	ECOORD	ESTDATE	MPELEV	ELEV	WIMSID
WS-20	PZ	150625.66	2155776.48	23-May-43	1293.99	1295.25	OF060
WS-21	PZ	149646.72	2155576.42	19-Jun-43	1298.66	1299.6	OF060
WS-22	PZ	149638.89	2154331.98	09-Jun-43		1289.6	OF060
WS-23	PZ	148665.73	2155272.49	06-Aug-43		1299.26	OF060
WS-24	PZ	147402.05	2155905.65	28-Sep-43	1279.7	1279.45	OF060
WS-25	PZ	146201.7	2155914.2	09-Nov-43	1257.18	1258.97	OF060
WS-26	PZ	145212.09	2155893.2	18-Nov-43		1244.14	OF060
WS-27	PZ	147366.78	2159349.82	01-Dec-53		1324.4	OF060
WS-29	PZ	147431.17	2148217.26	01-Jul-89	1274.75	1275	OF060
WS-3	PZ	156643.38	2145606.18	11-Sep-42		1221.52	OF060
WS-30	PZ	157294.67	2142775.58	12-Dec-91	1206.39	1220	OF060
WS-31	PZ	153614.94	2142886.28	17-Dec-91	1220.47	1220	OF060
WS-32	PZ	158741.99	2148897.65	09-Sep-93	1250.01	1250	OF060
WS-33	PZ	152060.47	2157245.18	09-Jan-92	1285	1283.55	OF060
WS-34	PZ	151118.96	2144620.85	09-Apr-08	1257	1256.74	OF060
WS-5	PZ	154736.01	2145615.59	01-Jun-42	1215.3	1250.39	OF060
WS-7	PZ	152751.63	2146099.38	15-Aug-43	1229.99	1230	OF060

SECTION 10: ATTACHMENT C - ODEQ letters approving NFA for a SWMU

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Section 11 Other Federal Laws

[40 CFR 270.14(b)(20)]

11.1 Wild and Scenic Rivers Act (16 U.S.C. 1273 *et seq.*)

This permit renewal does not entail the construction of a water resources project that would have a direct adverse effect on the values for which a national wild and scenic river was established.

11.2 National Historic Preservation Act of 1966 (16 U.S.C. 470 *et seq.*)

This permit renewal will have no potential adverse effects on properties listed or eligible for listing in the National Register of Historic Places.

11.3 Endangered Species Act (16 U.S.C. 1531 *et seq.*)

There are no federal or state listed threatened or endangered species of plants or wildlife found at the facility and surrounding area. The Texas horned lizard (THL) recently (2011) have been observed in the vicinity (approximately 500 feet south of the hazardous waste storage area yard in DLA warehouse). The migrant loggerhead shrike could transit the area, although habitat is marginal. Both of these species are considered state species of special concern. During hazardous waste management activity, Tinker AFB will exercise precaution regarding these species. Discovery of these potential species will be immediately reported to the natural resource specialist at Tinker AFB for further assessment or actions to protect these species.

11.4 Coastal Zone Management Act (16 U.S.C. 1451 *et seq.*)

This permit renewal does not involve any activity affecting land or water use in a coastal zone.

11.5 Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*)

This permit renewal does not involve the impoundment, diversion, or other control or modification of any body of water.

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ATTACHMENT 1: TINKER INSTRUCTION 32-7004, HAZARDOUS WASTE MANAGEMENT (CURRENT VERSION SUBJECT TO CHANGE)

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ATTACHMENT 2: TINKER PLAN 19-2, SPILL PREVENTION AND EMERGENCY RESPONSE PLAN FOR HAZARDOUS AND EXTREMELY HAZARDOUS MATERIAL AND SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN (CURRENT VERSION SUBJECT TO CHANGE)

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ATTACHMENT 3: 2005 FINAL RCRA PERMIT MODIFICATION TO MONITOR WELL SAMPLING PROTOCOL TINKER AIR FORCE BASE, OKLAHOMA

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