ALTUS AIR FORCE BASE
PERMIT ATTACHMENT 3
FINAL ADMINISTRATIVE ORDER
DOCKET No. RCRA-VI-002(h)-95-H

RESPONSE TO COMMENTS/FINAL DECISION DOCUMENT
EPA REGION 6

under

Final Administrative Order (Order), Docket No. RCRA-VI-002(h)-95-H, pursuant to Section 3008(h) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §6928(h)

for

Altus Air Force Base
Altus, Oklahoma
OK9571824045

INTRODUCTION

EPA proposed a final remedy for addressing soil and groundwater contamination at the Altus Air Force Base (Altus AFB) site in Jackson County, Altus, Oklahoma on September 6, 2007 as part of the RCRA corrective action requirements outlined in the above-mentioned Order. The EPA Order was issued on November 6, 1996 and a complete record of soil and groundwater investigations is available for review in the Administrative Record. A public meeting was held in Altus, Oklahoma on September 6th to open the 45-day public comment period which ended on October 22, 2007. EPA has received comments and is now prepared to make the final decision regarding this remedy. The final conceptual site model is documented in the Final Corrective Measure Study (August 2007). EPA's remedy proposal is documented in the Statement of Basis for Altus Air Force Base (September 2007).

CORRECTIVE ACTION OBJECTIVES

The EPA-proposed remedy relies on the attainment of specific cleanup goals. This approach is sometimes referred to as "performance-based" and is focused on progress towards meeting the cleanup goals. The cleanup goals are outlined in the corrective action objectives (CAO's) for groundwater, surface soils, subsurface soil and surface water. EPA met with representatives from Oklahoma Department of Environmental Quality (ODEQ) on June 26 – 28, 2007 to finalize the Corrective Action Objectives (CAO's) outlined below.

Groundwater

Corrective Action Objective 1:
The final groundwater CAO is to contain the contaminant plume, rather than return the groundwater in the uppermost aquifer to its maximum beneficial use. This decision is based on EPA's review of the use, value and vulnerability of the affected uppermost aquifer. Because of high chloride and sulfide content in the upper aquifer, the Oklahoma Water Resources Board (OWRB) has classified this aquifer as a Class III aquifer having a beneficial use as agricultural and municipal/industrial cooling water. Altus AFB is

underlain by about 20 feet of terrace deposits of Quaternary age, consisting of unconsolidated sands, silts and clays. Below the terrace deposits there are transitions to a weathered zone of the Hennessey shale. The weathered zone of shale transitions to a more consolidated shale below depths of 40 feet. The consolidated shale extends to depths greater than 150 feet. The high chloride content of the upper aquifer is, in fact, contributing to the weathering of the Hennesey shale, but the extensive layer of consolidated shale serves as a confining unit to the deeper usable aquifer.

The value of an aquifer is based on its potential impact on the underlying aquifer, potential discharge to surface water, and potential exposures to indoor air. Regional groundwater studies reveal that the upper aquifer (from about 8 feet below ground surface to about 45 feet below ground surface) is not hydraulically connected to the lower aquifer. The upper aquifer in this area discharges to local creeks, producing surface water that is brackish in nature with high chloride and sulfide content. Potential for contaminated indoor air from the affected groundwater at Altus AFB is high due to the volatile nature of the contaminants and the shallow depth to groundwater. Altus AFB will mitigate potential indoor air exposures in administrative buildings located directly over existing plumes using engineered controls. Altus AFB will use institutional controls to protect offsite exposures, as described in the *Land Use Control Plan* currently being developed under the corrective measures implementation (CMI) phase of corrective action.

To support the groundwater cleanup objective, the distinct volatile organic compound (VOC) groundwater plumes in the upper aquifer will be managed as plume management zones. There are four groundwater plumes associated with Altus AFB. Each plume management zone will be called a "groundwater management unit" (GWMU) adequately delineated by groundwater monitoring wells (denoted as sentinel wells). EPA and ODEQ will agree on statistically significant protective concentration levels to be maintained at the sentinel well monitoring locations to show that each of the plumes are either stable or shrinking in size. EPA and ODEQ will approve the calculation of the protective concentration levels for each contaminant at the sentinel wells. The final point of compliance (POC) will be at the Base boundary, where concentrations of chemicals of concern must be at maximum concentration levels (MCLs) for drinking water. If Altus AFB is successful in eliminating the human health exposure pathway (including vapor intrusion) for offsite properties through controls on groundwater use, as agreed by property owners, the POC will move to the boundary of the area under control. Controls on groundwater use will be memorialized in the form of institutional controls, as described in the *Land Use Control Plan.* Details of the management of the plumes will be outlined in the *Performance Monitoring Plan* to be developed during the corrective measures implementation (CMI) phase of corrective action.

Groundwater vulnerability is the relative ease at which a contaminant introduced into the environment can migrate to an aquifer. At Altus, the upper aquifer is vulnerable to the past releases of contaminants because of the shallow depth to groundwater and the unconsolidated nature of the soils.

Corrective Action Objective 2:
To support the final groundwater cleanup objective, Altus must remove or treat source material in subsurface soils and/or groundwater to the extent practicable. Some chlorinated VOC's have higher specific gravities than water, and as a result, have the potential to sink in groundwater and form "pooled areas" on top of resistance bedrock. These pooled areas, also known as "DNAPL (dense non-aqueous phase liquid) pools" are source areas that will continue to leach contaminants to groundwater if not treated or removed. Removal or treatment of source material that could subsequently migrate into groundwater will enhance the attainment of the performance metrics. Source removal activities must target the removal of chlorinated VOC's in soils at concentrations that exceed their corresponding solubility constants in water.

Surface Soils

Corrective Action Objective 3:
ODEQ defines surface soils as the top two feet of soil. For the protection of human health from exposures of residual contaminants in surface soils, EPA is proposing a media-specific cleanup level at any identified release area. Contaminants of concern in surface soils must be remediated to levels that do not exceed **human health-based risk levels** that correspond to excess lifetime cancer risks of one in 100,000 (denoted as 1E-5) for an industrial outdoor worker exposure scenario. Non-carcinogenic contaminants must be remediated to levels that do not exceed a hazard index (HI) of 1 for an industrial outdoor worker. Confirmation sampling data from corrective actions at sites will confirm attainment of appropriate cleanup levels.

Subsurface Soils

Corrective Action Objective 4:
As stated in the CAO's for groundwater, Altus AFB must remove or treat source material in subsurface soils (greater than 2 feet below ground surface) that could subsequently migrate to groundwater, and attain a subsurface soil media-specific cleanup goal protective of groundwater. This determination of cleanup goals for subsurface soils is widely used and is based on the water/soil partitioning theory. This theory is conservative and assumes that contaminated soil and groundwater are in direct contact. The approach predicts the maximum amount of contamination that may remain in soil so that leachate from the contaminated soil will not violate groundwater cleanup standards.

A Base-wide *Site Management Plan* will provide on-site institutional controls to protect construction workers from exposure to residual contaminants in subsurface soils.

Surface Water

Corrective Action Objective 5:
Sampling of surface water features on and near Altus AFB reported elevated levels of COCs released from the contaminated aquifer. (Groundwater is connected to surface water in this area). However, because of the volatile nature of contaminants, the risk associated with exposure to contaminants in surface water is low. Therefore, the CAO for surface water is to monitor contaminant levels in surface water features associated with groundwater management units to assure protection of human and ecological

receptors. If sampling results indicate levels of contaminants are elevated, then the appropriate response will be made, as outlined in the *Contingency Plan* to be developed during Corrective Measures Implementation (CMI) phase of corrective action.

EPA'S FINAL SELECTED REMEDY

EPA's proposed remedy involves a combined approach of removal actions and implementation of a treatment technology. The preferred treatment technology is an in-situ bioremediation application known as enhanced reductive dechlorination (ERD). (See Table 1) To attain the CAO's outlined for Altus AFB, EPA is confident that a combination of activities using the ERD technology will address contaminants to levels that are protective of human health and the environment. Altus AFB will perform reviews of the effectiveness of the final remedy to meet CAO's every three years. During the course of performance reviews, as outlined in the *Performance Review Plan*, if there is a failure to meet the CAO's, then Altus AFB will implement the *Contingency Plan*, also being developed as part of the CMI phase of corrective action. The following is a summation of the selected final remedy;

Soil/groundwater excavation at source areas for **source removal**

Enhanced reductive dechlorination (ERD) for source zone treatment using **bioreactors**

Enhanced reductive dechlorination (ERD) for source containment using **bio-mulch walls** at the facility boundary and additional upgradient bio-mulch walls or enhancements of the bio-mulch walls, if necessary to meet the CAO's

Enhanced reductive dechlorination (ERD) using a **well injection circulation system** enhancing mass transfer from the nonaqueous phase to the aqueous phase (to address dissolved phase and residual DNAPL in the groundwater unit known as the "transmissive zone" that flows beneath the existing bio-mulch walls)

Optimization of selected ground water wells to monitor the GWMU's for compliance with the CAO's, as proposed in the *Performance Monitoring Plan* to be developed during Corrective Measures Implementation (CMI) phase of corrective action. Optimizing the locations, screened depth intervals and sampling parameters will be reviewed, approved and implemented to increase the efficiency of determining from monitoring data that CAO's are met.

Use of **institutional controls** to control offsite exposure to contaminated groundwater. Altus AFB must meet MCLs for contaminants in groundwater at the Air Force Base property boundary. Institutional controls on offsite properties must be in place in order to move the point of compliance to the new boundary of control. The effectiveness and placement of controls will be reviewed every three years as part of the *Performance Review Plan* during the corrective measures implementation phase of corrective action.

Source Removal

Removal of contaminated soils at source areas where concentrations of contaminants are elevated will advance the attainment of groundwater cleanup goals. Source removal through excavation of contaminated soil will also enable long-term cleanup goals to be reached in a shorter amount of time. Where applicable, Altus AFB should also remove contaminated groundwater as part of the de-watering process necessary for excavation.

Source Treatment and Containment using Enhanced Reductive Dechlorination (ERD) Technology

Pilot studies conducted at Altus AFB have shown the effectiveness of the use of bioreactors for the treatment of contaminant source zones. The introduction of carbon from the bioreactor enhances the reductive dechlorination process that breaks down contaminants to final daughter products that have less toxicity (Figure 1).

The use of bio-mulch walls along the boundaries have proven effective for treatment and containment of shallow groundwater contaminants (Figure 2). The bio-mulch walls are designed such that as groundwater passes through the wall, the contaminants are subjected to a treatment process before exiting the wall. The long-term effectiveness of bioreactors and bio-mulch walls has not been proven; therefore additional measures, such as additional bio-mulch walls installed upgradient and/or the addition of carbon substrates may be needed to ensure continued effectiveness. Also, there is a concern that the deeper groundwater "transmissive zone" is not affected by the bio-mulch wall treatment, since the walls were constructed to a depth of 35 feet, and the deeper transmissive zone extends to depths of greater than 45 feet in some areas. To address the deeper contamination, EPA's remedy includes the installation of a well injection circulation system or a well injection system to enhance treatment and containment of contaminants in the deeper transmissive zone.

Figure 1: A 2-Dimensional Schematic of the Bioreactor

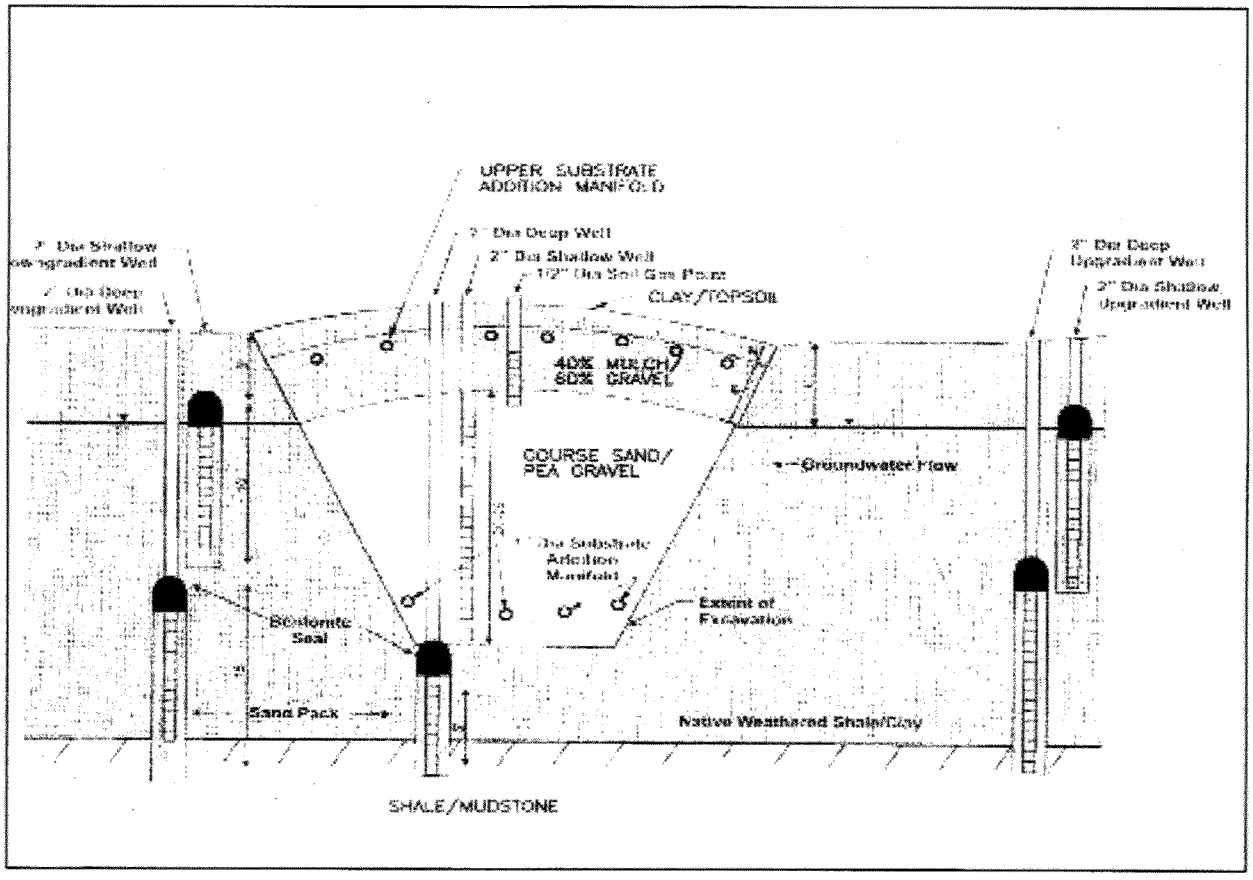

Figure 2: A 3-Dimensional Schematic of a Bio-Mulch Wall

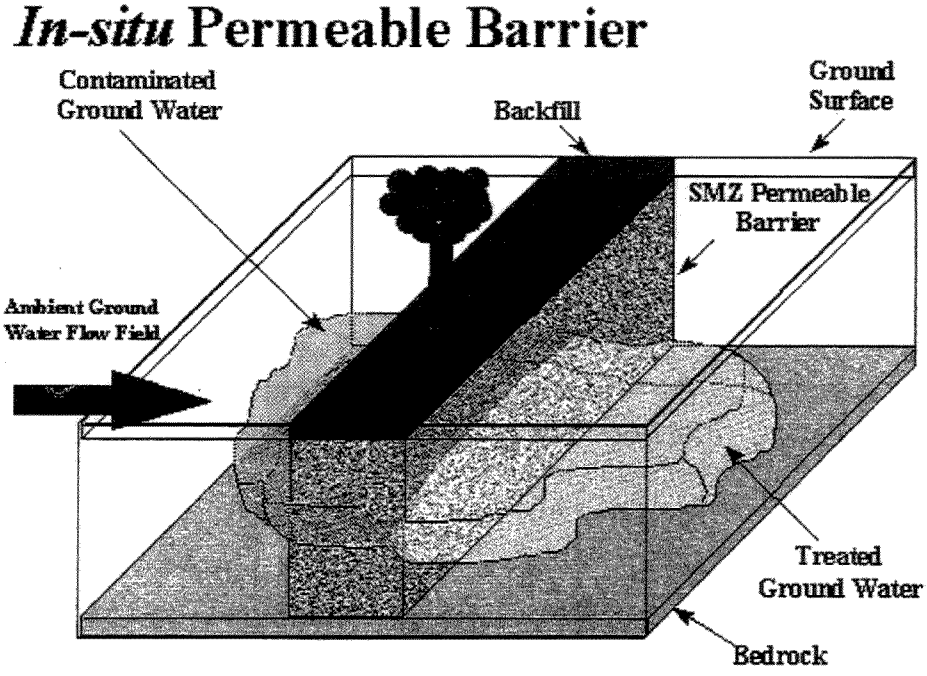

Table 1 Advantages of ERD Technology	
ERD is a "green" remediation	The insitu bioremediation of contaminants does not use nonrenewable energy sources.
Destruction of contaminants in-situ:	Chlorinated VOC's that are treated have the potential of being completely mineralized or destroyed. The benefits of in-situ treatment include; no secondary waste stream to treat, potential risks related to exposure during remediation are limited, and there is minimal impact to infrastructure.
Interphase mass transfer:	Data has shown that the enhancement of the anaerobic process may increase the rate of DNAPL source zone dissolution, thus speeding up the removal of sources that are contributing to groundwater contamination.
Potential application to a variety of COCs:	Other COCs affected are carbon tetrachloride and all daughter products of chlorinated ethenes.
Other degradation processes that take place simultaneously:	Other chemical reactions, both biological and abiological can be induced and/or enhanced to facilitate the destruction of chlorinated VOCs, which means there are many ways to enhance the system to produce results

PUBLIC PARTICIPATION ACTIVITIES

With assistance from Altus AFB, EPA hosted a public meeting on September 6, 2007 at the South West Technology Center in Altus, Oklahoma from 7 pm to 9:30 pm. Announcements for the public meeting appeared in the *Altus Times* on Sunday, August 5, and Sunday, August 12, 2007. The Administrative Record for the EPA Order was available for review during the public comment period at the Altus public library. Altus AFB is also required to have a *Community Relations Plan* to document how they will keep the public informed of the overall effectiveness of the remedy during the corrective measures implementation (CMI) phase of corrective action.

PUBLIC COMMENTS AND EPA RESPONSE

Dr. John Wilson, from the EPA National Risk Management Laboratory in Ada, Oklahoma made the comment that the mulch biowalls should not be referred to as "bark mulch biowalls" as used in the Statement of Basis document. The terminology is now changed to "bio-mulch walls".

EPA solicited comments from the U.S. Department of the Interior Bureau of Reclamation field office in Oklahoma City, Oklahoma and was notified that they had no official comments to submit.

EPA also solicited comments from Mr. Tom Buchanan of the Lugert-Altus Irrigation District in Altus, Oklahoma. [The Lugert-Altus Irrigation District uses a 270-mile system

of canals downstream of the Lake Altus dam to irrigate about 46,000 acres (Comparison of Irrigation Water Use Estimates Calculated from Remotely Sensed Irrigated Acres and State Reported Irrigated Acres in the Lake Altus Drainage Basin, Oklahoma and Texas, 2000 Growing Season)] Mr. Buchanan explained in a phone conversation with the EPA project manager that he had read the Statement of Basis document and that he was very interested if EPA could request that Altus Air Force Base line some of the irrigation canals on the Air Force property. He explained that this would conserve water for downgradient irrigation. The local region is interested in all water conservation efforts because the volume of water supply in Lake Altus is decreasing due to sediment loading in Lake Altus (see U.S. Department of the Interior Bureau of Reclamation Appraisal Report of the W. C. Austin Project, Oklahoma March 2005). This decrease in water volume, along with recent drought situations has affected irrigation efforts and farming. The EPA project manager explained to Mr. Buchanan that this could be included in the final remedy. Lining canals that are a water source to the groundwater plumes will also enhance our groundwater CAO of keeping the groundwater management plumes stable or shrinking in size, therefore EPA is including this project as part of the final remedy.

No other comments were formally received during the 45-day public comment period.

TECHNICAL ADDITIONS/CLARIFICATIONS TO THE EPA-PROPOSED REMEDY

1) To enhance the cleanup objective for surface soil (top 0 to 2 feet), EPA is including the following table of chemicals and their appropriate cleanup level:

Table 2 Surface Soil Cleanup levels		
Chemical of concern	Cleanup level (mg/kg) based on 1E-5 risk level	Cleanup level based on HI 1 or soil saturation (mg/kg)
Benzene	16	
Carbon tetrachloride	5.8	
Cis-1,2-dichloroethylene		160
1,2-Dichloroethane	8.4	
Trichloroethene (TCE)	53*	
Toluene		520
Vinyl Chloride	8.6	
Xylene		210

* TCE – using 0.013/mg/kg for oral slope factor and 0.007/mg/kg for inhalation slope factor, indoor worker.

2) To clarify the remediation application for addressing the deeper transmissive zone via a "well circulation system", as stated in the Statement of Basis, EPA would like to state that the application may be a well circulation system or a well injection system, whichever is proven most effective in the field to meet the CAO for groundwater.

3) To clarify how EPA has addressed indoor air issues at Altus AFB, the Final Corrective Measures Study (CMS) report (August 2007) reports in Section 2.3.2.3 that as part of the RFI, an evaluation of potential indoor air risks based on soil gas, subsurface soil gas, and indoor air sampling was conducted for three "worst case" facilities at the Base. This evaluation is provided in Appendix R of the Draft RFI/IA/CMS Report (November 2002). Collection of soil-gas samples included 20 locations along the southern Base boundary and 86 soil-gas samples in the off-site area. The Johnson-Ettinger model was applied following this sampling effort and Altus proposed that there was no indoor air risk. Because of recent debates on the use of the Johnson-Ettinger model, and the fact that the unsaturated zone for this facility is limited in depth, the EPA proposed to address indoor air issues by including the remediation of administration buildings at risk onsite (above the plume) with positive-pressure engineering controls as part of the final remedy. Also, to address indoor air issues for the offsite property, EPA first visited the affected offsite landowner and noted that living structures currently on the property had crawl space (thus providing venting of air before entering the living space). At the current time, the off-site groundwater plume is not directly below these structures. Secondly, EPA instructed Altus AFB to have institutional controls in place for the off-site property for the protection of future use of the property. The institutional controls are described in the *Land Use Control Plan* as part of the corrective measures implementation (CMI) phase of corrective action.

FUTURE ACTIONS

Following the final declaration of this Response to Comments/Final Decision document, EPA will review a Hazardous and Solid Waste Act (HSWA) permit jointly prepared by EPA and the ODEQ. The HSWA permit will specifically state all necessary conditions for the implementation of the remedy (known as the corrective measures implementation (CMI) phase of corrective action. Upon issuance of the ODEQ permit, which is equivalent in scope to the EPA Order, EPA will terminate the Final Administrative Order (Order), Docket No. RCRA-VI-002(h)-95-H, pursuant to Section 3008(h) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §6928(h). Implementation of the final remedy will then fall under the jurisdiction of the ODEQ Land Protection Division under the HSWA permit.

DECLARATION

Based on the administrative record compiled for this corrective action, I have determined that the selected remedy to be ordered at this site is appropriate and will be protective of human health and the environment.

John Blevins, Director
Compliance Assurance and Enforcement Division

12/19/07

Effective Date

FILED

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REGIONAL HEARING CLERK
EPA REGION VI

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 6

IN THE MATTER OF: ALTUS AIR FORCE BASE ALTUS, OKLAHOMA EPA I.D. NO. OK9571824045 RESPONDENT	FINAL ADMINISTRATIVE ORDER U.S. EPA DOCKET NO. RCRA-VI-002(h)95-H Proceeding under Section 3008(h) of the Resource Conservation and Recovery Act, as amended 42 U.S.C. § 6928(h)

I. JURISDICTION

1. This Final Administrative Order (Order) is issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency (EPA) by Section 3008(h) of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, (RCRA), and further amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. § 6928(h). The authority to issue this Order has been delegated to the Regional Administrator by EPA Delegation Nos. 8-31 and 8-32, dated April 16, 1985, and further delegated to the Director of the Compliance Assurance and Enforcement Division, Region 6 (Director).

2. This Order is issued to the United States Air Force ("Respondent"), the owner/operator of Altus Air Force Base, Altus, Oklahoma ("Facility"). This Order is based on the administrative record complied by EPA and incorporated herein by reference. The administrative record has been filed with the Regional Hearing Clerk, and is available for review by the Respondent and the public at EPA's Region 6 office at 1445 Ross Avenue, Dallas, Texas 75202-2733.

3. Congress has specifically waived any claim or defense of sovereign immunity that might otherwise be available to the Respondent regarding this Order. Pursuant to Section 6001 of RCRA, 42 U.S.C. § 6961, as amended by the Federal Facilities Compliance Act of 1992, Pub. Law No. 102-386, the Respondent is subject to, and shall comply with, all Federal, State, interstate, and local requirements, both substantive and procedural, respecting the control and abatement of solid waste or hazardous waste disposal and management in the same manner and to the same extent, as any person is subject to such requirements. Such Federal,

State, interstate, and local substantive and procedural requirements include, but are not limited to, all administrative orders and all civil and administrative penalties and fines.

II. PARTIES BOUND

1. This Order is issued to the U.S. Air Force, the owner/operator of Altus Air Force Base, Altus, Oklahoma.

2. No change in ownership or status relating to the Facility will in any way alter the status or responsibility of the Respondent under this Order. Any conveyance of title, easement, or other interest in the Respondent's Facility or a portion of the Respondent's Facility shall not affect Respondent's obligations under this Order. Respondent shall be responsible for and liable for any failure to carry out all activities required of the Respondent by the express terms and conditions of this Order, irrespective of its use of employees, agents, or consultants to perform any such tasks.

3. This Order shall apply to and bind Respondent, its officers, employees, agents, receivers, successors, assigns, and all other persons, including, but not limited to, contractors, and consultants acting under or on behalf of Respondent in connection with the implementation of this Order.

4. Respondent shall provide a copy of this Order to all contractors, subcontractors, laboratories, and consultants retained to conduct or monitor any portion of the work performed pursuant to this Order within seven (7) days of the effective date of this Order or date of such retention, and shall condition all such contracts on compliance with the terms of this Order.

5. Any documents transferring ownership and/or operations of the Facility from Respondent to a successor-in-interest shall include written notice of this Order; however, Respondent shall, no less than thirty (30) days prior to transfer of ownership or operation of the Facility, provide written notice of this Order to its successor-in-interest, and written notice of said transfer of ownership and/or operation to EPA.

III. STATEMENT OF PURPOSE

1. The purpose of this Order is to require the Respondent to identify, investigate, and prevent the further spread of releases of hazardous wastes and/or hazardous constituents to the environment, and to ensure that corrective action

deemed necessary by EPA be designed and implemented to protect human health and the environment.

2. This Order requires the Respondent to: (1) perform Interim Measures (IM) at the Facility to prevent or minimize the further migration of contaminants due to releases of hazardous constituents to the environment, or to mitigate current or potential threats to human health or the environment; (2) perform a RCRA Facility Investigation (RFI) to fully determine the nature and extent of any release(s) of hazardous waste or hazardous constituents at or from the Facility; (3) perform a Corrective Measure Study (CMS) to identify and evaluate alternatives for corrective action(s) to prevent or mitigate any migration of release(s) of hazardous wastes or hazardous constituents at or from the Facility, and to collect any other information necessary to support the selection of corrective measures at the Facility; and (4) implement the corrective measure or measures (Corrective Measure Implementation (CMI)) selected by EPA for the Facility.

IV. FINDINGS OF FACT

1. Respondent is the U.S. Air Force, a department of the Federal Government.

2. The Respondent is the owner/operator of Altus Air Force Base. Altus Air Force Base is located within the corporate limits of the City of Altus in Jackson County in southwestern Oklahoma (Latitude 34° 39′ 003″, Longitude 99° 16′ 006″).

3. Respondent is a generator of hazardous waste and has engaged in the treatment, storage, or disposal of hazardous waste at Altus Air Force Base subject to the interim status requirements of 40 C.F.R. Part 265, and Oklahoma's authorized RCRA program.

4. Respondent owned and operated the Facility as a hazardous waste management facility on or after November 19, 1980, the applicable date which renders facilities subject to the interim status requirements, or the requirement to have a permit under Sections 3004 and 3005 of RCRA, 42 U.S.C. §§ 6924 and 6925.

5. Pursuant to Section 3010(a) of RCRA, 42 U.S.C. § 6930(a), Respondent notified EPA of its hazardous waste activity. In the Notification of Hazardous Waste Activities dated July 10, 1980, Respondent identified itself as a generator, storer, and transporter of the following hazardous waste at the Facility:

40 C.F.R. § 261.21 - Ignitability (D001)
40 C.F.R. § 261.24 - Toxic (D000)
40 C.F.R. § 261.31 - Hazardous waste from non-specific sources (F001)
40 C.F.R. § 261.33 - Discarded commercial chemical, off-specifications products (U002, U036, U117, U159, U186, U220, U228).

6. Pursuant to Section 3005(e) of RCRA, 42 U.S.C. § 6925(e), on September 29, 1980, Respondent submitted Part A of its permit application and identified that it treats, stores, or disposes of hazardous wastes by operation of a surface impoundment and tank storage for the following hazardous waste:

40 C.F.R. § 261.21 - Ignitability (D001).

7. In its revised Part A Permit application, dated July 15, 1988, Respondent identified that it treats, stores or disposes of the following hazardous wastes by operation of tank and container storage:

40 C.F.R. § 261.21 - Ignitability (D001)
40 C.F.R. § 261.31 - Hazardous waste from non-specific sources (F002, F005)
40 C.F.R. § 261.33 - Commercial chemical, off specification products (U151).

8. Respondent submitted its Part B permit application to Oklahoma State Department of Health (OSDH) on November 8, 1988, for the following unit:

Unit 451:
Container Storage Unit ID 02
Tank Storage Unit ID 04.

The Part B permit application was later withdrawn by Respondent.

9. According to a RCRA Facility Assessment (RFA) Report dated July 5, 1990, prepared for EPA by PRC Environmental Management Inc., the topography at the Facility varies from generally flat to gently rolling hills. Surface elevations in the area range from 1,330 feet above sea level near the south end of the main runway to 1,390 feet above sea level at the extreme northern end of the Facility.

10. According to the RFA Report, two permanent streams, Stinking Creek and an unnamed tributary of Stinking Creek exist within the boundaries of Altus Air Force Base. Stinking Creek drains much of the northern and eastern sections of

the Facility. Additionally the Ozark Canal and an irrigation canal are near the Facility.

11. According to the U.S. Air Force Installation Restoration Phase I - Record Search Report, 1985, two private wells have been constructed near the Facility. One well located 4,000 feet west of the main gate is reported to be 60 feet deep, depth to ground water is 19 feet below surface. The second well is located at a private dwelling 4,200 feet north of the Facility; it is 122 feet deep and depth to ground water is 60 feet below surface.

12. According to the U.S. Air Force Installation Restoration Program (IRP) Report prepared by the U.S. Geological Survey, dated January, 1992, depth to ground water in the shallow residual soil at the Facility ranges from two (2) feet to 14 feet below land surface in the shallow residual soil of the Hennessey Shale. Movement of the ground water is generally to the southeast.

13. The RFA Report identified the following Solid Waste Management Units (SWMU's) and Areas of Concern (AOC's); and the IRP Report identified the IRP Sites (IRP), which are listed in Table 1 (with the exception of IRP Sites 12, 13, 14, and 17, which were later identified by the Respondent).

Table 1

SWMU	IRP	AOC	SWMU/IRP/AOC Name
01	06		Fire Protection Training Area No. 1
02	05		Fire Protection Training Area No. 2
03	03		Fire Protection Training Area No. 3
04	07		Fire Protection Training Area No. 4
05	08		Landfill No. 1
06	09		Landfill No. 2
07	04		Landfill No. 3 and POL Tank Sludge Burial
08	14		Landfill No. 4
09	01		Abandoned Aircraft Washrack Pond
10	02		Abandoned Aerospace Ground Equipment (AGE) Washrack Pond
11			Former Wastewater Treatment Plant

SWMU	IRP	AOC	SWMU/IRP/AOC Name
12			Red Fuming Nitric Acid Neutralization & Burial Site
13			Low-Level Radioactive Material Deposit Site
14			Underground Tank and Drum Storage Area
15			POL Tank Sludge Burial Area
16			Bulk Fuel Storage Tank Area
17			Explosive Ordinance Disposal Area
18			Oil and Water Separators
19			Holding tank at Facility 291
21	10		Service Station, BX
26	12		Auto Hobby Shop (including holding tank at Facility 343)
	17		TCE Spill Site
		1	Sanitary Sewage Evaporation Pond
	13	2	Flight Line Fuel System
		4	Sanitary Sewer System

14. The Altus Air Force Base Environmental Flight Chief verbally notified EPA on January 6, 1994, that sample analyses from two ground water monitoring wells located 10-12 feet inside the southern boundary of the Facility had concentrations of Trichloroethene (TCE) of up to 17,000 ppb in the ground water within the shallow residual soil mantle of the Lower Permian Hennessey Group, and that TCE has probably migrated off-site onto privately owned property.

15. According to the IRP Report, ground water, surface water, soil, and sediment were sampled at the individual IRP sites. The analytical results document the release of hazardous waste or hazardous waste constituents to the environment at the following sites:

a) IRP Site 1 (SWMU #9) - Abandoned Aircraft Washrack Pond. The unlined earthen evaporation pond and associated washrack was in operation from 1970 to 1977. The pond, approximately 5200 sq. ft. in area, received oils, greases, cleaning solutions, and solvents. Analytical data collected in

May 1989, from soil samples of the residual soils of the Hennessey Shale near the approximate location of the old pond, includes the following concentrations of hazardous waste, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Mercury	Soil	31 mg/kg
Total Petroleum Hydrocarbons	Soil	3,200 mg/kg
Naphthalene	Soil	2.2 mg/kg

b) IRP Site 2 (SWMU #10) - Aerospace Ground Equipment (AGE) Washrack Evaporation Pond. The unlined impoundment, approximately 9600 sq. ft. in area, received cleaning solutions, solvents, oil, grease, and pesticides. The unlined pond was in operation from 1970 to 1985, and was filled and graded in 1986. Analytical data obtained from three monitoring wells in 1989, and four soil borings in May 1991, indicate the following concentrations of hazardous waste, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Toluene	Soil	99 mg/kg
Lead	Soil	83 mg/kg
Total Petroleum Hydrocarbons	Soil	23,800 mg/kg
Trichloroethane	Soil	13 mg/kg
Total Petroleum Hydrocarbons	Ground Water	16 ug/l
Benzene	Ground Water	9,700 ug/l
Toluene	Ground Water	2,000 ug/l
Xylene	Ground Water	1,200 ug/l
1,2-Dichloroethane	Ground Water	370 ug/l
2,4,6-Trichlorophenol	Soil	68 ug/l

c) IRP Site 3 (SWMU #3) - Fire Protection Training Area (FPTA) Number 3 is approximately 100,000 sq. ft. in area. Fire protection training was conducted at the FPTA from 1960 to 1982. The areas within the FPTA used for combustion were shallow, unlined pits where the waste material was poured prior to being ignited. Analytical data collected from four boreholes in April 1989, and four monitoring wells in 1989 and 1991, indicate the following concentrations of hazardous wastes, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Trichloroethene	Ground Water	950 ug/l
1,2-Dichlorobenzene	Ground Water	8.9 ug/l
Total Petroleum Hydrocarbons	Ground Water	3000 ug/l
Total Petroleum Hydrocarbons	Soil	4,700 mg/kg
Acetone	Soil	22 mg/kg
Xylene	Soil	24 mg/kg
2-Butanone	Soil	0.65 mg/kg
4Methyl-2Pentanone	Soil	0.97 mg/kg

d) IRP Site 4 (SWMU #7) - Landfill Number 3 and Petroleum, Oil and Lubricant (POL) Tank Sludge Burial. This unlined landfill, approximately 15 acres in area was in operation from 1956 to 1983. The POL sludge was buried approximately three feet deep at the north end of the landfill. The landfill is bounded on the west by the Irrigation canal and partly bounded on the east by Stinking Creek. Analytical data collected from one borehole in 1989, from five monitoring wells in 1989 and 1991, and bottom-material from the drainage canal indicate the following concentrations of hazardous waste, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Total Petroleum Hydrocarbons	Soil and/or sediment (from drainage canal)	2,200 mg/kg
Acetone	Soil	0.23 mg/kg
Lead	Soil	19 mg/kg

Contaminant	Impacted Media	Concentration
Arsenic	Soil	6.9 mg/kg
Trichloroethene	Ground Water	430 ug/l
Trans-1,2-Dichloroethene	Ground Water	20 ug/l
Total Petroleum Hydrocarbons	Ground Water	3,000 ug/l

e) IRP Site 5 (SWMU #2) - Fire Protection Training Area (FPTA) Number 2 is an estimated 40,000 sq. ft. in area. The areas within the FPTA used for combustion were shallow, unlined pits where fuels, oils, and solvents were poured on the ground prior to ignition. FPTA operations were conducted from 1956 to 1960. Analytical data collected from soil samples in 1989, and from three monitoring wells in 1989 and 1991, indicate the following concentrations of hazardous waste, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Total Petroleum Hydrocarbons	Soil	110 mg/kg
2-Butanone	Soil	0.14 mg/kg
Trichloroethene	Ground Water	11 ug/l

f) IRP Site 6 (SWMU #1) - Fire protection Training Area (FPTA) Number 1 is approximately 40,000 sq. ft. in area. The areas within the FTPA used for combustion were shallow, unlined earthen pits where waste materials, contaminated fuels, waste oil, solvents, and thinners were poured on the ground prior to ignition. FPTA operations were conducted from 1954 to 1956. Analytical data collected from soil samples in 1989, indicate the following concentration of hazardous waste or hazardous waste constituent:

Contaminant	Impacted Media	Concentration
Acetone	Soil	0.43 mg/kg

g) IRP Site 7 (SWMU #4) - Fire Protection Training Area (FPTA) Number 4 operated from 1982 to early 1990 and is contained within a 75 foot (diameter), circular concrete structure. Within the structure, the soil is covered with approximately 18 inches of coarse aggregate. Underdrains in the aggregate

layer connect to an oil-water separator and lead to an unlined evaporation pond about 50 feet south of the concrete ring. JP-4 fuel was the flammable liquid used in the training area. Analytical data collected from four boreholes in 1989, and five monitoring wells in 1989 and 1991, indicate the following concentrations of hazardous wastes, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Total Petroleum Hydrocarbons	Soil	1,100 mg/kg
Total Petroleum Hydrocarbons	Soil	9,200 mg/kg
Xylene	Soil	11 mg/kg
Benzene	Ground Water	57 ug/l
Trichloroethene	Ground Water	29 ug/l
Tetrachloroethene	Ground Water	26 ug/l
1,2-Dichlorobenzene	Ground Water	2.8 ug/l

h) IRP Site 8 (SWMU #5) - Landfill Number 1 is unlined and approximately three acres in size. The landfill was used from 1942 to 1945, and from 1953 to 1954. Materials disposed of at this landfill consisted of garbage, wood, metal, paper, and shop wastes. Analytical data collected in 1989 from soil in the drainage canal southeast of the landfill indicates the following concentrations of hazardous wastes, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Total Petroleum Hydrocarbons	Soil	1,400 mg/kg
Lead	Soil	2,000 mg/kg

i) IRP Site 9 (SWMU #6) - Landfill Number 2 is an eight foot deep, unlined, trench type landfill which operated from 1955 to 1956. The landfill encompassed approximately 0.8 acres and received mixed municipal wastes, including garbage, paper, metal, wood, and shop wastes. Analytical data collected in 1989 from four monitoring wells indicate the following hazardous waste or hazardous waste constituent:

Contaminant	Impacted Media	Concentration
Trichloroethene	Ground Water	21 ug/l

j) IRP Site 10 (SWMU #21) - The BX Service Station has four fiberglass underground storage tanks used to store gasoline, waste oils, and waste hydraulic fluid. Analytical data collected from soil gas and soil samples in 1989, and from four monitoring wells in 1989 and 1992, indicate the following concentrations of hazardous wastes, hazardous waste constituents, or petroleum hydrocarbons:

Contaminant	Impacted Media	Concentration
Total Petroleum Hydrocarbons	Soil	65 mg/kg
1,2-Dichloroethane	Ground Water	2.9 ug/l
Benzene	Soil Gas	46,300 ppm

k) IRP Site 17 - The TCE Spill Site is a ground water plume which extends approximately 1000 feet off-site beyond the south boundary of the Facility, and within 800 feet of the Tributary of Stinking Creek. Analytical data obtained in December 1993, from two monitoring wells near the south boundary, and analytical data collected in 1994 from off-site temporary monitoring wells indicate the following hazardous waste or hazardous waste constituent:

Contaminant	Impacted Media	Concentration
Trichloroethene	Ground Water	17 ppm

16. The hazardous wastes and hazardous waste constituents identified in paragraph 15 above include known and suspected carcinogens and mutagens. Carcinogens and mutagens can effect the central nervous system and damage internal organs at low levels. These chemicals, under certain conditions of dose, duration, or extent of exposure, constitute a threat to human health by inhalation, ingestion and/or absorption. The following information was compiled from the Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites (September 27, 1985), EPA's Integrated Risk Information System (IRIS), and 40 C.F.R. Part 141:

a) Benzene - Carcinogenicity classification A - human carcinogen. Benzene exposure is associated with chromosomal damage in both humans and animals, although it is not mutagenic in microorganisms; it is fetotoxic

and lethal to embryos in experimental animals. Exposure to benzene has resulted in leukemia in humans. It also adversely affects the hematopoietic system. Very high concentrations in air (about 20,000 ppm) can cause death in minutes, with central nervous system depression and convulsions, and cardiovascular collapse. Vertigo, headache, nausea, drowsiness, and eventual unconsciousness result from milder exposures. Dermal adsorption of liquid benzene can result in erythema, blistering, scaly dermatitis. The maximum contaminant level (MCL) for benzene in drinking water is 0.005 mg/l.

b) Arsenic - Carcinogenicity classification A - human carcinogen. Oral exposure to arsenic contaminated drinking water has shown significantly elevated standard mortality ratios for cancer of the bladder, lung, liver, kidney, skin and colon. The maximum contaminant level (MCL) for arsenic in drinking water is 0.05 mg/l.

c) Lead - Carcinogenicity classification B2 - probable human carcinogen. Exposure to lead has produced kidney tumors in animals. Human exposure to lead can severely damage the brain and kidney, cause abortion, and damage the male reproductive system. Lead exposure may cause premature births, decrease intelligence quotient score, reduce the growth of young children, and affect memory. The action level for lead in drinking water is 0.015 mg/l.

d) Trichloroethene - Trichloroethene has induced hepatocellular carcinomas in mice and was mutagenic when tested using several microbial assay systems. The maximum contaminant level (MCL) for trichloroethene in drinking water is 0.005 mg/l.

e) 1,2-Dichloroethane - Carcinogenicity classification B2 - probable human carcinogen. 1,2-Dichloroethane is a mutagenic in bacterial test systems. The maximum contaminate limit (MCL) in drinking water is 0.005 mg/l.

f) Tetrachloroethene - Tetrachloroethene produces liver cancer in mice when administered orally by gavage. Renal and hepatotoxicities have been reported following inhalation exposure of rats to fairly high concentrations. The maximum contaminant limit (MCL) in drinking water is 0.005 mg/l.

g) Mercury - Both organic and inorganic forms of mercury are reported to be teratogenic and embryotoxic in

experimental animals. In humans, prenatal exposure to methylmercury has been associated with brain damage. Mercury can also affect the central and peripheral nervous system and the kidney. The maximum contaminant level (MCL) in drinking water is 0.002 mg/l.

h) Toluene - Acute exposure to toluene at concentrations of 375-1,500 mg/kg produces central nervous system depression and narcosis in humans. Chronic inhalation exposure to toluene at relatively high concentrations produces cerebellar degeneration and an irreversible encephalopathy in mammals. The maximum contaminant level (MCL) for toluene in drinking water is 1 mg/l.

V. CONCLUSIONS OF LAW AND DETERMINATIONS

Based on the Findings of Fact set out above, and the administrative record, the Director has determined that:

1. Pursuant to Section 6001 of RCRA, 42 U.S.C. § 6961, each department, agency, and instrumentality of the executive, legislative, and judicial branches of the Federal Government having jurisdiction over any solid waste management facility or disposal site, or engaged in any activity resulting, or which may result, in the disposal or management of solid waste or hazardous waste shall be subject to, and comply with, all Federal, State, interstate, and local requirements, both substantive and procedural (including any requirements for permits or reporting or any provision for injunctive relief and such sanctions as may be imposed by a court to enforce such relief), respecting control and abatement of solid waste or hazardous waste disposal in the same manner, and to the same extent, as any person is subject to such requirements.

2. Pursuant to Section 6001 of RCRA, 42 U.S.C. § 6961, Respondent is a federal agency subject to all requirements of RCRA in the same manner and extent as any person is subject to such requirements.

3. Respondent is a "person" within the meaning of Section 1004(15) of RCRA, 42 U.S.C. § 6903(15), and 40 C.F.R. § 260.10.

4. Respondent is the owner/operator of an "existing hazardous waste management facility" as defined at 40 C.F.R. § 260.10, located at Altus, Oklahoma.

5. Respondent was authorized to operate under interim status pursuant to Section 3005(e) of RCRA, 42 U.S.C. § 6925(e).

6. Certain wastes and constituents found at the Facility are hazardous wastes or hazardous constituents as defined or set forth by Sections 1004(5) and 3001 of RCRA, 42 U.S.C. §§ 6903(5) and 6921, 40 C.F.R. Part 261, and as listed in the Oklahoma Department of Environmental Quality (ODEQ) Rule 210 (which incorporated 40 C.F.R. Part 261, by reference in its entirety).

7. Respondent released hazardous wastes or hazardous waste constituents, as defined or set forth by Section 3001 of RCRA, 42 U.S.C. § 6921, and 40 C.F.R. Part 261, into the environment from the Facility.

8. Respondent is subject to the provisions of the Federal Facility Compliance Act of 1992, Public Law No. 102-386.

9. Respondent is subject to the provisions of Section 3008(h) of RCRA, 42 U.S.C. § 6928(h).

10. Based on the release of hazardous waste or hazardous constituents into the environment from the Facility, the Director has determined that the actions required by this Order are consistent with RCRA, and the actions ordered below are necessary to protect human health or the environment.

Based on the foregoing, it is hereby ORDERED that Respondent shall perform the following actions in the manner and by the dates specified below:

VI. WORK TO BE PERFORMED

Respondent shall undertake, continue to take, and complete each of the following actions to the satisfaction of EPA and in accordance with the terms, procedures and schedules set forth in the Corrective Action Plan ("CAP"), Attachment I. The CAP is hereby incorporated in this Order by reference as if reproduced in full herein.

1. INTERIM MEASURES (IM)

   a) Within one hundred twenty (120) days of the effective date of this Order, Respondent shall submit a Draft Interim Measures Workplan (IM Workplan) to EPA for the stabilization of the AGE Washrack Pond, IRP Site 02, for EPA review and approval. The purpose of this IM is to minimize the further release of hazardous waste or hazardous waste constituents to the ground water, and mitigate the current or potential threat to human health and/or the environment. The IM Workplan shall be prepared in accordance with the requirements contained in the CAP, and shall identify and evaluate

interim measures, which shall be consistent with and integrated into any long term remedy at the Facility.

Respondent shall evaluate the interim measures (IMs) necessary to control the further spread of contamination from IRP Site 02. At a minimum, the following IM shall be evaluated:

- Excavation and removal of the contaminated soil and sludge down to the bottom of the impoundment or to the top of the saturated zone and treatment of the waste.

- Placement of a temporary cap and slurry wall to minimize rain water infiltration, control movement of ground water into the waste disposal area, and slow the migration of contamination.

Within thirty (30) days after receipt of EPA's comments on the Draft IM Workplan, Respondent shall submit a revised IM Workplan to EPA addressing all of EPA's comments to the satisfaction of EPA. EPA will approve or modify the revised IM Workplan. The revised IM Workplan, as approved or modified by EPA, shall become the Final IM Workplan. Upon approval or modification of the Final IM Workplan by EPA, Respondent shall undertake, or continue to take the IM in accordance with the IM Workplan, and concurrently with other corrective action activities.

b) In the event Respondent identifies a current or potential threat to human health and/or the environment, in addition to IRP Site 02, the Respondent shall immediately notify EPA orally, and in writing within five (5) days, summarizing the immediacy and magnitude of the potential threat to human health and/or the environment.

If additional information becomes available to EPA after the effective date of this Order which indicates the existence of a current or potential threat to human health and/or the environment, EPA will provide notification to Respondent so that Respondent can initiate interim measures. Within one hundred twenty (120) days of the notifications described above, Respondent shall submit a Draft Interim Measures Workplan (IM Workplan) for EPA review and approval that identifies Interim Measures which mitigate this threat, and are consistent with and integrated into any long term remedy at the Facility. The IM Workplan shall be prepared in accordance with the requirements contained in the CAP.

Within thirty (30) days after receipt of EPA's comments on the Draft IM Workplan, Respondent shall submit a revised IM Workplan to EPA, addressing all of EPA's comments to the satisfaction of EPA. EPA will approve or modify the revised IM Workplan. The revised IM Workplan, as approved or modified by EPA, shall become the Final IM Workplan. Upon approval or modification of the Final IM Workplan by EPA, Respondent shall undertake, or continue to take the Interim Measures in accordance with the IM Workplan, and concurrently with other corrective action activities.

c) The IM Workplan(s) shall ensure that the Interim Measures are designed to control or abate threats to human health and/or the environment and/or to prevent or minimize the further spread of contamination while long-term remedies are pursued at the Facility.

d) Within thirty (30) days after the completion of the construction of the IM (except for long term operation, maintenance, and monitoring), the Respondent shall submit a Draft Interim Measures Implementation Report in accordance with the requirements specified in the CAP to EPA for review and approval. Within thirty (30) days of receipt of EPA's comments on the Interim Measures Implementation Report, Respondent shall submit a Final Interim Measures Implementation Report to EPA for review and approval, addressing all of EPA's comments to the satisfaction of EPA.

2. RCRA FACILITY INVESTIGATION (RFI)

a) Within one hundred fifty (150) days of the effective date of this Order, Respondent shall submit a Draft Description of Current Conditions Report to EPA for review and approval. The Draft Description of Current Conditions shall be prepared in accordance with the requirements in the contained in CAP. The Draft Description of Current Conditions Report may incorporate the existing data from the U.S. Air Force Installation Restoration Program (IRP) Reports for Altus Air Force Base, in accordance with the requirements contained in the CAP.

b) Within thirty (30) days after receipt of EPA's comments on the Draft Description of Current Conditions Report, Respondent shall submit a Final Description of Current Conditions Report to EPA for review and approval, addressing all of EPA's comments to the satisfaction of EPA.

c) Within one hundred fifty (150) days of the effective date of this Order, Respondent shall submit to EPA a Draft RCRA Facility Investigation (RFI) Workplan. The Draft RFI Workplan shall be prepared in accordance with the requirements in the CAP.

d) The RFI Workplan shall be developed in accordance with, at a minimum, RCRA, its implementing regulations, and EPA guidance documents, including, but not limited, to those documents referenced in Attachment II, and any other documents determined by EPA to be relevant during the course of this action.

e) The RFI Workplan shall describe in detail the methodology for determining the presence, magnitude, horizontal and vertical extent, direction, and rate of movement of any hazardous wastes or hazardous waste constituents within and beyond the Facility boundary.

f) The RFI Workplan shall conform to the requirements of the CAP, and shall document the procedures the Respondent shall use to conduct those investigations necessary to: (1) characterize the potential pathways of contaminant migration; (2) characterize the source(s) of contamination; (3) define the degree and horizontal and vertical extent of contamination; (4) identify actual or potential receptors; and (5) support the development of alternatives from which a corrective measure will be selected by EPA. A specific schedule for implementation of all activities shall be included in the RFI Workplan.

g) In accordance with the provisions of the CAP, the RFI Workplan shall include: (1) a Project Management Plan; (2) a Data Collection Quality Assurance Plan; (3) a Data Management Plan; (4) a Health and Safety Plan; and (5) a Community Relations Plan.

h) Within thirty (30) days after receipt of EPA's comments on the Draft RFI Workplan, Respondent shall submit a Final RFI Workplan to EPA for review and approval. EPA will approve or modify the revised RFI Workplan. The revised RFI Workplan as approved or modified by EPA shall become the Final RFI Workplan. Respondent shall implement the Final RFI Workplan according to the schedule set forth in the Final RFI Workplan.

i) Within 365 days of the approval of the RFI Workplan, Respondent shall submit to EPA a Draft RFI Report for review and approval. The Draft RFI Report shall be prepared in accordance with the requirements contained in the CAP.

j) Within thirty (30) days after receipt of EPA's comments on the Draft RFI Report, Respondent shall submit, for EPA review and approval, a Final RFI Report which addresses all of EPA's comments to the satisfaction of EPA.

k) Concurrent with the submission of the Draft RFI Report, Respondent shall submit a Draft Investigative Analysis Report for EPA review and approval.

l) Within thirty (30) days after receipt of EPA's comments on the Draft Investigation Analysis Report, Respondent shall submit, for EPA review and approval, a Final Investigation Analysis Report which addresses all of EPA's comments to the satisfaction of EPA.

m) During the RCRA Facility Investigation, it may be necessary to revise the Final RFI Workplan to increase or decrease the detail of information collected to accommodate the Facility specific situation. If such revisions are made, the schedule for deliverables affected by these revisions may be adjusted by EPA.

3. CORRECTIVE MEASURES STUDY (CMS)

a) Within one hundred fifty (150) days of the approval of the Final RFI Report, or upon written direction from EPA, Respondent shall submit to EPA a Draft CMS Report for review and approval. The CMS Report shall be performed in a manner consistent with the requirements in the CAP.

b) Within thirty (30) days after receipt of EPA's comments on the Draft CMS Report, Respondent shall submit a Final CMS Report, which addresses all of EPA's comments to the satisfaction of EPA. EPA will approve the revised Final CMS Report or modify it. The revised Final CMS Report shall become the Final Corrective Measures Study.

c) During the Corrective Measures Study, it may be necessary to revise the CMS to increase or decrease the detail of information collected to accommodate the Facility specific situation. If such revisions are made, the schedule for deliverables affected by these revisions may be adjusted by EPA.

d) The Corrective Measures Study shall be developed in accordance with, at a minimum, RCRA, its implementing regulations, and EPA guidance documents, including, but not limited, to those documents referenced in

Attachment II, and any other documents determined by EPA to be relevant during the course of this action.

4. CORRECTIVE MEASURES IMPLEMENTATION (CMI)

a) Unless otherwise specified in this Order, within one hundred fifty (150) days of Respondent's receipt of notification of EPA's selection of the corrective measure, or upon written direction from EPA, Respondent shall submit to EPA a Corrective Measures Implementation Program Plan ("CMI Program Plan").

b) Respondent shall develop and submit to EPA draft deliverables as described in a manner consistent with the CMI Scope of Work contained in the CAP. These deliverables are subject to review, comment, and approval by EPA. The required deliverables shall include, but not be limited to: (1) a Program Management Plan; (2) a Community Relations Plan; (3) Design Plans and Specifications; (4) an Operation and Maintenance Plan; (5) a Cost Estimate; (6) a Project Schedule; (7) Construction Quality Assurance Objectives, (8) a Health and Safety Plan; (9) a Preliminary Design, (10) an Intermediate Design, (11) a Prefinal Design, (12) Prefinal Design and Final Design, (13) a Construction Quality Assurance Plan, (14) a Prefinal Inspection Report, (15) a Corrective Measure Implementation Plan, and (16) a Corrective Measure Implementation Report. The Respondent shall submit the above deliverables according to the schedule set forth in the CAP.

c) The Corrective Measures Implementation Workplan shall be developed in accordance with, at a minimum, RCRA, its implementing regulations, and EPA guidance documents, including, but not limited, to those documents referenced in Attachment II, and any other documents determined by EPA to be relevant during the course of this action.

d) Unless otherwise specified in this Order, within thirty (30) days after receipt of EPA's comments on any of the CMI deliverables, Respondent shall submit for EPA review and approval, revised Final deliverables, which address all of EPA's comments to the satisfaction of EPA.

e) Upon EPA approval or modification of all deliverables described in the CMI Scope of Work contained in the CAP, Respondent shall implement the activities of these deliverables.

f) During the Corrective Measures Implementation, it may be necessary to revise the Final CMS to increase or decrease the detail of information collected to accommodate the Facility specific situation. If such revisions are made, the schedule for deliverables affected by these revisions may be adjusted by EPA.

5. SUBMISSIONS / AGENCY APPROVAL / ADDITIONAL WORK

a) Within five (5) days of approval or modification by EPA of any Workplan(s), Respondent shall commence work and implement the tasks required by the Workplan(s), in accordance with the standards, specifications and schedule stated in the Workplan(s) as approved or modified by EPA.

b) Beginning with the month following the effective date of this Order, Respondent shall provide EPA with the appropriate IM, RFI, and CMS progress reports every month, due on the tenth (10th) day of the following month. The CMI monthly and semi-annual progress reports are also due the tenth day of the following month. The progress reports shall conform to requirements in relevant Scopes of Work contained in the CAP.

c) The Respondent shall provide EPA with the results of all sampling and testing performed under this Order in every third monthly progress report as specified in Section VI.5.(b).

d) EPA will review all draft and final reports or workplans required under this Order, and notify the Respondent in writing of EPA's approval/disapproval of the deliverables or any part thereof. Within thirty (30) days of receipt of EPA's disapproval of any deliverable, or such other period of time as provided in Attachment I, Respondent shall address the deficiencies to EPA's satisfaction and submit a revised submittal. EPA shall approve, disapprove, or modify the revised submittal. Upon EPA approval or modification, the submittal shall be deemed incorporated into and part of this Order.

e) Any noncompliance with such EPA approved plans, reports, specifications, schedules, and attachments shall be construed as a violation of the terms of this Order, and subject to the penalty provisions of Section XIX. Oral advice or approvals given by EPA representatives will not relieve Respondent of their obligation to obtain any formal, written approvals required by this Order.

f) Four (4) copies of all deliverables shall be hand delivered, or sent by certified mail, return receipt requested, to the EPA Project Manager. An additional one (1) copy shall be sent to ODEQ. Respondent shall also submit to EPA a copy of all report submittals on 3.5 inch computer disk. The text shall be in a format compatible with WordPerfect version 5.1 or later, and data shall be in a format compatible with Lotus 123 version 2.2 or later.

In all instances which this Order requires written submissions to EPA, each submission must be accompanied by the following certification signed by a "responsible official":

> I certify that the information contained in or accompanying this submission is true, accurate and complete. As to those identified portions of this submission for which I cannot personally verify the truth and accuracy, I certify as the Facility official having supervisory responsibility for the person(s) who, acting upon my direct instructions, made the verification, that this information is true, accurate, and complete.

For the purpose of this certification, a "responsible official" means person in charge of a principal Facility function, or any other person who performs similar decision-making functions for the Facility.

g) All work performed pursuant to this Order shall be under the direction and supervision of an engineer or geologist with expertise in hazardous waste site cleanup. Respondent shall notify EPA in writing of the name, title, and qualifications of the engineer or geologist, and of any contractors or subcontractors and their personnel to be used in carrying out the terms of this Order within thirty (30) days after the effective date of this Order, or within thirty (30) days of entering into to such contract or subcontract.

h) EPA may determine, or Respondent may propose that certain tasks, including investigatory work, engineering evaluation, or procedure/methodology modifications, are necessary in addition to or in lieu of the tasks included in any EPA-approved workplan, when such additional work is necessary to meet the purposes set forth in Section III: Statement of Purpose. If EPA determines that Respondent shall perform additional work, EPA will notify the Respondent

in writing and specify the basis for its determination that the additional work is necessary. Within thirty (30) days after the receipt of such determination, Respondent shall have the opportunity to meet or confer with EPA to discuss the additional work. If required by EPA, Respondent shall submit for EPA approval, a workplan for the additional work. EPA will specify the contents of such workplan. Such workplan shall be submitted within (30) days of receipt of EPA's determination that additional work is necesary, or according to an alternative schedule established by EPA. Upon approval of a workplan by EPA, Respondent shall implement it in accordance with the schedule and provisions contained therein.

VII. PROJECT MANAGER

1. Within ten (10) days of the effective date of this Order, EPA and Respondent shall each designate a Project Manager and notify each other in writing of the Project Manager it has selected. Each Project Manager shall be responsible for overseeing the implementation of this Order. The EPA Project Manager or his designate will be EPA's designated representative for the Facility. All communications between Respondent and EPA, including all documents, reports, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order, shall be directed through the Project Managers.

2. The Parties shall provide written notice within five (5) days after changing Project Managers.

3. If EPA determines that activities in compliance or noncompliance with this Order have caused or may cause a release of hazardous waste, hazardous constituents, or is a threat to human health or environment, or that Respondent is not capable of undertaking any studies or corrective measure ordered, EPA may order Respondent to discontinue work being conducted pursuant to this Order for such period of time as EPA determines may be needed to abate any such releases or threats, and/or to undertake any action which EPA determines is necessary to abate such releases or threats. Failure to comply with EPA's stop work order may result in a penalty of not to exceed $25,000 per day of continued non-compliance with EPA's stop work order, pursuant to Section 3008(h)(2) of RCRA, 42 U.S.C. § 6928(h)(2).

4. In the event EPA suspends the Work or any other activity at the Facility, EPA may extend affected schedules under this Order for a period of time equal to that of the suspension of the Work or other activities, plus reasonable additional time for resumption of activities. If the delay pursuant to

this section is caused by Respondent or its contractor's non-compliance with this Order, then any extension of the compliance deadlines shall be at EPA's sole discretion. Any extensions in the schedules set out in this Order or its attachments must be made by EPA in writing, and incorporated by reference into this Order.

5. The absence of the EPA Project Manager from the Facility shall not be cause for the stoppage or delay of work.

VIII. SAMPLING AND DATA/DOCUMENT AVAILABILITY

1. The Respondent shall submit to the EPA the results of all sampling and tests or other data generated by its employees and/or consultants with respect to the implementation of this Order. Data which has not yet undergone QA/QC, shall be submitted with the monthly progress reports stamped "Subject to Revision".

2. Respondent shall submit these results in monthly progress reports as described in Attachment I, and Sections VI.5(b) of this Order.

3. Respondent shall specify the name and address of the laboratory to be used for sample analysis. EPA reserves the right to conduct a performance and QA/QC audit of the above specified laboratory. If the audit reveals deficiencies in lab performance or QA/QC, resampling and analysis shall be required.

4. At the request of EPA, the Respondent shall allow split or duplicate samples to be collected by EPA, and/or its authorized representatives, of any samples collected by the Respondent pursuant to the implementation of this Order. The Respondent shall notify EPA not less than fourteen (14) days in advance of any well installation or sample collection activity.

IX. REPORTING AND PUBLIC ACCESS TO DOCUMENTS AND SAMPLING DATA

The Respondent may assert a business confidentiality claim covering all or part of any information submitted to EPA pursuant to this Order. Analytical data generated pursuant to this Order shall not be claimed as confidential. Confidentiality claims shall be submitted to EPA in accordance with the procedures outlined in 40 C.F.R. Part 2, in particular, 40 C.F.R. § 2.203(b), and shall include a written statement explaining how the information claimed to be confidential meets the substantive criteria for use in confidentiality determinations found in 40 C.F.R. § 2.208, or such claim shall be deemed waived. If EPA approves the claim, EPA will afford the information confidential status, as specified in 40 C.F.R. Part 2, Subpart B. Information

determined not to be confidential may be made available to the public without further notice to the Respondent. If the Respondent makes no claim of confidentiality for information submitted pursuant to this Order, EPA will make the information available without further notice to the Respondent.

X. PUBLIC COMMENT AND PARTICIPATION IN CORRECTIVE MEASURE(S) SELECTION

1. EPA will provide the public with an opportunity to review and comment on the final draft of the corrective Measures Study Report and a description of EPA's proposed corrective measure(s), including EPA's justification for proposing such corrective measure(s) (the "Statement of Basis").

2. Following the public comment period, EPA may approve the Corrective Measures Study Report and select a final corrective measure(s) or require Respondent to revise the Report and/or perform additional corrective measures studies.

3. EPA will notify Respondent of the final corrective measure(s) selected by EPA in the Final Decision and Response to Comments (RTC). The notification will include EPA's reasons for selecting the corrective measure.

XI. FACILITY ACCESS AND RECORD RETENTION

1. Subject to all applicable national security laws and regulations, EPA, and/or any EPA authorized-representative(s) are authorized, allowed, and permitted pursuant to Section 3007(a) of RCRA, 42 U.S.C. § 6927(a), to enter and freely move about all property at the Facility at all reasonable times for the purposes of enforcing the requirements of RCRA, including:

   a. interviewing site personnel and contractors, inspecting records, operating logs, and contracts related to the Facility;

   b. reviewing the progress of Respondent in carrying out the terms of this Order;

   c. conducting such tests as EPA deems necessary;

   d. using a camera, video camcorder, sound recorder, or other documentary type equipment; and

   e. verifying the reports and data submitted to EPA by Respondent.

2. If the Respondent denies any aspect of access, the Respondent shall provide a written explanation, including reference to the applicable statute(s) or regulation(s), within twenty-four hours, stating the reason for the denial and providing a recommendation for accommodating the requested access in an alternate manner.

3. Upon request of EPA, the Respondent shall provide all necessary security briefings to EPA, and shall assist EPA in obtaining any security clearances necessary to carry out the provisions of this Order.

4. Respondent shall permit EPA to inspect and copy all documents, and other writings, including all sampling and monitoring data, in any way pertaining to work undertaken pursuant to this Order.

5. To the extent areas adjacent to the Facility are owned by parties other than those bound by this Order, Respondent shall use its best efforts to obtain site access agreements from the present owners to perform work pursuant to this Order no later than thirty (30) days of EPA approval of the specific workplan. Best efforts shall include, but not be limited to, requiring Respondent to pay reasonable rental costs and compensation for losses sustained by the owner or occupant of the realty. Access agreements shall provide access to Respondent, its Contractor(s), the United States, EPA, the State of Oklahoma, ODEQ, and their representatives, including contractors. Any such access agreements shall be incorporated by reference into this Order. In the event that site access agreements are not obtained within thirty (30) days of the specific workplan approval, Respondent shall notify EPA by telephone within 24 hours after expiration of the above thirty (30) day period, and shall within seven (7) days of the oral notification, notify EPA in writing of the failure to gain such site access agreements regarding both the lack of, and efforts to obtain, such agreements. If EPA is able to obtain access, Respondent shall perform work described in this Order.

6. Nothing in this subsection is intended to limit, affect or otherwise constrain EPA's rights of access to property pursuant to applicable law.

7. All data, information, and records created or maintained in connection with the implementation of work under this Order, including the Respondent's contractors, shall be made available to EPA upon request. Respondent shall retain all such data, information or records for six (6) years after termination of the Order, and provide notification to EPA and ODEQ sixty (60) days prior to the destruction of any such documents. All employees of Respondent and all

persons, including contractors who engage in activity under this Order, shall be available to and shall cooperate with the EPA.

XII. RESERVATION OF RIGHTS

1. EPA expressly reserves all statutory and regulatory powers, authorities, rights, remedies, both legal and equitable, which may pertain to Respondent's failure to comply with any of the requirements of this Order, including without limitation, the assessment of penalties under Section 3008(h)(2) of RCRA, 42 U.S.C. § 6928(h)(2). This Order shall not be construed as a waiver or limitation of any rights, remedies, powers and/or authorities which EPA has under RCRA, CERCLA, or any other statutory, regulatory, or common law enforcement authority of the United States.

2. This Order shall not be construed to effect or limit the rights or responsibilities of any Federal, State, or local agency or authority pursuant to any other statutory provision, nor shall the entry of this Order limit or otherwise preclude the EPA from taking additional enforcement action pursuant to Section 3008(h) of RCRA, 42 U.S.C. § 6928(h), Section 106 of CERCLA, 42 U.S.C. § 9606, or any other available legal authority, should the EPA determine that such actions are warranted. Nor shall this Order be construed to affect or limit in any way the obligation of the Respondent to comply with all Federal, State, and local laws and regulations governing the activities required by this Order. This Order shall not be construed as a ruling or determination of any issue related to any Federal, State, or local permit whether required in order to implement this Order or required in order to continue or alter operations of the Facility (including but not limited to construction, operation or closure permits required under RCRA), and the Respondent shall remain subject to all such permitting requirements. Nothing in this Order is intended to release or waive any claim, cause of action, demand or defense in law or equity that any party to this Agreement may have against any person(s) or entity not a party to this Agreement.

3. EPA expressly reserves all rights and defenses that it may have, including the right both to disapprove of work performed by Respondent pursuant to this Order and to request that Respondent perform tasks in addition to those stated in Attachment I of this Order.

4. Notwithstanding any other provision of this Order, the Respondent shall remain responsible for obtaining any applicable Federal, State, or local permit for any activity at the Facility including those necessary for the

performance of the work and for the operation or closure of the Facility.

XIII. OTHER CLAIMS

Nothing in this Order shall constitute or be construed as a release from any claim, cause of action, demand, or defense in law or equity, against any person, firm, partnership, or corporation for any liability it may have arising out of or relating in any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous constituents, hazardous substances, hazardous wastes, pollutants, or contaminants found at, taken to, or taken or migrating from the Facility.

XIV. SUBSEQUENT MODIFICATION OF ORDER

1. This Order may be modified by EPA to ensure protection of human health and the environment. Such amendments shall be in writing, and shall be effective and incorporated into the Order thirty (30) days after service of the amendment on the Respondent, unless the Respondent files an objection to the modification with EPA and the Regional Hearing Clerk. 40 C.F.R. Part 24 and 42 U.S.C. § 6961(b)(2) shall govern the proceedings under this section, and the hearing shall be limited to the scope of the proposed amendment.

2. Any reports, plans, specifications, schedules, and attachments required by this Order are, upon written approval by EPA, incorporated into this Order.

3. This Order may also be modified by mutual agreement of EPA and the Respondent. Any agreed modifications shall be in writing, be signed by both parties, shall have as their effective date the date on which they are signed by EPA, and shall be incorporated into this Order.

XV. EPA APPROVALS/DISAPPROVALS

All decisions, determinations, and approvals required to be made by EPA under this Order must be in writing. If EPA does not approve any plan, report, or other item required to be submitted to EPA for its approval pursuant to this Order, the Respondent shall address any deficiencies as directed by the EPA, and resubmit the plan, report, or other item for the EPA's approval within the time period specified in this Order.

XVI. PARTICIPATION IN COMMUNITY RELATIONS ACTIVITIES

Respondent shall be given notice of, provide suppport, and shall participate in public meetings, as appropriate, which may be held

or sponsored by EPA to explain activities at or concerning the Facility, including the findings of the RFI and CMS.

XVII. TERMINATION AND SATISFACTION

Respondent may seek termination of this Order by submitting to EPA a written document which indicates Respondent's compliance with all requirements of this Order and the associated dates of approval correspondence from EPA. The provisions of this Order shall be deemed satisfied upon Respondent's and EPA's execution of an "Acknowledgment of Termination and Agreement to Record Preservation and Reservation of Rights" ("Acknowledgment"). The Acknowledgment will specify that Respondent has demonstrated to the satisfaction of EPA that the terms of this Order, including any additional tasks determined by EPA to be required pursuant to this Order, have been satisfactorily completed. Respondent's execution of the Acknowledgment will affirm Respondent's continuing obligation (1) to preserve all records as required in Section XI: Facility Access and Record Retention; and (2) to recognize EPA's reservation of rights as required in Section XII: Reservation of Rights, after all other requirements of the Order are satisfied.

XVIII. QUALITY ASSURANCE

Throughout all sample collections and analysis activities, Respondent shall use EPA-approved quality assurance, quality control, and chain-of-custody procedures, which shall be part of proposed and approved plans.

Respondent shall:

1. Follow all EPA guidance for sampling and analysis unless determined by EPA not to be applicable;

2. Notify EPA and ODEQ not less than fourteen (14) days in advance of any field sampling or installation activity;

3. Inform the EPA Project Manager not less than fourteen (14) days in advance which laboratories will be used by Respondent, and use its best efforts to ensure that EPA personnel and EPA authorized representatives have reasonable access to the laboratories and personnel used for analysis;

4. Ensure that laboratories used by Respondent for analyses perform such analyses according to EPA methods (SW-846, 3rd Edition or as superseded) or other methods deemed satisfactory to EPA. If methods other than EPA methods are to be used, Respondent shall submit all protocols to be used for analyses to EPA for approval within thirty (30) days prior to the commencement of analyses; and

5. Ensure that laboratories used by Respondent for analyses participate in a quality assurance/quality control program equivalent to that which is followed by EPA. As part of such a program, and upon request by EPA, such laboratories shall perform analysis on known samples provided by EPA to demonstrate the quality of the analytical data.

XIX. PENALTY PROVISIONS

Failure or refusal to carry out the terms of this Order in a manner deemed satisfactory to EPA subjects Respondent to a civil penalty in an amount not to exceed $25,000 for each day of non-compliance with this Order, in accordance with Section 3008(h) of RCRA, 42 U.S.C. § 6928(h).

XX. STATEMENT OF SEVERABILITY

If any provision or authority of this Order, or the application of this Order to any party or circumstances, is held by any judicial or administrative authority to be invalid, the application of such provisions to other parties or circumstances and the remainder of the Order shall not be effected thereby.

XXI. WAIVER OF OPPORTUNITY TO CONFER WITH ADMINISTRATOR AND EFFECTIVE DATE

1. Pursuant to Section 6001(b) of RCRA, 42 U.S.C. § 6961(b), no administrative order issued to a department, agency, or instrumentality of the United States shall become final (effective) until such department, agency, or instrumentality has had the opportunity to confer with the Administrator of EPA.

2. Pursuant to the Joint Response of Parties to Recommended Decision filed October 24, 1996, Respondent explicitly waives its right to confer with the Adminstrator. Therefore, this Order shall become effective upon receipt by the Respondent, as provided by 40 C.F.R. §§ 24.04(e) and 24.19.

IT IS SO ORDERED:

NOV 5 1996

Dated:_____

_____

Samuel Coleman, P.E.
Director
Compliance Assurance and Enforcement Division
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

CERTIFICATE OF SERVICE

I hereby certify that on the 6th day of November, 1996, the original of the foregoing Final Administrative Order was hand delivered to the Regional Hearing Clerk, U.S. Environmental Protection Agency, Region 6, First Interstate Bank Tower, 1445 Ross Avenue, Dallas, Texas 75202-2733, and that true and correct copies of the Final Administrative were sent to the following by certified mail, return receipt requested:

CERTIFIED MAIL - RETURN RECEIPT REQUESTED P 422 558 172

Daniel W. Kiefer
AETC/JACE
61 Main Circle
Randolph Air Force Base, Texas 78150

CERTIFIED MAIL - RETURN RECEIPT REQUESTED P 422 558 173

Philip J. Tyler
Deputy Regional Counsel
Environmental Law Division - Central Region
U.S. Air Force
Suite 505, Box 116
525 Griffin Street
Dallas, Texas 75202

Evan L Pearson

ATTACHMENT I

CORRECTIVE ACTION PLAN

SCOPE OF WORK FOR THE IMPLEMENTATION OF INTERIM MEASURES

AT

ALTUS AIR FORCE BASE

PURPOSE

Interim Measures are implemented so as to prevent or mitigate a current or potential threat(s) to human health and/or the environment, and/or prevent or minimize the further migration of contamination. Interim measures must be consistent with and integrated into any long term remedy at the Facility.

SCOPE

The Interim Measures to be implemented at the Facility consist of the following tasks:

A. Interim Measures Work Plan

B. Interim Measures Implementation

C. Reports

IMPLEMENTATION OF INTERIM MEASURES

The Respondent shall submit a workplan as described below in accordance with Section VI.1 of the Order.

A. Interim Measures (IM) Workplan

The IM Workplan shall include, but not be limited to the following:

1. A statement of the objectives of each interim measure, including how the measure prevents or mitigates a potential or actual threat to human health and the environment, and is consistent with and integrated into any long term plan for the facility; and

2. Proposed location, design, schedule, construction, monitoring, operation, and maintenance requirements of the interim measures.

B. Interim Measures Implementation

The Interim Measures described in the IM Workplan(s) shall be implemented according to the schedule(s) included in the IM Workplan(s) which is/are approved by EPA.

C. Reports

The Respondent shall prepare plans, specifications, and reports as set forth above to document the design, construction, operation, maintenance, and monitoring of the interim measures. In addition, the documentation shall include, but not be limited to the following:

1. Progress Reports

The Respondent shall at a minimum provide ODEQ and EPA with signed, monthly IM progress reports containing:

a. A description and estimate of the percentage of the IM completed;
b. Summaries of all findings;
c. Summaries of all changes made in the IM during the reporting period;
d. Summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;
e. Summaries of all problems or potential problems encountered during the reporting period;
f. Actions being taken to rectify problems;
g. Changes in personnel during the reporting period;
h. Projected work for the next reporting period; and

i. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

2. Interim Measure Implementation Report

Within thirty (30) days after the completion of the construction of the IM (except for long term operation, maintenance, and monitoring), the Respondent shall submit a Draft IM Implementation Report to EPA for review and approval. The Report shall document that the project is consistent with the design specifications, and if the interim measures are performing adequately. The report shall include, but not be limited to the following elements:

a. Synopsis of the interim measures and certification of the design and construction;
b. Explanation of any modifications to the plans and why these were necessary for the project;
c. Listing of the criteria, established before the interim measures was initiated, for judging the functioning of the interim measures and also explaining any modification to these criteria;
d. Results of facility monitoring, evaluating to what extent the interim measures will meet or exceed the performance criteria; and
e. Explanation of the operation and maintenance (including monitoring) to be undertaken at the Facility.

This report shall include the inspection summary reports, inspection data sheets, problem identification and corrective measure reports, block evaluation reports, photographic reporting data sheets, design engineers' acceptance reports, deviations from design and material specifications (with justifying documentation), and as-built drawings.

Within thirty (30) days after the receipt of EPA's comments, Respondent shall submit a Final IM Implementation Report to EPA for review and approval, addressing all of EPA's comments to the satisfaction of EPA.

Facility Submission Summary

A Summary of the information reporting requirements contained in the Interim Measures Scope of Work is present below:

Facility Submission	Due date*
Draft IM Workplan	120 days of the effective date of the Order
Final IM Workplan	30 days after receipt of EPA's comments on Draft IM Workplan
Draft IM Implementation Report	30 days after completion of construction of the Interim Measure(s)
Final IM Implementation Report	30 days after receipt of EPA's comments on Draft IM Report
Progress Reports	Monthly

*All dates are calculated from the effective date of this Order unless otherwise specified.

SCOPE OF WORK FOR THE RCRA FACILITY INVESTIGATION (RFI)

AT

ALTUS AIR FORCE BASE

PURPOSE

The purpose of this RCRA Facility Investigation (RFI) is to determine the nature and extent of releases of hazardous wastes or constituents from regulated units, solid waste management units, and other source areas at the Facility and to gather all necessary data to support the Corrective Measures Study. The Respondent shall furnish all personnel, materials, and services necessary for, or incidental to, performing the RFI at the Facility. In order to define the scope of the RFI Workplan, the Description of Current Conditions (Task I) shall follow the format of Facility Investigation (Task III) incorporating the appropriate portions of the RFI Workplan requirements. The proposed RFI Workplan shall then include the portions of the Facility Investigation not adequately covered under Task I, as determined and approved by EPA.

Scope

The RCRA Facility Investigation (RFI) consists of five tasks:

Task I: Preliminary Report: Description of Current Conditions

- A. Facility Background
- B. Nature and Extent of Contamination
- C. Pre-Investigation Evaluation of Corrective Measure Technologies

Task II: RFI Workplan

- A. Project Management Plan
- B. Data Collection Quality Assurance Plan
- C. Data Management Plan
- D. Health and Safety Plan
- E. Community Relations Plan

Task III: Facility Investigation

- A. Environmental Setting
- B. Source Characterization
- C. Contamination Characterization
- D. Potential Receptor Identification

Task IV: Investigation Analysis

Task V: Progress Reports

TASK I: PRELIMINARY REPORT: DESCRIPTION OF CURRENT CONDITIONS

Within one hundred fifty (150) days of the effective date of this Order, the Respondent shall submit to the EPA for review and approval a Draft Description of Current Conditions Report providing the background information pertinent to the Facility and contamination as set forth below. The Respondent shall include in the Current Conditions Report existing information and data gathered during any previous investigations or inspections on the nature and extent of contamination. In response to the information developed during the U.S. Air Force Installation Restoration Program (IRP) at Altus Air Force Base, the Draft Description of Current Conditions Report may incorporate applicable IRP Reports to satisfy the requirements as set forth below. Additional data gathered subsequent to the IRP reports shall be included in the Current Conditions Report. The Current Conditions Report will provide the necessary data to support the Corrective Measures Study and define the scope of the RFI Workplan (Task II) and the RFI Report (Task III). EPA will review the Draft Description of Current Conditions Report and provide comments thereon to the Respondent. Within thirty (30) days of receipt of EPA's comments on the Draft Description of Current Conditions Report, Respondent shall submit a Final Description of Current Conditions Report to EPA for review and approval, addressing all of EPA's comments to the satisfaction of EPA.

A. Facility Background

The Respondent's report shall summarize the regional location, pertinent boundary features, general facility physiography, hydrogeology, and historical use of the Facility for the treatment, storage, or disposal of solid and hazardous waste. The Respondent's report shall include, but not be limited to the following:

1. Map(s) depicting the following:

   a. General geographic location;
   b. Property lines, with the owners of all adjacent property clearly indicated, and all land previously owned and/or used by the Facility around what has been designated as the Facility;
   c. Topography (with a contour interval of five (5) or ten (10) feet and an approximate scale of 1 inch = 400 feet), waterways, all wetlands, floodplain, surface water features, drainage patterns;
   d. All past or present tanks, buildings, production areas, product storage sites, utilities, paved areas, easements, rights-of-way, and other features;

e. All solid or hazardous waste treatment, storage or disposal areas active after November 19, 1980;
f. All known past solid or hazardous waste treatment, storage or disposal areas regardless of whether they were active on November 19, 1980;
g. All known past and present product and waste underground tanks or piping;
h. Surrounding land uses (residential, commercial, agricultural, recreational);
i. The location of all ground water monitoring and production wells. These wells shall be clearly labeled and ground and top of casing elevations included;
j. The location of all past or present hydrocarbon storage tanks and pipelines on or adjacent to the facility; and
k. The location of all past or present wastewater and stormwater outfalls and associated drainage ditches, canals, and piping.

All maps shall be of sufficient detail and accuracy to locate and report all past, current, and future work performed at the site;

2. A history and description of ownership and operation, solid and hazardous waste generation, treatment, storage, and disposal activities at the Facility;

3. Evaluation of existing monitoring wells including a review of records concerning well completion, a field inspection, and an evaluation of the well's suitability for monitoring ground water quality at the Facility;

4. Approximate dates or periods of all known past product and waste spills, identification of the materials spilled, the amount spilled, the location where spilled, and a description of the response actions conducted (local, state, or Federal response units or private parties), including any inspection reports or technical reports generated as a result of the response; and

5. A summary of past permits requested and/or received, permitted discharge limits, any enforcement actions and their subsequent responses, and a list of studies performed for the Facility.

B. Nature and Extent of Contamination

The Respondent shall include in the Preliminary Report the existing information on the nature and extent of contamination.

1. The Respondent's report shall summarize all possible source areas of contamination. This, at a minimum, shall include all regulated units, solid waste management units, process areas, spill areas, and other suspected source areas of contamination. For each area, the Respondent shall identify the following:

   a. Location of unit/area (which shall be depicted on a facility map);
   b. Quantities of solid and hazardous wastes;
   c. Hazardous waste or constituents, to the extent known; and
   d. Identification of areas where additional information is necessary.

2. The Respondent shall prepare an assessment and description of the existing degree and extent of contamination. This shall include:

   a. Available monitoring data and qualitative information on locations and levels of contamination at the Facility;
   b. All potential migration pathways including information on geology, pedology, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality; and
   c. The potential impact(s) on human health and the environment, including demography, ground water and surface water use, and land use.

C. <u>Pre-Investigation Evaluation of Corrective Measure Technologies</u>

Respondent shall include in the Preliminary Report an identification of site criteria that influence the selection of corrective measure technologies that may be used on-site or off-site for the containment, treatment, remediation, and/or disposal of contamination. Respondent shall also identify any field, laboratory, bench or pilot scale data that need to be collected in the facility investigation to facilitate the evaluation and selection of the final corrective measure or measures (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.), and any presumptive remedies that may be applicable.

TASK II: RFI WORKPLAN REQUIREMENTS

The Respondent shall prepare Draft and Final RFI Workplans in accordance with Section VI.2 of the Order. Within one hundred fifty (150) days of the effective date of this Order, the Respondent shall submit a Draft RFI Workplan to EPA. The Draft RFI Workplan shall include the development of several plans, which shall be prepared concurrently. EPA will review the Draft RFI Workplan and provide comments thereon to the Respondent. Within thirty (30) days of receipt of EPA comments, Respondent shall modify the Draft RFI Workplan to address such comments and shall submit the revised RFI Workplan to the EPA. EPA will approve the revised RFI Workplan or modify it. The revised RFI Workplan as approved or modified by EPA shall become the Final RFI Workplan. During the RFI, it may be necessary to revise the Final RFI Workplan to increase or decrease the detail of information collected to accommodate the facility specific situation. The RFI Workplan includes the following:

A. Project Management Plan

The Respondent shall prepare a Project Management Plan which will include a discussion of the technical approach, schedules, budget, and personnel. The technical approach shall include rationale necessary to investigate each media (soil, ground water, surface water, soil gas, and air). This includes each area of concern which may have contamination from Facility activities. The technical approach shall address all the requirements set forth in Task III of the RCRA Facility Investigation in this Corrective Action Plan. The Project Management Plan will also include a description of qualifications of personnel performing or directing the RFI, including contractor personnel. This plan shall also document the overall management approach to the RFI.

B. Data Collection Quality Assurance Plan

The Respondent shall prepare a plan to document all monitoring procedures: sampling, field measurements and sample analysis performed during the investigation to characterize the environmental setting, source, and contamination, so as to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented.

1. Data Collection Strategy

The Data Collection Strategy section of the Data Collection Quality Assurance Plan shall include, but not be limited to the following:

a. Description of the intended uses for the data, and the necessary level of precision and accuracy for these intended uses;
b. Description of methods and procedures to be used to assess the precision, accuracy, and completeness of the measurement data;
c. Description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Examples of factors which shall be considered and discussed include:

i) Environmental conditions at the time of sampling;
ii) Number of sampling points;
iii) Representativeness of selected media; and
iv) Representativeness of selected analytical parameters.

d. Description of the measures to be taken to assure that the following data sets can be compared to each other:

i) RFI data generated by the Respondent;
ii) RFI data generated by persons other than the Respondent; and
iii) Data previously generated by Respondent or Respondent's agents.

e. Details relating to the schedule and information to be provided in quality assurance reports. The reports shall include, but not be limited to:

i) Periodic assessment of measurement data accuracy, precision, and completeness;
ii) Results of performance audits;
iii) Results of system audits;
iv) Significant quality assurance problems and recommended solutions; and
v) Resolutions of previously stated problems.

2. Sampling

The Sampling section of the Data Collection Quality Assurance Plan shall discuss:

a. Selecting appropriate sampling locations, depths, etc.;

b. Determining a statistically sufficient number of sampling sites;
c. Measuring all necessary ancillary data;
d. Determining conditions under which sampling should be conducted;
e. Determining which media are to be sampled (e.g., ground water, air, soil, sediment, etc.);
f. Determining which parameters are to be measured and where;
g. Selecting the frequency of sampling and length of sampling period;
h. Selecting the types of sample (e.g., composites versus grabs) and number of samples to be collected;
i. Documenting field sampling operations and procedures, including:

    i) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters and adsorbing reagents);
    ii) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;
    iii) Documentation of specific sample preservation method;
    iv) Calibration of field devices;
    v) Collection of replicate samples;
    vi) Submission of field-biased blanks, where appropriate;
    vii) Potential interferences present at the Facility;
    viii) Construction materials and techniques, associated with monitoring wells and piezometers;
    ix) Field equipment listing and sample containers;
    x) Sampling order; and
    xi) Decontamination procedures.

j. Selecting appropriate sample containers;
k. Sample preservation; and
l. Chain-of-custody, including:

    i) Standardized field tracking reporting forms to establish sample custody in the field prior to shipment; and
    ii) Pre-prepared sample labels containing all information necessary for effective sample tracking.

3. Field Measurements

The Field Measurements section of the Data Collection Quality Assurance Plan shall discuss:

a. Selecting appropriate field measurement locations, depths, etc.;
b. Providing a statistically sufficient number of field measurements;
c. Measuring all necessary ancillary data;
d. Determining conditions under which field measurement should be conducted;
e. Determining which media are to be addressed by appropriate field measurements (e.g., ground water, air, soil, sediment, etc.);
f. Determining which parameters are to be measured and where;
g. Selecting the frequency of field measurement and length of field measurements period; and
h. Documenting field measurement operations and procedures, including:

    i) Procedures and forms for recording raw data and the exact location, time, and facility-specific considerations associated with the data acquisition;
    ii) Calibration of field devices;
    iii) Collection of replicate measurements;
    iv) Submission of field-biased blanks, where appropriate;
    v) Potential interferences present at the Facility;
    vi) Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;
    vii) Field equipment listing;
    viii) Order in which field measurements were made; and
    ix) Decontamination procedures.

4. Contaminated Material Disposal

All contaminated material generated by activities required in the RFI shall be disposed of in accordance with all applicable state and Federal regulations.

5. Sample Analysis

The Sample Analysis section of the Data Collection Quality Assurance Plan shall specify the following:

a. Chain-of-custody procedures, including:

   i) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment, and verify the data entered onto the sample custody records;
   ii) Provision for a laboratory sample custody log consisting of serially numbered standard lab-tracking report sheets; and
   iii) Specification of laboratory sample custody procedures for sample handling, storage, and disbursement for analysis.

b. Sample storage procedures and holding times;
c. Sample preparation methods;
d. Analytical procedures, including:

   i) Scope and application of the procedure;
   ii) Sample matrix;
   iii) Potential interferences;
   iv) Precision and accuracy of the methodology; and
   v) Method detection limits.

e. Calibration procedures and frequency;
f. Data reduction, validation and reporting;
g. Internal quality control checks, laboratory performance and systems audits and frequency, including:

   i) Method blank(s);
   ii) Laboratory control sample(s);
   iii) Calibration check sample(s);
   iv) Replicate sample(s);
   v) Matrix-spiked sample(s);
   vi) "Blind" quality control sample(s);
   vii) Control charts;
   viii) Surrogate samples;
   ix) Zero and span gases; and
   x) Reagent quality control checks.

h. Preventive maintenance procedures and schedules;
i. Corrective action (for laboratory problems); and
j. Turnaround time.

C. Data Management Plan

The Respondent shall develop and initiate a Data Management Plan to document and track investigation data and results. This plan shall identify and set up data documentation

materials and procedures, project file requirements, and project-related progress reporting procedures and documents. The plan shall also provide the format to be used to present the raw data and conclusions of the investigation.

1. Data Record

The data record shall include, but not be limited to the following:

a. Unique sample or field measurement code;
b. Sampling or field measurement location and sample or measurement type;
c. Sampling or field measurement raw data;
d. Laboratory analysis ID number;
e. Property or component measured; and
f. Result of analysis (e.g., concentration).

2. Tabular Displays

The following data shall be presented in tabular displays:

a. Unsorted (raw) data;
b. Results for each medium, or for each constituent monitored;
c. Data reduction for statistical analysis;
d. Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and
e. Summary data.

3. Graphical Displays

The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

a. Display sampling location and sampling grid;
b. Indicate boundaries of sampling area, and areas where more data are required;
c. Display levels of contamination at each sampling location;
d. Display geographical extent of contamination;
e. Display contamination levels, averages, and maxima;
f. Illustrate changes in concentration in relation to distance from the source, time, depth, or other parameters;
g. Indicate features affecting intramedia transport and show potential receptors; and

h. Illustrate the structural geology in the area of the Facility, including detailed structural geology of the Facility site.

D. Health and Safety Plan

The Respondent shall prepare a Facility Health and Safety Plan.

1. Major elements of the Health and Safety Plan shall include:

   a. Facility description including availability of resources such as roads, water supply, electricity and telephone service;
   b. Describe the known hazards and evaluate the risks associated with the incident and with each activity conducted, including, but not limited to on and off-site exposure to contaminants during the implementation of interim measures at the facility.
   c. List key personnel and alternates responsible for site safety, response operations, and for protection of public health;
   d. Delineate work area;
   e. Describe levels of protection to be worn by personnel in work area;
   f. Establish procedures to control site access;
   g. Describe decontamination procedures for personnel and equipment;
   h. Establish site emergency procedures;
   i. Address emergency medical care for injuries and toxicological problems;
   j. Describe requirements for an environmental surveillance program;
   k. Specify any routine and special training required for responders; and
   l. Establish procedures for protecting workers from weather-related problems.

2. The Facility Health and Safety Plan shall be consistent with:

   a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);
   b. EPA Order 1440.1 - Respiratory Protection;
   c. EPA Order 1440.3 - Health and Safety Requirements for Employees engaged in Field Activities;
   d. Facility Contingency Plan;
   e. EPA Standard Operating Safety Guide (1984);
   f. OSHA regulations, particularly in 29 C.F.R. Parts 1910 and 1926;

g. State and local regulations; and
h. Other EPA guidance as provided.

E. Community Relations Plan

The Respondent shall prepare a plan for the dissemination of information to the public regarding investigation activities and results.

TASK III: FACILITY INVESTIGATION

The Respondent shall conduct those investigations necessary to: characterize the Facility (Environmental Setting); define the source (Source Characterization); define the degree and extent of contamination (Contamination Characterization); and identify actual or potential receptors.

The investigations should result in data of adequate technical quality to support the development and evaluation of the alternatives during the Corrective Measures Study.

The facility investigation activities shall follow the plans set forth in the RFI Workplan. All sampling and analyses shall be conducted in accordance with the Data Collection Quality Assurance Plan.

Within 365 days of the approval of the RFI Workplan, Respondent shall prepare and submit to EPA for review and approval, a Draft RFI Report which shall contain an analysis and a summary of all facility investigations implemented pursuant to the conditions contained in this Task. EPA will review the Draft RFI Report and provide comments thereon to the Respondent. Within thirty (30) days of receipt of EPA comments, Respondent shall submit a Final RFI Report to EPA for review and approval. EPA will approve or modify the revised RFI Report. The revised RFI Report as approved or modified shall become the Final RFI Report.

A. Environmental Setting

The Respondent shall collect information to supplement and verify existing information on the environmental setting at the Facility. The Respondent shall characterize the following:

1. Hydrogeology

The Respondent shall prepare a report evaluating hydrogeologic conditions at the Facility. This report shall provide the following information:

a. A description of the regional and Facility specific geologic and hydrogeologic characteristics affecting ground water flow beneath the Facility, including:

i) Regional and facility specific stratigraphy: description of strata including strike and dip, identification of stratigraphic contacts;
ii) Regional structural geology;
iii) Depositional history;

iv) Identification and characterization of areas and amounts of recharge and discharge;
v) Regional and Facility specific ground water flow patterns; and
vi) Characterization of seasonal variations in the ground water flow regime.

b. An analysis of any topographic features that might influence the ground water flow system.

c. Based on field data, tests, gamma and neutron logging of existing and new wells, piezometers and borings and cores, a representative and accurate classification and description of the hydrogeologic units which may be part of the migration pathways at the Facility (i.e., the aquifers and any intervening saturated and unsaturated units) including, but not limited to the following:

i) Hydraulic conductivity, transmissivity, storativity, and porosity (total and effective);
ii) Lithology, grain size, sorting, degree of cementation;
iii) An interpretation of hydraulic interconnections between saturated zones; and
iv) The attenuation capacity and mechanisms of the natural earth materials (e.g., ion exchange capacity, organic carbon content, mineral content, etc.).

d. Based on field studies and cores, structural geology and hydrogeologic cross sections showing the extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of the migration pathways identifying:

i) Sand and gravel deposits in unconsolidated deposits;
ii) Zones of fracturing or channeling in consolidated or unconsolidated deposits; and
iii) Zones of higher permeability or low permeability that might direct and restrict the flow of contaminants.

e. Based on data obtained from ground water monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring including:

i) Water-level contour and/or potentiometric maps;
ii) Hydrologic cross sections showing vertical gradients;
iii) The flow system, including the vertical and horizontal components of flow;
iv) Any temporal changes in hydraulic gradients, for example, due to tidal or seasonal influences; and
v) Development of flow net maps using well cluster data.

f. A description of man-made influences that may affect the hydrogeology of the Facility, identifying:

i) Active and inactive local water-supply and production wells with an approximate schedule of pumping; and
ii) Man-made hydraulic structures (pipelines, french drains, ditches, etc.).

2. Soils

The Respondent shall conduct a program to characterize the soil and rock units in the vicinity of the contaminant release(s). Such characterization shall include, but not be limited to the following information:

a. USCS soil classification;
b. Surface soil distribution;
c. Soil profile, including ASTM classification of soils;
d. Hydraulic conductivity (saturated and unsaturated);
e. Directional relative permeability;
f. Bulk density;
g. Soil pH;
h. Soil organic content;
i. Cation exchange capacity;
j. Particle size distribution;
k. Moisture content;
l. Infiltration (field test);
m. Storage capacity;
n. Mineral content; and
o. Soil conductivity.

3. Surface Water and Sediment

The Respondent shall conduct a program to characterize the surface water bodies, marshes, creeks, wetland

areas, and the ditches surrounding and crossing the Facility. Such characterization shall include, but not be limited to the following activities and information:

a. Description of the temporal and permanent surface water bodies including:

   i) For all local surface water bodies, wetland areas, ditches, and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations, and flooding tendencies (i.e., 100 year event); and
   ii) Drainage patterns.

b. Description of the chemistry of the natural surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biochemical oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients (NH_3, NO_3^-, NO_2^-, PO_4^{-3}), chemical oxygen demand, total organic carbon, and specific contaminant concentrations, as proposed by Respondent and approved by EPA.

c. Description of sediment characteristics including:

   i) Deposition area;
   ii) Thickness profile; and
   iii) Physical parameters (e.g., grain size, density, ion exchange capacity, etc.)

B. Source Characterization

Respondent shall document and quantify the following specific characteristics at all known source areas (where wastes have been placed, collected, or removed) after November 1980, and to the extent known or ascertainable for periods prior thereto:

1. Source Areas

2. Unit/Disposal Area characteristics:

   a. Location of unit/disposal area;
   b. Type of unit/disposal area;
   c. Design features;
   d. Operating practices (past and present);
   e. Period of operation;
   f. Age of unit/disposal area;
   g. General physical conditions; and
   h. Method used to close the unit/disposal area.

3. Waste Characteristics:

a. Type and date of placement for waste placed in each unit:

i) Hazardous classification (e.g., flammable, reactive, corrosive, oxidizing or reducing agent);
ii) Quantity; and
iii) Chemical composition.

b. Physical and chemical characteristics of the wastes:

i) Physical form (solid, liquid, gas);
ii) Physical description (e.g., powder, oily sludge);
iii) Temperature;
iv) pH;
v) General chemical class (e.g., acid, base, solvent);
vi) Molecular weight;
vii) Density;
viii) Boiling point;
ix) Viscosity;
x) Solubility in water;
xi) Cohesiveness of the waste;
xii) Vapor pressure; and
xiii) Flash point.

c. Migration and dispersal characteristics of the waste:

i) Sorption;
ii) Biodegradability, bioconcentration, biotransformation;
iii) Photodegradation rates;
iv) Hydrolysis rates; and
v) Chemical transformations.

C. Contamination Characterization

The Respondent shall collect analytical data on ground water, soils, surface water, and sediment contamination in the vicinity of the Facility. These data shall be sufficient to define the extent, origin, direction, and rate of movement of contaminant plumes. Data shall include time and location of sampling, media sampled, concentrations found, conditions during sampling, and the identity of the individuals performing the sampling and analysis. The Respondent shall address the following types of contamination at the Facility:

1. Ground Water Contamination

Respondent shall characterize the vertical and horizontal extent of the ground water contamination plume(s). This characterization shall include monitoring wells completed with the screened interval at the very base of the aquifer as well as monitoring wells completed at various depths dependent upon hydrogeological conditions and contaminant characteristics. Characterization of the plume beyond facility boundaries shall be conducted with a program utilizing present monitoring wells, additional wells, and soil gas testing. This investigation shall at a minimum, provide the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the Facility;

b. The horizontal and vertical direction of contamination movement;

c. The velocity of contaminant movement;

d. The velocity of ground water;

e. The horizontal and vertical concentration profiles of 40 C.F.R. Part 264, Appendix IX constituents in the plume(s) that are measured by EPA approved procedures;

If the Respondent can document all of the hazardous wastes and/or hazardous constituents that have been disposed of in a particular SWMU or AOC, or document that certain hazardous wastes and/or hazardous constituents have not been disposed in a particular SWMU or AOC, the Respondent may propose, for EPA review and approval, a target analyte list that is a subset of the Appendix IX list. The Respondent shall provide justification for deletion of any Appendix IX constituents.

f. An evaluation of factors influencing the plume movement; and

g. An extrapolation of future contaminant movement.

The Respondent shall document the procedures used in making the above determinations (e.g., well design, well construction, geophysics, modeling, etc.).

2. Soil Contamination

The Respondent shall conduct an investigation to characterize the nature and extent of any contamination of the soil and rock units above the water table. The investigation shall provide the following information:

a. A description of the vertical and horizontal extent of contamination both on-site and off-site;

b. A description of contaminant and soil chemical properties within the contaminant source area and plume. This includes contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation, and other factors that might affect contaminant migration and transformation;

c. Specific soil properties and contaminant concentrations as proposed by Respondent and approved by EPA to include at a minimum:

i) USCS soil classification;
ii) Soil profile, including ASTM classification of soils;
iii) bulk density of soil;
iv) soil pH;
v) particle size distribution;
vi) moisture content;
vii) storage capacity;
viii) mineral content;
ix) soil conductivity;
x) concentration of 40 C.F.R. Part 261, Appendix VIII constituents.

If the Respondent can document all of the hazardous wastes or hazardous constituents that have been disposed of in a particular SWMU or AOC, or document that certain hazardous wastes and/or hazardous constituents have not been disposed of in a particular SWMU or AOC, the Respondent may propose, for EPA review and approval, a target analyte list that is a subset of the Appendix VIII list. The Respondent shall provide justification for deletion of any Appendix VIII constituents.

d. The direction and velocity of contaminant movement;

e. An extrapolation of future contaminant movement; and

f. The Respondent shall implement a soil boring investigation to determine the extent of soil contamination at the Facility. All borings will extend to a depth of two feet above the water table at the time of drilling. Soil gas monitoring will be performed during all borings. Laboratory analysis of borings for contaminants listed in C.2.c.x of the above section will be performed on soils at depths where either visual contamination is evident, or soil gas concentrations indicate contamination. Boreholes shall be pressure-cemented back to the surface, utilizing a tremie pipe inserted in the borehole to within two (2) feet of the total depth of the borehole and cement-bentonite grout circulated back to the surface. The cement-bentonite grout shall consist of a 2-5% bentonite content by weight, with pumped grout weight of no less than 12.5 lbs/gal. Any shrinkage after settling of the grout shall be remedied by filling the remaining void with additional cement-bentonite grout. Disposal of all drilled soils will conform to all applicable state and federal regulations.

g. Off-site soil contaminant plumes shall be defined using soil borings, soil gas monitoring, laboratory analyses, and closure of boreholes as described immediately above.

h. A characterization of the physical and chemical nature of soils and contaminants in the following areas:

    i) All ditches and run-off accumulation areas at or near the Facility property boundaries;
    ii) All contaminated soil storage areas and waste piles;
    iv) Railcar unloading areas;
    v) Truck unloading areas; and
    vi) Any other areas of concern.

i. Maps of all areas included in the soil investigation which are at a scale of approximately one inch to twenty feet.

3. Surface Water and Sediment Contamination

The Respondent shall conduct a surface water and sediment investigation to characterize contamination resulting from releases at the Facility.

The investigation shall include, but not be limited to the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the Facility, and the extent of contamination in underlying sediments;
b. The horizontal and vertical direction of contaminant movement;
c. The contaminant velocity;
d. An evaluation of the physical, biological, and chemical factors influencing contaminant movement;
e. An extrapolation of future contaminant movement;
f. The surface water and sediment investigation must include the following to ensure adequate assessment of contaminants at or near the Facility:

    i) Samples of any ponded water bodies inside the Facility boundary and immediately outside the Facility boundary;
    ii) Samples from drainage ditches, culverts, etc., which accept water from the Facility and drain to wetland areas and/or surface water bodies;
    iii) Samples from surface water bodies at or near the Facility property boundaries;
    iv) Analysis of samples for general water quality parameters shall at a minimum, include temperature, pH, dissolved oxygen (DO), conductivity, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total dissolved solids (TDS), total organic carbon (TOC), and nutrients; and
    v) Analysis of samples for constituents related to past and present Facility activities as described in C.2.c.x of this section.

g. Maps for all areas included in the surface water and sediment investigation which are a scale of approximately one inch to one hundred feet.

The Respondent shall document the procedures used in making the above determinations.

4. Wetlands Monitoring

Respondent shall investigate all wetland areas as, defined by Section 404 of the Clean Water Act, at or near the Facility property boundaries. Respondent shall determine if contamination has reached any wetland areas with a sampling and analysis plan designed to characterize the physical and chemical nature of surface water, sediments, soils, and contaminants. If the Respondent believes that a certain wetland area need not be investigated under this Order, the Respondent may propose, for EPA review and approval, to eliminate the area from the sampling and analysis plan. Any such proposal shall include a justification for excluding that area from this Order.

D. Potential Receptors

The Respondent shall collect all available data describing the human populations and environmental systems that are susceptible to contaminant exposure from the Facility. Chemical analysis of biological samples may be needed. Data on observable effects in ecosystems shall also be obtained. The following characteristics shall be identified:

1. Local uses and possible future uses of ground water:

   a. Type of use (e.g., drinking water source: municipal or residential, agricultural, domestic/non-potable, and industrial) for each aquifer around and beneath the Facility; and
   b. Location of ground water users including wells and discharge areas.

2. Local uses and possible future uses of surface waters draining the Facility:

   a. Domestic and municipal (e.g. potable and lawn/gardening watering);
   b. Recreational (e.g. swimming, fishing);
   c. Agricultural;
   d. Industrial; and
   e. Environmental (e.g. fish and wildlife propagation).

3. Human use of or access to the Facility and adjacent lands and surface waters, including but not limited to:

   a. Recreation;
   b. Hunting;
   c. Fishing;
   d. Residential;

e. Commercial;
f. Zoning; and
g. Relationship between population locations and prevailing wind direction.

4. A description of the biota in surface water bodies on, adjacent to, or affected by the Facility.

5. A description of the ecology overlying and adjacent to the Facility.

6. A demographic profile of the people who use or have access to the Facility and adjacent land, including, but not limited to: age; sex; and sensitive subgroups.

7. A description of any endangered or threatened species near the Facility.

TASK IV: INVESTIGATION ANALYSIS

Concurrent with submission of the Draft RFI Report, the Respondent shall submit to EPA for review and approval, a Draft Investigation Analysis Report to support the selection of media cleanup standards for the Facility. Within thirty (30) days of receipt of EPA comments on the Draft Investigation Analysis Report, Respondent shall submit a Final Investigation Analysis Report to EPA for review and approval, addressing all of EPA's comments to the satisfaction of EPA.

Media Cleanup Standards

The Respondent shall submit the following information to support EPA's selection/development of media cleanup standards of any releases that may have adverse effects on human health and the environment.

A. Ground-water Cleanup Standards

The Respondent shall provide the following information to support EPA's selection/development of ground water cleanup standards for all of the 40 C.F.R. Part 264 Appendix IX constituents found in the ground water during the Facility Investigation (Task III):

1. For any constituents for which an maximum contaminant level (MCL) has been promulgated under the Safe Drinking Water Act, the MCL value;

2. Background concentration of the constituent in the ground water; or

3. An alternate standard (e.g., an alternate concentration limit (ACL) for a regulated unit) to be approved by EPA; and

4. The potential for health risks caused by human exposure to hazardous waste constituents.

B. Soil Cleanup Standards

The Respondent shall provide the following information to support EPA's selection/development of soil cleanup standards:

1. The effectiveness and reliability of containing, confining, and collecting systems and structures in preventing contaminant migration;

2. The potential for contaminant migration and impact to the ground water;

3. The patterns of land use in the region;

4. The potential for health risks caused by human exposure to hazardous waste constituents; and

5. The potential for damage to domestic animals, wildlife, food chains, crops, vegetation, and physical structures caused by exposure to hazardous waste constituents.

C. Surface Water and Sediment Cleanup Standards

If relevant, the Respondent shall provide the following information to support EPA's selection/development of surface water and sediment cleanup standards:

1. The effectiveness and reliability of containing, confining, and collecting systems and structures in preventing contaminant migration;

2. The current and potential uses of nearby surface waters and any water quality standards established for those surface waters;

3. The potential for damage to domestic animals, wildlife, food chains, crops, vegetation and physical structures caused by exposure to waste constituents;

4. The patterns of land use in the region; and

5. The potential for health risks caused by human exposure to waste constituents.

D. Other Relevant Cleanup Standards

The Respondent shall identify any additional relevant and applicable standards for the protection of human health and the environment (e.g., National Ambient Air Quality Standards, Oklahoma Air Toxics Guidelines, Federally approved state water quality standards, etc.).

TASK V: PROGRESS REPORTS

The Respondent shall at a minimum provide ODEQ and EPA with signed, monthly RFI progress reports containing:

1. A description and estimate of the percentage of the RFI completed;

2. Summaries of all findings;

3. Summaries of all changes made in the RFI during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups or the State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in contact personnel during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

RCRA Facility Investigation Scope of Work is presented below:

FACILITY SUBMISSION	DUE DATE*
Draft Report: Description of Current Conditions (Task I)	150 days of the effective date of the Order
Final Report: Description of Current Conditions (Task I)	30 days after receipt of EPA comments on Draft Description of Current Conditions Report
Draft RFI Workplan (Task II)	150 days of the effective date of the Order
Revised RFI Workplan (Task II)	30 days after EPA comments on Draft RFI Workplan
Implementation of Approved RFI Workplan (Task III)	Upon receipt of EPA approval of Revised RFI Workplan
Draft RFI Report (Task III)	365 days after RFI Workplan Approval
Final RFI Report (Task III)	30 days after EPA comment on Draft RFI Report
Draft Investigation Analysis Report (Task IV)	Concurrent with Draft RFI Report
Final Investigation Analysis Report (Task IV)	30 days after EPA comment on Draft Investigation Analysis Report
Progress Reports on Tasks I through IV	Monthly

* All due dates are calculated from the effective date of this Order unless otherwise specified.

SCOPE OF WORK FOR THE CORRECTIVE MEASURE STUDY

AT

ALTUS AIR FORCE BASE

PURPOSE

The purpose of this Corrective Measure Study (CMS) is to develop and evaluate the corrective action or alternatives, and to recommend the corrective measure or measures to be taken at the Facility. Based on the results of the RFI, and in consideration of the Pre-investigation Evaluation of Corrective Measure Technologies (Task I.C.), the Respondent shall identify, screen, and develop the alternatives for removal, containment, treatment, and/or other remediation of the contamination, based on the objectives established for the corrective action.

SCOPE

The Corrective Measure Study consists of three tasks:

Task VI: Identification and Development of the Corrective Measure Alternatives

- A. Description of Current Condition
- B. Establishment of Corrective Action Objectives
- C. Identification Screening and Development of the Corrective Measure Alternatives

Task VII: Evaluation of the Corrective Measure Alternatives

- A. Protective of Human Health and the Environment
- B. Attain Media Cleanup Standards
- C. Control the Sources of Releases
- D. Comply with Applicable Standards for Management of Wastes
- E. Long-Term Reliability and Effectiveness
- F. Reduction in the Toxicity, Mobility, or Volume of Wastes
- G. Short-Term Effectiveness
- H. Implementability
- I. Cost Estimate
- J. Public Involvement

Task VIII: Reports

- A. Progress Reports
- B. Draft Report
- C. Final Report

TASK VI: IDENTIFICATION AND DEVELOPMENT OF THE CORRECTIVE ACTION ALTERNATIVES

Based on the results of the RFI and in consideration of the identified Corrective Measure Technologies (Task I.C.), the Respondent shall identify, screen, and develop the alternatives for removal, containment, treatment and/or other remediation of the contamination based on the objectives established for the corrective action.

A. Description of Current Condition

The Respondent shall submit an update to the information describing the current situation at the Facility and the known nature and extent of the contamination as documented by the RFI Report. The Respondent shall provide an update to information presented in Task I of the RFI to ODEQ and EPA regarding previous response activities and any interim measures which have or are being implemented at the Facility. The Respondent shall also make a Facility specific statement of the purpose for the response, based on the results of the RFI. The statement of purpose shall identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. Establishment of Corrective Action Objectives

The Respondent shall propose to the EPA for review and approval, facility specific objectives for the corrective action. These objectives shall be based on media cleanup standards, public health and environmental criteria, information gathered during the RFI and interim measures, EPA guidance, and the requirements of any applicable state and Federal statutes and regulations.

C. Identification, Screening, and Development of Corrective Measure Alternatives

1. Identification

The Respondent shall list and describe potentially applicable technologies for each affected media that may be used to achieve the corrective action objectives. The Respondent should consider including a table that summarizes the available technologies. Depending on the site-specific conditions, EPA may require the Respondent to include additional technologies.

The Respondent shall include innovative treatment technologies when appropriate, especially in situations where there are a limited number of applicable corrective measure technologies.

The Respondent shall rely on engineering practice to determine which of the previously identified technologies appear most suitable for the Facility. Technologies can be combined to form the overall corrective action alternatives. The alternatives developed should represent a workable number of option(s) that each appear to adequately address all site problems and corrective action objectives. Each alternative may consist of an individual technology or a combination of technologies.

2. Screening

The Respondent shall screen the preliminary corrective measure technologies identified in Task I.C. of the RFI, and any supplemental technologies to eliminate those that may prove infeasible to implement, that rely on technologies unlikely to perform satisfactorily or reliably, or that do not achieve the corrective measure objective within a reasonable time period. This screening process focuses on eliminating those technologies which have severe limitations for a given set of waste and site-specific conditions. The screening step may also eliminate technologies based on inherent technology limitations.

The Respondent shall evaluate and document the technology limitations of the corrective measure alternatives identified above which prove infeasible to implement given the existing set of waste and site specific conditions.

Site, waste, and technology characteristics which are used to screen inapplicable technologies are described in more detail below:

a. Site Characteristics

Site data shall be reviewed to identify conditions that may limit or promote the use of certain technologies. Technologies whose use is clearly precluded by site characteristics should be eliminated from further consideration.

b. Waste Characteristics

Identification of waste characteristics that limit the effectiveness or feasibility of technologies is an important part of the screening process. Technologies clearly limited by these waste characteristics should be eliminated from consideration. Waste characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (on/off-site).

c. Technology Limitations

During the screening process, the level of technology development, performance record, and inherent construction, operation, and maintenance problems shall be identified and supported by performance data for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated, may be eliminated in the screening process. For example, certain treatment methods have been developed to a point where they can be implemented in the field without extensive technology transfer or development.

3. Development

Utilizing the technologies which are not eliminated in the screening process outlined in Task VII.C.2., the Respondent shall develop corrective measure alternatives to achieve the corrective action objectives established in Task VII.B.

TASK VII: EVALUATION OF THE CORRECTIVE MEASURE ALTERNATIVES

The Respondent shall describe and evaluate each corrective measure alternative that passes through the Initial Screening in Task VI. For each alternative which warrants a more detailed evaluation, including those situations when only one alternative is being proposed, the Respondent shall provide detailed documentation of how the potential remedy will comply with each of the standards (i.e., Task VII.A. through Task VII.D.) listed below. These standards reflect the major corrective action objectives and components of remedies including cleanup of releases, source control and management of wastes that are generated by remedial activities. The Respondent shall also provide detailed documentation for each of the additional evaluation criteria (i.e. Task VII.E. through Task VII.J.) which supports the use of viable remedial alternatives.

A. Protective Human Health and the Environment

The standard for protection of human health and the environment is a general mandate derived from the RCRA statute. This standard requires that remedies include those measures that are needed to be protective, but are not directly related to media cleanup, source control, or management of wastes. An example would be a requirement to provide alternative drinking water supplies in order to prevent exposures to releases from an aquifer used for drinking water purposes. Another example would be a requirement for the construction of barriers, or for other controls to prevent harm arising from direct contract with waste management units. Therefore, the Respondent shall include a discussion on what types of short term remedies are appropriate for the particular Facility in order to meet this standard. This information shall be provided in addition to a discussion of how the other corrective measure alternatives meet this standard.

B. Attain Media Cleanup Standards

Remedies shall be required to attain media cleanup standards set by state or federal regulations (e.g. ground water standards) or other standards set by EPA or the State of Oklahoma. The media cleanup standards for a remedy will often play a large role in determining the approach of implementing the remedy.

As part of the necessary information for satisfying this requirement, the Respondent shall address whether the potential remedy will achieve the preliminary remediation objective as identified by EPA as well as other alternative remediation objectives that may be proposed by the Respondent. The Respondent shall also include an estimate

of the time frame necessary for each alternative to meet these standards.

C. Control the Sources of Releases

A critical objective of any remedy must be to stop further environmental degradation by controlling or eliminating further releases that may pose a threat to human health and/or the environment. Unless source control measures are taken, efforts to clean up releases may be ineffective or, at best, will essentially involve a perpetual cleanup. Therefore, an effective source control program is essential to ensure the long-term effectiveness and protectiveness of the corrective action program.

The proposed source control standard is not intended to mandate a specific remedy or class of remedies. Instead, the Respondent is encouraged to examine a wide range of options. This standard should not be interpreted to preclude the equal consideration of using other protective remedies to control the source, such as partial waste removal, capping, slurry walls, in-situ treatment/stabilization and consolidation. Source controls may be needed to be combined with other measures, such as plume management or exposure controls, to ensure an effective and protective remedy.

D. Comply with Any Applicable Standards for Management of Wastes

The Respondent shall include a discussion of how the specific waste management activities will be conducted in compliance with all applicable state or federal regulations (e.g., CAMU closure requirements, land disposal restrictions).

E. Long-term Reliability and Effectiveness

The Respondent shall provide information on the reliability of each corrective measure including their operation and maintenance requirements and their demonstrated reliability. Emphasis is placed on the ability of any remedial approach to provide adequate protection of human health and the environment over the long term. Thus, source control technologies that involve treatment of wastes, or that otherwise do not rely on containment structures or systems to ensure against future releases, will be strongly preferred to those that offer more temporary, or less reliable, controls.

Demonstrated and expected reliability is a way of assessing the risk and effect of failure. The Respondent shall

evaluate whether the technologies have been used effectively under analogous site conditions, whether the combination of technologies have been used together effectively, whether failure of any one technology has an immediate impact on receptors, and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site (e.g., heavy rainstorms, etc.).

Most corrective measure technologies, with the exception of destruction, deteriorate with time. Often deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. Each corrective measure alternative shall be evaluated in terms of the projected useful life of the overall alternative and of its component technologies. Useful life is defined as the length of time the level of effectiveness can be maintained.

F. Reduction in the Toxicity, Mobility or Volume of Wastes

As a general goal, remedies will be preferred that employ techniques, such as treatment technologies, that are capable of eliminating or substantially reducing the inherent potential for the wastes in SWMUs (and/or contaminated media at the Facility) to cause future environmental releases or other risks to human health and the environment. Estimates of how much the corrective alternatives will reduce the waste toxicity, volume, and/or mobility may be helpful in applying this factor. This may be done through a comparison of initial site conditions to post-corrective measure conditions.

G. Short-term Effectiveness

Short-term effectiveness may be particularly relevant when remedial activities will be conducted in densely populated areas, or where waste characteristics are such that risks to workers or the environment are high and special protective measures are needed. Possible factors to consider include fire, explosion, exposure to hazardous substances and potential threats associated with treatment, excavation, transportation, and redisposal or containment of waste material.

H. Implementability

Implementability will often be a determining variable in shaping remedies. Some technologies will require state or local approvals prior to construction, which may increase the time necessary to implement the remedy. In some cases, state or local restrictions or concerns may necessitate eliminating or deferring certain technologies or remedial

approaches from consideration in remedy selection. Information to consider shall include, but not limited to:

1. Additional time of administrative activities (e.g., permits, rights of way, off-site approvals, etc.) required prior to implementing the corrective measure alternative;

2. The availability of adequate off-site treatment, storage capacity, disposal services, needed technical services and materials; and

3. The availability of prospective technologies for each corrective measure alternative.

4. Constructability is determined by conditions both internal and external to the Facility conditions, and includes such items as location of underground utilities, depth to water table, heterogeneity of subsurface materials, and location of the Facility (i.e., remote location vs. a congested urban area). The Respondent shall evaluate what measures can be taken to facilitate construction under these conditions. External factors which affect implementation include the need for special permits or agreements, equipment availability, and the location of suitable off-site treatment or disposal facilities; and

5. Time has two components that shall be addressed: the time it takes to implement a corrective measure, and the time it takes to actually see beneficial results. Beneficial results are defined as the reduction of contaminants to some acceptable, pre-established level.

I. Cost Estimate

The Respondent shall develop an estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative). The cost estimate shall include both capital and operation and maintenance costs.

1. Capital costs consist of direct (construction) and indirect (nonconstruction and overhead) costs.

   a. Direct capital costs include, but are not limited to:

      i) Construction costs: Costs of materials, labor (including fringe benefits and worker's compensation), and equipment required to install the corrective measure;

ii) Equipment costs: Costs of treatment, containment, disposal and/or service equipment necessary to implement the action; these materials remain until the corrective action is complete;

iii) Land and site-development costs: Expenses associated with purchase of land and development of existing property; and

iv) Buildings and services costs: Costs of process and nonprocess buildings, utility connections, purchased services, and disposal costs.

b. Indirect capital costs include, but are not limited to:

i) Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives;

ii) Legal fees and license or permit costs: Administrative and technical costs necessary to obtain licenses and permits for installation and operation;

iii) Startup and shakedown costs: Costs incurred during corrective measure startup; and

iv) Contingency allowances: Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes, and inadequate Facility characterization.

2. Operation and maintenance costs are post-construction costs necessary to ensure continued effectiveness of a corrective measure. The Respondent shall consider the following operation and maintenance cost components:

a. Operating labor costs: Wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operations;

b. Maintenance materials and labor costs: Costs for labor, parts, and other resources required for routine maintenance of facilities and equipment;

c. Auxiliary materials and energy: Costs of such items as chemicals and electricity for treatment plant operations, water and sewer service, and fuel;

d. Purchased services: Sampling costs, laboratory fees, and professional fees for which the need can be predicted;

e. Disposal and treatment costs: Costs of transporting, treating, and disposing of waste

materials, such as treatment plant residues, generated during operations;

f. Administrative costs: Costs associated with administration of corrective measure operation and maintenance not included under other categories;

g. Insurance, taxes, and licensing costs: Costs of such items as liability and sudden accidental insurance; real estate taxes on purchased land or rights-of-way; licensing fees for certain technologies; and permit renewal and reporting costs;

h. Maintenance reserve and contingency funds; and

i. Other costs: Items that do not fit any of the above categories. The relative cost of a remedy may be an appropriate consideration, especially in those situations where several different technical alternatives to remediation will offer equivalent protection of human health and the environment, but may vary widely in cost. However, in those situations where only one remedy is being proposed, the issue of cost would not need to be considered. Cost estimates could include costs for: engineering, site preparation, construction, materials, labor, sampling/analysis, waste management/disposal, permitting, health and safety measures,a training, operation and maintenance, etc.

J. Public Involvement

After a CMS has been performed by the Respondent, and EPA has selected a preferred alternative for proposal in the Statement of Basis, it is EPA's policy to request public comment on the Administrative Record and the proposed corrective measure(s). Changes to the proposed corrective measure(s) may be made after consideration of public comment. The EPA may also require that the Respondent perform additional corrective measures studies. If the public is interested, a public meeting may be held. After consideration of the public's comment on the proposed corrective measure, EPA develops the Final Decision and Response to Comments (RTC) to document the selected corrective measure, EPA's justification for such selection, and response to the public's comment. Additional public involvement activities may be necessary, based on Facility specific circumstances.

TASK VIII: REPORTS

Within one hundred fifty (150) days of the approval of the Final RFI Report, or upon written direction from EPA, Respondent shall prepare and submit to EPA for review and approval a Draft Corrective Measures Study (CMS) Report presenting the results of Tasks VI through VII. EPA will review the Draft CMS Report and provide comments thereon to the Respondent. Within thirty (30) days of receipt of EPA comments, Respondent shall submit a Final CMS Report to EPA for review and approval addressing all of EPA's comments to the satisfaction of EPA. EPA will approve the Final CMS Report or modify it. The revised Final CMS Report shall become the Final Corrective Measures Study.

A. Progress Reports

The Respondent shall at a minimum provide ODEQ and EPA with signed, monthly CMS progress reports containing:

1. A description and estimate of the percentage of the CMS completed;

2. Summaries of all findings;

3. Summaries of all changes made in the CMS during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in the personnel involved with the CMS during reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

B. Draft CMS Report

The Report shall at a minimum include:

1. Updated description of the current conditions at the Facility, including:

(a) Summary of field studies (ground water, surface water, soil, air); and

(b) Summary of any treatability studies.

2. A description of the corrective action objectives;

3. A description of the potentially applicable technologies, including:

(a) Identification of technologies; and

(b) Screening of technologies.

4. Description of potentially applicable technology limitations;

5. Description of corrective measure alternatives identified after initial screening process;

6. Description of corrective measure standards and evaluation criteria, including:

(a) Protection of human health and the environment;

(b) Media cleanup standards;

(c) Release source control;

(d) Compliance with applicable standards for management of wastes;

(e) Long-term reliability and effectiveness;

(f) Reduction in toxicity, mobility, or volume of wastes;

(g) Short-term effectiveness;

(h) Implementability;

(i) Cost estimates; and

(j) Public involvement.

C. Final CMS Report

The Respondent shall finalize the CMS Report addressing comments received from EPA on the Draft CMS Report.

Facility Submission Summary

A summary of the information reporting requirement contained in the Corrective Measure Study Scope of Work is presented below:

FACILITY SUBMISSION	DUE DATE*
Draft CMS Report (Tasks VI and VII)	150 days after receipt of EPA approval of the Final RFI Report or upon written direction from EPA
Final CMS Report (Tasks VI and VII)	30 days after receipt of EPA comments on the Draft CMS Report
Progess Reports (Task VIII)	MONTHLY

* All dates are calculated from the effective date of this Order unless otherwise specified.

SCOPE OF WORK FOR THE CORRECTIVE MEASURE IMPLEMENTATION

AT

ALTUS AIR FORCE BASE

PURPOSE

The purpose of this Corrective Measure Implementation (CMI) program is to design, construct, operate, maintain, and monitor the performance of the corrective measure or measures selected to protect human health and the environment. The Respondent shall furnish all personnel, materials and services necessary for the implementation of the corrective measure or measures.

SCOPE

The Corrective Measure Implementation program consists of four tasks:

Task IX: Corrective Measure Implementation Program Plan

- A. Program Management Plan
- B. Community Relations Plan

Task X: Corrective Measure Design

- A. Design Plans and Specifications
- B. Operation and Maintenance Plan
- C. Cost Estimate
- D. Project Schedule
- E. Construction Quality Assurance Objectives
- F. Health and Safety Plan
- G. Design Phases

Task XI: Corrective Measure Construction

- A. Responsibility and Authority
- B. Construction Quality Assurance Personnel Qualifications
- C. Inspection Activities
- D. Sampling Requirements
- E. Documentation

Task XII: Reports

- A. Progress Reports
- B. Draft Reports
- C. Final Reports

TASK IX: CORRECTIVE MEASURE IMPLEMENTATION PROGRAM PLAN

The Respondent shall submit Draft and Final Corrective Measures Implementation Program Plans (CMI Program Plans) as described below in accordance with Section VI.4 of the Order. Within one hundred fifty (150) days of Respondent's receipt of notification of EPA's selection of the corrective measure, or upon written direction from EPA, the Respondent shall submit draft Corrective Measures Implementation Program Plans to EPA. The Draft CMI Program Plans shall include the development and implementation of several plans, which require concurrent preparation. EPA will review the Draft CMI Program Plans and provide comments thereon to the Respondent. Within thirty (30) days after receipt of EPA comments, Respondent shall submit the Final CMI Program Plans to the EPA for review and approval, addressing all of EPA's comments to the satisfaction of EPA. It may be necessary to revise the CMI Program Plans as the work is performed to focus efforts on a particular problem. The Program Plan shall include, but not be limited to the following:

A. Program Management Plan

The Respondent shall prepare a Program Management Plan which shall document the overall management strategy for performing the design, construction, operation, maintenance, and monitoring of corrective measure(s). The Plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation. The Program Management Plan shall also include a description of qualifications of key personnel directing the Corrective Measure Implementation Program, including contractor personnel.

B. Community Relations Plan

The Respondent shall revise the Community Relations Plan as necessary to address the information needs of the community during design and construction activities.

1. Specific activities which must be conducted during the design stage are the following:

   a. Revise the Facility Community Relations Plan to reflect knowledge of citizen concerns and involvement at this stage of the process; and

   b. Prepare and distribute a public notice and an updated fact sheet at the completion of engineering design.

2. Depending on citizen interest at a Facility at this point in the corrective action process, community relations activities could range from group meetings to fact sheets on the technical status.

TASK X: CORRECTIVE MEASURE DESIGN

The Respondent shall prepare final construction plans and specifications to implement the corrective measure(s) at the Facility as defined in the Corrective Measure Study.

A. Design Plans and Specifications

The Respondent shall develop clear and comprehensive design plans and specifications which include, but are not limited to the following:

1. Discussion of the design strategy and the design basis, including:

   a. Compliance with all applicable or relevant environmental and public health standards; and
   b. Minimization of environmental and public interests.

2. Discussion of the technical factors of importance, including:

   a. Use of currently accepted environmental control measures and technology;
   b. The constructability of the design; and
   c. Use of currently acceptable construction practices and techniques.

3. Description of assumptions made and detailed justification of these assumptions.

4. Discussion of the possible sources of error and references to possible operation and maintenance problems.

5. Detailed drawings of the proposed design, including:

   a. Qualitative flow sheets; and
   b. Quantitative flow sheets.

6. Tables listing equipment and specifications.

7. Tables giving material and energy balances.

8. Appendices including:

   a. Sample calculations (one example presented and explained clearly for significant or unique design calculations);
   b. Derivation of equations essential to understanding the report; and
   c. Results of laboratory and/or field tests.

B. Operation and Maintenance Plan

The Respondent shall prepare an Operation and Maintenance Plan to cover both implementation and long term maintenance of the corrective measure(s). The plan shall be composed of the following elements:

1. Description of normal operation and maintenance (O&M);

    a. Description of tasks for operation;
    b. Description of tasks for maintenance;
    c. Description of prescribed treatment or operation conditions; and
    d. Schedule showing frequency of each O&M task.

2. Description of potential operating problems;

    a. Description and analysis of potential operation problems;
    b. Sources of information regarding problems; and
    c. Common and/or anticipated remedies.

3. Description of routine monitoring and laboratory testing;

    a. Description of monitoring tasks;
    b. Description of required laboratory tests and their interpretation;
    c. Required QA/QC; and
    d. Schedule of monitoring frequency and date, if appropriate, when monitoring may cease.

4. Description of alternate O&M;

    a. Should systems fail, alternate procedures to prevent undue hazard; and
    b. Analysis of vulnerability and additional resource requirements should a failure occur.

5. Safety plan;

    a. Description of precautions, of necessary equipment, etc., for site personnel; and
    b. Safety tasks required in event of system failure.

6. Description of equipment; and

    a. Equipment identification;
    b. Installation of monitoring components;
    c. Maintenance of site equipment; and
    d. Replacement schedule for equipment and installed components.

7. Records and reporting mechanisms required:

   a. Daily operating logs;
   b. Laboratory records;
   c. Records for operating costs;
   d. Mechanism for reporting emergencies;
   e. Personnel and maintenance records; and
   f. Monthly/annual reports to State agencies.

An initial Draft Operation and Maintenance Plan shall be submitted simultaneously with the Prefinal Design Document submission, and the Final Operation and Maintenance Plan with the Final Design Documents.

C. Cost Estimate

The Respondent shall develop cost estimates for the purpose of assuring that the Facility has the financial resources necessary to construct and implement the corrective measure(s). The cost estimate developed in the Corrective Measure Study shall be refined to reflect the more detailed/accurate design plans and specifications being developed. The cost estimate shall include both capital and operation and maintenance costs. An initial Cost Estimate shall be submitted simultaneously with the Prefinal Design Document submission and the Final Cost Estimate with the Final Design Documents.

D. Project Schedule

The Respondent shall develop a detailed Project Schedule for construction and implementation of the corrective measure(s) which identifies timing for initiation and completion of all critical path tasks. The Respondent shall specifically identify dates for completion of the project and major interim milestones which shall be enforceable terms of this Order. An initial Project Schedule shall be submitted simultaneously with the Prefinal Design Document submission and the Final Project schedule with the Final Design Document.

E. Construction Quality Assurance Objectives

The Respondent shall identify and document the objectives and framework for the development of a construction quality assurance program including, but not limited to the following: responsibility and authority; personnel qualifications; inspection activities; sampling requirements; and documentation.

F. Health and Safety Plan

The Respondent shall modify the Health and Safety Plan developed for the RCRA Facility Investigation to address the activities to be performed at the Facility to implement the corrective measure(s).

G. Design Phases

The design of the corrective measure(s) shall include the phases outlined below.

1. Preliminary design.

Within thirty (30) days after EPA approval of the Final Program Plan, the Respondent shall submit the Preliminary design when the design effort is approximately 30% complete. At this stage the Respondent shall have field verified the existing conditions of the Facility. The preliminary design shall reflect a level of effort such that the technical requirements of the project have been addressed and outlined so that they may be reviewed to determine if the final design will provide an operable and usable corrective measure. Supporting data and documentation shall be provided with the design documents defining the functional aspects of the program. The preliminary construction drawings by the Respondent shall reflect organization and clarity. The scope of the technical specifications shall be outlined in a manner reflecting the final specifications. The Respondent shall include with the preliminary submission design calculations reflecting the same percentage of completion as the designs they support.

2. Intermediate design.

Complex project design may necessitate review of the design documents between the preliminary and the prefinal/final design. Unless otherwise directed by EPA, within forty-five (45) days after EPA approval of the Final Program Plan, the Respondent shall submit the Intermediate design when the design effort is approximately 60% complete. The intermediate design submittal should include the same elements as the prefinal design.

3. Correlating plans and specifications.

General correlation between drawings and technical specifications, is a basic requirement of any set of working construction plans and specifications. Before

submitting the project specifications, the Respondent shall:

a. Coordinate and cross-check the specifications and drawings; and

b. Complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

These activities shall be completed prior to the 95% prefinal submittal to the EPA.

4. Equipment start-up and operator training.

The Respondent shall prepare, and include in the technical specifications governing treatment systems, contractor requirements for providing: appropriate service visits by experienced personnel to supervise the installation, adjustment, startup, and operation of the treatment systems; and training covering appropriate operational procedures once the startup has been successfully accomplished.

5. Additional studies.

Corrective Measure Implementation may require additional studies to supplement the available technical data. At the direction of the EPA for any such studies required, the Respondent shall furnish all services, including field work as require, materials, supplies, plant, labor, equipment, investigations, studies, and superintendence. Sufficient sampling, testing and analysis shall be performed to optimize the required treatment and/or disposal operations and systems. There shall be an initial meeting of all principal personnel involved in the development of the program. The purpose will be to discuss objectives, resources, communication channels, role of personnel involved and orientation of the site, etc. The interim report shall present the results of the testing with the recommended treatment or disposal system (including options). A review conference shall be scheduled after the interim report has been reviewed by all interested parties. The final report of the testing shall include all data taken during the testing and a summary of the results of the studies.

6. Prefinal and final design.

Within sixty (60) days after EPA approval of the Final Program Plan, the Respondent shall submit the prefinal

design to EPA when the design effort is approximately 95% complete. Within thirty (30) days after approval of the prefinal submission, the Respondent shall execute the required revisions and submit the final documents 100% complete with reproducible drawings and specifications.

The prefinal design submittal shall consist of the Design Plans and Specifications, Operation and Maintenance Plan, Capital and Operating and Maintenance Cost Estimate, Quality Assurance Plan, Specifications for the Health and Safety Plan, and Project Schedule.

The final design submittal shall consist of the Final Design Plans and Specifications (100% complete), Respondent's Final Construction Cost Estimate, the Final Draft Operation and Maintenance Plan, Final Quality Assurance Plan, and Final Health and Safety specifications. The quality of the design documents shall be such that the Respondent would be able to include them in a bid package and invite contractors to submit bids for the construction project.

TASK XI: CORRECTIVE MEASURE CONSTRUCTION

Concurrently with the submission of the final design (Task X.G.6), the Respondent shall submit a draft construction quality assurance (CQA) plan to EPA. The CQA Plan shall be designed to ensure, with a reasonable degree of certainty, that a completed corrective measure(s) meets or exceeds all design criteria, plans and specifications. The CQA Plan is a facility specific document which must be submittted to EPA for approval prior to the start of construction. At a minimum, the CQA Plan shall include the elements which are summarized below. Within fifteen (15) days of receipt of EPA's comments on the draft CQA Plan, the Respondent shall submit a Final CQA Plan to EPA for review and approval, addressing all comments to the satisfaction of EPA. EPA will approve the Final CQA Plan or modify it. The revised Final CQA Plan as approved or modified by EPA shall become the Final CQA Plan. Upon EPA approval of the CQA Plan, the Respondent shall construct and implement the corrective measures in accordance with the approved design, schedule and the CQA Plan. The Respondent shall also carry out all elements of the approved Operation and Maintenance Plan.

A. Responsibility and Authority

The responsibility and authority of all organizations (i.e., technical consultants, construction firms, etc.) and key personnel involved in the construction of the corrective measure shall be described fully in the CQA Plan. The Respondent shall identify a CQA officer and the necessary supporting inspection staff.

B. Construction Quality Assurance Personnel Qualifications

The qualifications of the CQA officer and supporting inspection personnel shall be presented in the CQA Plan to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

C. Inspection Activities

The observations and tests that will be used to monitor the construction and/or installation of the components of the corrective measure(s) shall be summarized in the CQA Plan. The Plan shall include the scope and frequency of each type of inspection. Inspections shall verify compliance with all environmental requirements and include, but not limited to air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. The inspection shall also ensure compliance with all health and safety procedures. In addition to oversight inspections, the Respondent shall conduct the following activities:

1. Preconstruction inspection and meeting.

The Respondent shall conduct a preconstruction inspection and meeting with EPA to:

a. Review methods for documenting and reporting inspection data;
b. Review methods for distributing and storing documents and reports;
c. Review work area security and safety protocol;
d. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed; and
e. Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The preconstruction inspection and meeting shall be documented by a designated person and minutes should be transmitted to all parties.

2. Prefinal inspection.

Upon preliminary project completion, the Respondent shall notify EPA for the purposes of conducting a prefinal inspection. The prefinal inspection will consist of a walk-through inspection of the entire project site. The inspection is to determine whether the project is complete and consistent with the contract documents and the EPA approved corrective measure. Any outstanding construction items discovered during the inspection shall be identified and noted. Additionally, treatment equipment will be operationally tested by the Respondent. The Respondent shall certify that the equipment has performed to meet the purpose and intent of the specifications. Retesting shall be completed where deficiencies are revealed. The prefinal inspection report shall outline the outstanding construction items, actions required to resolve items, completion date for these items, and date for final inspection.

3. Final inspection.

Upon completion of any outstanding construction items, the Respondent shall notify EPA for the purposes of conducting a final inspection. The final inspection will consist of a walk-through inspection of the project site. The prefinal inspection report will be used as a checklist with the final inspection focusing on the outstanding construction items identified in the

prefinal inspection. Confirmation shall be made that outstanding items have been resolved.

D. Sampling Requirements

The sampling activities, sample size, sample locations, frequency of testing, acceptance and rejection criteria, and plans for correcting problems as addresses in the project specifications shall be presented in the CQA Plan.

E. Documentation

Reporting requirements for CQA activities shall be described in detail in the CQA Plan. This shall include such items as daily summary reports, inspections data sheet, problem identification and corrective measures reports, design acceptance reports, and final documentation. Provisions for the final storage of all records also shall be presented in the CQA plan.

TASK XII: REPORTS

The Respondent shall prepare plans, specifications, and reports as set forth in Task IX through Task XII to document the design, construction, operation, maintenance, and monitoring of the corrective measure. The documentation shall include, but not limited to the following:

A. Progress Reports

The Respondent shall at a minimum provide the EPA with signed, monthly progress reports containing:

1. A description and estimate of the percentage of the CMI completed;

2. Summaries of all findings and data;

3. Summaries of all changes made in the CMI during the reporting period;

4. Summaries of all contacts with representative of the local community, public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel associated with corrective measures during the reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

The Respondent shall also provide EPA with signed, semi-annual progress reports during the operation and maintenance of the corrective measures.

B. Draft Reports

1. Respondent shall submit a Draft Corrective Measure Implementation Program Plan as outlined in Task X;

2. Respondent shall submit Draft Construction Plans and Specifications, Design Reports, Project Schedule, Operation and Maintenance Plan, and Study Reports as outlined in Task XI;

3. Respondent shall submit a Draft Construction Quality Assurance Program Plan and Documentation as outlined in Task XI; and

4. At the "completion" of the construction of the project, Respondent shall submit a Draft Corrective Measure Implementation (CMI) Report to EPA. EPA will review the Draft CMI Report and provide comments thereon to the Respondent. Within thirty (30) days after receipt of EPA comments, Respondent shall submit the Final CMI Report to the EPA for review and approval, addressing all of EPA's comments to the satisfaction of EPA. The Report shall document that the project is consistent with the design specifications, and that the corrective measure is performing adequately. The Report shall include, but not be limited to the following elements:

   a. Synopsis of the corrective measure and certification of the design and construction;

   b. Explanation of any modifications to the plans and why these were necessary for the project;

   c. Listing of the criteria, established before the corrective measure was initiated, for judging the functioning of the corrective measure and also explaining any modification to these criteria;

   d. Results of Facility monitoring, indicating that the corrective measure will meet or exceed the performance criteria; and

   e. Explanation of the operation and maintenance (including monitoring) to be undertaken at the Facility.

This report shall include all of the daily inspection summary reports, inspection summary reports, inspection data sheets, problem identification and corrective measure reports, block evaluation reports, photographic reporting data sheets, design engineers' acceptance reports, deviations from designated material specifications (with justifying documentation) and as-built drawings.

C. Final Reports

Respondent shall finalize the Corrective Measure Implementation Program Plan, Construction Plans and Specifications, Design Reports, Operation and Maintenance Plan, Project Schedule Study Reports, Construction QA Program Plan/Documentation, Additional Studies Report and

the Corrective Measure Implementation Report incorporating comments received on Draft submissions.

Submission Summary

A summary of the information reporting requirements contained in the Corrective Measure Implementation Scope of Work is present below:

Facility Submission	Due Date
Draft Program Plans (Task IX)	150 days after receipt of EPA Remedy Selection or upon written direction from EPA
Final Program Plans (Task IX)	30 days after receipt of EPA comments on Draft Program Plans
Design Phases (Task X.A and G) -Preliminary Design (30% completion)	30 days after EPA approval of Final Program Plan
-Intermediate Design (60% completion)	45 days after EPA approval of Final Program Plan
-Prefinal Design (95% completion)	60 days after EPA approval of Final Program Plan
-Final Design (100% completion)	30 days after receipt of EPA comments on Prefinal Design
-Draft Submittals (Task X.B through F)	Concurrent with Prefinal Design
-Final Submittals (Task X.B through F)	Concurrent with Final Design
Additional Studies: Interim Report (Task X.G)	[DATE ESTABLISHED PRIOR TO FINAL DESIGN]
Additional Studies: Final Report (Task XI.G)	15 days after EPA comment on Interim Report
Draft Construction Quality Assurance Plan (Task XI)	Concurrent with Final Design
Final Construction Quality Assurance Plan (Task XI)	15 days after EPA comment on Draft Construction Quality Assurance Plan

Construction of Corrective Measures	As approved in Final Design upon approval of Final Construction Quality Assurance Plan
Prefinal Inspection Report (Task XI)	15 days after Prefinal Inspection
Draft CMI Report (Task XII)	Upon completion of construction phase
Final CMI Report (Task XII)	30 days after EPA comment on Draft CMI Report
Progress Reports for Tasks IX through XII	Monthly
Progress Reports during Operation and Maintenance	Semi-annual

ATTACHMENT II

CORRECTIVE ACTION REFERENCE LIST

CORRECTIVE ACTION REFERENCE LIST

The following list comprises guidance documents and other information sources which may be useful in implementing corrective action activities at RCRA facilities. Contacts for additional information are included at the end of this list.

"*RCRA Corrective Action Plan - Final*," EPA 520-R-94-004, May 1994.

"*Interim Final RCRA Facility Investigation (RFI) Guidance*," Volumes I-IV, EPA/530/SW-89-031, May 1989.

"*Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies*", EPA/600/R-92/128, July 1992.

"*Identification and Compilation of Unsaturated/Vadose Zone Models*", EPA/600/R-94/028, March 1994.

"*Handbook: Stabilization Technologies for RCRA Corrective Actions*," EPA/625/6-91/026, August 1991.

"*Innovative Treatment Technologies: Annual Status Report (Sixth Edition)*," EPA 542-R-94-005, Number 6, September 1994.

"*Terms of Environment - Glossary, Abreviations, and Acronyms*," EPA 175-B-94-015, Revised April 1994.

"*Evaluation of Technologies for In-Situ Clean-up of DNAPL Contaminated Sites*," EPA 600/R-94/120.

"*Subsurface Characterization and Monitoring Techniques*," A Desk Reference Guide, Volume I, Solids and Ground Water, Appendices A and B, EPA/625/R-93/003a, May 1993.

"*Subsurface Characterization and Monitoring Techniques*," A Desk Reference Guide, Volume II, The Vadose Zone, Field Screening and Analytical Methods, Appendices C and D, EPA/625/R-93/003b, May 1993.

"*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*," Interim Final EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988.

"*RCRA Ground-water Monitoring Technical Enforcement Guidance Document (TEGD)*," OSWER Directive 9950.1, September 1986.

"*Handbook: Ground Water*," Volumes I and II, EPA/625/6-90/016 (a&b), September 1990 and July 1991.

"*Ground-Water Modeling: An Overview and Status Report*," EPA/600/2-89/028, December 1988.

"*Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities,*" Interim Final, EPA/530/SW-89/026, April 1989.

"*Data Quality Objectives for Remedial Response Activities,*" EPA/540/G-87/003 & 004, OSWER Directive 9335.0-7B, March 1987.

"*Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors,*" OSWER Directive 9285.6-03, March 25, 1991.

"*Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A),*" OSWER Directive 9585.7-01A; Interim Final, EPA/540/1-89/002, December 1989

"*Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B, Development of Preliminary Remediation Goals),*" OSWER Directive 9585.7-01B.

"*Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives),*" OSWER Directive 9585.7-01C.

"*Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual. Supplemental Guidance: "Standard Default Exposure Factors*". OSWER Directive 9285.6-03.

"*Risk Assessment Guidance for Superfund, Volume II: Environmental Evaluation Manual,*" Interim Final, EPA/540/1-89/001, March 1989.

"*Final Guidance for Data Useability in Risk Assessment,*" (Parts A & B), OSWER Directive 9285.7-09A, April 1992.

"*Supplemental Guidance to RAGS: Calculating the Concentration Term,*" OSWER Directive 9285.7-08I.

"*Exposure Factors Handbook,*" Office of Health and Environmental Assessment. EPA/600/8-89/043.

"*Integrated Risk Information System - (IRIS),*" On-line Computer Service.

"*Health Effects Assessment Summary Tables,*" Office of Emergency and Remedial Response. Publication 9200.6-303.

"*Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference Document,*" EPA 600/3-89/013, March 1989.

"*Framework for Ecological Risk Assessment,*" EPA/630/R-92-001 (January 1992).

"*A Review of Ecological Assessment Case Studies from a Risk Assessment Perspective*," EPA/630/R-92/005 May 1993.

"*A Review of Ecological Assessment Case Studies from a Risk Assessment Perspective, Volume II*," EPA/630/R-94/003, July 1994.

"*ECO Update, Ecological Assessment of Superfund Sites: An Overview*," Publication 9345.0-05I, Vol 1, No. 2 (December, 1991).

"*ECO Update, Developing A Work Scope for Ecological Assessment*," Publication 9345.0-05I, Vol. 1, No. 4 (May 1992).

"*Checklist for Ecological Assessment/Sampling*," Draft, Office of Solid Waste and Emergency Response (January 1993).

"*A Compendium of Superfund Field Operations Methods*," Two Volumes, EPA/540/P-87/001a&b, OSWER Directive 9355.0-14, August 1987.

"*Technical Guidance Document: Construction Quality Assurance for Hazardous Waste Land Disposal Facilities*," EPA 530/SW-86/031, OSWER Directive 9472.003, October 1986.

"*Corrective Measures for Releases to Ground Water from SWMUs*," Draft Final, EPA/530-SW-88-020, March 1985.

"*Basics of Pump-and-Treat Groundwater Remediation Technology*," EPA/600/8-90/003, March 1990.

"*Technical Guidance for Corrective Measures--Determining Appropriate Technology and Response for Air Releases*," Draft Final, EPA/530-SW-88-021, March 1985.

"*Air/Superfund National Technical Guidance Study Series*," Volumes I-IV, EPA 450/1-89-001,002,003,004 (1989 and 1990).

"*Corrective Measures for Releases to Soil from SWMUs*," Draft F EPA/530-SW-88-022, March 1985.

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