Kirtland Air Force Base
Albuquerque, New Mexico

Corrective Measures Study Work Plan
Solid Waste Management Unit ST-64

Final Draft - October 30, 1997

377 ABW/EMR
2000 Wyoming Blvd. SE
Kirtland AFB, New Mexico 87117-5659

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INSTALLATION RESTORATION PROGRAM
KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

CORRECTIVE MEASURES STUDY WORK PLAN
FOR
SWMU ST-64
FORMER U.S. ARMY CORPS OF ENGINEERS
VEHICLE MAINTENANCE YARD (ST-64) (FORMER ST-337)

FINAL DRAFT

OCTOBER 30, 1997

Prepared for

HQ AFCEE/ERD

ENVIRONMENTAL RESTORATION DIVISION

BROOKS AFB, TEXAS 78235-5363

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Prepared by

CH2M HILL

ALBUQUERQUE, NEW MEXICO

NOTICE

This Corrective Measures Study Work Plan has been prepared for the U.S. Air Force by CH2M HILL for the purpose of aiding in the implementation of a final remedial action plan under the Installation Restoration Program (IRP). As the plan relates to actual or possible releases of potentially hazardous substances, its release prior to an Air Force final decision on remedial action may be in the public's interest. The limited objectives of this plan and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this plan, since subsequent facts may become known which may make this plan premature or inaccurate.

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This Corrective Measures Study Work Plan describes remediation technology evaluation activities that will be performed during 1997 at SWMU ST-64 Former U.S. Army Corps of Engineers Vehicle Maintenance Yard (Former ST-337) in the RCRA Part B Permit for Kirtland AFB, New Mexico.

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PREFACE

This Corrective Measures Study Work Plan describes the remediation technology evaluation activities that will be performed during 1997 at solid waste management unit ST-64, Former U.S. Army Corps of Engineers Vehicle Maintenance Yard of the RCRA Part B Permit for Kirtland Air Force Base (AFB). The plan addresses the requirements of the U.S. Air Force (USAF) statement of work, dated March 6, 1997.

This plan was prepared by CH2M HILL in September and October 1997. Mr. Bassim D. Shebaro of the Air Force Center for Environmental Excellence was the Restoration Team Chief and Mr. Rodney Arnold served as the Contracting Officer's Representative.

Michael J. Bitner
CH2M HILL Vice President

Amy R. Halloran, P.E.
CH2M HILL Project Manager

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FIGURES

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ACRONYMS

AFB	Air Force Base
bgs	belowground surface
B&RE	Brown & Root Environmental
CMS	Corrective Measures Study
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
GRO	gasoline range organics
HHRB	human health risk-based
ICM	Interim Corrective Measures
mg/kg	milligram per kilogram
NMED	New Mexico Environment Department
PCB	polychlorinated biphenyl
PID	photoionization detector
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	solid waste management unit
SVOC	semi-volatile organic compound
TAL	target analyte list
TPH	total petroleum hydrocarbons
USAF	U.S. Air Force
UTL	upper tolerance limit
VOC	volatile organic compound

EXECUTIVE SUMMARY

This Work Plan was prepared as guidance for the Corrective Measures Study (CMS) to be conducted at solid waste management unit ST-64 Building 20212, Former U.S. Army Corps of Engineers Vehicle Maintenance Yard (ST-64) (former ST-337), Kirtland Air Force Base, New Mexico. The goal of the CMS is to justify and recommend the appropriate corrective measures to protect human health and the environment from contamination that was identified during the Appendix III Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) conducted in 1995 and 1996.

This site was initially investigated during Phase 1 of the Appendix III RFI (USAF, 1995b). All soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), target analyte list (TAL) metals, and polychlorinated biphenyls (PCBs)/pesticides. The Phase 1 analytical results indicated that SVOC and TPH concentrations were detected in some samples at levels in excess of U.S. Environmental Protection Agency (EPA) Region 6 human health risk-based (HHRB) screening levels and/or New Mexico Environment Division (NMED) action levels. Follow-on sampling was conducted during the Appendix III Phase 2 RFI (USAF, 1997). All samples were analyzed for VOCs, SVOCs, and TPH. The analytical results indicated that TPH concentrations were detected in some samples at levels exceeding the 100 milligram per kilogram (mg/kg) NMED TPH action level. All VOC and SVOC concentrations were below the EPA Region 6 HHRB screening levels.

Based on the RFI results, an ICM has been recommended for this site. The ICM will consist of excavation, soil characterization, and disposal of TPH- and SVOC-contaminated soil as detected in the Phases 1 and 2 RFI investigations. Soil contaminated with SVOCs above the HHRB screening levels and/or TPH above the NMED underground storage tank action level of 100 mg/kg will be removed down to a depth of 10 ft belowground surface. Removal of contaminated soil to a depth of 10 ft should mitigate any potential human exposure to compounds that exceed HHRB screening levels. Representative soil samples will be collected from the bottom and sides of the excavated areas to verify contaminant removal.

The CMS will be performed once the analytical data from the ICM are available. The CMS will determine what, if any, corrective measures are still required for the site based on the appropriate technical, environmental, and human health criteria.

1. INTRODUCTION

This Work Plan was prepared as guidance for a Corrective Measures Study (CMS) to be conducted at solid waste management unit (SWMU) ST-64 Building 20212, Former U.S. Army Corps of Engineers Vehicle Maintenance Yard (ST-64) (former ST-337), Kirtland Air Force Base (AFB), New Mexico. The location of the site is shown in Figure 1-1. The CMS goal is to select the appropriate remedial alternatives to reduce the risk to human health and the environment. Contamination was identified during the Appendix III Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) conducted in 1995 and 1996. This CMS Work Plan was developed to serve as a guide for the study, and contains site descriptions, results of previous investigations, plans, and rationale for the CMS. This Work Plan is considered a deliverable under Contract Number F41624-94-D-8053, Delivery Order No. 0092.

1.1 Description of the Corrective Measures Study

Based on the RFI results, a CMS has been recommended for this site. The CMS will consist of four tasks:

- Task 1: Identification and development of the corrective measure alternative or alternatives
- Task 2: Evaluation of the corrective measure alternative or alternatives
- Task 3: Justification and recommendation of the corrective measure or measures
- Task 4: Reports

Each of these tasks will be performed as specified in the model scope of work developed by the U.S. Environmental Protection Agency (EPA) and published in document EPA/530-SW-88-028.

Purpose

The purpose of this CMS is to develop and evaluate the corrective action alternative or alternatives and to recommend the corrective measure or measures to be taken at ST-64 at Kirtland AFB in Albuquerque, New Mexico. CH2M HILL and their subcontractor, Brown & Root Environmental (B&RE), will furnish the personnel, materials, and services necessary to prepare the CMS, except as otherwise specified.

1.2 Scoping Documents

This scope of work is based upon the model scope of work developed by the EPA and published in document EPA/530-SW-88-028 in June 1988. The model scope of work has been modified as necessary to complete the CMS considering facility-specific conditions and the requirements of Kirtland's Part B Permit, EPA Region VI, and the New Mexico Environment Department (NMED).

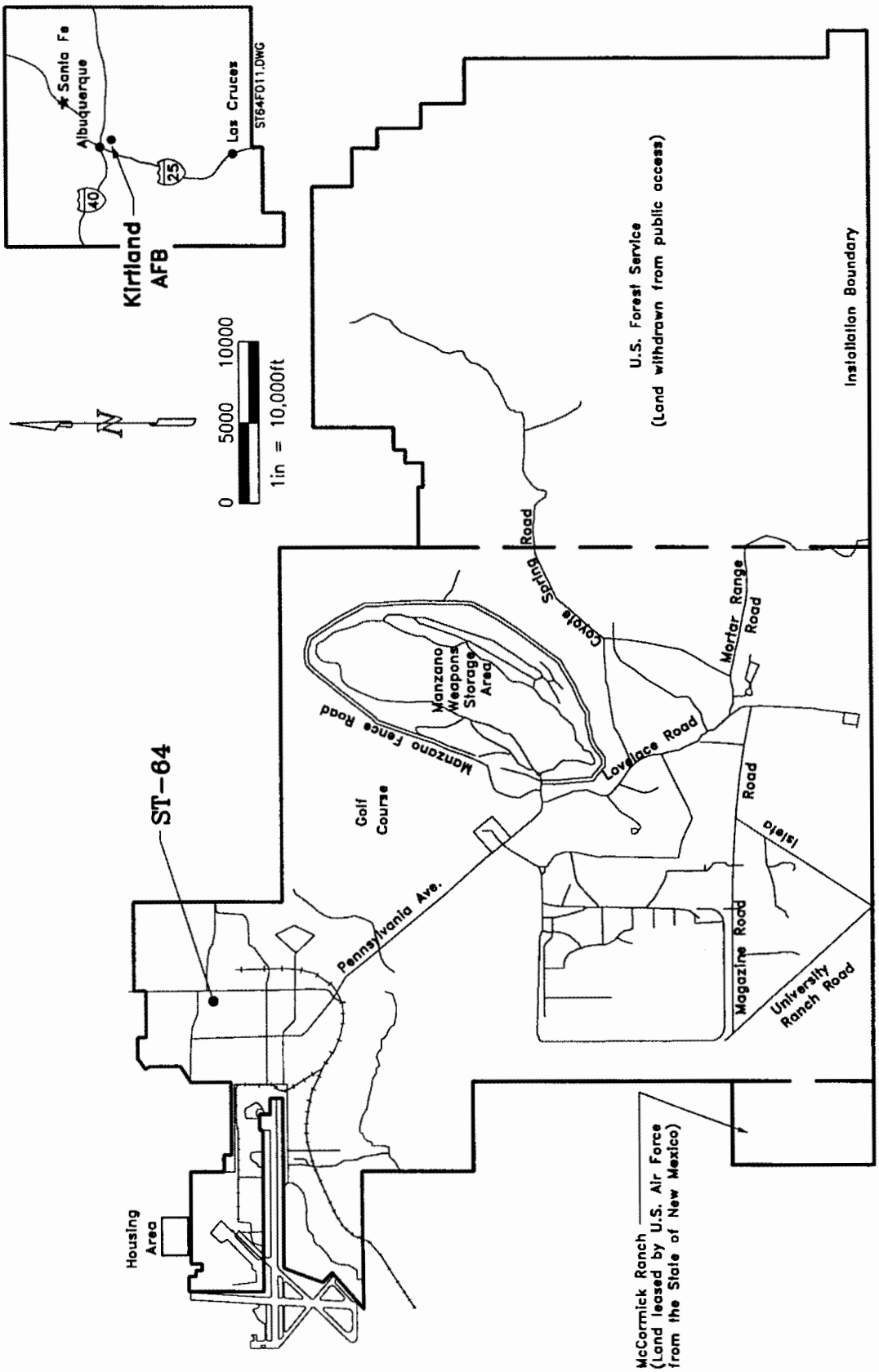


Figure 1-1. Site Location Map

2. BACKGROUND INFORMATION

A site map of SWMU ST-64 at Kirtland AFB is depicted in Figure 2-1. This includes the limits of the excavation for the Interim Correctives Measures (ICM) currently being performed at the site. SWMU ST-64 is located at 4th Street and G Avenue in the northwest portion of Kirtland AFB. This SWMU is the former U.S. Army Corps of Engineers Vehicle Maintenance Yard, which is adjacent to the site where Building 20212 was located (building has recently been demolished). A soil/gravel area was previously used for the aboveground storage of liquid waste generated by the vehicle maintenance facility. Six 55-gallon drums, placed on wooden pallets, were used to store liquid waste including motor oil, brake fluid, and antifreeze. Contamination in the soil was identified during the Appendix III RFI. Results of the RFI are discussed in Section 2.1.

2.1 Results of Previous Investigations

This site was initially investigated during Phase I of the Appendix III RFI (USAF, 1995a). Samples were collected from five boreholes (ST-337C-01 through -05). Borehole ST-337C-01 was installed at a background location. The remaining holes (ST-337C-02 through -05) were installed in an area exhibiting surface soil staining. All soil samples were analyzed for volatile organic compounds (VOCs) (EPA Method 8240), semi-volatile organic compounds (SVOCs) (EPA Method 8270), total petroleum hydrocarbons (TPH) (EPA Method 8015 Modified), target analyte list (TAL) metals (EPA Method 6010), and polychlorinated biphenyls (PCBs)/pesticides (EPA Method 8080). The analytical results are presented in Table 2-1, with only those compound concentrations that exceeded the method detection limits reported. The results also are summarized below.

- Seven VOCs were detected; all concentrations were significantly below U.S. EPA Region 6 human health risk-based (HHRB) screening levels (EPA, 1996).

- Eighteen SVOCs were detected, with five at concentrations above HHRB screening levels: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno (123-c,d)pyrene. SVOCs above HHRB action levels were found in samples collected from 0 to 2 ft in boreholes ST-337C-02, ST-337C-04, and ST-337C-05. Other SVOCs detected in samples collected at this site were bis(2-ethylhexy)phthalate, di-n-butylphthalate, 2-methylnaphthalene, naphthalene, and phenol; none of these compounds was above HHRB screening levels.

- Diesel range organics (DRO) were detected in nine samples at concentrations ranging from 7.9 to 5,600 milligrams per kilograms (mg/kg). Four samples, collected from 0 to 13 ft in boreholes ST-337C-02 and ST-337C-03, contained concentrations in excess of the 100 mg/kg NMED TPH action level.

- Gasoline range organics (GRO) were detected in five samples at concentrations ranging from 0.29 to 150 mg/kg. One sample (ST-337C-03-0508) contained a concentration in excess of the 100 mg/kg NMED TPH action level (150 mg/kg).

- Arsenic and beryllium were the only metals detected at concentrations exceeding HHRB screening levels. Arsenic was detected in four samples at concentrations above the 6.5 mg/kg upper tolerance limit (UTL). These concentrations are naturally occurring throughout Kirtland AFB (USAF, 1995b).

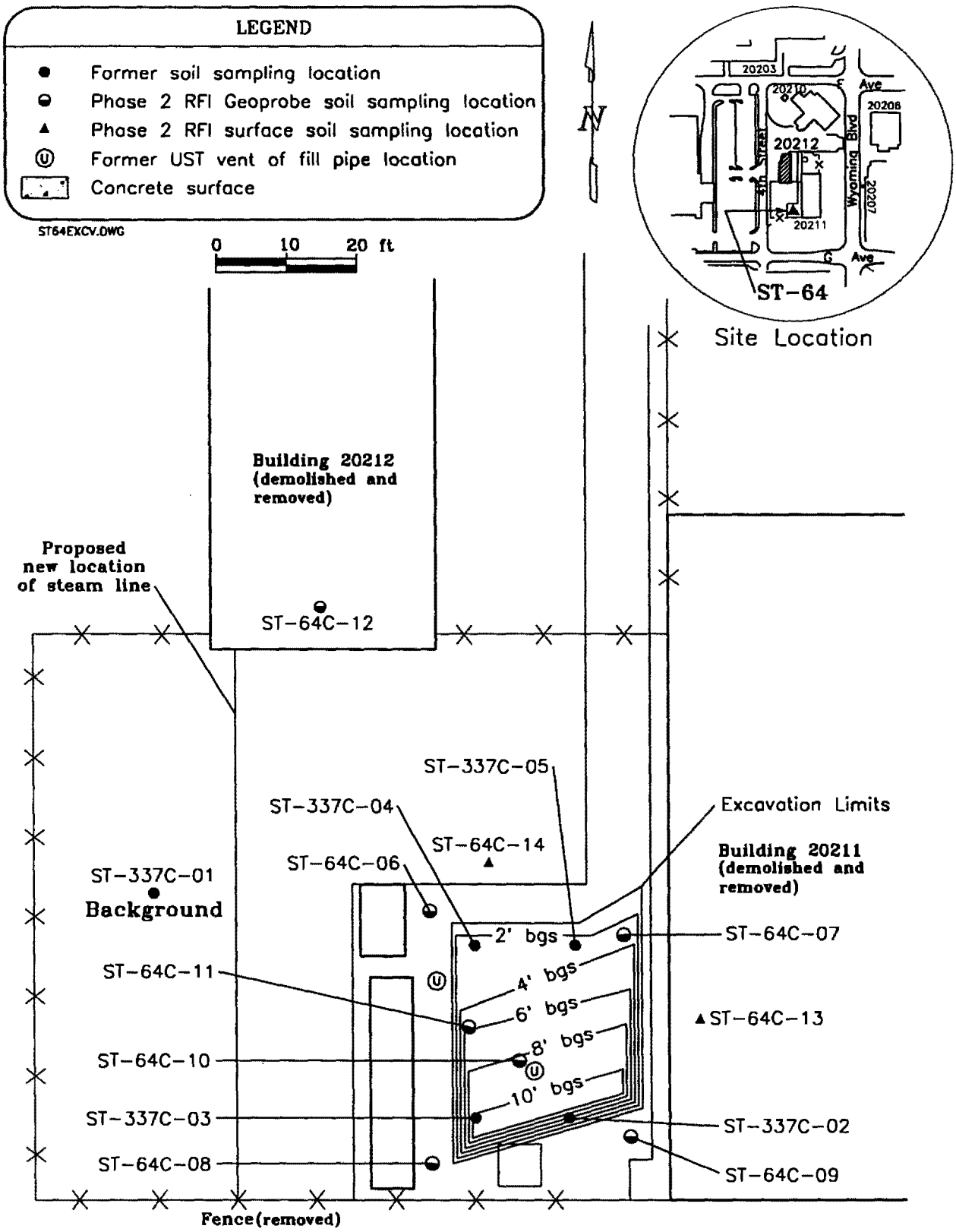


Figure 2-1. Site Map

Table 2-1. Summary of Appendix III Phase 1 RFI Reportable Analytical Results

Chemical Class	Analyte	HHRB Screening Level	Borehole Number and Sample Depth Interval (Concentrations in mg/kg)							
			ST337-01		*ST337C-02*			*ST337C-03*		
			5-7	10-12	0-2	5-8	10-13	0-2	5-8	10-13
VOC	Acetone	2,000	ND	0.006	0.004	0.003	ND	ND	0.18	0.087
	Ethylbenzene	2,900	ND	ND	ND	ND	ND	ND	3.2	1.8
	Methyl ethyl ketone	8,700	ND	ND	ND	ND	ND	ND	0.023	0.009
	Methyl isobutyl ketone	5,200	ND	ND	ND	ND	ND	ND	0.009	ND
	Methylene chloride	11.0	0.003	0.003	0.004	0.014	0.013	0.01	0.006	0.008
	Toluene	1,900	ND	0.003	ND	ND	ND	ND	0.003	0.003
	Total Xylenes	980	ND	ND	ND	ND	ND	ND	3.1	0.26
SVOC	Acenapthene	360	ND	ND	0.44	ND	ND	ND	ND	ND
	Anthracene	19.0	ND	ND	0.60	ND	ND	ND	ND	ND
	Benzo(a)anthracene	0.60	ND	ND	**2.6**	ND	ND	ND	ND	ND
	Benzo(a)pyrene	0.06	ND	ND	**1.8**	ND	ND	ND	ND	ND
	Benzo(b)fluoranthene	0.60	ND	ND	**3.5**	ND	ND	ND	ND	ND
	Benzo(g,h,i)perylene	N/A	ND	ND	**1.2**	ND	ND	ND	ND	ND
	Benzo(k)fluoranthene	6.1	ND	ND	1.5	ND	ND	ND	ND	ND
	bis(2-ethylhexyl)Phthalate	32.0	ND	ND	ND	ND	ND	ND	ND	ND
	Chrysene	24.0	ND	ND	3.2	ND	ND	ND	ND	ND
	di-n-Butylphthalate	6,500	ND	ND	ND	ND	ND	ND	ND	ND
	Dibenz(a,h)anthracene	0.06	ND	ND	**0.57**	ND	ND	ND	ND	ND
	Fluoranthane	2,600	ND	ND	6.3	ND	0.55	ND	ND	ND
	Indeno(1,2,3-c,d)pyrene	0.60	ND	ND	**1.2**	ND	ND	ND	ND	ND
	2-Methylnaphthalene	N/A	ND	ND	ND	ND	ND	ND	50.0	59.0
	Naphthalene	800	ND	ND	ND	ND	ND	ND	11.0	13.0
	Phenanthrene	N/A	ND	ND	3.2	ND	ND	ND	ND	ND
	Phenol	39,000	ND	ND	ND	ND	ND	ND	ND	ND
	Pyrene	2,000	ND	ND	5.0	ND	ND	ND	ND	ND
TPH	Diesel Range Organics	100	ND	9.9	46.0	93.0	**140**	**3,300**	**5,600**	**4,400**
	Gasoline Range Organics	100	ND	ND	ND	0.37	0.45	ND	**150**	86.0
METALS	Aluminum	77,000	5,450	3,750	6,860	8,090	9,580	10,800	9,750	6,660
	Arsenic	0.32 [2]	3.1	2.7	9.5	3.7	3.8	10.6	3.6	2.3
	Barium	5,300	153	100	160	236	221	176	200	168
	Beryllium	0.14 [2]	0.45	0.33	0.43	0.58	0.55	0.56	0.56	0.33
	Cadmium	38.0	ND	ND	0.54	ND	ND	ND	ND	ND
	Calcium	N/A	36,900	48,200	44,600	48,500	46,600	41,700	47,300	71,800
	Chromium, Total	210	8.6	11.6	11.6	11.0	6.9	7.6	10.2	6.5
	Cobalt	4,700	5.0	5.7	5.7	7.5	5.8	6.6	5.6	4.1
	Copper	2,800	16.0	20.8	20.8	22.8	14.3	13.7	31.3	17.6
	Iron	23,000	8,690	10,100	10,100	12,100	14,100	14,500	14,200	9,850
	Lead	400	6.5	37.5	37.5	8.0	10.6	8.9	5.5	3.4
	Magnesium	N/A	3,820	2,190	3,870	5,430	4,250	4,600	4,250	3,490
	Manganese	380	194	219	219	274	211	197	177	120
	Nickel	1,500	8.3	9.3	9.3	13.0	18.3	10.2	7.9	5.9
	Potassium	N/A	971	1,630	1,630	1,380	1,770	2,250	1,660	1,070
	Sodium	N/A	83.2	62.9	89.1	117	198	106	138	151
	Vanadium	540	18.8	11.9	20.8	25.4	31.6	31.0	33.0	23.5
	Zinc	23,000	30.3	36.8	67.2	41.7	30.7	37.1	30.4	22.2
PESTICIDES	DDE	1.3	ND	ND	ND	ND	ND	ND	ND	0.006
	DDT	1.3	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

1) HHRB Screening Level - EPA Region 6 human health risk-based residential screening level

2) Arsenic and beryllium concentrations are considered to be background concentrations rather than being attributable to anthropogenic activities at the site.

3) Concentrations in excess of screening levels are shown in bold and shaded.

Table 2-1. Summary of Appendix III Phase 1 RFI Reportable Analytical Results (Continued)

Chemical Class	Analyte	HHRB Screening Level	Borehole Number and Sample Depth Interval (Concentrations in mg/kg)						
			ST337C-04				*ST337C-05*		
			0-2	5-7	10-12	30-32	0-2	5-8	10-13
VOC	Acetone	2,000	ND	ND	0.007	ND	ND	0.014	0.005
	Ethylbenzene	2,900	ND	ND	ND	ND	ND	ND	ND
	Methyl ethyl ketone	8,700	ND	ND	ND	ND	ND	0.004	ND
	Methyl isobutyl ketone	5,200	ND	ND	ND	ND	ND	ND	ND
	Methylene chloride	11.0	0.005	0.004	0.004	0.003	0.005	0.005	0.004
	Toluene	1,900	0.018	ND	ND	ND	ND	ND	ND
	Total Xylenes	980	0.026	ND	ND	ND	ND	ND	ND
	Acenapthene	360	ND	ND	ND	ND	ND	ND	ND
	Anthracene	19.0	ND	ND	ND	ND	0.36	ND	ND
	Benzo(a)anthracene	0.60	0.37	ND	ND	ND	**0.87**	ND	ND
	Benzo(a)pyrene	0.06	**0.41**	ND	ND	ND	0.77	ND	ND
	Benzo(b)fluoranthene	0.60	0.48	ND	ND	ND	**0.69**	ND	ND
	Benzo(g,h,i)perylene	N/A	ND	ND	ND	ND	0.40	ND	ND
	Benzo(k)fluoranthene	6.1	0.38	ND	ND	ND	0.77	ND	ND
	bis(2-ethylhexyl)Phthalate	32.0	ND	ND	ND	0.45	ND	ND	ND
	Chrysene	24.0	0.47	ND	ND	ND	0.95	ND	ND
	di-n-Butylphthalate	6,500	ND	0.47	ND	0.49	ND	ND	ND
	Dibenz(a,h)anthracene	0.06	ND	ND	ND	ND	ND	ND	ND
	Fluoranthane	2,600	0.82	ND	ND	ND	2.1	ND	ND
	Indeno(1,2,3-c,d)pyrene	0.60	ND	ND	ND	ND	0.41	ND	ND
	2-Methylnaphthalene	N/A	ND	ND	ND	ND	ND	ND	ND
	Naphthalene	800	ND	ND	ND	ND	ND	ND	ND
	Phenanthrene	N/A	ND	ND	ND	ND	1.5	ND	ND
	Phenol	39,000	ND	0.54	0.58	ND	ND	ND	ND
	Pyrene	2,000	0.66	ND	ND	ND	1.7	ND	ND
TPH	Diesel Range Organics	100	7.9	ND	ND	ND	31.4	ND	ND
	Gasoline Range Organics	100	0.29	ND	ND	ND	ND	ND	ND
METALS	Aluminum	77,000	11,300	9,490	5,990	4,340	10,600	7,210	8,980
	Arsenic [2]	0.32 [2]	17.1	3.4	3.3	1.1	10.9	2.1	2.8
	Barium	5,300	125	224	94.8	67.7	191	179	137
	Beryllium [2]	0.14 [2]	0.54	0.54	0.42	0.31	0.54	0.43	0.43
	Cadmium	38.0	ND	ND	ND	ND	ND	ND	ND
	Calcium	N/A	27,500	31,100	33,000	17,600	33,700	31,500	49,400
	Chromium, Total	210	9.5	1.1	5.5	5.2	8.2	10.6	6.7
	Cobalt	4,700	6.4	6.1	4.2	6.5	6.4	5.2	5.3
	Copper	2,800	14.2	29.9	76.2	76.3	13.5	58.6	11.2
	Iron	23,000	14,700	13,500	8,820	13,000	14,400	10,400	10,900
	Lead	400	20.4	4.2	3.9	3.8	14.9	4.1	5.0
	Magnesium	N/A	4,090	4,450	2,450	2,870	4,200	3,700	3,400
	Manganese	380	215	205	105	189	221	169	119
	Nickel	1,500	9.2	8.6	5.5	11.3	8.2	6.7	7.7
	Potassium	N/A	2,460	1,750	974	1,000	2,230	1,240	1,400
	Sodium	N/A	107	286	263	148	161	196	200
	Vanadium	540	31.7	29.0	21.0	24.4	31.5	21.7	26.4
	Zinc	23,000	37.2	37.3	44.5	46.3	34.2	42.6	21.4
PESTICIDES	DDE	1.3	0.008	ND	ND	ND	0.052	ND	ND
	DDT	1.3	0.022	ND	ND	ND	ND	ND	ND

Notes:

1) HHRB Screening Level - EPA Region 6 human health risk-based residential screening level

2) Arsenic and beryllium concentrations are considered to be background concentrations rather than being attributable to anthropogenic activities at the site.

3) Concentrations in excess of screening levels are shown in bold and shaded.

- Two pesticides, 1,1-bis(chlorophenyl)-2,2-dichlorethene (DDE) and 1,1-bis(chlorophenyl)-2,2,2-trichloroethane (DDT), were detected at concentrations significantly below HHRB screening levels.

Follow-on sampling was conducted during the Appendix III Phase 2 RFI (USAF, 1997). Eight boreholes (ST-64C-06 through ST-64C-13) were sampled at 0- to -2, 5- to 7-, 10- to 12-, and 20- to 22-ft belowground surface (bgs). Additional samples were collected at 10-ft intervals at ST-64C-06 (to 52 ft), ST-64C-09 (to 42 ft), ST-64C-11 (to 32 ft), and ST-64C-13 (to 42 ft) due to elevated photoionization detector (PID) readings. Two surface soil samples (ST-64C-14 and ST-64C-15) were collected in an area formerly covered by a concrete slab. All samples were analyzed for VOCs, SVOCs, and TPH. The analytical results are presented in Table 2-2, with only those compound concentrations that exceeded the method detection limits reported. The results also are summarized below:

- No VOCs were detected in any of the samples collected during the Phase 2 RFI.

- Thirteen SVOCs were detected, all below the HHRB screening levels.

- Diesel range hydrocarbons were detected at concentrations exceeding the 100 mg/kg NMED TPH action level in the 0- to 2-ft samples from boreholes ST-64C-07 (160 mg/kg), ST-64C-10 (420 mg/kg), and ST-64C-11 (170 mg/kg).

2.2 Work Plan and Rationale

Based on the RFI results, a CMS has been recommended for this site.

The CMS consists of four tasks:

Task 1: Identification and Development of the Corrective Measure Alternative or Alternatives
- A. Description of Current Situation
- B. Establishment of Corrective Action Objectives
- C. Laboratory and Bench-Scale Study (if required)
- D. Screening of Corrective Measures Technologies
- E. Identification of the Corrective Measure Alternative or Alternatives

Task 2: Evaluation of the Corrective Measure Alternative or Alternatives
- A. Technical/Environmental/Human Health/Institutional
- B. Cost Estimate

Task 3: Justification and Recommendation of the Corrective Measure or Measures
- A. Technical
- B. Environmental
- C. Human Health

Task 4: Reports
- A. Progress
- B. Draft (internal)
- C. Proof (internal)
- D. Final Draft (submitted to NMED and EPA)
- E. Final (submitted to NMED and EPA)

Table 2-2. Summary of Appendix III Phase 2 RFI Reportable Analytical Results (Concentrations in mg/kg)

Chemical Class	Analyte	HHRB [1] Screening Level	Borehole Number and Sample Depth Interval								
			ST-64C-06		*ST-64C-07*			*ST-64C-08*			*ST-64C-09*
			30–32	*50–52*	*0–2*	*0–2*	*20–22*	*0–2*	*10–12*	*20–22*	*0–2*
TPH	Diesel Range	100	4.4	17.0	64.0	**160** [2]	7.8	33.0	6.4	7.4	6.0
	Gasoline Range	100	<0.21	<0.21	<0.20	NA	<0.21	<0.20	<0.22	<0.21	<0.21

Chemical Class	Analyte	HHRB [1] Screening Level	Borehole Number and Sample Depth Interval							
			ST-64C-10				*ST-64C-11*	*ST-64C-12*	*ST-64C-13*	*ST-64C-14*
			0–2	*0–2*	*5–7*	*20–22*	*0-2*	*5–7*	*40–42*	*0–2*
TPH	Diesel Range	100	**420**	26.0	85.0	8.3	**170**	<5.0	9.2	5.8
	Gasoline Range	100	<0.21	<5.0	6.1	<0.21	<5.0	11.0	<0.22	<0.21

Notes:

1) HHRB Screening Level - EPA Region 6 human health risk-based residential screening level

2) Concentrations in excess of screening levels are shown in bold and shaded.

The following sections discuss the work to be performed under each of these tasks.

Task 1: Identification and Development of the Corrective Measure Alternative or Alternatives

In this task, alternatives for removal, containment, treatment, and/or other remediation of the contamination will be identified, screened, and developed based on the objectives established for the corrective action. The alternatives developed will be based upon the results of the RCRA RFI at the site and the appropriate regulatory guidelines. The identification and development of the corrective measure alternatives will consist of the following subtasks.

A. Description of Current Situation

The information describing the current situation at the SWMU and the known nature and extent of the contamination as documented by the RFI report will be updated to include any changes since the RFI report. This will include information on previous response activities and any interim measures that have or are being implemented at the site. The description of the current situation will also include a site-specific statement of the purpose for the response, based on the results of the RFI. The statement of purpose will identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. Establishment of Corrective Action Objectives

The CMS will present site-specific objectives for the corrective action. These objectives will be developed in conjunction with EPA and NMED, and will be based on:

1. Public health and environmental criteria
2. Information gathered during the RFI
3. EPA and NMED guidance
4. Requirements of any applicable federal statutes

At a minimum, all corrective action objectives concerning groundwater releases from regulated units will be consistent with, and as stringent as, those required under 40 CFR 264.100.

C. Laboratory and Bench-Scale Study

If a new technology or a new application of an existing technology is proposed in the CMS, laboratory and/or bench-scale studies will be performed to determine the applicability of the technology. The testing requirements will be determined based on literature review, vendor contacts, and past experience.

Before the tests are performed, a test plan will be developed and submitted to NMED and EPA. The test plan will identify the type(s) and goal(s) of the study, the level of effort needed, and the procedures to be used for data management and interpretation.

Upon completion of the test, the test results will be evaluated with respect to the site-specific questions identified in the test plan. A report that summarizes the test results will then be prepared and submitted to NMED and EPA.

D. Screening of Corrective Measure Technologies

The preliminary corrective measure technologies and any supplemental technologies will be screened 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 will focus on eliminating those technologies that have severe limitations for the conditions at ST-64. The screening step may also eliminate technologies based on inherent technology limitations. Site waste and technology characteristics that will be used to screen inapplicable technologies are described in more detail below:

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

2. **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 will be eliminated from consideration. Waste characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (onsite/offsite).

3. **Technology Limitations.** During the screening process, the level of technology development, performance record, and inherent construction, operation, and maintenance problems will be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated will be eliminated in the screening process.

E. Identification of the Corrective Measure Alternative or Alternatives

Corrective measure alternative or alternatives will be identified based on the corrective action objectives and analysis of Preliminary Corrective Measure Technologies. Engineering practice will be used to determine which of the previously identified technologies appear most suitable for the site. Technologies may be combined to form the overall corrective action alternative or alternatives. The alternative or alternatives developed will 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. The reasons for excluding technologies will be documented during this phase.

Task 2: Evaluation of the Corrective Measure Alternative or Alternatives

During this task, each corrective measure alternative that passes through the Initial Screening will be described and evaluated. The evaluation will be based on technical, environmental, human health, and

institutional concerns. Cost estimates for implementation of each corrective measure will also be developed.

A. Technical/Environmental/Human Health/Institutional

A description of each corrective measure alternative will be developed, which includes, but is not limited to, the following:

1. Preliminary process flow sheets
2. Preliminary sizing and type of construction for buildings and structures
3. Rough quantities of utilities required

Each alternative will be evaluated in the four following areas:

1. **Technical.** Each corrective measure alternative will be evaluated based on performance, reliability, implementability, and safety.

   a. Performance will be evaluated based on the effectiveness and useful life of the corrective measure:

      i) Effectiveness will be evaluated in terms of the ability to perform intended functions (such as containment, diversion, removal, destruction, or treatment). The effectiveness of each corrective measure will be determined either through design specifications or by performance evaluation. Any specific waste or site characteristics that could potentially impede effectiveness will be considered. The evaluation will also consider the effectiveness of combinations of technologies.

      ii) Useful life is defined as the length of time the level of effectiveness can be maintained. Most corrective measure technologies, with the exception of destruction or natural attenuation, deteriorate with time. Often, deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. Each corrective measure will be evaluated in terms of the projected service lives of its component technologies. Resource availability in the future life of the technology, as well as appropriateness of the technologies, will be considered in estimating the useful life of the project.

   b. The reliability of each corrective measure including their operation and maintenance requirements and their demonstrated reliability will be evaluated, including:

      i) Operation and maintenance requirements (the frequency and complexity of necessary operation and maintenance). Technologies requiring frequent or complex operation and maintenance activities will be regarded as less reliable than technologies requiring little or straightforward operation and

maintenance. The availability of labor and materials to meet these requirements will also be considered.

ii) Demonstrated and expected reliability, as a way of measuring the risk and effect of failure. It will be determined whether the technologies have been used effectively under analogous 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.

c. The implementability of each corrective measure including the relative ease of installation (constructability) and the time required to achieve a given level of response will be described, including:

i) Constructability, as determined by conditions both internal and external to the facility conditions and including such items as location of underground utilities, depth to water table, heterogeneity of subsurface materials, and location of the site (i.e., remote location vs. a congested urban area). The measures that can be taken to facilitate construction under these conditions will be determined. External factors that affect implementation include the need for special permits or agreements, equipment availability, and the location of suitable offsite treatment or disposal facilities.

ii) 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.

d. Each corrective measure alternative will be evaluated with regard to safety. This evaluation will include threats to the safety of nearby communities and environments as well as those to workers during implementation. Factors to be considered are fire, explosion, and exposure to hazardous substances.

2. **Environmental.** An Environmental Assessment will be performed for each alternative. The Environmental Assessment will focus on the site conditions and pathways of contamination actually addressed by each alternative. The Environmental Assessment for each alternative will include, at a minimum, an evaluation of:

a. Short-term beneficial and adverse effects of the response alternative; adverse effects on environmentally sensitive areas

b. Long-term analysis of measures to mitigate adverse effects

3. **Human Health.** Each alternative will be assessed in terms of the extent to which it mitigates short- and long-term potential exposure to any residual contamination and protects human health both during and after implementation of the corrective measure. The assessment will describe the levels and characterizations of contaminants onsite, potential exposure routes, and potentially affected population. Each alternative will be evaluated to determine the level of exposure to contaminants and the reduction over time. For management of mitigation measures, the relative reduction of impact will be determined by comparing residual levels of each alternative with existing criteria, standards, or guidelines acceptable to EPA and NMED.

4. **Institutional.** The relevant institutional needs will be assessed for each alternative. Specifically, the effects of federal, state, and local environmental and public health standards, regulations, guidance, advisories, ordinances, or community relations on the design, operation, and timing of each alternative will be evaluated.

B. Cost Estimate

An estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative) will be developed. The cost estimate will 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:

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

   b. Indirect capital costs include:

      i) Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives
      ii) Legal fees and license of 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

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 following operation and maintenance cost components will be considered:

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. Auxillary 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: Annual payments into escrow funds to cover (1) costs of anticipated replacement or rebuilding of equipment and (2) any large unanticipated operation and maintenance costs

i. Other costs: Items that do not fit any of the above categories

Task 3: Justification and Recommendation of the Corrective Measure or Measures

The CMS report will present justification and recommend corrective measures alternative(s) based upon technical, human health, and environmental criteria. These recommendations will include summary tables, which allow the alternative or alternatives to be understood easily. Tradeoffs among health risks, environmental effects, and other pertinent factors will be highlighted. The corrective measure alternative

or alternatives to be implemented will be selected based on the results of Tasks 2 and 3. At a minimum, the following criteria will be used to justify the final corrective measure or measures.

A. Technical

1. **Performance**—Corrective measure or measures that are most effective at performing their intended functions and maintaining the performance over extended periods of time will be given preference.

2. **Reliability**—Corrective measure or measures that do not require frequent or complex operation and maintenance activities and that have proven effective under waste and facility conditions similar to those anticipated will be given preference.

3. **Implementability**—Corrective measure or measures that can be constructed and operating to reduce levels of contamination to attain or exceed applicable standards in the shortest period of time will be preferred.

4. **Safety**—Corrective measure or measures that pose the least threat to the safety of nearby residents and environments as well as workers during implementation will be preferred.

B. Human Health

The corrective measure or measures must comply with existing EPA criteria, standards, or regulations for the protection of human health. Corrective measures that provide the minimum level of exposure to contaminants and the maximum reduction in exposure with time are preferred.

C. Environmental

The corrective measure or measures posing the least adverse impact (or greatest improvement) over the shortest period of time on the environment will be favored.

Task 4: Reports

A CMS report presenting the results of Tasks 1 through 4 and recommending a corrective measure alternative will be prepared and submitted to NMED and EPA Region VI. Two copies of the preliminary report shall be provided by the Air Force to NMED and two copies will be provided to EPA.

A. Progress

As required by the Part B Permit, the Air Force will at a minimum provide EPA with signed, quarterly (or at some other agreed-upon frequency) progress reports containing:

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

2. Summaries of all contacts with representative of the local community, public interest groups, or state government during the reporting period

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

4. Actions being taken to rectify problems

5. Changes in personnel during reporting period

6. Projected work for the next reporting period

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

B. Final Draft

A final draft CMS report will be submitted to EPA and NMED. This report will at a minimum include:

1. A description of the site

    a. Site topographic map and preliminary layouts

2. A summary of the corrective measure or measures

    a. Description of the corrective measure or measures and rationale for selection
    b. Performance expectations
    c. Preliminary design criteria and rationale
    d. General operation and maintenance requirements
    e. Long-term monitoring requirements

3. A summary of the RFI and impact on the selected corrective measure or measures

    a. Field studies (groundwater, surface water, soil, air)
    b. Laboratory studies (bench-scale, pilot-scale)

4. Design and implementation precautions

    a. Special technical problems
    b. Additional engineering data required
    c. Permits and regulatory requirements
    d. Access, easements, rights-of-way
    e. Health and safety requirements
    f. Community relations activities

5. Cost estimates and schedules

    a. Capital cost estimate
    b. Operation and maintenance cost estimate

c. Project schedule (design, construction, operation). Two copies of the final draft will be provided by the Air Force to EPA and two copies will be provided to NMED

C. Final

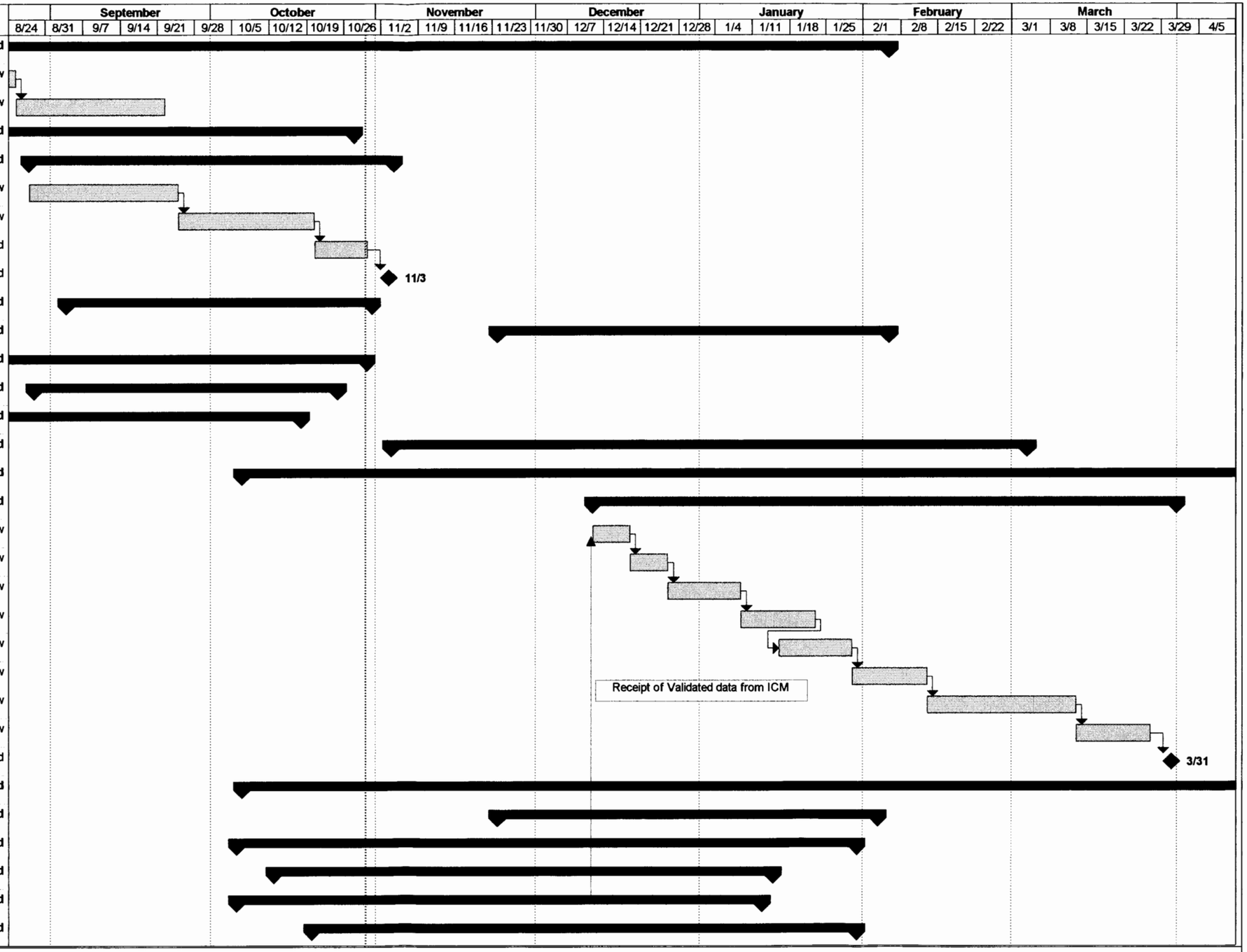
The Air Force will finalize the CMS report incorporating comments received from EPA and NMED on the Draft CMS report.

2.3 Deliverable Summary

A summary of the information reporting requirements contained in the CMS Scope of Work is presented below and in Figure 2-2.

Deliverable	Due Date
Draft CMS Report to the Air Force for review	60 days after receipt of data from the ICM
Final Draft CMS Report to EPA and NMED	Two weeks after receipt of Air Force comments
Final CMS Report	60 days after receipt of public and EPA comment on the Draft CMS
Progress Reports	Quarterly (unless modified by NMED and EPA)

ID	Task Name	Duration
1	**TASK 1- MOD1 WORKPLANS**	**141d**
2	1.1 - Project Planning/Scoping Meetings, Pre-Survey	4.5w
3	1.2 - Project Schedule	4w
4	**1.3 ST-346 SAP Addendum**	**48d**
9	**1.4 ST-64 CMS Workplan**	**48.5d**
10	1.4.1- Draft Workplans	4w
11	1.4.2 - KAFB Draft Review	3.5w
12	1.4.3 - Final Draft Workplans	8d
13	1.4.4 - Final Draft Workplans to EPA and NMED	1d
14	**1.5 RW-68 CMS Workplan**	**41.5d**
19	**1.6 ST-70 CMS Workplan**	**54d**
26	**1.7 ST-70 ICM Workplan**	**50.5d**
31	**1.8 WP-58 ICM Workplan**	**41d**
36	**1.9 ST-64 ICM Workplan**	**42d**
41	**TASK 2- ST-346 RFI Activities**	**86d**
51	**TASK 3- CORRECTIVE MEASURES STUDIES AT ST-64, RW-68**	**164d**
52	**3.1 CMS at ST-64**	**78d**
53	3.1.1 ID Corrective Measures Technologies	1w
54	3.1.2 Corrective Measures Technologies Memorandum	1w
55	3.1.3 ID Corrective Measures Alternatives	2w
56	3.1.4 Cost Estimate	2w
57	3.1.5 Corrective Measures Alternatives Memorandum	2w
58	3.1.6 Draft CMS Report	2w
59	3.1.7 Kirtland Review of Draft CMS Report	4w
60	3.1.8 Final Draft CMS Report	2w
61	3.1.9 Final Draft CMS Report to EPA and NMED	1d
62	**3.2 CMS at RW-68**	**164d**
81	**3.3 CMS at ST-70**	**52d**
93	**TASK 4- INTERIM CORRECTIVE MEASURES AT ST-70, WP-58**	**85d**
94	**4.1 ICM at ST-70**	**68d**
108	**4.2 ICM ST-64**	**71d**
122	**4.3 ICM WP-58**	**75d**



Project Schedule
Revised 10/30/97

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

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USAF, 1995b. *Kirtland Air Force Base-Wide Plans for the Installation Restoration Program,* Kirtland Air Force Base, Albuquerque, New Mexico, March 1995.