RCRA PART B PERMIT APPLICATION

HOLLOMAN AFB 20,000-POUND

EXPLOSIVE DISPOSAL AREA

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Prepared for
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LIST OF ACRONYMS

AFB	Air Force Base
AFCC	Air Force Communications Command
AFLC	Air Force Logistics Command
AFSC	Air Force Satellite Command
ALMC	Army Logistics Management Command
ASTM	American Society for Testing and Materials
BLS	below land surface
CFR	Code of Federal Regulations
COR	Contracting Officer Representative
DDNP	diazodinitrophenol
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
DRMR	Defense Reutilization and Marketing Region
DRMS	Defense Reutilization and Marketing Service
EAV	Environmental Quality Assurance Visits
ED	explosive disposal (30,000 Explosive Ordnance disposal Facility)
EOD	explosive ordnance disposal
EPA	U.S. Environmental Protection Agency
EP	Extraction Procedure, Method 1310 (per 40 CFR 261, Apps. II and III)
FML	flexible membrane liner
GC	gas chromatography
HMDI	hexamethylene diisocyanate
HMIS	Hazardous Material Information System
HMX	cyclotetramethylenete tetranitramine
Kcal/mol	thousand calories per mole
MEK	methyl ethyl ketone
MIBK	methyl isobutyl ketone
MILSPEC	military specification
MOBSS	Mobility Support Squadron
MS	mass spectroscopy
MSDS	Material Safety Data Sheet
MSL	mean sea level
MT	Moving Trench (300 Pound Moving Trench Facility)
NAAQS	National Ambient Air Quality Standards
NC/NG	nitrocellulose/nitroglycerin
NDI	Nondestructive Inspection
NEMA	National Electrical Manufacturers Association
NMEID	New Mexico Environmental Improvement Division
NMHWR	New Mexico Hazardous Waste Rules
NRC	nonreusable container
NSN	National Stock Number
OSC	ON-Scene Coordinator
OEHL	Occupational and Environmental Health Laboratory
PCB	Polychlorinated biphenyl
PEL	permissible exposure limit
PETN	pentaerythrite tetranitrate
PELT	Paint Filters Liquid Test
PMEL	Precision Measurements Engineering Laboratory

LIST OF ACRONYMS (Continued)

PPE	personnel protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QPL	qualified product listing
RCRA	Resource Conservation and Recovery Act
RDX	trimethylene trinitramine
SCS	Satellite Communications Squadron
SP gr	specific gravity
SPR	Spill Prevention Response
SRT	Spill Response Team
STC	single trip container
TAC	Tactical Air Command
TCA	trichloroethane
TCE	trichloroethylene
TDI	toluene diisocyanate
TDB	total dissolved solids
tartly	trinitropheylmethylnitramine
TKN	total kjeldahl nitrogen
TO	Technical Order
TOC	total organic compounds
TOX	total organic halides
TSCA	Toxics Substance Control Act
TSDF	Treatment, Storage, and Disposal Facility
TNT	trinitrotoluene
USAF	United States Air Force
VOC	volatile organic compound

SECTION A

HAZARDOUS WASTE PERMIT APPLICATION

SECTION B

FACILITY DESCRIPTION

B-1 GENERAL DESCRIPTION

Holloman Air Force Base (AFB) is located on approximately 50,700 acres of land in Otero County of South-central New Mexico. The Facility lands are situated in the northern Chihuahuan Desert in the region known as the Tularosa Basin that is bounded to the east and west by the Sacramento and San Andres Mountains, respectively. The base is located adjacent to White Sands Missile Range and White Sands National Monument is located south of the base. Regional water supplies are derived from Bonita Lake located approximately 60 miles north of the base and the Boles, Douglas, and /San Andres Well Fields located 14 miles to the southeast.

The nearest population center is the city of Alamogordo located approximately 7 miles to the east. Regional metropolitan centers include El Paso, Texas, located 75 miles south-southwest and Albuquerque, New Mexico, located 210 miles north of the facility. The primary transportation route for the facility is Highway 70 that traverses the southern boundary of the base in a northeasterly direction. The general location of Holloman AFB is depicted in figure B-1, volume 2.

Holloman AFB was initiated as a temporary facility developed to provide gunnery and bomber training to aircrews during World War II. The base mission was altered in the postwar years to the development of pilotless aircraft, guided missiles, and associated equipment. In the late 1950s the base was transferred to the Air Force Systems Command (AFSC) and designated as the Air Force Missile Development Center. On January 1, 1971 , the base mission expanded to provide lead-in fighter training for the 479th Tactical Training Wing and its components..

Currently, Holloman AFB hosts the Air Combat Command (ACC) 49th Fighter Wing, which includes pilot training, mobility support, and combat support operations. The primary AFSC component located at Holloman AFB is the 6586th Test Group, which is responsible for evaluation of propulsion and navigational systems for aircraft, space vehicles and missiles. A variety of tenant organizations are assigned to Holloman AFB including the 4th Satellite Warning Squadron, the New Mexico State University Primate Research Laboratory, the 4th and 25th Weather Wing. A general layout of the facility is provided in Figure B-2, Vol 2.

As a result of ACC readiness requirements and the 46th Test Group activities, a variety of ordnance, munitions, incendiaries, and propellants become waste because of exceedance of shelf-life, unanticipated deterioration, or failure to attain specifications that render the device non-serviceable. These waste explosives are considered characteristically hazardous under the Resource Conservation and Recovery Act (RCRA) due to reactivity (D003). Rocket motors that exceed 300lbs are treated at the 20,000-Pound Explosive Disposal (20,000lb ED) Area that is the subject of this permit. These units are regulated under 40 CFR 264, Sub-part X, codifies at 40 CFR 264.600 et seq.

The 20,000lb ED Area consists of a clear zone of a clear zone of approximately 1680 feet in diameter. A graded circular area of approximately 200 feet encircles the treatment pits and has an earthen berm that ranges from approximately 1 to 2 feet in height. A firebreak of approximately 6 feet in width encircles the entire area and also serves as a security road for the unit.

The 20,000lb ED Area derives its name from the relevant operating procedures for this treatment activity. The total mass of solid propellant rocket motors that are simultaneously treated in the trench is limited to 20,000 pounds. This total includes the mass of the casings, other associated containment devices, and detonating charges. Although the precise number of treatment occurrences during any year is variable, discrete treatment events occur at typical frequencies of one event every 2-3 months. More specific information on ordnance constituents, trench construction, and operating procedures is provided in future sections.

The treatment zone is developed by excavation of two circular pits, approximately 20 feet apart, with approximate dimensions of 40 to 60 feet diameter and 10 feet in depth. Treatment of the wastes is accomplished by placement of the propellant item and C-4 charges into the deepest pit with the waste subsequently detonated. After completion of the detonation, the area is thoroughly inspected to ensure that the waste has been destroyed and to collect ejected residuals. Once inspection is completed, the pit is closed by backfilling with the original soil. The location of this unit and its surrounding area relative to the main base is provided in Figure B-3, Vol 2.

B-2 TOPOGRAPHIC MAP

The general requirements are met in a topographic map of the 20,000lb ED Area and the surrounding area in Figure B-4, Vol 2. The provided topographic map indicates that the unit is located in relatively flat terrain for above the 100 year floodplain boundaries. No surface water of constant flow conditions is located in the area, although arroyos that contain runoff are located in the vicinity of the unit.

The topographic map delineates the area relief at intervals of 25 feet. the map scale of 1 inch equal to 400 feet is used in all Holloman AFB facility maps. Because of the cleared nature of the area and limited topographic relief, this topographic map delineates the area in the same detail as that provided by a scale of 1 inch equal to 200 feet.

B-2a SURROUNDING LAND USES

THE 20,000lb ED Area is located approximately 2600 feet within the northern boundary of Holloman AFB. White Sands Missile Range lies to the north and west of the adjacent base boundaries. All lands within Holloman AFB boundaries are under the control of the U.S. Air Force. Thus, the unit is surrounded by federal lands for a distance of several miles in all directions.

B-2b UNIT BOUNDARIES

The unit boundary is designated in Figure B-4. This figure also delineates the clear zone surrounding the unit which extends to a radial distance of 8150 feet. Holloman AFB facility boundaries are designated in Figure B-3, Vol 2.

B-2c WIND ROSE

Wind roses are provided separately in Exhibit E-6. Pertinent meteorological data, including wind dispersion modeling, are also provided in Section E-3.

B-2d ACCESS CONTROL

Access to the unit is provided by a single paved road that terminates at the entrance to the unit. Access is controlled by Test Track safety personnel with radio contact with the Track Control Facility.

B-2e INJECTION AND WITHDRAWAL WELLS

No injection or withdrawal wells are located within the unit's boundary or the adjacent area. There are no wells located within the clear zone surrounding these munitions areas. The location of groundwater wells within the boundaries of Holloman AFB and the location of wells in the areas adjacent to the base boundaries are discussed in Section E-1. Hydrogeologic data for Holloman AFB are also presented in Section E-1.

B-2f STRUCTURES

No buildings are located within the 20,000lb ED Area. All nonordnance-related structures located within the clear zone are vacated prior to operations and cordoned off during the operations.

B-2g RECREATION ACCESS

No recreation areas are located in the vicinity of the 20,000 ED Area.

B-2h RUNOFF CONTROL SYSTEMS

Runon and runoff control systems are not present in the vicinity of the 20,000lb ED Area. Such systems are unnecessary in the area of the unit due to limited precipitation received and the limited slope of the surrounding area.

B-2i ACCESS AND INTERNAL ROADS

The only access to the 20,000lb ED Area is a paved surface that terminates at the entrance to the unit.

B-2j STORM, SANITARY, AND PROCESS SEWERS

No storm sewers, sanitary, or process-related conveyances are located within the vicinity of the 20,000lb ED Area.

B-2k LOADING AND UNLOADING AREA

Explosive ordnance is unloaded strictly at the ground location at the time designated for the treatment event. Explosive wastes are generally transferred directly from the transfer vehicle to the pit. Procedures to prevent hazards during loading/unloading operations are addressed in Section F, "Procedures to Prevent Hazards".

B-2l FIRE CONTROL FACILITIES

There are no fire control facilities at the 20,000 ED Area. Immediate response fire control equipment, such as fire extinguishers and shovels, are brought to the unit during operations. Base Fire Department capability is available to respond to emergencies should such an event occur. The fire department is notified 24 hours prior to thermal treatment events.

B-2m SURFACE WATERS

Surface water flows in the vicinity of Holloman AFB are generally intermittent in nature. The topographic map provided as Figure B-4 indicates the boundaries for the 100-year and 500-year floodplains are not near the unit. Surface water flow patterns and draws that contain intermittent flow are further discussed in Section E-2.

B-2n FLOOD CONTROL/DRAINAGE BARRIERS

No structures for the control of flooding or drainage are present at the 20,000lb ED Area. An earthen berm of approximately 2 feet in height surrounds the entire treatment zone and provides some runon control. The unit is elevated sufficiently above the floodplain elevations that flooding potential is considered virtually nonexistent.

B-3 LOCATION INFORMATION

The 20,000lb ED Area is exempt from seismic considerations because the unit is located in Otero County which is not among the political jurisdictions designated in Appendix VI, 40 CFR 265.

B-3a FLOODPLAIN STANDARD

The 20,000lb ED Area is not located within the 100-year or 500-year floodplains of intermittent. The 100-year and 500-year floodplains are designated in the topographic map provided as Figure B-4. Additional information related to surface drainage patterns is provided in Section E-2, "Surface Media Assessment".

B-4 TRAFFIC INFORMATION

Access to the 20,000lb ED Area unit is provided by a single paved road. A dirt road provides access from paved road to the excavated pits. The pits are approximately on quarter mile from the paved road.

Traffic along this route is restricted to official use of the EOD personnel during explosive operations, but may be accessed by Test Track personnel who are needed during operations.

As a result of these restrictions, the typical traffic volume and pattern consist of a maximum of several vehicles per day that are in transit to or from the unit. The precautions taken to ensure safe transport of the waste to the unit are described in Sections D and F.

B-4a ACCESS ROAD SURFACE

The single access road to the unit designated in Figure B-3 is a paved surface. This surface is periodically maintained to prevent formation of holes, ditches, or other deformation that would increase the possibility of accidental detonation during transport.

B-4b LOAD-BEARING CAPACITY

The paved service road was graded and compacted to provide capacity for automobiles, light trucks, heavy trucks, and service vehicles.

SECTION C

WASTE CHARACTERISTICS

This section describes the physical and chemical characteristics of the waste that is thermally treated at the 20,000lb ED Area. The waste analysis plan that identifies sampling and analytical protocols is provided in Section C-2.

The 20,000lb ED Area consists of a cleared area with two pits which are excavated within this zone in order to thermally treat waste-propellant devices. The wastes that are treated in these excavations are considered characteristically hazardous on the basis of reactivity (D003). During treatment, a pit is partially filled with subject waste. Detonation charges that consist of cyclotrimethylene trinitramine (RDX) explosive are added to the pile in order to detonate the waste. The detonation reaction renders the explosive wastes nonreactive and results in both solid and gaseous by-products. Depending upon combustion conditions, the gaseous by-products will consist of carbon monoxide (CO), carbon dioxide (CO_2), water (H_2O), nitrogen (N_2), and various nitrogen oxides (NO_x). Solid by-products include casings from the waste and possibly trace concentrations of incompletely oxidized reactive material. Reaction by-products that are solid will be retained in the pit (except for ejected components), but the gaseous reaction by-products are allowed to vent to the atmosphere. Due to the difficulties and obvious hazards associated with collection of gas samples in the immediate vicinity of the detonation zone, this plan does not address the gas phase reaction by-products. An assessment of the gaseous constituents released during combustion is provided in a Section E-3.

C-1 CHEMICAL AND PHYSICAL ANALYSIS

The wastes that are treated in the 20,000lb ED Area are generally propellant devices. Only rocket motors that exceed the mass limit at the 300lb treatment area are regularly treated at the 20,000lb ED Area. Similar constituents are used in the formulation of the different items, but the quantity of specific energetic materials varies. In addition to the energetic material, the waste consists of the unit metallic components associated with these devices such as the casing. The total mass of the energetic material in typically limited to less than 1000 pounds per device. The energetic materials contained in these wastes are considered characteristically hazardous on the basis of reactivity (D003) or ignitability (D001). Nitroglycerin (P081) is listed on the basis of its reactivity. The reactive wastes are identified as such because these materials are explosives that deflagrate or detonate when subjected to shock or heat. The ignitable components of these wastes are strong oxidizers.

Single-base propellants contain nitrocellulose (with 12.5-13% N) as the primary constituent. In addition to nitrocellulose, single-base propellants contain organic nitro compounds, stabilizers, and metal salts. The organic nitrocompounds commonly employed in single-base systems include trinitrotoluene and dinitrotoluene. Organic nitro compounds are utilized to disperse the nitrocellulose as colloidal particles. Stabilizers are required in the composition due to the tendency of nitrocellulose to decompose during storage, particularly as moisture is absorbed. Decomposition of nitrocellulose is an exothermic reaction that is indicated initially by an acid odor or condition that progresses to emission of red fumes and spontaneous ignition as the propellant becomes unstable. Due to this condition, nitrocellulose-based propellants are stored in bulk, are vigorously monitored for pH changes, and are compounded with stabilizers used to retard decay. Typical stabilizers used to retard this condition include diphenylamine, nitrodiphenylamine, diethyl diphenylurea, and petroleum jelly (cordite). As decomposition proceeds, nitrophenylamines, nitroureas, and nitroanilines are formed. This variety of the analogs will be present in waste single-based propellants. However, as the original concentration of the stabilizer seldom exceeds 1.0%, the concentration of those decomposition products will be in the parts per thousand range.

In addition to nitrocellulose fuel, nitro-based dispersion agent, and stabilizer certain propellants incorporate small quantities of metal compounds and elements. These compounds include potassium sulfate, tin and graphite that are not characteristically hazardous.

Double-base propellant formulations include both nitrocellulose and nitroglycerin with limited quantities of stabilizers and additives. Nitroglycerin serves as both the gelatinizing agent and a fuel in these compositions. In addition to the nitroglycerin, small quantities of dibutylphthalate, diethyphthalate, or triacetin are compounded to enhance colloidal suspension of the nitrocellulose. The stabilizing agents for double-base compositions do not differ from the stabilizers common to single-base systems. However, the metallic additives for double-bas systems may include barium or potassium nitrate, calcium sulfate, calcium carbonate, or lead stearate in addition to the metallics used in single-base compositions.

The relative concentrations of these components in propellants varies depending upon the intended end use. In general, nitrocellulose is the predominant constituent and is present in concentrations of 50 to 70%. Nitroglycerin is the second largest constituent in the propellant composition. These two compounds constitute greater than 95% of the standard military double-base formulations. The addition of inerts and stabilizers provides the balance to greater than 99% of the formulation, with less than 1.0% of the formulation composed of various nitrates or lead stearate.

Composite propellants consist of ammonium pirate, an inorganic oxidant such as potassium nitrate, and an organic binder. These propellants are heterogeneous solids that may be press formed to the desired shape. Composite formulations are not handled at the 20,000lb ED Area.

Although the term "colloidal suspension" has been applied to propellants, these compositions are completely solid without free liquids. Physically, propellants compositions consist of powders that are incorporated into solid or waxlike binders and pressed into strips, cords, and other linear shapes. although dry nitrocellulose is unstable, incorporation of the binders renders the mixture relatively stable. Propellants, including double-base formulations, are not sensitive to shock and cannot be ignited by ordinary shock or frictional effects. Propellants are sensitive to electric spark only if the material has been finely divided as is present as dust. Thus, propellants present a fire hazard to the degree that a sufficiently strong heat source is available to ignite the composition. Unless finely divided, ignition usually requires either open flame or detonation of a high explosive placed adjacent to the propellant material.

The composition of commonly utilized single-base and double-base propellants is provided in Table C-1. Specific propellants that have been thermally treated at the 20,000lb ED Area are discussed in a future section.

Nitroglycerin has been discussed previously in conjunction with propellants. In pure form, nitroglycerin is a colorless liquid with a molecular weight of 227 that fuses to the solid state at approximately 13° C. the specific gravity of nitroglycerin is 1.596^{20} and the liquid viscosity is 36 centipoise at 20°C. Nitroglycerin decomposes with gas evolution at temperatures of 145°C. The published explosion temperature for nitroglycerin is 222°C, with evolution of approximately 368 Kcal/mol of heat and 715 mL of gas per gram of charge. Nitroglycerin is extremely sensitive to shock, being detonated by a 2 kg weight dropped from a height of 16 cm in the Bureau of Mines reactivity tests. For this reason, nitroglycerin is compounded with other energetics or inerts to facilitate handling. In pure form, it may be absorbed through the skin into the circulatory system and causes increased pulse rate and blood pressure.

Nitrocellulose is a mixture of esters formed by the nitration of cellulose with a mixture of sulfuric and nitric acids. As used in military formulations, nitrocellulose contains a minimum of 12.2% nitrogen. Although nitrocellulose is not truly soluble in any solvent, certain alcohols, ketones, and aromatic nitrocompounds will disperse nitrocellulose as a colloidal suspension. Water has no solvent action upon nitrocellulose but is absorbed to between 2-3% with the resultant deterioration to the unstable form. Cellulose nitrate has a specific gravity` of 1.65. The explosive temperature for cellulose nitrate is approximately 230°C with evolution of 661 Kcal/mol of heat upon combustion or 272 Kcal/mol of heat upon detonation that is accompanied by evolution of approximately 700 mL of gas per gram charge. Nitrocellulose is extremely sensitive to spark ignition if handled in dry form. The shock sensitivity of nitrocellulose is greater than that of nitroglycerin and is listed as detonation by a 2kg weight dropped from a height of 9 cm in the Bureau of Mines test.

C-1a WASTE IN CONTAINERS

Most waste that will be treated at the 20,000lb ED Area will be transported to the treatment area in the original product container. Propellants are contained within chambers that are generally cylindrical in shape and constructed of aluminum and steel. A primary consideration in development of propellant, explosive, or pyrotechnic systems is long-term storage stability which requires compatibility of container and the energetic material.

Receipt of the waste in the product container, combined with the fact that commonly-used military propellants are compatible with one another, ensures the fact incompatible wastes are not mixed. The reactive wastes to be treated at the 20,000lb ED Area are solid in nature and contain no free liquid.

C-1b WASTE IN TANKS --Not Applicable

C-1c WASTE IN PILES --Not applicable

C-1d WASTE IN IMPOUNDMENTS --Not Applicable

C-1e WASTE IN INCINERATORS --Not Applicable

C-1f WASTE IN LANDFILLS

After each treatment event in the 20,000lb ED Area, the residuals are covered with backfill material. The inspection requirements discussed in Section D and the general nature of the waste ensure that residents no longer exhibit the characteristics of ignitability or reactivity. The waste analysis requirements discussed in Section C-2 are designed to ensure that the residuals are not EP toxic, that hazardous constituents are not present at levels of regulatory concern, and confirm that the waste is no longer ignitable or reactive. Residuals that do not meet these criteria are removed from the unit as described in Section D. Thus, the closed trench operates as a solid waste landfill, but is not a land disposal unit for hazardous waste landfill, but is not a land disposal unit for hazardous waste.

C-1g WASTE IN LAND TREATMENT --Not Applicable

C-1h WASTE IN MISCELLANEOUS UNITS

This section addresses the specific wastes that have been treated at the

20,000lb ED Area and are expected to require continued treatment at this unit. The waste characteristics and compositions previously presented in this section were provided to fulfill requirements for a general description of the waste characteristics. The previously provided information also gives background data in the unexpected event that a permit modification is required in order to thermally treat any of the compositions that differ slightly from the waste that have been historically managed.

This section also addresses the characteristics of the waste that must be known for proper management of the waste. This information is derived form published sources. Analysis to support the published data is not required because of the limited deviation allowed within the product specifications that manufacturers of military propellants must follow. The waste that is treated at the 20,000lb ED Area has essentially the same composition as serviceable propellants, but is considered hazardous waste because of shelf-life exceedance, deterioration during storage, or failure to complete exhaust during testing of motors.

In general, the characteristics of the waste that must be known are:

- presence of free liquids,
- basis for hazard designation,
- waste composition,
- ignition or explosion temperature,
- heat of combustion and/or detonation,
- sensitivity to shock or electrical ignition,
- storage stability (tendency to decompose during storage),
- compatibility with container or other energetic material, and
- solubility characteristics.

It must be noted that the unique nature of these materials presents difficulties in development of these data in all instances. In some instances, the parameters are not readily measured because of the instability of the material. For many energetic materials, the particle size, degree of subdivision, compressed density of the material in the ordnance, age, and atmospheric conditions affect the value derived for these parameters. The same material may provide different values for certain parameters for no apparent reason. Thus, the published data presented in this section represents the accepted values for those parameters derived from various tests.

The composition of the propellant devices that have been treated at the 20,000lb ED area, and that are expected to require continued treatment, is provided in Table C-2. Additives to the double-base propellant compositions are also identified in Table C-2. Single-base or composite propellants are not thermally treated at the 20,000lb ED Area. In addition to the specific formulations for the propellants, Table C-2 identifies the components present in primer compositions or the initial detonating agents associated with these energetic items. The primer is not always treated in conjunction with the propellant. Table C-3 presents data on the characteristics of the constituent used in these propellants. Data on the explosive train (that is a serviceable ordnance and not waste) is also presented in these tables.

Three waste characteristics relevant to proper handling and treatment are not addressed in these tables: (1) the presence of free liquids, (2) compatibility of these wastes with the container, and (3) compatibility with other energetic materials. As previously indicated, the energetic compositions used for these military applications contain no free liquid and consist of finely divided powders or wax-like materials compressed to a variety of shapes. These wastes are managed in the original product container and the materials of the casing were specifically selected at the time of design to be compatible with the energetic material to ensure longevity during storage. Thus, further consideration of these compatibility concerns is not warranted and is prohibitive because of the dangers inherent in any attempt to re-package these materials. Furthermore, these wastes are not re-packaged or stored at the unit. The energetic formulations that are thermally treated at the 20,000lb ED Area are mutually compatible as demonstrated by the fact that these materials are often blended together in a single formulation or conjointly packaged in a single device. In addition to their mutual compatibility, the energetic materials are not removed for blending purposes and, therefore, mixing of incompatible wastes does not occur. Although some limited data concerning reactivity toward water and other reagents are provided in this section, the wastes treated at the 20,000lb ED Area are not mixed with any reagents incidentally or to effect treatment. Such data are provided solely for informational purposes.

The wastes that are treated in the 20,000lb ED Area are characteristically hazardous by reactivity or ignitability. Certain constituents, present in trace amounts, are EP toxic. However, the presence of these constituents does not necessarily render the entire waste material EP toxic. The only waste device that may incorporate EP metals is the detonating squib noted in Tables C-2 and C-3. The primer or detonator used to effect treatment is not a waste.

The shock sensitivity of energetic materials may be determined by the Bureau of Mines impact test. The shock sensitivity data provided in this section are based on the Bureau of Mines method. In practice, this method involves placement of 0.02 gram of the subject material in a brass cup that is subsequently impacted by a 2kg weight dropped from a measurement height. Sensitivity is recorded as the height required to initiate detonation in one of ten tests.

Sensitivity to friction is measured by the pendulum test. In this method, a specifically weighted bare-metal shoe is attached to a pendulum designed to pass in contact with a grated anvil containing 7.0 grams of energetic materials 18 times during the test. This sensitivity test is utilized less often than impact and is, therefore, not reported.

Heat and electrical spark sensitivity are determined by several techniques. The most reliably reported data are the explosion temperature as determined by submersion of the subject material in a vat of heated bismuth alloy. Both the explosion temperature and any separately noted spark sensitivity data from energetic materials are reported in this section.

C-2 WASTE ANALYSIS PLAN

This section addresses the parameters of concern for waste treated at the 20,000 ED Area. The rationale for the selection of these parameters, sampling methods, analytical protocols, and frequency of analysis are described.

Functionally, the prime constituents are alkoxy nitrates. Inorganic nitrates, chlorates, or peroxides, reactive metals, and inert components (casings and projectiles) are also present. The individual relative components that require treatment are well defines in terms of constituents and are characteristically hazardous by reactivity and/or ignitability . Although certain other constituents are EP toxic in themselves, it is questionable that these components render the entire waste component EP toxic.

The nature of the treatment by-products is dependent upon the category of device from which the waste is derived. Propellant constituents will be converted largely to the gaseous products CO_2, CO, H_2O, N_2, and, to some degree, NOx. Some extremely limited possibility exists that these materials may fail to entirely decompose.

The nitrate oxidant from primers or detonators will convert to sodium or potassium nitrite ($NaNO_2$, KNO_2). Other oxidants are converted to the oxide. Fuels such as antimony sulfide or thiocyanate are converted to the oxide or sulfate.

The sampling and analysis plan outline in this section focuses on solid reaction products because of the hazards associated with plume sampling in the vicinity of the treatment zone. Section E-3 addresses “Air Assessment”.

C-2a(1) Waste analysis will not be performed prior to the treatment of these wastes. Sampling prior to treatment would so greatly increase the potential for accidental detonation, with resultant property damage and personal injury, that such efforts are not warranted. The containers that hold these energetic materials (product or waste) are sealed in accordance with exceedingly specific manufacturing specifications designed to prolong storage stability and reduce the potential for unplanned detonation or ignition from impact. For example, nitrocellulose propellant mixtures are hygroscopic to 3-4 weight percent if exposed to moist air. The hydrolysis that accompanies exposure of nitrocellulose to air (even at low relative humidity values) renders the material unstable and evolution of NO_2 or auto-combustion occur. Dismantling of the devices (that would be required for sampling) not only increases hazard by exposure of material but increases the potential for detonation due to the friction and shock sensitivity of the materials.

Additionally, the composition of these materials is well defined on the basis of published literature and tightly controlled manufacturing specifications. Thus these materials are analogous to pure discarded commercial products for which sampling would only prove redundant. Prior to treatment of any waste not specifically identifies in Section C-1, a complete listing of all ingredients common to that energetic item will be obtained to determine its suitability for treatment in the 20,000lb ED Area.

The use and handling of these materials is tightly controlled and the device is sealed; therefore, the possibility to mix unspecified items with the energetic materials does not exist. No other wastes are treated in conjunction with these devices in the 20,000lb ED Area because joint treatment is specifically prohibited by Technical orders.

C-2a(2) PARAMETERS AND RATIONALE (POSTDETONATION)

Post treatment analysis of residuals presents less risk to sampling and analytical personnel that attempts to perform predetonation sampling because successful treatment renders the waste non-reactive and non-ignitable. Thermal treatment of propellants converts the alkoxynitrates to gaseous products. The gaseous products will consist primarily of N_2, CO, CO_2, H_2O, and to some degree NO_x. However, because of the difficulties and hazards of gas sampling in the treatment zone, the focus of this plan is the solid residuals that remain in the pit.

The potential solid residues include TCLP metals, the original energetic constituents, decomposition products from the energetic materials, the original inerts and additives, and the decomposition products of the inerts. The TCLP metals result from oxidants present in primers. Decomposition of the oxidants yields the TCLP metals in the form of nitrites, chlorides, and oxides that are expected to remain in the solid treatment residues. Thus, certain TCLP metals were selected as parameters of concern for post-treatment sampling and analyses. However, selection of the entire spectrum of TCLP metals was considered unnecessary because certain of these metals are not present in the input materials. The TCLP metals that result from primer or detonation compositions are Ba or Pb, but are contributed to a limited extent. Certain detonation charges may contain mercury fulminate, although the use of this compound in ordnance has been largely discontinued in favor of lead azide or styphnate. Antimony sulfide, present in certain primer compositions, was also selected as a parameter of concern.

The energetic materials utilized in propellants or explosives contain highly unstable bonds that are readily ruptured during combustion or detonation. The ready disassociation of these compounds with a resultant high gas volume yield is the rationale for their selection as energetic material. During combustion and detonation of these materials, conversion to elemental gases is essentially complete. Thus, the potential for residues that consist of the original constituent is limited. Poor oxidative conditions exert little influence upon decomposition of those types of materials since a criterion for the selection of these compounds as explosives is a high-oxygen balance. This criterion is imposed to ensure that the decomposition reactions are driven essentially to elemental gases in order to yield the greatest power upon detonation.

The possibility for formation of lower molecular weight analogs of the original species is even less than the potential for unreacted energetic species. Both the high-oxygen balance and inherent bond instability in the molecules contribute to complete disassociation once rupture of the bonds is initiated. For example, carbon-to-carbon bonds have disassociation energies on the order of 100-230 KCal/mol, but the dissociation energies for the carbon-nitrogen bonds in aryl structures is on the order of 50-65 KCal/mol. Thus, the nitro groups are readily released from the molecule. Once fragmentation occurs, the NO_2 radical readily oxidizes the hydrocarbon species to CO, CO_2, and H_2O with the nitro group reduced to elemental nitrogen.

Although the potential for unreacted energetic materials is extremely limited, certain of these were selected as parameters of concern to demonstrate the effectiveness of treatment.

On the basis, RDX, because of its use to initiate detonation, was selected as a parameter of concern. Analysis of the residual for nitrate and organic nitrogen was selected as parameters to measure the completeness of the combustion of nitrocellulose and nitroglycerin that have lower decomposition temperatures than RDX. In addition, the samples will be tested for reactivity to confirm that reactive wastes have been completely treated. Analysis for any lower molecular weight analogs was not considered because of the tendency of the original constituents to totally decompose. Additionally, prediction of such constituents on the basis of thermo-chemistry and reaction kinetics is precluded due to the complexity of the reaction in the detonation.

The inerts that are present in the compositions include the binders and additives. Of these materials, only dinitrotoluene, that is occasionally incorporated in propellants, is considered a hazardous constituent. Although it is present in a limited number of compositions and expected to decompose under these conditions to NO_x, N_2, CO, H_2O, and CO_2, it was selected for analysis.

The parameters of concern are summarized in Table C-4. These include certain TCLP metals, antimony, RDX, NO_3-N, Total Kjeldahl Nitrogen (TKN), and dinitrotoluene.

C-2b TEST METHODS

Samples of the solid residuals and underlying soils will be prepared and analyzed according to protocols from SW-846, Test Methods for Evaluating Solid Waste, Third Edition. The TCLP metals are prepared by analysis of EP extracts by Method 3010 and Method 3050 for total metals. Mercury is analyzed by cold vaporatomic absorption, Methods 7470 and 7471. If aluminum, chromium, or iron interferences prevent quantification of antimony or lead, these analytes will be quantitated by atomic absorption. TKN is prepared by digestion of the residues or soil in sulfuric acid with the digestrate analyzed by ion selective electrode, colormetric, or titrimetric techniques as specified in Method EPA 351.3 (EPA-600/4-79-020, Methods for chemical Analysis of Water and Wastes.

No approved method exists for the quantification of RDX or reactivity. The method selected for this analysis was liquid chromatography as specified in Journal of Chromatographic science 23:532-4, 1985. The test method selected to determine reactivity was the Bureau of Mines Impact Test. This method was briefly described in Section C-1. The analytical methods for residuals and soils from the pit are outlined in Table C-4 on the following page.

C-2c SAMPLING METHODS

Samples of the treatment residuals and underlying soils will be taken annually to demonstrate the effectiveness of the treatment and to ensure that hazardous wastes are not present. A random sampling methodology will be used to collect representative samples.

Selection of random samples will be facilitated by division of the pit bottom surface into grids. Each grid dimensions will be approximately 3 feet x 3 feet to yield 300-500 grids. Each grid will be successively numbered along the rows until each grid is numbered.

As described in EPA/530-SW-84-012, Waste Analysis Plans--A Guidance Manual, a random number table will be used to select the grids for sampling locations. A description of the use of the random number table for posttreatment and sub-unit closure is provided with the table as Exhibit C-1. The number of samples to be taken is determined by application of ASTM

D140-70, Standard Method of Sampling Bituminous Materials. The selection table from this method is also provided as Exhibit C-1.

This sampling methodology will result in division of each pit bottom surface into approximately 300-500 grids that are considered to represent both surface layer and subsoil residuals. Thus, a total of seven or eight samples of surface residuals and subsoils will be taken.

Soil samples will be taken to a depth of approximately 2 feet with a handheld auger. A minimum of three corings will be taken from the center of each grid and composited in a glass pan that has been precleaned with a soap/water solution and rinsed in deionized water, acetone, and deionized water. Cleaning solution will be brought to the unit to allow cleaning of equipment between each grid sampled. Both the residual and soil samples will be homogenized by the use of a separately dedicated stainless-steel spoon.

After the sample is composited, a quantity of either the residual material or soil will be transferred to two 8-oz, wide-mouth glass jars with teflon-lined screw-type lids that have been precleaned to EPA protocols. One sample jar will be collected for metals and one for organics. A sufficient quantify of samples will be transferred to the container to completely fill the container volume. The sample jar will be tightly closed, taped, and a sample identification/analyitcal request form will be attached to the container. A corresponding chain-of-custody sample log sheet will be completed by the sampler. Both the chain-of-custody log and the sample tag will identify the grid location from which the cample was taken. Solid samples in the field are preserved by placement of the sample container in an ice chest that contains an ice/water mixute.

Table C-4. Parameters of Concern for Treatment Residuals in the 20,000lb ED Area

Parameter	Preparation Method	Analytical Method
Specific EP Metals	1310	1310
Barium	3010,3050	6010
Mercury	7470, 7471	7470, 7471
Lead	3010, 3020, 3050	6010, 7421
Antimony	3020, 3050	6010, 7041
Cyclotrimethylenetrinitramine	LC[a]	L.C.
NO_2 - NO_3	9200	9200
Total Kjeldahl Nitrogen	351.3	351.3
Reactivity	NA[b]	Bureau of Mines Impact Test
Dinitrotoluene	3540, 3550	8250

[a] L.C. = liquid chromatography
[b] NA = not applicable

C-2d FREQUENCY OF ANALYSIS

Sampling, as specified in Section C-2(C) and the corresponding analysis indicated in Section C-2(b), will be performed annually. Although historically only about six detonations are performed each year, this frequency was selected to ensure effectiveness of treatment and prevent storage of hazardous waste in the area.

EXHIBIT C-1

SELECTION OF RANDOM SAMPLES

EXHIBIT C-1

SELECTION OF RANDOM SAMPLES

The random number table included to this exhibit is used in the following manner:

1. The sampler proceeds to the row that corresponds to the month of the sampling event.

2. The sets of numbers are followed across the selected row until the sets that correspond with the date of the sampling event are reached.

3. The counting location within the grid selected by the preceding steps is selected by counting horizontally and vertically to the digit occupied by the last tow digits of the present year. For 1988, the starting location is identifies as the 8th column in the grid and the 8th row of the grid. Rows 1-5 are in the first set of digits and rows 6-10 are the second set of digits. For a sampling event on 10/14/88, the beginning number in the identified grid is "2".

4. Proceeding left to right, each set of two digits (i.e., 24, 88, 35, 33, 25,44, 01, 78, 03, ect.) are selected. Values larger than the sample population are discarded. For trench sampling with 30 cells, the locations would be grids 24, 25, and 01 If both residuals and soils are taken, the sample locations are grids 24, 25, and 01. Grids 03, 18, and 05 will be sampled for soils. If a value is repeated (i.e., 18, 18), the value is used only once.

The following table is from ASTM D140-70 and is used for selection of the required number of samples in dry unconsolidated materials. An example of grid numbering for both residuals and soils is provided on the following pages.

SECTION D

PROCESS INFORMATION

D-1 CONTAINERS -- Not Applicable

D-2 TANKS -- Not Applicable

D-3 WASTE PILES -- Not Applicable

D-4 SURFACE IMPOUNDMENTS -- Not Applicable

D-5 INCINERATORS -- Not Applicable

D-6 LANDFILLS -- Not Applicable

D-7 LAND TREATMENT -- Not Applicable

D-8 MISCELLANEOUS UNITS

The 20,000lb ED Area provides treatment to waste propellant items that are considered to be characteristically hazardous on the basis of reactivity or ignitability. The unit consists of a cleared circular area approximately 1600 feet in diameter that is encircled by and approximately 2 to 3 foot earthen berm. Within this cleared area, a pit that is approximately 20 to 30 feet in diameter is excavated to a depth of approximately 10 feet. The subject reactive wastes are placed in the pit, and RDX charges are attached. During treatment, the initial RDX detonation results in rupture of the propellant casing that allows detonation of the contents to occur. After the detonation, the EOD personnel inspect the pit contents to ensure that all reactive materials have been destroyed.

D-8a TYPE AND QUANTITY OF WASTE

Types of waste that have previously been treated in the 20,000lb ED Area were identified in Section C-1. These wastes may be summarized as propellent that consists primarily of nitrocellulose and nitroglycerin.

RDX charges in the form of an explosive train are used to initiate detonation. The charge, primer, and detonator are not waste items when used in this fashion. The total mass limit per treatment event is 20,000 pounds of these waste devices. Propellant devices typically contain a larger percentage of energetic material per total mass than do explosive items. The percentage of energetic material in propellant devices is estimated to range from 40 to 50% of the total mass. The remainder of the mass of these items is present as the casings or canister that holds the energetic material. Thus, for any given treatment event, the total quantity of energetic material will be less than 8,000 to 10,000 pounds. The nature of the generating process (shelf-life exceedance, failure to exhaust during use, etc.) prohibits strict specification of the total mass of the energetic material present in the pit for any discrete treatment event, although it is probable that the total energetic mass seldom exceeds 10,000 pounds. Thus, it is estimated that the total mass of energetic material annually treated in the 20,000 ED Area seldom exceeds 50, 000 pounds.

D-8b(1) LINER EXEMPTION

Recently promulgated 40 CFR 264.601 standards for miscellaneous units indicate that "permits, terms and provisions shall include those requirements of Subparts I through 0" of Part 264 that are appropriate to the miscellaneous unit being permitted. Under RCRA standards, all land-based units, with the exception of land treatment, are required to provide line systems in the design unless exempted from this requirement. A request for exemption from the application of any liner standards is submitted.

D-8b EXEMPTION BASED ON EXISTING PORTION

An exemption on the basis that the 20,000 ED Area existing portion of a land-disposed unit is not requested. The 20,000 ED Area does not provide land disposal of hazardous waste, but is utilized for the purpose of treatment and renders the waste nonhazardous in nature.

D-8b(2) EXEMPTION BASED ON ALTERNATIVE DESIGN, LOCATION, AND OPERATING CHARACTERISTICS

An exemption from application of liner standards is requested on the basis of alternative design, location, and operating characteristics. The combined effect of these factors is to significantly reduce the potential for migration of any hazardous constituent from the unit.

D-8b(2)(a) ALTERNATIVE DESIGN

The design considerations that are pertinent to this request are:

(1) Installation of any liner system is impractical for the conditions that are experience during thermal treatment.

(2) Thermal treatment renders the waste nonreactive and nonnegotiable. Posttreatment sampling and the management practices for residuals combine to ensure that hazardous wastes are not disposed of in the trench.

The first design consideration that supports the request for exemption from application of liner standards results from the impracticality of liner placement in or near the treatment zones. Placement of any form of liner material directly beneath the waste is prohibited because it would be destroyed.

Theoretical calculations based upon estimated products of combustion indicate that temperatures in the treatment zone will range from 2100^{o}C to 3200^{o}C. Thus, any FML type material that was placed directly beneath the waste would be destroyed. Furthermore, concrete could note serve as a liner material because detonation during treatment would result in its fragmentation.

During detonation, fragmentation of the ordinance casings occurs as heat input to the item causes pressure to increase within the casings. Upon rupture , fragments of the casing are eject in all directions with great velocity. The impact of these fragments upon any liner material would destroy the containment integrity even if it is assumed that the liner could withstand the temperatures.

Placement of a liner at some depth below the treatment zone is not practical since the posttreatment crater extends to depths of approximately 30 to 40 feet. This considerations indicates the need for such a separation between any possible liner and detonation zone that the value of the liner would be questionable.

Exemption from application of liner standards is support on the basis that the 20,000lb ED Area functions as a thermal treatment unit and does not provide for disposal of hazardous waste. Waste that are input to the ED Area are considered characteristically hazardous on the basis of reactivity or ignitability. Posttreatment inspections of the residuals is designed to ensure that reactive fragments do not exist. Furthermore, annual sampling and analysis is performed to confirm that the residuals and underlying soils do not exhibit any of the characteristics of hazardous waste.

Conjunctive treatment nonordnance type waste (i.e., solvents) is prohibited by Technical Order (TO) 11A-1-42 and Holloman AFB Regulation 125-2. Thus, the only listed wasted placed for treatment is nitroglycerin (P081). The detonation train may contain lead azide, lead styphnate, or mercury fulminate in addition to the RDX charge, but these are not waste items. Mercury fulminate is rarely used because of its extreme instability. In these limited number of primers that may contain mercury fulminate, the total mass of this compound is less than 0.24 grams.

Posttreatment sampling of the residues is designed to confirm that the residuals are not reactive in nature. The parameters for extraction procedure (EP) toxicity, NO_2-NO_3, and TKN are indicated in the posttreatment analytical protocols to confirm that the residual no longer exhibits the characteristics for which these wastes were listed. Residuals that exhibit the characteristic of EP toxicity or reactivity are removed from the unit prior to its posttreatment coverage with active soils.

Additionally, the sampling protocols are designed to ensure that additional hazardous constituents are not present in the residuals. The additional hazardous constituents that may be present include dinitrotoluene, tetracene, and antimony based compounds.

Although some potential exists for dinitrotoluene enter the trench for treatment, this constituent does not meet the listing criteria for discarded commercial products or products in which the listed constituent is the sole active ingredient. Tetrecene (a nitrosamine-based compound) and antimony sulfide meet only the not otherwise specified (NOS) criteria for hazardous constituents and are not specifically listed. Under the conditions of the thermal treatment, the organic constituents are oxidized to CO, CO_2, N_2, NO_x, H_2O, and are not expected to remain in the residuals. The posttreatment protocols are designed to confirm the destruction of these constituents and ensure that these compounds are not present at the time of subunit closure.

D-8b(2)(b) LOCATION

The location considerations pertinent to the request for exemption from application of liner standards are:

1. The 20,000lb ED Area is located in an area with limited precipitation.
2. The net aquifer recharge rate in the area is negative.
3. The uppermost aquifer is of insufficient quality for use as a potable water supply.

The Tularosa Basin climate is arid with exceptionally low precipitation and low relative humidity. Over a period of 44 years, the average annual precipitation was 8.3 inches. The peak monthly precipitation during this time was 4.5 inches and the maximum 24-hour event for the 44-year period was 2.1 inches.

The mean annual lake evaporation, commonly used to estimate evapotranspiration and aquifer recharge is 67 inches per year. Thus, the annual net precipitation is -59 inches per year and recharge rates to the uppermost aquifer are limited. Additionally, the potential contribution of runon/runoff to contaminant transport is limited because theTularosa Basin is closed with respect to surface water flows. The limited surface water drainage that occurs within the base is controlled by intermittent streams and arroyos. The 20,000lb ED Area, located in the more elevated portions of the base, is approximately 50 to 100 feet above the main base. No intermittent streams are nearby. Runon that might contribute to contaminant transport is excluded by an earthen berm of approximately 2 to 3 feet in height. Thus, the potential for contaminant transport by surface water is limited.

The depth to the water table is reported as <10 feet in the southern portions of the base. It is considered probable that the water table is at >10 foot depths below the 20,000lb ED Area because the area's surface elevation ranges from approximately 50 to 100 feet above the areas reported to have water table depths of 10 feet. This conclusion is supported by historical evidence that water has never been encountered during treatment.

It should be noted that the underlying aquifer is naturally high in sulfite and chloride salts (>10,000 ppm). These concentrations render the aquifer useless as a potable water supply. Thus, any unlikely contaminant transport to groundwaters from the 20,000lb ED Area would not result in impacts to drinking water supplies. A future section further describes the hydrogeological factors pertinent to the 20,000lb ED Area and further addresses the potential for contaminant transport.

D-8b(2)(c) OPERATING CHARACTERISTICS

The operating characteristics pertinent to the request for exemption from application of liner standards are:

1. The 20,000lb ED Area provides thermal treatment to wastes that are hazardous primarily due to reactivity. Treatment of these wastes yields nonhazardous residues; thus, no disposal of hazardous waste is performed.

2. Treatment events are not conducted during precipitation events or if such event is imminent.

3. No free liquids are treated in the unit. Accumulation of free liquids within the residuals contained in the trench is prevented by the pit operation.

4. Runon is unlikely to enter the pit because of the limited annual precipitation.

5. Residuals are nonhazardous in nature. Organic constituents are converted to gaseous products during treatment. EP metal constituents are present in either elemental states or as oxides that are of limited solubility.

6. Annual inspections and sampling are designed to identify the presence of any unreacted hazardous waste or hazardous constituents. Treatment is repeated if unreacted wastes are found in the trench.

Residuals are removed if sampling reveals EP toxicity or unacceptable concentrations of hazardous constituents.

Section D-8b(1) discussed the operation of the 20,000lb ED Area as a thermal treatment unit and indicated that hazardous waste is not disposed of in the trench.

The TO (TO 11A-1-42) Holloman AFB regulations govern operations at the 20,000lb ED Area. Thermal treatment operations are conducted only during weather conditions that are identified as excellent or fair in Table 1-1 of the technical order indicated as Exhibit D-1. In general, these conditions allow treatment events only at specified daytime conditions of:

(1) wind speed 3-15 miles per hour,
(2) temperature >55°F, and
(3) clear or partly cloudy skies.

Thermal treatment is not performed during precipitation events. If partly cloudy skies exist, the base meterological division is contacted to ensure that precipitation is not imminent. The waste that are treated in the unit contain no free liquids.

The organic constituents of the initial charge are converted to gases during treatment. The distribution of expected gas products from treatment is indicated in Section E-3. During treatment, the oxidant portion of the C-4 detonators (which is the primary potential source of EP metals) is reduced to the elemental form or the oxide as indicated in a previous section. Barium oxide from the nitrate in the priming charge is soluble to the extent of approximately 3.5%. Lead oxide (possibly from primers or detonators) is soluble to the limited extent of approximately 20 mg/L. Antimony and mercury oxides exhibit solubility similar to the oxide of lead. In general, detonators that are the primary potential source for lead or mercury are less than 1.0 gram in mass.

The final operating characteristics consideration is management of residuals to ensure that hazardous wastes are not closed in place at the time of placing the soil cover. Residuals management involves inspections to ensure that all items placed in the pit are destroyed, annual sampling, and removal of residuals that are characteristically hazardous. Inspection requirements and residuals management are further defined in Sections D-8d and F. Posttreatment sampling was discussed in Section C

D-8b(3) GROUNDWATER MONITORING EXEMPTION

A request for exemption from application of groundwater monitoring standards is submitted. This request is based upon consideration of the factors listed below.

(1) The 20,000 ED Area operates as a thermal treatment unit and the activities conducted at this unit are not considered disposal of hazardous waste. Residuals are inspected and sampled to confirm the effectiveness of treatment. Sampling is also designed to ensure that subsoils are not contaminated. Residuals that exhibit hazardous waste characteristics or contaminated soils are removed from the unit.

(2) The groundwater monitoring requirements are defined as waste piles and treatment units, surface impoundments, and landfills that receive hazardous waste after July 26, 1982. No specific groundwater monitoring requirements are applied to miscellaneous units regulated under 40 CER 264, Subpart X. Sampling protocols of Section C are intended to ensure that operation as a regulated unit does not occur.

(3) The design considerations and operating practices relative to this unit, discussed in the preceding section, indicate that the potential for migrations of constituents is limited. In particular, the factors that limit the potential for migration are:

- no free liquids are treated;
- construction of the drainage ditch in the trench prevents contact with runon and limited precipitation that might occur;
- the mobility of the potential constituents in the residuals is limited. Organics are translated to gas products as discussed in the Section E-3. Of the oxides from primary or detonating charges, (P) or (SbO) have solubilities of less than 20 mg/L and only BaO has appreciable solubility.

(4) As described in Section E-1, the location characteristics of the unit indicate the potential for migration is very limited.

D-8c DESIGN AND CONSTRUCTION

The 20,000lb ED Area consist of any approximately 1680 foot diameter explosive zone area in which approximately 40 t0 60 feet diameter by 10 feet deep pits are alternately developed. Access to this area is provided by a single paved road that terminates at the end the Test Track. A dirt road of approximately one quarter mile is used for access from the paved road to the pit. The unit is used for thermal destruction of wasted propellant devices. A total mass limit of 20,000 pounds of waste propellant (including inert casings, etc.) is established for the unit.

D-8c(1) SPECIFICATIONS

Treatment of waste propellant is facilitated by excavation of an approximately 40 to 60 foot diameter pit within the cleared area. The pit is opened, used for thermal treatment, and covered with original soil. Subsequent treatment events are performed by development of excavation in the same location in the same fashion. To limit treatment amount in a single pit, and therefore enhance safety, two pits may be operable at one time. If two pits are used the combined mass of the waste will not exceed 20,000lb.

Construction of the thermal treatment pit is initiated by submission of a work order from, the EOD office to Holloman AFB Civil Engineering. This work order specifies the general dimensions of the pit, its location, and anticipated date of use. Actual excavation is performed by civil engineering personnel accompanied by EOD specialists. During pit excavation operations, no energetic items are located in the 20,000lb ED Area. Pit excavations are mad with standard earth-moving equipment (backhoe) operated by personnel trained and certified in its use. Similar considerations apply to backfilling operations after treatment events

The dimensions of either of the initial excavations is approximately 40 to 60 feet diameter by a depth of approximately 10 to 12 feet. The excavation is developed with sufficient sidewall slope to ensure stability. Although these gypsum sands are sufficiently concretious in nature to allow sidewalls to be constructed at almost 90° general safety standards dictate sidewall slopes of approximately 2:1 (60°). During treatment, the detonation force widens the trench to a diameter of approximately 70 to 90 feet and a depth of approximately 30 to 40 feet.

During excavation, soil removed from the trench zone is placed away from the pit. The soil pile is separate from the excavation in order to prevent loose material from reentering the excavation and to prevent any runoff from the soil pile from entering the trench during its active life. During development of the excavation, the trench bottom is lightly compacted to provide suitable foundation for operations.

Treatment is performed in two designate pit locations, residuals are inspected and sampling is performed annually. Upon return of analytical results that indicate a lack of contamination, the pit is continued to be used. The interim cover is intended to further reduce the limited potential for migration of waste or constituents during periods between treatment events. Treatments are restricted during the time between sampling and analytical results. Upon receipt of verification that contamination does not exist, the subunit is cleared for treatments. Residuals management is further addressed in Section D-8d.

D-8c(2) PROTECTION FROM PRECIPITATION

Protection from precipitation is provided to waste prior to and during treatment events by operating constraints that prohibit thermal treatment during precipitation events. Thermal treatment is also prohibited if such events are imminent. After completion of the treatment event, residuals that remain in the trench are protected from precipitation by the arid climate and backfill procedures discussed earlier.

D-8c(3) RUNON CONTROLS

Several natural factors contribute to a limited potential for runon to enter the unit during the posttreatment period or prior to use of a recently opened unit. These factors include the limited precipitation received in the area, the moderate soil permeability that aids surface water infiltration, the limited relief present in the pit area, the pit area elevation relative to the surrounding area, and the high evaporative flux present in the region. Although these factors severely restrict the potential for runon entering a subunit prior to use or after a thermal treatment event, several safety factors have been incorporated into the 20,000lb ED Area design and operation. The entire area is surrounded by an approximately 2 t0 3 foot high earthen berm that restricts entry of runon from adjacent areas of higher elevation. Soils from the excavation are separated from the pit opening to prevent runoff from the pile from entering the trench prior to treatment events. Finally, if precipitation occurs during the interim between trench excavation and precipitation occurs during the interim between trench excavation and treatment, the pit is not used until any standing liquids have dissipated.

D-8c(4) WIND DISPERSAL CONTROLS

The average annual wind speed in the region is approximately 5.7 miles per hour and the maximum monthly average wind speed is approximately 7 miles per hour. These values indicate limited potential for wind-based dispersion of treatment residuals. For these wind speed values, the fact that the residuals are located from approximately 30 to 40 feet below surface will prove sufficient to control wind dispersal. The maximum wind speed value for the 44-year period ending in August 1986 was approximately 80 miles per hour. If gale-force winds or wind speeds in excess of 15 miles per hour appear imminent, treatment will be postponed (see Section D-8d(1).

D-8c(5) SUBSURFACE DATA/SLOPE STABILITY

Subsurface data relevant to contaminant transport in the unsaturated or saturated zones is provided in Section E-1. Four soil horizons are traversed in the pit depth with the upper approximately 1 foot of soils being predominantly sands that are slightly sticky and nonplastic in nature. Below the 1-foot depth, the soils consist of gypsum that demonstrates transition from non-sticky nonplastic, and moist soil (approximately 20 inches) to gypsum soils that are slightly plastic, slightly sticky, hard, and somewhat friable. Geotechnical data, such as Atterberg limits, unconfined compression, direct shear strength or triaxial compression are not available. Therefore, to ensure slope stability of trench sidewalls, an approximate 2:1 slope is used for construction of the trench.

D-8c(6) SETTLEMENT POTENTIAL/LOAD-BEARING CAPACITY

The subunits are marked to designate their location after backfilling. Waste transport vehicles do not traverse the surface of the trenches, and the capacity for this type of vehicle is not required. The only equipment that traverses the unit surface is earth-moving equipment required for excavation. The load-bearing capacity of the backfilled subunit is essentially equivalent to that of the unconsolidated materials present in the other undeveloped portion of the base. This capacity is sufficient to support light earth-moving equipment.

Limited subsidence occurs in the subunits because the void volume is relatively unaffected by treatment operations. After treatment, the cover and backfill consist largely of the initially removed soil. The ash residues comprise only a limited portion of the fill. However, to retard wind erosion reduce infiltration, and limit subsidence, the top layer in the cover will consist of mixed soils mounded slightly above the surface and compacted by five blade passes. Settlement of such a cover is not expected to occur, but any limited subsidence will be replaced by natural action of wind-borne soil motion.

D-8c(7) RUNOFF CONTROLS

The depressed nature of the pit excavation indicates that the potential for runoff contaminated with residuals from the unit is essentially nonexistent Residuals from the trench are not brought to surface level at any time during the operation except for removal and disposal as hazardous waste (if required)..The natural factors (limited relief, moderate soil permeability, low precipitation that contribute to the limited potential for runon entering the unit also limit runoff from the clear zone. Therefore, no runoff controls are applied at the unit.

D-8c(8) DISTANCE REQUIREMENT

Interim status standards for thermal treatment units that provide detonation of waste explosives and propellant mixtures specify certain minimum distance requirements. These distance are based upon actual poundage of waste explosives present in the unit. Although the actual mass of energetic material present in the 20,000lb ED Area operations is unknown, it is expected to be less than 10,000 pounds. For this mass of energetics, the required distance to buildings or adjacent property is 1730 feet (530 m). The clear zone boundary (no unauthorized entry, structures, etc.) is specified as 1680 feet from the 20,000lb ED Area. The nearest building is located approximately 1750 feet from the 20,000lb ED Area.

D-8d TREATMENT PROCESS

The 20,000lb ED Area provides thermal treatment to waste propellant identified as hazardous waste due to ignitability or reactivity, Certain constituents that may be present in these wastes are considered EP toxic or Appendix VIII hazardous constituents. Thermal treatment is facilitated by excavation of a pit that is used for a single detonation limited to a total mass of 20,000 pounds.

D-8d(1) PROCESS DESCRIPTION/OPERATING PRACTICES

Operational procedures at the 20,000lb ED Area are governed by TO 11A-1-42 and Holloman AFB Regulation 136-2. These orders specify certain atmospheric conditions for treatment operations. In summary, these conditions are:

- ° temperature: general (>55°F); winter (not specified);
- ° wind speed: general (4 to 15 miles per hour); winter (7 to 15 miles per hour;
- ° precipitation: no treatments allowed;
- ° cloud cover: none or limited; and
- ° time: 0800 to 1800 hours.

The climatic conditions at Holloman AFB generally allow detonation to be conducted under conditions specified as "excellent" in TO 11A-1-42 (Exhibit D-3).

Personnel who perform operations in the 20,000 ED Area are specifically EOD-trained staff members. The total number of EOD personnel is limited to those required to perform the operation. A minimum of two personnel are which is an EOD supervisor, is required for all operations. These personnel are provided both initial training at the Indian Head, MD, school for ordnance and also receive annual reviews concerning ordnance items and RCRA requirements. Section H outlines required training. During all operations, the EOD supervisor operates as the range manager and controls initiation of the thermal treatment. Prior to initiation of the treatment event, all other EOD personnel are required to move and take cover south of the 20,000lb ED Area outside the danger area.

Several efforts are performed prior to the thermal treatment event. All waste energetic items destined for treatment are inspected, logged, and accounted for prior to removal from stock or other designation as waste. It should be noted that these items become waste primarily through shelf-life exceedance or inequalities noted during inspections of serviceable items. A complete inventory of items to be treated is compiled on the advance disposal request which requires HQ approval before treatment can proceed. Additionally, an inventory of items to be treated is recorded on the EOD Report (AFTO 358), included as Exhibit D-2. Prior to the scheduled treatment event, the EOD supervisor notifies the following base agencies:

- meteorological service (for imminent weather conditions).
- munitions control
- base medical service,
- security police,
- base operations,
- base fire chief (the IOSC if emergency occurs), and
- base environmental coordinator.

The waste energetic items are transported in accordance with TO 11A-1-60 and other relevant orders. Prior to transport, the EOD supervisor brief all member of the team on hazards associated with specific items, pertinent technical data technical orders, specified treatment procedures, safety precautions, and transport procedures. Upon arrival at the unit, all waste energetic items are inspected and accounted for by comparison with the previously prepared inventory. During transport and operations, all nearby road are cleared, posted, and maintained free of traffic.

To limit the potential for incidental detonations, all removal primer and detonating items are removed from the waste energetic items. No attempt is made to remove these items if they are integral parts of the device.

The actual treatment is facilitated by placement of the waste items in the excavation and attachment of C-4 (RDX) donor charges to the waste item. An "explosive train" is constructed and detonation is initiated from the bunker located in the clear zone. The donor device consists of a series of components that are referred to as an explosive train once the individual devices are placed in combination. An explosive train consists of a primer, and initial detonating agent, and a high explosive is achieved by step-wise detonating of the proceeding components.

Primers compose an extremely small portion of total explosive train and are present in the device in quantities of 0.04 to 0.2 grams of energetic material.

Primary compositions are mixtures of finely-divided powders of various salts. An oxidant fuel and explosive are combined in the primary composition. Typical oxidant are barium nitrate and potassium chlorate. Fuels in the priming mixture are present in an amount equal to the oxidant (approximately 30%) and are one or more of the following compounds: lead thiocyanate, antimony sulfide, or calcium silicide. The explosive charge constitutes from 5 to 30% of mixture and is highly explosive in nature. Common explosive used in primers are lead azide, lead styphnate, and diazodinitrophenol (DDNP). If the explosive train operates without the use of the initial detonating charge, the explosive in the primer will consist of trinitrotoluene or pentaerythrite tetranitrate (PETN). The remainder of the primer composition consists of inert binders (gum arabic, wax, etc.).

The initial detonating agent for munitions or ordnance consists of a small charge of compressed high explosive. These agents are compounded to have stability to shock or heat that is intermediate between the very sensitive primer and the less sensitive high explosive charge. This charge consist of relatively pure (<99%) explosive similar to that used in the primer composition. The compounds typically utilized as the initial detonating agent include lead azide, lead styphnate, DDNP and tetracene. The total mass of the initial detonating charge is also small and usually consists of less than 100 gram of the agent.

High explosives may be segregated into four classes that are defined as single-compound explosive, binary explosives, plastic explosives, and dynamites. All four categories of explosives are based upon a limited group of energetic materials that are either compounded together (binary explosives) or mixed with inert binders (plastic explosives and dynamties).

Of the approximately 20 compounds that may be used for this purpose, the wastes that are thermally treated at the 20,000lb ED Area use a very limited number of energetic materials. These materials include: nitroglycerin, nitrocellulose, trinitrotoluene (TNT), PETN, trinitrophenylmethylnitramine (tetryl), cyclotrimethylene (RDX), and cyclotetramethylenete tranitramine (HMX)).

Many binary explosives are formulated from the components listed above. For example, cyclotol is a mixture of RDX and TNT, octal refers to mixtures of HMX and TNT, and pentolite refers to mixtures of PETN and RDX. None of the binary explosives are thermally treated in the 20,000 ED Area

Plastic explosives are formulated by blending certain explosives listed above with binders, waxes, and oils. The energetic materials most commonly used for plastic explosives are RDX, TNT, and nitrocellulose. Certain waste munitions thermally treated at the 20,000lb ED Area incorporate the energetic material's plastic explosive.

Nitroglycerin has been discussed previously in conjuction with propellants. In pure form, nitroglycerin is a colorless liquid with a molecular weight of 227 that fuses to the solid state at approximately 13°C. The specific gravity of nitroglycerin is 1.596^{20} and the liquid viscosity is 36 centipoise at 20°C. Nitroglycerin decomposes with gas evolution at temperatures of 145°C. The published explosion temperature for nitroglycerin is 222° with evolution of approximately 368 Kcal/mol of heat and 715 ml of gas per gram of charge.

Nitroglycerin is extremely sensitive to shock, being detonated by a 2 kg weight dropped from a height of 16 cm in the Bureau of Mines reactivity tests. for this reason, nitroglycerin is compounded with other energetics or inerts to facilitate handling. In pure form, it may be absorbed through the skin into the circulatory system and cause increased pulse rate and blood pressure.

Nitrocellulose is a mixture of esters formed by the nitration of cellulose with a mixture of sulfuric and nitric acids. As used in military formulations, nitrocellulose contains a minimum of 12.2% nitrogen. Although nitrocellulose is not truly soluble in any solvent, certain alcohols, ketones, and aromatic nitro compounds will disperse nitrocellulose as colloidal suspension. Water has no solvent action upon nitrocellulose but is absorbed to between 2 to 3% with the resultant deterioration to the unstable form. Cellulose nitrate has specific gravity of 1.65. The explosive temperature for cellulose nitrate is approximately 230° with evolution of 661 Kcal/mol of heat upon combustion or 272 Kcal mol of heat upon detonation that is accompanied by evolution of approximately 700mL of gas per gram charge. Nitrocellulose is extremely sensitive to spark ignition if handled in dry form. The shock sensitivity of nitrocellulose is greater than that of nitroglycerin and is listed as detonation by a 2 kg weight dropped from a height of 9 cm in the Bureau of Mines test.

TNT is available in six isomeric forms although 2,4,6-TNT is the form most commonly utilized. Pure TNT fuses at 80.7°C, has a specific gravity of 1.65, and liquid viscosity of 13.9 CP at 85°C. TNT is among the least sensitive of military explosives, requiring an 85-cm height for detonation by 2 kg weight in the Bureau of Mines test. In addition, TNT has a very high explosion temperature (475°C) and is sensitive to electrical spark only if finely divided. Upon detonation, TNT 245 Kcal/mol of heat and 730 mL of gas per gram of charge. The heat of combustion of TNT is 821 Kcal/mo. TNT derives its value largely from its stability during storage and the ability to melt cast components.

PETN is an aliphatic nitrate formed by the nitration of pentaerythritol [$C(CH_2OH)_4$]. Highly purified PETN melts at 141°C and has a crystal density of 1.76. The heat of combustion of PETN is 600 Kcal/mol. Upon detonation at 215°C, PETN YIELDS 439 Kcal/MOL OF HEAT AND 790 ML OF GRAS PER GRAM OF CHARGE. PETN has an impact sensitivity similar to nitroglycerin (17cm) but is not sensitive to electrical detonation.

Tetryl, (2,4,6-trinitrophenylmethylnitramine) is an nitro derivative of methylsubstituted picramide (trinitroaniline) that is formed by nitration dimethlyaniline. Pure tetryl melts at 130°C and has a crystal density of 1.73. Tetryl yields 324 Kcal/mol of heat with expulsion of 760mL of gas per gram at its explosion temperature of 257°C. The heat combustion of tetryl is 840 Kcal/mol. Tetryl is less sensitive to impact than nitroglycerin but is greater sensitivity than TNT with detonation occurring with a 2 kg weight dropped from height of 26 cm in the Bureau of Mines test. Tetryl is toxic if inhaled with a recommended permissible exposure level (PEL) of 1.5 mg/m^3.

Cyclotrimethylene trinitramine (RDX) OR TU is a colorless solid that melts at 204° and has a crystal density of 1.82. Impact tests show RDX to be of similar sensitivity to tetryl with detonation occurring at 32cm. RDX is the second most powerful military explosive with greater power than tetryl or PETN and nearly equivalent power to nitroglycerin. The heat of detonation from RDX is 285 Kcal/mol with formation of 908mL gas per gram charge. The stability of RDX is similar to that of TNT.

HMX is formed during synthesis of RDX. In pure form, HMX has a crystal density of 1.87 and a fusion temperature of 276° The heat of combustion of HMX is 660 Kcal/mol and the heat of explosion is 390 Kcal/mol. The explosion temperature of HMX (337°C) is greater than RDK but HMX is of equivalent power to RDX upon detonation, yielding approximately 810 mL of gas per gram of charge. HMX is of limited toxicity as is RDX. Unlike RDX, the tetranitramine is seldom used in single compositions but is more commonly blended with TNT under the name Octol. The high explosive device used to detonate these waste items is composition C-4. This high explosive consists of approximately 90% RDX and 10% polyisobutylene.

Inspection of the residuals is performed as soon as the detonation has occurred. Furthermore, the surrounding area is thoroughly inspected to find any ordnance that may have ejected from the unit. If any untreated energetic device is found, treatment is repeated.

D-8d(2) EXPECTED PERFORMANCE/TEST RESULTS

Solid residuals are sampled annually according to the protocols described in the Section C. Upon receipt of the analytical results, the data will be submitted to NMED to demonstrate the effectiveness of the treatment and that no hazardous constituents remain. A letter submittal that identifies sampling location and analytical results will also be submitted. If contamination exists, the removal, as outlined in Section D-8d(3) will also be communicated.

Gaseous reaction products are not monitored during combustion. The expected gas phase products and downwind concentrations are addressed in Section E-3.

D-8d(3) RESIDUALS MANAGEMENT

Although solid residuals rarely remain after detonation, solid residuals that result from thermal treatment remain in the trench unless the sampling results indicate the need for removal. The following contamination criteria were selected as indicative that residuals from any given treatment event must be removed from the unit:

(1)	TCLP (metals)	>TCLP levels
(2)	organic nitrogen/$N0_3$ (indicates nitroglycerin/nitrocellulose)	>1000 ppm
(3)	TNT/RDX	>1000 ppm
(4)	Antimony (1000 times regulatory standard)	10 ppm

If these values are exceeded, the residuals are removed from the subunit. In addition to removal of the residuals, the first 6 inches of soil in the trench bottom will also be containerized, labeled, and transported to the DRMO facility as hazardous waste.

After removal of the first 6 inches, the soils underlying to a depth of 1 foot will be sampled and analyzed to determined if these criteria are met. Successive removal and sampling at 1-foot increments will be performed until the above criteria are achieved.

EXHIBIT D-1
TECHNICAL ORDER 11A-1-42

EXHIBIT D-2
EXAMPLE OF EOD INVENTORY REPORT

SECTION E

ENVIRONMENTAL PERFORMANCE STANDARDS

E-1 SUBSURFACE ASSESSMENT

E-1a VOLUME AND CHARACTERISTICS OF THE WASTE

The types of wastes that have previously been treated in the 20,000lb ED Area were identified in Section C-1. These wastes may be summarized as:

- ° Pyrotechnics that contain an oxidant, fuel, priming charge, binder, and in some items colorant, retardant, or other additives.
- ° Propellant that consists primarily of nitrocellulose and nitroglycerin.
- ° Explosive devices that contain RDX, TNT, and trace quantities of detracting agents.

The total mass unit per treatment event is 20,000lb pounds of these waste devices. Each category of device will contain different quantities of energetic material. Therefore, the percentage of energetic material contained in the total mass unit varies. Pyrotechnic and propellant devices typically contain a larger percentage of energetic material per total mass than do explosive items. The percentage of energetic material in pyrotechnic devices is estimated to range from 40 to 80% of the total mass. It is estimated that propellant devices typically contain 50 to 60 % of the total mass as energetic material. On a mass basis, explosive devices contain smaller quantities of energetic material (40 to 50% of the total mass of the device). Thus, for any given treatment event the total quantity of energetic material may range from 8,000 to almost 10,000 pounds. The nature of the generating process (shelf-life exceedance, failure to detonate during use, etc.) prohibits strict specification of the total mass of the energetic material present in the 20,000lb ED Area for any discrete treatment event, although it is probable that the total energetic mass seldom exceeds 10,000 pounds. Thus, it is estimated that the average mass of energetic material treated in the 20,000 ED Area is approximately 50,000 pounds per year.

Although some potential exists for dinitrotoluene or hexachlorobenzene to enter the 20,000lb ED Area for treatment, these constituents do not meet the listing criteria for discarded commercial products or products in which the listed constituent is the sole active ingredient. Tetracene (a nitrosaminebased compound) and antimony sulfide meet only the NOS criteria for hazardous constituents and are not specifically listed. Under the conditions of the thermal treatment, the organic constituents are oxidized to CO, CO_2, N_2, NO_x, H_20, and possibly HX of hexachlorobenzene is present and are not expected to remain in the residuals. The posttreatment sampling protocols are designed to confirm the destruction of these constituents and ensure that these compounds are not present at the time of subunit closure. The potential for hexachlorobenzene as a constituent in the feed stream is very limited because this constituent has been largely replaced by PVC as both additive and colorant.

Thus, both the general nature of the treatment operation and sampling protocols ensure that hazardous waste or constituents are not present at levels of concern. Analysis performed in 1983, shown in Table D-1, indicate that neither the soil, ash, or ordnance casing exhibit EP toxicity. Additional analysis performed during 1984 included the soil and residues from both the side and bottom of an active subunit. These results also indicate that residuals are not EP toxic and that contaminants have not migrated to underlying soils.

Thus, results submitted in a previous section indicate that historically the solid residuals that remain in the 20,000lb ED Area are nonhazardous in nature. The organic constituents of the initial charge are converted to gases during treatment. This distribution of gas products from treatment is indicated in Section E-3. During treatment, the oxidant portion of these energetic items (which is the primary potential source of EP toxic metals) is reduced to the elemental form or the oxide as indicated in Section C. For example, chromium (III) oxide, potentially present in thermite, is converted as elemental chromium during the reaction. Both the feed material and product are insoluble. Barium oxide, possibly present from the nitrate in the pyrotechnic devices, is soluble to the extent of approximately 3.5%. Lead oxide (possibly from pyrotechnics or detonators) is soluble to the limited extend of approximately 20 mg/L. Mercury oxides exhibit solubility similar to the oxides of lead. In general, detonators that are the primary potential source for lead or mercury are excluded in order to reduce the potential for detonation during treatment. Antimony oxide that may form from primer charges is only very slightly soluble (<15 mg/L). Solubility data for both the input constituents and certain other reaction by-products is provided in Tables C-5 and C-7.

E-1b HYDROGEOLOGIC CHARACTERIZATION

Holloman AFB is located in the southern part of the Tularosa Basin. The basin is approximately 120 miles long, bounded 8 miles to the east by the Sacramento Mountains and 20 miles to the west by the San Andreas Mountains. Elevations within the Tularosa Basin range from 4400 feet above mean seal level (MSL) at the northeast corner to 4000 feet MSL in the southwest corner. Elevations at the base range from 4100 to 4028 feet MSL.

Geologically, the Tularosa Basin is a graben structure, bounded on the east and west by mountains which are actually tilted fault blocks (CH_2M Hill, 1988). The base is underlaid by unconsolidated bolson deposits (sediments carried by water into the closed basin) more than 4000 feet thick in the vicinity of Holloman AFB. Figure E-1 illustrates a general east-west geologic cross section in the vicinity of Holloman AFB. Only the uppermost bolson deposits are of significance to this permit application.

Figure E-3 illustrates the relationship between the Sacramento Mountains and the bolson fill in relation to groundwater occurrence. At the base of the mountains, the hydraulic gradient is quite steep but then flattens out quickly. In the vicinity of Holloman AFB, the ground surface slopes gently to the southwest, but at a slightly higher rate than the water table. Depth to water table at the well fields near the mountains is 270 feet or more below land surface (BLS), while at Holloman AFB the water table is 5 to 10 feet BLS. Figure E-3 and E-4 illustrate the configuration of the water table. Like surface drainage, groundwater flows to the southwest, discharging by evapotranspiration.

The bolson fill is derived from soluble rocks such as limestone, dolomite, and particularly gypsum, of the surrounding mountains. Fresh water recharges the fill at the base of the mountains. Since the bolson fill consists of highly soluble materials, groundwater dissolves formation minerals and water quality degrades with increased contact time. In fact, the only fresh groundwater in the vicinity is near the source recharge.

Results of boring and slug and pump test, conducted from July through November 1987 (Radian corporation, 1988) at Holloman's sewage treatment lagoons, describe the shallow aquifer as being composed of saturated sands, silts, and clays hydraulically interconnected. Discontinuous clays separate coarsegrained, shallow water-bearing sand and silt units from deeper units of equal or greater grain size. The bolson fill aquifer exists under water table conditions in the first saturated shallow zone. With increasing depth, successive clay and silt units created semiconfining conditions. Artesian conditions do not exist at the shallow depths that were investigated. A comparison of transmissivity, hydraulic conductivity , and storage coefficient calculations in the slug tests and pump test yielded values that would be expected in highly stratified inhomogeneous basin fill sediments (see Section E-1d).

E-1b(1) DEPTH TO UPPERMOST AQUIFER

Depth to the water table at well fields near the Sacramento Mountains is 270 feet or more BLS. At Holloman AFB, the water table is 5 to 10 feet BLS.

E-1b(2) ESTIMATED ANNUAL RECHARGE

The annual precipitation at Holloman AFB averages 7.9 inches, with annual extremes from 2.5 inches to 13.5 inches. The mean annual lake evaporation rate, commonly used to estimate the mean annual evapotranspiration rate, averages an estimate 67 inches per year. The annual net precipitation for the area is approximately -59 inches per year.

E-1b(3) SUBSURFACE CHARACTERIZATION

Most of the base is covered with well-drained soils (fine sandy loam) formed in typsiferous sediments of eolian (wind blown) or alluvial orgin (CH_2M Hill, 1983). These soils comprise the Holloman-Gypsum land Yesum complex. The soils are thin and overlie discontinuous beds of gypsum. Below is a typical soil profile as described by the U.S. Department of Agriculture Soil Conservation Service:

A. Horizon - to 3 inches: very pale brown very fine sandy loam, pale brown moist: Weak medium and coarse granular structure: soft, very friable, nonsticky and nonplastic, very few very fine and fine roots: common very fine and fine interstitial pores; strongly calcareous: moderately alkaline: clear smooth boundary.

C1 Horizon - 3 to 13 inches: very pale brown very fine sandy loam, brown moist: massive; soft, very friable, slightly sticky and nonplastic very few fine and medium roots; common fine and very fine interstitial pores: strongly calcareous; moderately alkaline; clear smooth boundary.

C2 Horizon -12 to 20 inches: very pale brown gypsum, pale brown moist; massive; soft, very friable, slightly sticky and nonplastic; very few fine and medium roots; few fine and common very fine interstitial pores; strongly calcareous; moderately alkaline; clear smooth boundary.

C3 Horizon - 20 to 60 inches: white gypsum, pale brown moist: massive: slightly hard. very friable, slightly sticky and slightly plastic: common fine and very fine interstitial pores; strongly calcareous; moderately alkaline.

Figure E-2 shows a geologic cross section of the bolson fill deposits in the vicinity of Holloman AFB. The shallow bolson deposits are Miocene to Pleistocene alluvial, clays, sands, and gravels. The sediments are highly stratified. The basal contact of the bolson is estimated to be the top of permian bedrock (depth unknown).

Lithologies encountered during subsurface investigations at Holloman's wastewater treatment lagoons consists of a thin layer (approximately 3 to 11 feet thick) of dry silt and/or sand underlaid by saturated sand or sand and silt layer. The shallow and layer is usually underlaid by a thin clay layer (approximately 2 to 7 feet thick) or interbedded sand, silt, and clay. A second saturated zone consisting of sand, silt, and clay underlies this clay layer. This saturated zone ranges in thickness from approximately 34 to about 50 feet. At these depths, some holes were completed in a green clay layer and some hoses were completed while still in the saturated zone.

E-1c EXISTING GROUNDWATER QUALITY

Groundwater throughout the Holloman AFB area is naturally high in total dissolved solids (TDS). Field samples taken during an investigation of Holloman's sewage treatment lagoons (Radian Corporation, 1988) revealed TDS levels that exceeded 10,000 mg/L, making the water saline (10,000 to 100,000 mg/L). These TDS levels are attributable primarily to sulfates and chlorides. There has been no sampling for waste constituents specific to the ED unit.

E-1d GROUNDWATER DIRECTION AND FLOW RATE

Water enters the bolson fill aquifer at the edge of the Tularosa Basin and moves downgradient to the southwest. Groundwater discharges by evapotranspiration in the basin's interior near the White Sands National Monument.

Flow rates in the shallow bolson fill aquifer are general low due to the low hydraulic gradient and moderately low permeability of sediments. Calculated groundwater velocities using information derived from slug tests performed in nine piezometers at Holloman's wastewater treatment lagoons (Radian Corporation, 1988) ranged from 0.003 to 0.13 feet per day. Table E-1 shows groundwater velocities based upon the results of the slug tests. The average hydraulic conductivity of 9 piezometers tested was 46 gallons per day per square foot. The average transmissivity value was 210 gallons per day per square foot. Transmissivity, storage coefficient, and hydraulic conductivity data from pump tests (Radian Corporation, 1988) are shown in Table E-2.

E-1e PROXIMITY TO GROUNDWATER WITHDRAWAL POINTS

No water supply wells are located on Holloman AFB because of the poor quality of groundwater (Radian Corporation, 1988). Base potable water supplies are obtained from Bonita Lake and from 21 wells in three separate well fields located on the western slope of the Sacramento Mountains approximately 10 miles east of Holloman AFB. Production wells in that area intercept groundwater at depths ranging from 250 to 300 feet BLS (CH_2M Hill, 1983).

E-1f POTENTIAL IMPACTS ON HUMAN HEALTH

This information is not required for this permit application because the uppermost aquifer (or hydraulically connected aquifers) is not used for drinking water supply. Because groundwater below Holloman AFB contains high TDS (in excess of 10,000 mg/L), the groundwater is designated as unfit for human consumption based upon New Mexico Water quality Control Regulations (Radian Corporation, l988.

Table E-1. Horizontal Groundwater Velocity Results from Nine Slug Tests, Holloman AFB, New Mexico

Well Number	Total Depth (ft. below surface	Hydraulic Conductivity (gpd/ft^2)	Porosity [b] (%)	Velocity [c] (ft/day	(ft/year)
S-2	24.75	7.1	40	0.007	2.6
S-4	20.00	85.6	30	0.13	47.5
S-5	17.00	61.8	40	0.07	25.6
S-8	22.00	56.2	50	0.05	18.3
S-11	19.00	80.2	30	0.12	43.8
S-15	15.00	69.9	30	0.11	40.2
S-16	34.00	45.8	40	0.05	18.3
D-2	77.00	2.8	40	0.003	1.1
D-5	64.70	3.1	30	0.004	1.5
Average		45.8	36.7	0.06	21.0

a Modified from Radian Corporation, 1988.
b Based on the following values for porosity: sand= 30%; silt =40%; clay = 50%.
c Velocity (v) = $\frac{K(dh/dl)}{7.5a}$

Table E-2. Transmissivity, Storage Coefficient, and Hydraulic Conductivity Data and Pump Tests[a]

Well ID	Total ft below surface	Transmissivity (gpd[b]/ft)2	Storage Coefficient	Hydraulic Conductivity (gpd/ft2)
P-1	77.00	126	NR[c]	12.6
D-3	75.00	377	0.00005	37.7
S-12	12.00	ND[d]	ND	ND
P-2	12.00	106	NR	10.6
S-13	20.00	ND	ND	ND
S-14	35.00	ND	ND	ND
D-4	58.00	330	0.0002	33

a. Modified from Radian Corporation, 1988.
b. gpd = gallons per day
c. NR =- Not Reported. Jacob straight-line method and Theis curve-matching technique unacceptable due to pump-well interference.
d. ND = Not determined. Drawdown. Drawdown response was sufficient or too sporadic to plot T and S values.

E-lg POTENTIAL IMPACTS ON SUBSURFACE PHYSICAL STRUCTURES AND FOOD CHAIN CROPS

This information is not required because there are no downgradient or near base irrigation wells (Radian Corporation, 1988). Also, corrosive wastes are not generated at the OB unit and there are no physical structures present that may be affected by potential corrosive wastes migrating with groundwater.

E-1h POTENTIAL IMPACTS ON WILDLIFE, DOMESTIC ANIMALS, AND VEGETATION

Because of the high negative rate of not yearly precipitation (approximately -59 inches) and the unsuitability of the shallow aquifer as a drinking of irrigation water source, this information is not required for this permit application.

E-1i LAND USE PATTERNS

Real property records indicate land used for the ED unit consists of leased acreage within the boundary of Holloman AFB. Recommended land use restrictions fro the site (CH^2M Hill, 1983) include restrictions on the following:

° recreational use,
° well construction on or near the site,
° housing on or near the site,
° agricultural use,
° surface water impoundments,
° construction,
° excavation,
° unnecessary burning operations or ignition sources,
° vehicular traffic, and
° site access.

E-1j ASSESSMENT OF GROUNDWATER MIGRATION POTENTIAL

The potential for groundwater contamination at Holloman AFB is high, in general, due to the high groundwater table (10 to 15 feet BLS). This potential is reduced somewhat by the low driving force for vertical contaminant migration (CH^2M Hill, 1983). Contaminants entering the groundwater would move very slowly (due to the low hydraulic gradient and moderately low permeability) to the southwest, towards the White Sands National Monument.

Groundwater at Holloman AFB exceeds 10,000 mg/L TDS making it unusable as a domestic or agricultural water supply source. The nearest downgradient potable supply well is approximately 20 miles west of the base (Radian Corporation, 1988). The nearest livestock well is 3.5 miles to the southwest.

E-2 SURFACE MEDIA ASSESSMENT

This section reviews the 11 factors that must be considered in the assessment of impacts upon surface media. Surface media refers to surface waters and the soil surface. Data that have previously been provided are only referenced.

E-2a VOLUME AND CHARACTERISTICS OF THE WASTE

The hazardous characteristics, chemical functionalities, physical characteristics, and annual quantities of waste to be treated at these units were previously described in Sections E-1a and C-1. Solubility data presented in Sections C, D, and E-1a are also relevant to the surface media assessment.

E-2b CONTAINMENT FACILITIES

Sections D-2 and D-4 describe preventative measures for migration of waste or waste constituents from the unit. These elements include the pit sidewalls and the earth berm around the clear zone. These elements restrict ejection of waste residuals during treatment events, ensure residuals are retained in the treatment zone, and restrict runon into or runoff from the unit. Additionally, as described in Section D, the area surrounding the detonation zone is graded to divert runon from entering the unit. Thus, the containment design restricts migration to the mechanisms of detonation-related ejection of waste from the unit, and limited quantities of contaminated runon/runoff that escape. Treatment of waste is not performed during precipitation events, if such events are predicted to occur within the 48 hour time frame surrounding the treatment, or if such an event appears imminent.

E-2c HYDROLOGICAL CHARACTERISTICS

Data on surface soils and topsoils surrounding these units were discussed in Section E-1. Most of the base is covered with well drained soils (fine sandy loam) formed in gypsiferous sediments of eolian (wind blown) or alluvial (stream deposition) origin. The soils are thin and overlie discontinuous beds of gypsum. The soils are nearly level with slopes ranging from 0 to 5%. A typical soil profile, as described by the US Department of Agriculture, Soil Conservation Service, follows:

A Horizon - 0 to 3 inches: very pale brown very fine sandy loam, pale brown moist; weak medium and coarse granular structure; soft, very friable, non-sticky and nonplastic; very few very fine and fine roots; common very fine and fine interstitial pores; strongly calcareous; moderately alkaline; clear smooth boundary.

C1 Horizon - 3 to 13 inches: very pale brown very fine sandy loam, brown moist; massive; soft, very friable, slightly stick and nonplastic very few fine and medium roots; common fine and very fine interstitial pores; strongly calcareous; moderately alkaline; clear smooth boundary.

C2 Horizon - 12 to 20 inches: very pale brown gypsum, pale brown moist; massive; soft, very friable, slightly sticky and nonplastic; very few fine and medium roots; few fine and common very fine interstitial pores; strongly calcareous; moderately alkaline; clear smooth boundary.

C3 Horizon - 20 to 60 inches: white gypsum, pale brown moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine interstitial pores; strongly calcareous; moderately alkaline.

Surface water resources within the Tularosa Basin are limited by the high evaportranspiration rate and low annual rainfall. Surface water is either lost to evaporation and infiltration or collects in the lowest point in the basin at or near Lake Lucero, located at the southwest edge of the gypsum dune field west of the base. Surface water within the basin makes its way to Lake Lucero. Here, also a discharge point for groundwater, sulfate salts are concentrated by evaporation. The prevailing southwest winds than pick up and transport the salts, primarily gypsum, in a northeasterly direction to continue building the dune field of the White Sands National Monument.

The base is crossed by several southwest trending "arroyos" or intermittent stream beds including Lost River (the largest), Dillard Draw, and several smaller tributaries such as Red Arroyo and Arroyo Cavacita. Lost River is fed by groundwater seeps or springs. The river appears and disappears along its course as springs add water and evapotranspiration and infiltration recapture it.

The intermittent streams and arroyos occurring within the basin are important drainage features only during the infrequent heavy rainfall, conveying surface water southwest to the basin's lowest elevation point.

Surface drainage within the undeveloped parts of the base is controlled by the major arroyos including Lost River, Dillard Draw, and their tributaries. Surface flows are directed southwest toward the White Sands National Monument. Lost River at one time discharged into White Sands National Monument after traversing the base. Lost River has now been dammed on the base just east of the property boundary. This was done to ensure that base storm drainage would not enter the National Monument.

Drainage within the developed portion of the base flows by way of ditches and culverts to the southwest corner of the base in the vicinity of the wastewater treatment lagoons. Figure E-5 illustrates base topography and drainage patterns.

E-2d PRECIPITATION PATTERNS

A tabular monthly summary for precipitation received at Holloman AFB over the preceding 44 years is provided as Table E-3.

E-2e GROUNDWATER DATA

Depth to the uppermost aquifer is discussed in Section E-1. These data are derived from soil corings taken in the vicinity of the Holloman AFB sewage treatment lagoons. A general hydrogeologic description of the soil stratigraphy for the unsaturated zone, saturated zone, and confining layer is also provided. Groundwater quality data is presented in Section E-1.

E-2f PROXIMITY TO SURFACE WATERS

No continual surface water flow is present in the vicinity of these units. The intermittent flows that occur in Dillard Draw or the Lost River are separated from these units by a considerable distance. All of the thermal treatment units at Holloman AFB are located above the 100-year floodplain elevation.

E-2g WATER QUALITY STANDARDS AND USE

No water quality standards apply to the intermittent surface flows present at Holloman AFB. The only continual bodies of water present on the base are the sewage treatment lagoons located in the southwest portion of the base.

E-2h WATER QUALITY DATA

Water quality data are not applicable to the intermittent stream flows that result from precipitation events.

E-2i LAND USE PATTERNS

Local land use designations for the areas surrounding these units are discussed in section E-1i. A land ownership map for the immediate vicinity is provided as Figure B-5 (in back pocket). No industrial development zones are located near Holloman AFB. Any contaminant migration to surface waters would, therefore, not impact industrial development.

E-2j IMPACTS ON HUMAN HEALTH

Impacts to human health that may be caused by migration of waste or waste constituents are expected to be limited in scope. The intermittent waters of Holloman AFB are not withdrawn for drinking water or industrial use. Volatilization of any organic contaminant is not expected as these contaminants will be converted largely to gas form during treatment.

The more possible impact to human health would occur from contaminated runoff entering one of the intermittent streams. However, the potential for this form of migration is exceptionally limited by the low rainfall and high evaporation rates of the area. Additionally, with the exception of ejected fragments, the residuals from treatment events are contained below surface level. The units used for treatment are treated in areas of limited relief.

E-2k POTENTIAL IMPACTS ON WILDLIFE, DOMESTIC ANIMALS, AND VEGETATION

No livestock operations are conducted within the ED area or surrounding area. Livestock grazing may occur sporadically approximately 0.5 miles east of the 20,000 ED Area, but no impacts that result from surface-water-carried migration can be envisioned that would affect this operation because it is not traversed by waters local to the unit. No horticultural or silvicultural operations are located in the vicinity of the reservation.

If migration of waste or hazardous constituents occurred by surface water transport, some exceedingly limited impact upon these species may occur through use of nearby waters as a drinking source or from surface contact.

The only threatened or endangered species that occurs on Holloman AFB is the White Sands Pupfish that resides in the brackish pools of the lower Lost River. The species is a group of two species as classified by the State of New Mexico, but is not listed by the U.S. Fish and Wildlife Service. Because of the distance of these waters from the units, no impacts can be envisioned.

E-2l ASSESSMENT OF SURFACE WATER MIGRATION POTENTIAL

Assessment of the factors presented in this section indicates that the potential for migration of waste or hazardous constituents by surface water transport is limited . Contaminant transport to surface soils or surface waters adjacent to the 20,000lb ED Area is limited to deposition of particulates ejected during detonation. The limited quantity and wide-area dispersion of the deposited contaminants would limit any impact to minimal effects. Although some “hot spots” may result through this deposition, the potential for their formation is limited and the size of such localized contamination would be very small. Additionally, posttreatment inspections to collect fragments will reduce the potential for this type of transport. Furthermore, because of the arid climate, runoff contamination from any such localized zones would be of limited duration. Only hazardous metal constituents would be expected to exhibit appreciable environmental half-lives and the soil samples are screened for those constituents. Additionally, the general operational characteristics in which the unit is regularly covered further reduces runoff based transport.

E-3 AIR ASSESSMENT

E-3a VOLUME AND CHARACTERISTICS OF THE WASTE

Refer to Section E-1a for a discussion of waste volume and characteristics.

E-3b REDUCTION OR PREVENTION OF EMISSIONS

There are no structures or control systems designed to prevent or reduce emissions of hazardous constituents to the air.

E-3c OPERATING CHARACTERISTICS

The ED unit at Holloman AFB is currently operated on an intermittent basis for treatment of waste energetic items. Nearly all of the energetic materials are transformed into gaseous or particulate form. Operating procedures for both subunits were presented in Section D. The time required for the detonation process consists of two components which include the following:

- waste placement and stacking (1 to 8 hours),
- detonation inspection (1 hour)

The emissions associated with the process are nearly instantaneous due to the nature of the treatment process. Total emissions and analysis of potential receptor exposures are presented for typical treatment cases in Section E-3f.

E-3d ATMOSPHERIC, METEOROLOGICAL, AND TOPOGRAPHIC CHARACTERISTICS

The 20,00lb ED Area at Holloman AFB is situated on flat terrain. There are no complex topographic features in the vicinity. The meteorologic conditions on-site were previously presented in Table E-3. Additionally, wind roses for the last four quarters are summarized in Figure E-6. (Vol 2, page 10)

E-3e EXISTING AIR QUALITY

Otero County, NM, is identifies as an attainment area for all National Ambient Air Quality Standards (NAAQS). Holloman AFB emits none of the

NESHAP parameters other than benzene, toluene, and xylene from fueling of aircraft. Table E-4 summarizes state and federal NAAQS and PSD increments.

E-3f ASSESSMENT OF AIR MIGRATION POTENTIAL

In order to assess the potential for contaminant migration via the air medium, the types and quantities of emissions must be identified for treatment methods as applied to the routine waste streams. A search of available literature reveals that there is some data in regard to detonation products of explosive materials but a scarcity of information on detonation explosives. the following discussion on detonation emissions is excerpted from AP-42, EPA.

"The emissions from explosives detonation are influenced by many factors such as explosive composition, product expansion, method of priming , length of charge, and confinement. These factors are difficult to measure and control in the field and are almost impossible to duplicate in a laboratory test facility. With the exception of a few studies in underground mines, most studies have been performed in laboratory test chambers that differ substantially from the actual environment. These approximations cannot be made more precise because explosives are not used in a precise, reproducible manner.

Carbon monoxide is the pollutant produced in greatest quantity from explosives detonation. TNT, an oxygen deficient explosive, produces more CO than most dynamites, which are oxygen balanced. But all explosives produce measurable amounts of CO, Particulates are produced as well, but such large quantities of particulate are generated in the shattering of the rock and earth by the explosive that the quantity of particulates from the explosive charge cannot be distinguished. Nitrogen oxides (both NO and NO_2) are formed, but only limited data are available on these emissions. Oxygen deficient explosives are said to produce little or no nitrogen oxides, but there is only a small body of data to confirm this. Unburned hydrocarbons also result from explosions, but in most instances, methane is the only species that has been reported."

A literature search was performed to identify the relative concentrations of CO, NO_x, CO_2, HX, and P_4O_{10} that result from the thermal treatment of propellants, explosives, and pyrotechnics that contain $TlCl_4$ and phosphorus. Some limited data on the detonation of propellants and explosives was found. Emissions data from detonation of nitrocellulose/nitroglycerin (NC/NG) propellant mixtures, TNT, and RDX were found in the literature. Limited data from burning of NC/NG propellant and TNT were also found.

The limited data available were used to formulate mean balance emissions for anticipated worst-case scenarios. The assumptions utilized in these calculations were:

(1) Alkyl nitrate energetics behave in a manner similar to NC/NG.

(2) Aryl nitrate energetics behave similarly to TNT and/or RDX.

(3) Propellant mixtures contain approximately 50% energetic material as a percentage of the total mass.

(4) Pyrotechnics contain approximately 75% of the total mass as the energetic material.

Based on these assumptions and extrapolation of the literature data, worst-case scenarios were developed in order to project emissions. A summation of the cases is presented below.

Case 1: Assumes detonation of 20,000 pounds of rocket motors containing 10,000 pounds of NC/NG propellant. A carbon monoxide yield of 1000 pounds was calculated: NO_x emissions were negligible.

Case 2: Assumes open burning of 250 pounds of 33% propellant and 66% mixed aryl nitrate explosives. This scenario yields the largest CO and NX_x values. The CO yield was calculated as 8.3216 and NO_x was estimated at 9.15 pounds. The mixture was assumed to be 25% energetic material.

Case 3: Assumes OB of 250 pounds of phosphorus based charges and incindiary devices considered to be 75% energetic material (including $T1C1_4$). The yields for this scenario were P_40_{10} (388 pounds) HC1 (46.9 pounds), and TSP (41.3 pounds).

Case 4 Assumes OB of 250 pounds containing hexachlorobenzene pt-12% to be 75% energetic material. The thermal NO_x yield was 5.6 pounds and the HC1 yield was 20.6 pounds.

Case 5: Assumes OB of 250 Pounds of NC/NG considered to be 100% energetic. The NO_x yield was 50 pounds and the CO yield was 87.5 pounds.

The mass balance basis used for calculations is presented as a fraction of pounds of charge in Tables E-5. Values for burning of pyrotechnics are based strictly on mass balance of theoretical combustions.

The worst-case values were used as input values for the PUFF model 13 and the outputs are provided as Exhibit E-2.

The output from the model indicated that detonation of these large masses will exceed the NAAQS at distances of 0.5 km, but that the concentration was approximately 50% of the NAAQS value (40 mg/m^3) at a distance of 1.0 km. This was the only scenario that violated any criteria pollutant NAAQS.

TABLE E-5. PROJECTED EMISSIONS FROM EXPLOSIVES DETONATION

	ESTIMATED EMISSIONS RATE (POUNDS PER POUND CHARGE)				
Charge	N_2	NO_x	CO	CO_2	H_2O
RDX,HMX	0.38	NEG[a]	0.25	0.20	0.01
Propellant Mix	0.19	NEG	0.10	0.56	0.12
TNT, Cyclotol	0.10	Neg	0.60	0.50	0.25

[a] Neg - negligible

EXHIBIT E-1

DESCRIPTION OF PUFF MODEL AND OUTPUT

FOR WORST-CASE EMISSIONS

E. Description of Puff Release

The dispersion of a puff can be described in Gaussian terms just as the continuous release. In a continuous model the plume disperses in the vertical (z) and horizontal cross wind (y) direction. In a puff model the dispersion takes place in the z, y, and downwind (x) direction. The calculated concentration is the peak instantaneous concentration and it is independent of wind speed.

When a release occurs the gas forms a spherically-shaped cloud just above the point of release. The concentration in the cloud is highest at the center. The cloud then is transported by the wind growing in size as it entrains ambient air. The growth of the cloud and its movement can be compared to a balloon that gradually inflates as it is moved by the wind. The mass of the gas in the cloud does not change as the cloud moves downwind, but its concentration does, as more ambient air is entrained.

Sometimes the release is not instantaneous but takes place over a period of several minutes such as when gas in a cylinder leaks out or during the interval between the time a leak in a valve is discovered and it can be stopped. In cases such as these the cloud may become somewhat elongated and look like a blimp or a hot dog. By assuming an instantaneous release a puff model will overestimate peak concentrations, but it will have virtually no effect on average concentrations provided the average concentrations provided the averaging time is long enough.

F. Puff Model dispersion Coefficients

The EPA puff model uses dispersion coefficients developed by studying instantaneous release.[6] These coefficients generally provide for less plume dilution than the familiar Pasquill-Gifford coefficients. The table show the dispersion coefficients. Figures 10 and 11 plot the coefficients on a diagram of the Pasquill-Gifford coefficients.

Coefficient = ax^b where x is downwind distance in meters

	Horizontal (x and Y)		Vertical (z)	
Stability	a	b	a	b
Unstable	.14	.92	.53	.73
Neutral	.06	.92	.15	.70
Very Stable	.02	.89	.05	.61

Since the dispersion in the x and y direction are generally considered to be equal, some authors refer to the standard deviation in the horizontal as σ_r (r for radius).

G. Average Concentrations from Puff Release

Average Concentration is a function of wind speed. For example, a wind of 10 knots will transport twice as much air past a site as wind of 5 knots. The average concentration is a function of the number of standard deviations in the horizontal direction (sigma -x or sigma-r) that pass a given point for the averaging time in questions. At long downwind distances and low wind speeds the average concentration will not be much less than the peak instantaneous concentration. The puff has become so dilute that possibly less than one sigma passes a point for the averaging time specified.

At the other extreme, there is a significant difference between average and peak instantaneous close to the release point. This is because the puff is small in dimension and most of the material passing a point is air except for the very concentrated puff. Figure 12 illustrates how a puff would disperse from a pipeline break.

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H. Puff Equations

The basic equation is :

$$x_f = \frac{Q_m}{(2\pi)^{1.5}\sigma_x\sigma_y\sigma_z} \exp\{-\frac{1}{2}\{\frac{y}{\sigma_y})^2\} \ \{\exp\{-\frac{1}{2}(\frac{H+z}{\sigma_z})\} + \exp\{-\frac{1}{2}(\frac{H-z}{\sigma_z})^2\}\}$$

Note that Q is a release quantity in this equation, not a release rate. X is a peak instantaneous concentration, not the average concentration.

x_f = peak instantaneous concentration (grams per cubic meter)
Q_m = Source strength (grams)
π = 3.1416
σ_x= horizontal downwind dispersion coefficient (meters) (This value is often set equal to σ_y)
σ_y = horizontal crosswind dispersion coefficient (meters)
σ_z = vertical dispersion coefficient (meters)
H = effective stack height (meters)

I. When to use Puff or Continuous Release Models

The puff model should be used when the release interval of the cloud is less than the travel time of the cloud. For example, if the release took place over a period of 10 minutes, then it would be appropriate to calculate concentrations at receptors beyond a 10-minute travel time distance it would be appropriate to use a puff 14 model based on the release of a series of puffs at intervals of, say, one minute or use a continuous release model such as PAL or ISCST.

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14. For receptors within a 10 minute travel time distance it would be appropriate to use a puff model.

SECTION F

PROCEDURES TO PREVENT HAZARDS

This section addresses security procedures, inspection requirements, preparedness requirements, procedures taken to prevent accidental detonation, prevention of mixing of incompatible waste, and means to reduce personnel exposure. The procedures outlined in this section are designed to ensure compliance with 40 CFR 264.601 and the general requirements of 40 CFR 264.33 and 40 CFR 264.15.

F-l SECURITY

This section summarizes security precautions relative to Holloman AFB and 20,000 ED treatment units within the base confines. Holloman AFB is located on approximately 50,700 acres that consist primarily of unimproved property. White Sands Missile Range and White Sands National Monument bound the base to the north and south, respectively.

F-la SECURITY PROCEDURES AND EQUIPMENT

F-la(1) 24-HOUR SURVEILLANCE SYSTEM

The primary mission of Holloman AFB is to provide upgrade and continuation training for aircrews assigned to T38, F-4, and F117 aircraft. Additionally, solid base propulsion systems for military devices are tested at the area identified as the Test Track. The general nature of these activities is such that portions of the base facility are under constant surveillance. In particular, such areas include the Test Track Facility, flight line areas, and the munitions building. In addition to these surveillance measures, the main base area and any base area adjacent to these secure zones is patrolled at intervals both day and night. Traffic access to Holloman AFB is provided only by Highway 70 that traverses the southern boundary of the base and La Luz gate on the eastern boundary. Access can also be gained from White Sands Missile Range. Entrances to the base from Highway 70 are manned by armed guards 24-hour per day. These general surveillance practices provide general 24-hour surveillance to the treatment unit.

F-la(2) BARRIER AND MEANS TO CONTROL ENTRY

The 20,000LB EOD Area is located at the end of a single access road which runs approximately 20 miles along the length of the test track. Entrance to the test track area is controlled by Test Track personnel and the Security Police. Entrance to these units is restricted to authorized visitors on approval of the EOD supervisor. Visitors to the units must be accompanied by EOD personnel. Additionally, the treatment unit is provided with only a single entrance.

F-1a(3) WARNING SIGNS

Warning signs that indicate the controlled access nature of the treatment unit is present at the entry point to the facility boundary. The unit is posted with signs that state: "Danger, Explosive Disposal Area, Keep Out". The signs at the entrance and along the circumference of the surrounding fence of distances at intervals of 300 feet are legible at distances greater than greater than 25 feet. The sign are in English and Spanish.

F-2 INSPECTION SCHEDULE

F-2a GENERAL INSPECTION REQUIREMENTS

The complexity and special nature of the activities conducted at Holloman AFB result in delegation of responsibility for general inspection requirements among various groups. Corrective action for deficiencies found during these routine inspections, repair and preventive maintenance of various items of equipment, and maintenance of inspection records are also delegated among these various groups. Among the areas covered by the routine inspection and maintenance activities are:

- ° Fire control Equipment: fire extinguishers, pump truck equipment (pumps, hoses, horns and sirens, etc.) fire alarms, and self-contained breathing apparatus.
- ° Emergency Equipment: protective clothing, safety glasses, face shields emergency eyewashes, chemical respirators, etc.
- ° Security Equipment: fences, gates, locks, facility lighting, signs, etc.
- ° Structures: road surfaces, vegetation-free zones, fireboards
- ° Communication Systems: radios, base intercom, base evacuation system, etc.
- ° Vehicular Equipment: transport vehicles.

An inspection program has been established to inspect all components of the treatment units for malefactions, deteriorations, signs of contaminant release that indicate potential for migration of hazardous waste constituents to the environment, or the potential for human endangerment. These inspections are performed prior to treatment, after treatment, and at regular intervals during inactivity to permit the use of corrective measures that will minimize such problems.

Vehicles used to transport demolition materials, explosives, and personnel are inspected daily and inspections documented on AF Form 1800.

Table F-1 presents the inspection schedule for inspecting safety and emergency equipment, security devices, structural equipment, communications equipment, mobile equipment, and range areas. Also listed is inspection of the clear zones around these units for vegetation. Clearing operations of the natural vegetation are then based on these inspections.

F-2a(1) TYPES OF PROBLEMS

The inspections schedule identifies the types of problems (e.g., malfunctions or deteriorations) which are checked during inspections.

F-2a(2) FREQUENCY OF INSPECTION

Inspection of all materials, security devices, safety equipment, and communication devices will be inspected before each EOD operation. This frequency of inspection will determine equipment deteriorations and malfunctions between inspections.

F-2b SPECIFIC PROCESS INSPECTION REQUIREMENTS -- Not Applicable

F-2b(1) CONTAINER INSPECTION -- Not Applicable

Table F-1 General Inspection Schedule

Area/Equipment	Specific Item	Types of Problems	Frequency of Inspection
Safety and Emergency Equipment	Face shields and extra protective eyeglasses	Broken and dirty equipment	Monthly
	Disposable respirators	Out of stock, not required, filter types for materials being handled.	Monthly, as needed
	Fire extinguishers (Min.= 2)	In need of recharging	Monthly/after each use
	Vehicular radio; handheld radio	Inoperable	As used
	First aid equipment and supplies	Items out of stock or inoperable	As used
	Protective clothing (impermeable full body coveralls, gloves and foot coverings	Holes, thin areas, tears	As used
Security Devices	Facility fence	Corroded chain-fence and barbed wire, burrowing, signs of intrusion	Bi-weekly
	Signs	Illegible	Bi-weekly
EOD Vehicle	Brakes	Worn pads and rotors	Prior to each treatment
	Hydraulics	Leaking	Prior to each treatment
	Trailer hitches	Loose and missing safety chains	Prior to each treatment
	Running emergency lights	Burned out	Prior to each treatment
	Horns/sirens	Inoperative	Prior to each treatment

Table F-1. General Inspection Schedule

Area/Equipment	Specific	Types of problems	Frequency of Inspection
Operating equipment	Demolition tool kit	Items missing and damaged	Prior to use
	General purpose tool kit	Items missing and damaged	Prior to use
	Pioneer tool kit	Items missing and damaged	Prior to use
	Demolition ordinance/initiation agents	Nonserviceable, exceeds shelf life damaged, corroded, deteriorated	Weekly, prior to use
Treatment Zone	Waste items	Inventory reconciliation	Prior to transport or treatment
	Residuals	Scattered, free-standing liquids	After treatment
	Trench walls	Settlement, cave-in	Before use
	Clear zone/general area	Vegetation, burrowing, corrosion, signs of runon/runoff	Monthly
	Firebreak	Vegetation, scrap, debris	Monthly
	Roads	Settlement, holes, ditches	Annual

F-2b(2) TANK INSPECTION -- Not Applicable

F-2b(3) WASTE PILE INSPECTION -- Not Applicable

F-2b(4) SURFACE IMPOUNDMENT INSPECTION -- Not Applicable

F-2b(5) INCINERATOR INSPECTION -- Not Applicable

F-2b(6) LANDFILL INSPECTION -- Not Applicable

F-2b(7) LAND TREATMENT INSPECTION -- Not Applicable

F-2b(8) MISCELLANEOUS UNIT INSPECTION

The inspection schedule used for the treatment unit is provided as Table F-1. This inspection plan addresses unit specific structures, emergency equipment, operational equipment, safety equipment, communications systems, transport vehicles, and the treatment zone (including the cleared area).

F-2c REMEDIAL ACTION

If inspections reveal that nonemergency maintenance is needed, then Holloman AFB personnel will initiate immediate action(s) to preclude further damage and reduce the need for emergency repairs. If a hazard is imminent, or has already occurred during the course of an inspection, or any time between inspections, then remedial action will immediately be taken. Appropriate authorities will be notified according to the Holloman Contingency Plan, Section G of this application. In the event of an emergency involving the release of hazardous constituents to the environment, efforts will be directed towards containing the hazard, removing it, and subsequently decontaminating the affected area as outlined in the Holloman AFB Contingency Plan. The general nature of the remedial action to be taken is noted in the Inspection Log.

F-2d INSPECTION LOG

A sample inspection log for these units is given in TO 11A-142. The log includes spaces for the date of the inspection, identity of the inspector, and the specific items to be inspected and provides for records of remedial action.

F-3 WAIVER OF PREPAREDNESS AND PREVENTION REQUIREMENTS

No waiver is requested.

F-3a EQUIPMENT REQUIREMENTS

F-3a(1) INTERNAL COMMUNICATIONS

Refer to the Holloman Spill Prevention and Response (SPR) Plan for information on the alarm system at Holloman AFB. Personnel that enter the treatment zone for inspection of operation are provided with hand-held two-way radios.

F-3a(2) EXTERNAL COMMUNICATIONS

External communications capabilities are provided through the base operator. Communications systems include Defense Switched Network (DSN), FTS, and Southwest Bell System.

F-3a(3) EMERGENCY EQUIPMENT

Refer to the emergency equipment available at the treatment units during operations which includes fire extinguishers, two-way radios, and personnel protective equipment such as gloves and respirators.

F-3a(4) WATER FOR FIRE CONTROL

Water for fire control is not available at this unit. Base fire department trucks are available during operations for emergency response.

F-3b AISLE SPACE REQUIREMENTS -- Not Applicable

F-4 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

F-4a UNLOADING OPERATIONS

Procedures to prevent incidental detonation of the waste are also applicable to spill prevention during pretreatment operations. These procedures are indicated in Section C. EOD procedures to prevent accidental detonation are detailed to TP 11A-1-42 and TP 11A-1-60. In general, these procedures specify use of nonsparking tools, encasement to reduce impact, use of certain clothing materials, and, most importantly, removal of primers and initial detonators from the device. The explosive nature of the waste indicates the greater hazard to be incidental detonation during transfer of waste into the detonation zone. None of the energetic waste contains free liquid.

F-4b RUNON AND RUNOFF

Runon is prevented from intering this unit by the berm surrounding the treatment area. Additionally, the area surrounding the units is inspected on a regular basis for signs of visible contamination (detonation fragments or discoloration). Detonation fragments that are discovered are collected and inspected by EOD for signs of reactivity. If any surrounding soils exhibit signs of visible contamination, the soils will be analyzed by the protocols indicted in Section C and, if necessary, collected for disposal as hazardous waste. In addition, a complete hydrogeological survey will be completed in 1993 to assess runon and runoff affects. Results of the survey will be forwarded to NMED.

F-4c WATER SUPPLIES

No water lines are present in the vicinity of these units. Impacts to surrounding groundwater or surface waters are discussed in Section E.

F-4d EQUIPMENT AND POWER FAILURE

Operations at the unit will not be affected if a facility power outage occurs. None of the unit-specific equipment requires electrical power.

F-4e PERSONNEL PROTECTION EQUIPMENT

The equipment appropriate for employees at specific facilities and areas of the plant is specified by EOD orders and the bioenvironmental engineer. They consider the characteristics of the waste types to be handled, including toxicity, ignitability, reactivity, corrosivity, routes of exposure, and similar information. The bioenvironmental staff reports to the OSC whenever the Contingency Plan is implemented, and they assist him in specifying the protective equipment for firefighters, rescue teams, spill cleanup personnel, equipment decontaminators etc.

Procedures to ensure safe handling of these reactive waste are detailed in TOs 11A-1-42 and 11A-1-60. All operations are performed by fully-trained EOD personnel under the direction of the EOD Supervisor. These personnel are familiar with procedures to be followed for the material being handled.

F-5 PREVENTION OF REACTION OF IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTES

F-5a PRECAUTIONS TO PREVENT IGNITION OF REACTION OF IGNITABLE OR REACTIVE WASTE

Each waste item that is destined for treatment at the unit is handled in accordance with TOs 11a-1-42 and 11A-1-60. Waste energetic items are not opened at any time due to the potential for incidental detonation. Postdetonation residues are inspected to ensure no untreated waste remains in the zone.

F-5b GENERAL PRECAUTIONS FOR HANDLING IGNITABLE OR REACTIVE WASTE AND MIXING OF INCOMPATIBLE WASTE

The general procedures for handling these wastes are detailed in referenced TO procedures

F-5c MANAGEMENT OF INCOMPATIBLE WASTE IN CONTAINERS-

No waste is stored at these units prior to thermal treatment.

F-5d MANAGEMENT OF INCOMPATIBLE WASTE IN CONTAINERS-Not Applicable

F-5f INCOMPATIBLE WASTE IN TANKS-Not Applicable

F-5g IGNITABLE OR REACTIVE WASTES IN WASTE POLES-Not Applicable

F-5h INCOMPATIBLE WASTES IN WASTE PILES-Not Applicable

F-5i IGNITABLE OR REACTIVE WASTES IN SURFACE IMPOUNDMENTS-Not Applicable

F-5j INCOMPATIBLE WASTE IN LANDFILLS-Not Applicable

F-5k IGNITABLE OR REACTIVE WASTES IN LANDFILLS-Not Applicable

F-5l INCOMPATIBLE WASTE IN LANDFILLS-- No- Not Applicable

F-5m LIQUID WASTES IN LANDFILLS -- Not Applicable

F-5n SPECIAL REQUIREMENTS FOR CONTAINERS DISPOSED IN LANDFILLS --Not Applicable

F-5o IGNITABLE OR REACTIVE WASTES IN LAND TREATMENT --Not Applicable

F-5p INCOMPATIBLE WASTE IN LAND TREATMENT Not Applicable

As indicated in Sections C and D, the general formulation of these items incorporates multiple energetic compounds in a manner known as a

“Detonation Train”. Additionally, the compounds are often commingled in binary or ternary explosive formulations. For this reason, some of the energetics that are combined exhibit incompatibility under normal conditions.

SECTION G
CONTINGENCY PLAN

The information provided in this section is adopted from the Holloman AFB Spill Prevention and Response Plan, Holloman AFB Regulation 136-2. The plan is divided into six sections that identify:

- overall mission,
- designated parties and their responsibilities
- spill prevention, control, and countermeasures,
- contingency plan requirements and actions,
- contingency training, and
- plan review and update.

Additionally, the Spill Prevention and Response Plan provides a series of annexes that identify contingency requirements for specific and other nonspecific base locations. Annex II-8 is used in conjuction with the sections of the Spill Prevention and Response Plan indicated above in response to emergencies at these locations. The Spill Prevention and Response Plan is provided as Exhibit G-1

G-1 GENERAL INFORMATION

OB/OD operations occur at three location on Holloman AFB identified as the EOD training range, moving trench, and test tract. Accordingly, contingency information is provided for these three locations.

This contingency plan will continually be reviewed and revised if any of the following occur: the facility permit is revised; the plan is inadequate in an emergency; the procedures herein can be improved; facility operations change in a way that alters the plan the emergency coordinator changes; or the emergency equipment list changes. Amendments to this plan can be initiated by any responsible party. Proposed changes may be submitted to 49 CES/CEV as the office with primary responsibilities to represent the permit holder. Adopted changes will be provided to all record holders of this permit application.

Copies of the plan are available at the Holloman AFB civil engineering office and the base EOD office.

The facility name, address, ID number, and owner/operator are provided below:

- Name: Holloman
- Owner: United States Air Force

- Operator: 49 CES/CEV
- EPA ID No: NM6572124422

16 A copy of the topographic map included in Figure B-4 shows the area surrounding the unit. Figure B-3 designates the location of the unit relative to the main base area.

G-1 EMERGENCY COORDINATORS

The emergency coordinators will coordinate and direct control and cleanup efforts at the scene in case of an incident involving the transportation, handling, or demolition of explosive waste items. The emergency coordinators can designate other personnel to assist them in the event of an emergency and have the full authority to obtain fire and medical support service should the need arise.

Prior to operations by EOD personnel, the EOD supervisor contacts the following base offices: meteorology, munitions, medical services, security police, base operations, Environmental Coordinator, and fire chief and the NMED. Therefore, the capabilities of these organizations are alerted in the event that potential emergencies occur during EOD treatment operations.

The primary on-scene coordinator (ISC) for Holloman AFB is the Commander, 49th Support Group. The title and work phone number of the primary OSC and designated alternates are provided below:

Title	Base Phone No.
Commander	5541
Base Civil Engineer	3071
Base fire Chief	1117
Command Post	7575

G-3 IMPLEMENTATION

The decision to implement the Contingency Plan for the unit depends upon whether an imminent or actual incident could threaten human health or the environment. The purpose of this section is to provide guidance to the emergency director in making this decision by providing decision-making criteria.

The Contingency Plan will be implemented in the following situations:

- An unplanned fire or unplanned explosion occurs at an OB/OD unit such that:

- the potential for human injury exists;
- toxic fumes that could endanger human health or the environment are released;

- the fire could spread on-site or off-site and possibly ignite other flammable materials or cause heat-induced explosions;
- the use of water and/or chemical fire suppressants could result in contaminated runoff that could endanger human health or the environment; and
- an imminent danger exists that an explosion could ignite other hazardous wastes at the facility and possibly result in the release of toxic material.

° A spill or unplanned release of hazardous material occurs the unit such that;
  - the spill could cause the release of toxic liquids or fumes that could endanger human health or the environment;
  - the spill cannot be contained in the immediate areas resulting in potential off-site soil contamination and/or ground or surface water pollution that could endanger human health or the environment; and
  - the spilled material inadvertently detonates or combusts.

° A fire or explosion occurs during transport of the waste or residuals to or from the unit.
° A planned treatment event results in:
- damage to the unit beyond that normal to such treatment event and such that release is imminent; or
- ignites any structure, road surface, etc. in the vicinity.
° During rupture of a cylinder, the cylinder is released from its securing device.

G-4 EMERGENCY RESPONSE PROCEDURES

G-4a NOTIFICATION

The EOD team members discovering a potential emergency incident at any of these units will notify Range Control. The Range Control Supervisor will, in turn, notify the OSC or alternate. The OSC or alternate will immediately activate the internal alarm system to notify or evacuate personnel, if appropriate. In addition, the OSC or alternate will notify the base Fire Chief, Environmental Coordinator, Base Civil engineer, and Medical Services as required.

The appropriate local agencies with designated response roles will be notified by the OSC if their help is needed. The appropriate state agencies will be notified is their assistance is needed, or the incident requires reporting of this level.

The evacuation routes to be used in the event of an emergency, noted in Section G-3, are the unit entrances, provided that the extent of the incident may be limited to the immediate vicinity but temporary evacuation is required. Evacuation from the main base are, if required, is designated in Holloman AFB Disaster Plan 355-1, Disaster Preparedness. Notification and evacuation are further addressed in the Spill Prevention and Response Plan (Exhibit G-1) and Disaster Plan 355-1 (Exhibit G-2).

G-4b IDENTIFICATION OF HAZARDOUS WASTES

The OSC will immediately identify the character, exact source, amount, and a real extent of the material involved in the unplanned incident. The initial identification method will be by visual inspection of the incidents effects, spilled material, and location of the release. Plan records, including inventories and process and waste log sheets, are available at the EOD and base Environmental Coordinator's office to aid in estimating the composition and quantity of released material. Base Bioenvironmental Engineering will sample to verity hazardous material identification to determine boundaries of contaminated areas and contaminant concentrations, and to verify proper cleanup activities are completed.

Resources such as plant storm-line diagrams and material-storage locations are available at the Base Operations office and will be utilized to determine control procedures.

G-4c HAZARD ASSESSMENT

Possible hazards to the environment and public health will b e assessed by the OSC, and the need for local evacuation and notification of local authorities will be determined. In assessing the situation, the OSC will consult with the Environmental Coordinator, Bioenvironmental Engineer, and base Fire Chief. These parties will consider both direct and indirect effects of the event on human health, welfare, and natural resources. In assessing the event, the potential for direct and indirect effects shall indicate, but not be limited to, fire, explosion, further release occurrence, toxic gases, or injection by runon and runoff. The following portions of the Spill Prevention and Response Plan are referred to for this assessment: Annex I, Annex II-8, Annex III and Annex VI. Action will be taken to control releases and minimize effects during such an emergency, if the situation involves the release or potential release of toxic effluents.

The OSC (in conjunction with the noted personnel) will determine whether unit has had a release which could threaten human health or the environment outside the base. Bioenvironmental Engineering will survey the area and advise the OSC in the establishment of protective boundaries around the contaminated areas.

If a release results in a vapor cloud, several methods are available for assessing the hazards. Portable equipment for direct air monitoring can be used to make a rapid determination of the most volatile organics.

Meteorological data, including wind, speed, wind direction, temperature, dew point, barometric pressure, and an automatically-calculated stability factor are continuously available from base meteorological towers. These data, along with information about the source of an atmospheric release, can be used to predict the direction, extent, and estimated concentration profile of a contaminated release.

If the assessment of the incident indicates that evacuation of areas downwind of the unit may be advisable, the OSC will immediately notify HQ ACC/CEV and the appropriate local authorities. He will consult with these officials to help decide whether local areas should be evacuated. The OSC or the Environmental Coordinator will immediately notify the National Response Center (using their 24-hour toll free number, 800-424-9902).

G-4d CONTROL PROCEDURES

Potential accidents at these units can be considered either unplanned fire/explosion, inadvertent facility damage, or spill material release. Natural disasters such as earthquakes, hurricanes, or tornadoes are not assumed to cause actions which fall into one of these categories. Procedures for responding to these incidents are contained in the Spill Prevention and Response Plan, Disaster Preparedness Plan, and TO 11A-1-60. Specific actions to be taken at these units include:

° Ordnance Transportation Vehicles

- Explosion. In the event of an explosion, personnel will immediately withdraw to a safe distance and evaluate the situation. NOTE: This does not apply to detonation during transport which requires immediate implementation of the referenced Spill Prevention and Response Plan and Disaster Plans. Heavy-bodied trucks have been specifically chosen for this task due to the inherent risk associated with these materials. Transport limits and requirements are specified in relevant EOD technical orders.

- Fire. In the event of a fire involving a transport vehicle with ordnance on-board, an attempt to control the fire with available extinguishers may be permissible if the fire is initially away from the ordnance. If not, personnel will withdraw to a safe distance and advise appropriate authorities.

° Material Spill. In the event of a diesel fuel spill, shovels will be used to construct a dike around the spill to contain lateral movement. As much free liquid as possible will be returned to the container. The fuel-soaked soil will be excavated and placed in impervious recovery containers for transportation to an approved disposal location. The base Environmental Coordinator will be contacted for disposal information.

G-4e PREVENTION OF RECURRENCE OR SPREAD OF FIRES, EXPLOSIONS, OR RELEASES

The Holloman Spill Prevention and Response Plan should be referenced for this information. At a minimum, follow-up actions will include:

° Start actions to collect, treat, and dispose of nonexplosive waste or other materials as appropriate. This will be a joint operation involving EOD, fire, and Bioenvironmental Engineering personnel.

° Ensure that EOD, fire, and safety personnel investigate the cause of the emergency and provide a technical report to the Commander, 49th Support Group within 72 hours.

° Ensure that proper restoration actions are started as soon as possible after appropriate explosives decontamination procedures have been completed. This will be a joint operation between safety and civil engineering personnel for Air force incidents. All decontamination actions will be documented and the records permanently maintained at Air Force EOD, Safety, and real estate offices.

° Ensure that equipment repaired or replaced as a result of the incident is recertifed, as necessary, prior to being placed.

G-4f STORAGE AND TREATMENT OF RELEASE MATERIAL

The Spill Prevention and Response Plan should be referenced for this information.

G-4g POSTEMERGENCY EQUIPMENT MAINTENANCE

The Spill Prevention and Response Plan should be referenced for this information.

G-4h CONTAINER SPILLS AND LEAKAGE

Any container spills or leakage which might occur at these units will be managed in accordance with the Holloman Spill Prevention and Response Plan.

G-4i TANK SPILLS AND LEAKAGE -- Not Applicable.

G-4j WASTE PILE SPILLS AND LEAKAGE -- Not Applicable.

G-4k SURFACE IMPOUNDMENTS, SPILL LEAKAGE, AND SUDDEN DROPS -- Not Applicable.

G-4l LANDFILL LEAKAGE -- Not Applicable.

G-5 EMERGENCY EQUIPMENT

These items will be available for EOD activities:

- first aid kit (NSN-654500-116-1410) or suitable substitute;
- ambulance or first aid vehicle;
- fire extinguisher: two per vehicle carrying class B/C explosives
- hand-held radio for contact with range control;
- vehicular radio for contact with Holloman AFB;
- team chief's response kit with maps;
- road kit: on per vehicle;
- general purpose tool kit;
- signal kit;
- pioneer tool kit (if required for specific treatment event);
- road flares;
- shovels: two per vehicle; and
- bulldozer.

G-6 COORDINATION REQUIREMENTS

In addition to the base organizations and personnel assigned to the response effort, provisions have been made for including off-base organizations in the response organization when on-base spill response resources and expertise are insufficient, and when off-base water, land, or air are adversely affected. Some of the significant off-base spill response resources that can be incorporated, as needed, are discussed in the paragraphs below.

a. Air Combat Command (ACC/CEV): MAJCOM office responsible to ensure environmental protection including spill response matters. This office located at Langley AFB, VA and can be reached at DSN 574-2601 or commercial 804-764-2601.

b. Air Force Engineering and Services Center (AFESC): The Air Force Engineering and Services Center is assigned the responsibility to provide technical guidance and assistance to major commands and bases in contingency operations and environmental planning. Technical expertise can be provided to the Air Force OSC on hazardous material identification, control, cleanup, and disposal. The AFESC/CEVP is located at Tyndall Air Force Base, Florida, and can be contacted at DSN 970-6167 or commercial (904) 283-6167.

c. State of New Mexico Response Team: The State of New Mexico Environment Department (NMED) has developed an Emergency Response Team to respond to spills occurring within the state boundaries. The state OSC will be briefed fully by the base OSC on the spill response. The state OSC will be familiar with the available sources of spill response. Equipment and materials within New Mexico. The NMED emergency response team phone number is (505) 827-9239.

d. City of Alamogordo Fire Department: Holloman AFB has mutual aid agreement with the city of Alamogordo Fire Department to provide assistant in the event it should be needed.

e. White Sands Missile Range: Certain information services are also available to assist in the event of an emergency. The include:

- CHEMTREC
- CHRIS Manual
- ETRIS
- OHMTAPS
- U. S. Air Force Occupational and Environmental Health Laboratory

Further information on these services is provided in the Spill Prevention and Response Plan.

G-7 EVACUATION PLAN

It is extremely unlikely that emergency operation at these units would require evacuation of other areas at Holloman AFB since these units are isolated from any other area or office buildings.

The general base excavation plan is provided as part of the Disaster Preparedness Plan (Exhibit G-2).

G-8 REQUIRED REPORTS

The emergency coordinator will notify the Holloman AFB Environmental Coordinator (49th CES/CEV) who will report at pollution incidents as necessary.

Notification by the environmental coordinator (DEV):

1. All pollution incidents will be reported as soon a practicable (by telephone during duty hours or by message during off-duty hours) to the following agencies:

a. HQ ACC/CEV
. DSN 574-2601; commercial (804) 764-2601

b. Regional Response Center
Environmental Protection Agency, Region VI
First Interstate Bank Tower
1445 Ross Avenue
Dallas, TX 75202-2733
(214) 767-2666/2720
Telex 910-861-4125

c. New Mexico Environment Department
1-(505)-827-9239

2. Major spills or potential manor spills will immediately reported by telephone and teletype to RRC (1.b above) and:
National Response Center
Environment Protection Agency
Nasiff Building
400 7th Street, S.W.
Washington, D. C. 20590
1-800-424-8802
Telex 426-0014
Medium spills will be reported to the above agencies as soon as practical.

EXHIBIT G-1

Holloman AFB SPILL PREVENTION RESPONSE PLAN
(applicable sections)

EXHIBIT G-2
HOLLOMAN AFB DISASTER PREPAREDNESS PLAN

SECTION H
PERSONNEL TRAINING

H-1 OUTLINE OF TRAINING PROGRAM

Facility personnel who handle hazardous wastes must successfully complete a program of classroom instruction and/or on -the-job-training in order to prepare them to operate and maintain the facility/unit in a manner which ensures that facility's compliance with RCRA training requirements.

All DoD EOD personnel attend the Explosive Ordnance School at Indian Head Naval Ordnance Station, Indian Head, MD. Explosive Ordnance School incorporates hazardous waste management training for the specific wastes that are treated in the unit. This is the single training point for all military personnel in the EOD career field. Senior EOD personnel also support this training with on-the job training and close supervision.

H-1a JOB TITLES AND DUTIES

EOD supervisor personnel at Holloman AFB are directly responsible for the proper handling of explosive ordnance. The duties, responsibilities, and qualifications of these position are as follows:

Air Force EOD Supervisor

Responsibilities: Directs the operations at the EOD section at Holloman AFB. The EOD supervisor provides assistance and guidance on explosive ordnance disposal and management at the EOD areas.

Duties:

1. Plans, coordinates, and directs all EOD operations at Holloman AFB. Interprets regulations and develops necessary operating procedures as required. Determines requirements for manpower, space, and equipment and initiates actions required. Determines need for modifications to existing facilities and initiates action to improve economy, efficacy safety, and physical security of operations. Develops appropriate requirements and initiates requests for work.

2. Personal contacts: Maintains personal contacts with local and state government agencies and military commands.

3. Work assignment and review: Assigns work to subordinate employees or supervisors based on priorities. Makes decisions on work problems referred by subordinate supervisors. Assures that workload and project responsibilities are specifically delegated and assigned to subordinates.

H-1b TRAINING CONTENT, FREQUENCY, AND TECHNIQUES

H-1b-(1) EOD TRAINING PROGRAM

This program is taught at Indian Head, MD, and is for all EOD personnel within DoD. All personnel must pass the basic course and supervisor personnel must pass the two additional advanced courses. All EOD personnel are required to complete annual reviews of the basic course. The course outline is as follows:

1. Explosive Ordnance Disposal Specialist/Technician Career Field
- **A**. Progression in career ladder 464X0
- **B**. Duties of AFSCs 46430/50/70

2. Security
- **A**. Communications Security (COMSEC)
  - **(1)** Classify information and use MAJCOM/SOA EEFIS
  - **(2)** Prevent security violations
  - **(3)** observe security precautions
- **B**. Operations Security (OPSEC)
  - **(1)** Background and history of OPSEC
  - **(2)** Definition of OPSEC
  - **(3**) Relationship of OPSEC to other security programs including COMSEC, Information Security, and Physical Security
  - **(4)** Common OPSEC vulnerabilities
  - **(5)** OPSEC significance of unclassified data and procedures
  - **(6)** Specific OPSEC vulnerabilities of AFSC 464-X0
- **C.** Resource Security
  - **(1)** EOD publications
    - **a.** Storage requirements
    - **b.** Control/Access procedures
    - **c.** Destruction/Disposition requirements
  - **(2)** Protection of firearms and munitions
  - **(3)** Arming and use of force by USAF personnel

3. Air Force Occupational Safety and Health
- **A.** The USAF safety program
- **B.** Principles pertaining to:
  - **(1)** Ground safety
  - **(2)** Explosives and missile safety
  - **(3)** Nuclear surety
- **C**. Investigate and report USAF mishaps

4. Publications
- **A.** USAF publications
- **B**. USAF technical orders (TO)

(1) USAF TO system
(2) Use indexes (NI & RI)
(3) Locate desired information
(4) Use TOs when performing tasks
(5) Establish and maintain TO files
(6) Initiate TO improvement reports
(7) Requisition TOs

5. Participate in USAF Graduate Evaluation Program

6. Management

A. EOD Unit Management
(1) Organizational structure
(2) Functions and responsibilities

B. Inspection system

C. Material deficiency reporting

7. Applied principles of Physics

A. Properties of matter

B. Laws of motion

C. Simple machines

D. Measurement systems
(1) English
(2) Metric
(3) Convert from system to system

8. Fundamentals of Electricity

A. Ohms Law

B. Series circuit

C. Parallel circuits

9. EOD Tools

A. Maintain tools

B. Handtools
(1) Select proper tools
(2) Use tools properly

C. Special tools
(1) Select proper tools
(2) Use tools properly

10. Military Explosives (General)

A. Identification

B. Characteristics

C Effects

11. Destruction of Explosive Material

A. Demolition equipment

B. Firing systems
(1) Electric
(2) Non-Electric

C. Disposal procedures
(1) Routine
(2) Emergency

D. Munitions residue
(1) Inspect
(2) Certify
(3) Turn-in
E. Environmental considerations
F. Transport munitions

12. Render Safe Techniques
A. Immobilize fuzes
B. Remove fuzes by remote means
C. Disable electrical components
D. Disrupt firing trains
E. Use shaped charges and demolition techniques

13. Chemical Warfare Agents
A. Classification
(1) Physical state
(2) Tactical use
(3) Physiological action
(4) Persistency
B. Use protective clothing and equipment
C. Downwind hazards
D. Use detection and identification kits
E. Apply first aid/self air procedures
F. Use decontaminants and decontamination equipment

14. Chemical Munitions
A. Munitions characteristics
B. Identify
C. Seal and package leaking munitions
D. Respond to incidents involving chemical munitions
E. Transport hazardous chemical munitions
F. Use disposal methods

15. Placed Munitions
A. Land mine and fuzes
(1) Classification
(2) Identification
B. Booby traps and fuzes
(1) Classification
(2) Identification
C. Locate
(1) Land mines
(2) Booby traps
D. Placed munitions and their fuze
(1) Render safe
(2) Disposal
E. Placed munitions of foreign countries

16. Projected Munitions, Rockets, and Grenades

- **A.** Projected munitions and their fuzes
  - **(1)** Classifications
  - **(2)** Identification
  - **(3)** Locate
  - **(4)** Render safe
  - **(5)** Disposal
- **B.** Projected munitions, rockets, and grenades of foreign countries

17. Dropped Munitions

- **A.** Bombs
  - **(1)** Classification
  - **(2)** Identification
  - **(3)** Render safe
  - **(4)** Disposal
- **B.** Bomb clusters and dispensers
  - **(1)** Classification
  - **(2)** Identification
  - **(3)** Render safe
  - **(4)** Disposal
- **C.** Fuses
  - **(1)** Classification
  - **(2)** Identification
  - **(3)** Render safe
  - **(4)** Disposal
- **D.** Dropped munitions of foreign countries

18. Aircraft Systems and Explosives

- **A.** Aircraft egress/weapons systems
  - **(1)** Aircraft/egress
  - **(2)** Gun systems
  - **(3)** Release systems
  - **(4)** Missile/rocket launching systems
  - **(5)** Miscellaneous explosive-actuated devices
- **B.** Aircraft explosive devices
  - **(1)** Locate
  - **(2)** Render safe
  - **(3)** Remove
  - **(4)** Disposal

19. Pyrotechnics

- **A.** Classification
- **B.** Identification
- **C.** Render safe
- D. Disposal

20. Guided Missiles
- **A.** Classification
- **B.** Identification
- **C.** Propulsion Systems
  - **(1)** Identification
  - (2) Characteristics
- **D.** Hazardous missile components and propellants
  - **(1)** Identification
  - **(2)** Render safe
  - **(3)** Removal
  - **(4)** Disposal
- **E.** Guided missile of foreign countries

21. Nuclear Weapons
- **A**. Classification
- **B.** Identification
- **C.** Fuzing and firing systems
- **D.** Nuclear weapons and hazardous components
  - **(1)** Render safe
  - **(2)** Disposal
- **E.** Use protective clothing and equipment
- **F.** Use equipment

22. Radiac Instruments, Radiological Monitoring, and Radiological Hazards
- **A.** Principles of RADIAC instruments operation
- **B.** Use RADIAC instruments
- **C.** Perform operator maintenance on RADIAC instruments
- **D.** Compute stay times

23. Explosive Ordnance Reconnaissance
- **A.** Recognition of terrain changes due to unexploded ordnance (UXO)
- **B.** Locate, mark, and report UXOs
- **C.** Incident categories
- **D.** Determine hazard distances
- **E.** Safety requirements
- **F.** Protective works
- **G.** Technical intelligence
  - **(1)** Use photographic equipment
  - **(2)** Reporting

24. Access and Recovery
- **A**. Characteristics of soils
- **B.** Effects of weather on soils
- **C.** Methods of gaining access
- D. Performing field rigging and improvised hoisting

E. Tie knots, bends, and hitches

25. Ranges
- **A.** Decontaminate ranges
  - **(1)** Active
  - **(2)** Inactive
  - **(3)** Excess
- **B.** Proficiency/Demolition ranges
  - **(1)** Establish
  - **(2)** Maintain

26. Improvised Devices
- **A.** Improvised explosive devices (IEDs)
  - **(1)** Identification
  - **(2)** Gain access
  - **(3)** Render safe
  - **(4)** Disposal
- **B.** Radiography interpretation
- **C.** Improvised nuclear devices (IND)

H-1b(2) RCRA TRAINING PROGRAM

All EOD personnel responsible for management and operations at the 20,000lb EOD Area are required to complete the RCRA training program offered at Holloman AFB. The course outline is provided as Exhibit H-1.

H-1c TRAINING DIRECTOR

The EOD supervisor is responsible for ensuring that assigned personnel receive adequate training in handling potentially hazardous wastes. Training directors at the EOD school in Indian Head, MD, are highly trained career specialists who provide the EOD training for all DoD personnel. Instructions for the RCRA course are indicated in Exhibit H-1. Records of previous and ongoing training courses are maintained at the EOD section.

H-1d RELEVANCE OF TRAINING TO JOB POSITION

The EOD supervisory personnel who will be responsible in case of an emergency have been trained in handling explosive ordnance and potentially hazardous waste and in responding to emergency situations. Each has attended the EOD school course at Indian Head Naval Ordnance Station. Completion of the RCRA training course in Exhibit H-1 is also required.

H-1e TRAINING FOR EMERGENCY RESPONSE

The Naval Ordnance Station training program ensures that personnel receive emergency response training. On-the-job training requires each person to read and understand various official publications including, but not limited to:

AFR 127-100	Explosives Safety Standards
AFOSH Regulation 127-66	General Industrial Operations
Code of Federal Regulations, Title 49	Transportation
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
T.O. 00-5-1	AF Technical Order System
T.O. 11A-1-1	Ammunition Restricted or Suspended
T.O. 11A-1-42	General Instructions for Disposal of Conventional Munitions
T.O. 11A-1-46	Fire Fighting Guidance, Transportation and Storage, Management Data, and Complete Round Charts
T.O. 11A-1-53	General Instructions for Ammunition Color coding, Identification of Empty and Inert Loaded Ammo Items and Components, and Assignment of Version Numbers to training and Dummy Ammunition Items
T.O. 11A-1-60	General Instructions for Inspection of Reusable Munitions Containers and Scrap Material Generated from Items Exposed to or Containing Explosives
T.O. 60 Series	This series is common to all military services. Various titles regarding specific items containing explosive ordnance, e.g., T.O. 60B-2-2-11-4 (Mk 106 Practice Bomb), T.O. 60F-2-2-1-7 (2.75 WP Warhead)

Additionally, EOD personnel responsible for operations at the EOD Area

Are provided additional training in emergency response as a portion of the Holloman AFB training program. This training includes the following applicable Air Force Occupational, Safety, and Health Standards"

AFOSH 111-1
AFOSH 127-31
AFOSH 127-38
AFOSH 127-43
AFOSH 127-66

H-2 IMPLEMENTATION OF THE TRAINING PROGRAM

The EOD supervisor and director of the Holloman AFB RCRA training program will ensure that all EOD personnel have met the training requirements within six months of this assignment at the facility. At the time of the submittal, all EOD personnel have completed the hazardous waste management portion of the training program. Training records for both the EOD and RCRA portions of the program are maintained at the EOD and Environmental Planning Branch.

Annual reviews and updates are required for both the EOD and hazardous waste management portions of the program. Records that specify the job title, duties, and progression in the training programs are maintained at the EOD branch. These records are maintained during tenure of the personnel at Holloman AFB.

EXHIBIT H-1

HAZARDOUS WASTE TRAINING OUTLINE

HAZARDOUS WASTE TRAINING OUTLINE

1. This training is provided primarily to accumulation/satellite accumulation point managers. Personnel who handle hazardous waste also receive this training. This course is designed to fulfill, in part, the requirements of 40 CFR 265.16. It is not intended to fulfill the requirements of 29 CFR 1910.120.

2. The following material is covered during the class:

A. Introduction RCRA

B. Definition of Hazardous Waste
- characteristics
- listed wastes

C. Accumulation point managers

D. Container use, marking, labeling and on base transportation

E. Contingency planning and emergency response.

SECTION I

CLOSURE PLANS, POSTCLOSURE PLANS, AND FINANCIAL REQUIREMENTS

I-1 CLOSURE PLANS

The 20,000lb Ed Area site is located in the northwest portion of the Holloman AFB boundary. Figures B-3 and B-4 fulfill the topographic map requirements and indicate the position of the unit within the base property.

The 20,000lb ED Area site is used to provide treatment to waste propellant compositions. Posttreatment inspections ensure that all energetic materials are treated. Additionally, sampling protocols, described in Section C, are designed to confirm that all energetic wastes are destroyed and that hazardous residuals do not remain in the area. Both residuals do not remain in the area. Both the residuals and underlying soils are sampled to confirm treatment effectiveness and to ensure that no hazardous wastes are disposed of. As a result of these factors, this closure plan presupposes “clean closure.” If sampling results indicate that clean closure cannot be achieved, a modification to the closure plan will be submitted 60 days prior to the date scheduled for initial closure actions.

I-1a CLOSURE PERFORMANCE STANDARD

This closure plan is designed to ensure that the unit will not require further maintenance, minimize the threat to human health and environment, and control or eliminate the escape of hazardous waste, hazardous constitutes, leachate, contaminated runoff, or decomposition products. This standard is met in the following manner:

1. During the active life of the unit, the posttreatment residuals and soils are sampled to demonstrate treatment effectiveness and ensure that residuals are nonhazardous.
2. During the interim period between treatment events, the residuals in the unit remain covered in order to retard leachate formation and prevent wind dispersal.
3. Annually, residuals and soils are sampled for characteristics of hazardous waste and suspected hazardous constituents. Residuals and soils that do not meet the criteria specific in Section D are removed from the unit until the underlying soil base is “clean”. Residuals and soils that are within the acceptable range are covered with natural fill.
4. The results of the sampling will be submitted to NMED during the unit’s active life.

I-lb PARTIAL AND FINAL CLOSURE ACTIVITIES

The closure of the 20,000lb ED Area site is a partial closure that involves closure of only this unit. Closure of all Treatment, Storage, or Disposal Facilities (TSDFs) at Holloman AFB will occur conjunctively with cessation of all base activities. This partial closure will be consistent with the general closure performance standards of 40 CFR 264.601. Coverage after us that occur during the active life of the unit are not considered partial closure. The anticipated date for initiation of these closure activities is January 1, 2050.

I-1c MAXIMUM WASTE INVENTORY

No inventory of waste will be present at the 20,000lb ED Area site at the time of closure. The total mass limit per treatment event is 20,000 pounds. The percentage of energetic material in propellant devices is estimated to range from 40 to 50% of the total mass. Consequently, the probable total energetic mass seldom exceeds 10,000 pounds.

I-1d INVENTORY REMOVAL, DISPOSAL, OR DECONTAMINATION OF EQUIPMENT

After the final treatment, residuals and soil samples will be taken in the final pit of the unit to demonstrate that no hazardous wastes remain and that hazardous constituents have not migrated during the active life of the subunit. If sampling results indicate otherwise, residuals and soils will be handled in the manner specified for the active life. The method for removal, disposal, and equipment decontamination, if required, is specified below.

I-1d(1) CLOSURE OF CONTAINERS -- Not Applicable
I-1d(2) CLOSURE OF TANKS -- Not Applicable
I-1d(3) CLOSURE OF WASTE PILES -- Not Applicable
I-1d(4) CLOSURE OF SURFACE IMPOUNDMENTS -- Not Applicable
I-1d(5) CLOSURE OF INCINERATORS -- Not Applicable
I-1d(6) CLOSURE OF LAND TREATMENT ZONE -- Not Applicable
I-1d(7) CLOSURE OF LANDFILLS -- Not Applicable
I-1d(8) CLOSURE OF MISCELLANEOUS UNITS
I-1d(8) (a) COVERAGE AFTER USE

As previously described, the underlying soils that remain in the pit are sampled and analyzed annually according to the protocols described in Section C. If the analytical results indicate that the residuals are hazardous, the residuals are removed from the pit. Prior to coverage underlying soils are sampled and analyzed at depths of approximately 1 foot intervals for the set of parameters as indicated in Section C. If these results indicate the soils are contaminated above the criteria listed in Section D, both the residuals and the soils will be excavated to a depth of approximately 1 foot. The removal, disposal, and decontamination procedures are summarized below.

STEP 1 - INITIAL SAMPLING

Following a treatment event and prior to coverage after use, residuals and soils are examined according to Section C. After annual sampling, if the soils are not contaminated, the unit is continued to be used. If sampling results indicated that residuals are hazardous or that underlying soils are contaminated, the remainder of the steps in this section are performed.

STEP 2 - REMOVAL

Residues and soil will be excavated to a depth of approximately 1 foot and containerized for disposal as hazardous waste in a permitted TSDF. Prior to disposal, these wastes will be stored in the Defense Reutilization and Marketing Office (DRMO) container storage facility. After removal of the first 1 foot of soil, random coring of soils under the trench will be taken with a hand-held auger to a depth of approximately 1 foot and composited for analysis. Locations were determined or described in Section C. If results indicate that criteria are not met in the first 1 foot, these soils will be removed by standard excavation equipment and managed as hazardous waste. Sampling and removal will proceed in 1-foot layers until the criteria described in Section D are met. Results from analysis of each layer will be submitted to NMED.

STEP 3 - BACKFILLING

Once the criteria in Section D are met, the excavation will be backfilled with clean soil. The top layer will consist of mixed soil (gypsum layers and topsoils, mounded to a height of approximately 12 inches, and compacted by a minimum of 5 blade passes. The closed subunit will be identified with 1-foot metal markers along all four sides.

STEP 4 - DECONTAMINATION

Upon completion of removal, all equipment used during the closure will be emplaced upon a linner that is brought to the area. This temporary base will be diked prior to equipment decontamination. All equipment will be decontaminated by steam cleaning. All rinsewaters will be collected, sampled for parameters of Section C, and if these criteria are exceeded, the rinsewaters will be handled as hazardous waste by storage at the DRMO facility and disposal at a permitted TSDF.

This form of closure is somewhat analogous to closure of a single cell in a landfill and a schedule for closure in this manner is not required. As indicated, all analytical results will be submitted to NMED and backfilling will not proceed until approval is granted.

I-1d(8) (b) - UNIT CLOSURE

The manner of operation for this unit indicates a strong probability that clean closure will be attainable. The steps taken to assure clean closure are described below.

STEP 1 - INITIAL SAMPLING

Ninety (90) days prior to the final treatment activities, soil coring samples will be taken by an auger-boring apparatus to a depth of >15 feet. Coring samples will be taken at 10-foot intervals. Sampling locations will be selected by division of the pit area into approximately 1000 grids of equal size and randomly determined in a manner similar to that described in Section C.

STEP 2 - MODIFICATION OF PLAN 1 CLOSURE NOTICE

In the unexpected event that sampling results indicate contaminant migration, a modified closure plan will be submitted to NMED. This plan will be based upon the extent and nature of contamination in the underlying media. The modified closure plan will be submitted to NMED 60 days prior to initiation of closure activities. If initial sampling results indicate “clean” closure is attainable, these results and a closure notice will be submitted 60 days prior to closure.

STEP 3 - FINAL TREATMENT/CLOSURE OF FINAL SUBUNIT

The final treatment event will performed as previously described. The posttreatment and subunit closure results will be submitted.

STEP 4 - CLOSURE

Clean closure will be achieved by grading of topsoils to retard erosion and runoff. To the extent practical, vegetative cover will be established. The area will be posted to indicate its previous use in a manner analogous to the current posting. Security procedures will be maintained.

STEP 5 - CERTIFICATION OF CLOSURE

Closure will be certified by an independent professional engineer who has had access to the closure plan, final subunit closure results, analysis of the soil cores, and the subunit during the closure activity. Certification of closure will be submitted to the NMED by registered mail within 60 days of completion of the closure action.

I-1e CLOSURE OF DISPOSAL UNITS -- Applicable

I-1f SCHEDULE FOR CLOSURE

A schedule for the closure of the unit is provided as Table I-1. Closure will be achieve within 180 days of the final waste treatment. The anticipated date for closure is January 1, 2050.

I-1g EXTENSION FOR CLOSURE TIME

No extension for closure time anticipated; however, if an extension is necessary to properly close the 20,000 ED Area, then a petition will be sent amending the Table I-1 closure schedule. This petition will demonstrate:

1. the need for more that 180 days to close the site,
2. the reasonable likelihood that a person other than the owner/operator will recommence operation of the site, and
3. that closure would be incompatible with continued operation of Holloman AFB.

I-2 POSTCLOSURE -- Not Applicable

I-3 NOTICE IN DEED -- Not Applicable

I-4 CLOSURE COST ESTIMATE

This facility is federally owned and exempt from this requirement

I-5 FINANCIAL ASSURANCE MECHANISM -- Not Applicable

I-6 POSTCLOSURE COST ESTIMATE

This facility is federally owned and exempt from this requirement.

I-7 FINANCIAL ASSURANCE MECHANISM FOR POSTCLOSURE -- Not Applicable.

I-8 LIABILITY REQUIREMENTS -- Not Applicable
I-9 STATE MECHANISM -- Not Applicable

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TABLE I-1: SCHEDULE FOR CLOSURE OF 20,000 ED AREA

Action	Day Completed
Initial sampling	-120
Modification of plan/closure notice	-60
Last waste treatment/subunit closure	-30
Closure begins	0
Grade and establish cover	90
Certify closure	180
Submission of certification	235

SECTION J-1
CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

During the period from August 1-12, 1988, representatives of EPA, Region VI were present at Holloman AFB to conduct a RCRA facilities assessment. The results of this assessment are included in “RCRA Facility Assessment, Preliminary Review/Visual Site Inspection Report, Holloman AFB, Nm EPA, I>D> #6572124422:, prepared for U>S> EPA Region VI by A. T. Kirney, Inc. and DPRA, September 1988.

SECTION K-1

OTHER FEDERAL LAWS

Information will be provided in accordance with the requirements of 40 CFR part 270.14(b) (20) at the request o f the New Mexico Department of Health and Environment. At this time, however, this facility is belied to be in compliance with the following federal laws: Wild and Scenic Rivers Act, National Historic Preservation Act of 1966, Endangered Species Act, Coastal Zoane Management Act, and the Fist and Wildlife Coordination Act.

SECTION L-1

CERTIFICATION

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

Signature: ____________________

Title: Deputy Base Civil Engineer

Date: October 26, 1992