EPA/ROD/R03-95/216
1995

EPA Superfund
Record of Decision:

ABERDEEN PROVING GROUND (EDGEWOOD AREA)
EPA ID: MD2210020036
OU 01
EDGEWOOD, MD
09/08/1995

Text:

FINAL

RECORD OF DECISION
INTERIM REMEDIAL ACTION
BUILDING 103 DUMP OPERABLE UNIT 1
EDGEWOOD AREA-ABERDEEN PROVING GROUND, MARYLAND

FEBRUARY 28, 1995

Distribution Restriction Statement:
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED A 0689-C-2
In accordance with Army Regulation 200-2, this document is intended by the Army to comply with the National Environmental Policy Act of 1969 (NEPA)

RECORD OF DECISION

for

INTERIM REMEDIAL ACTION

BUILDING 103 DUMP

OPERABLE UNIT 1

FEBRUARY 28, 1995

U.S. ARMY, EDGEWOOD AREA-ABERDEEN PROVING GROUND, MARYLAND

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

RECORD OF DECISION

Building 103 Dump, Operable Unit 1

Interim Remedial Action

U.S. Army Edgewood Area-Aberdeen Proving Ground, Maryland

February 28, 1995

SECTION 1

DECLARATION OF THE RECORD OF DECISION

1.1 S1TE NAME AND LOCATION

Building 103 Dump - Operable Unit 1, U.S. Army, Edgewood Area-Aberdeen Proving Ground (APG-EA), Maryland

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial action for the Building 103 dump. The selected interim remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

The State of Maryland Department of the Environment concurs that this interim remedial action is protective of both human health and the environment.

1.3 ASSESSMENT OF THE SITE

Actual or threatened release of hazardous substances from the Building 103 dump, if not addressed by implementing the interim response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health and welfare, and to the environment.

1.4 DESCRIPTION OF THE INTERIM REMEDIAL ACTION

This interim remedial action involves capping the Building 103 dump to 1) to prevent the infiltration of water into the dump with subsequent migration of contaminants to ground water and, 2) to prevent animal intrusion into the dump. The major components of this selected interim remedial action include constructing a multilayered cap-and-cover system over the Building 103 dump in accordance with Resource Conservation and Recovery Act (RCRA) requirements for hazardous waste landfill closure using a geosynthetic membrane and a sodium bentonite geocomposite mat. The design features of this cap and cover system will include: 1) an earthen material backfill cover (to include contaminated soil from the Building 503 Soils Operable Unit and non-hazardous drill cuttings from other APG-EA study areas) over the existing cover; 2) 2 feet of compacted semi-pervious earthen material over the backfill cover; 3) a sodium bentonite mat over the earthen material; 4) a geosynthetic membrane over the sodium bentonite mat; 5) a drainage layer over the geesynthetic membrane; 6) a cobble/gravel animal protective barrier and, 7) a final earthen vegetative cover. Surface water controls will be constructed tO accommodate seasonal precipitation. A gas collection/filtration system will be constructed to filter any emissions from the dump.

The Army has organized the remedial effort at the Budding 103 dump into two operable units: Operable Unit 1 - the source of contamination, and Operable Unit 2 - ground-water contamination. This interim remedial action does not address treatment of the contaminated ground water associated with the Building 103 dump. Groundwater issues are the subject of an additional investigation by the Army to more completely determine the nature and overall extent of groundwater contamination at APG-EA. A separate groundwater operable unit will address remediation of contaminated ground water beneath the Building 103 dump.

1.5 STATUTORY DETERMINATIONS

The selected interim remedy is protective of human health and the environment in the short term and is adequate protection until a final ROD is signed for the Canal Creek area, and is cost effective. It complies with Federal and State of Maryland requirements that are legally applicable, or relevant and appropriate to the interim remedial action. This interim remedy utilizes permanent solutions to the maximum extent practicable for this operable unit. However, because excavation of the Building 103 dump with subsequent

treatment of the contents was found to be hazardous and not practicable, this interim remedy does not satisfy statutory preference for removal and treatment as a principal element of the remedy. The size of the dump, hazards associated with excavation of the dump, and excessive costs associated with the excavation alternative preclude a remedy in which contaminants can be excavated and treated effectively. The statutory preference will be addressed by the final response action.

The selected remedy is consistent with the Superfund Program policy regarding waste containment at landfills (40 CFR § 300.430), where removal and treatment is impracticable. The Building 103 dump will be further investigated as part of the on-going Canal Creek Remedial Investigation/Feasibility Study (RI/FS). This investigation will determine if further sections are necessary to fully address the Building 103 dump. If further remediation is required, the selected remedy for Operable Unit 1 of the Building 103 dump will be consistent with those actions. If no further remediation is required, then this action may be final.

Because the selected interim remedy will result in hazardous substances remaining on-site, a review under Section 121(c) of CERCLA, 42 U.S.C. §9621(c), will be conducted within five years to ensure the interim remedy continues to provide adequate protection of human health and the environment. That review will include consideration of the following elements:

- Continued integrity of the cap-and-cover system
- Contaminant concentrations in ground water beneath the Building 103 dump
- Generation of gas/vapors at the dump

LEAD AND SUPPORT AGENCY ACCEPTANCE
OF THE RECORD OF DECISION
EDGEWOOD AREA-ABERDEEN PROVING GROUND, MARYLAND
FOR INTERIM REMEDIAL ACTION AT
BUILDING 103 DUMP OPERABLE UNIT 1

Signature sheet for the foregoing Record of Decision for the interim remedial action at the Building, 103 dump at the Edgewood Area-Aberdeen Proving Ground (APG-EA) between the U.S. Army and the United States Environmental Protection Agency, Region III, with concurrence by the Maryland Department of the Environment.

<IMG SRC 0395216A>

_____ _____

Date Richard W. Tragemann
Major General, U.S. Army
Commanding
Aberdeen Proving Ground

<IMG SRC 0395216B>

_____ _____

Date Raymond J. Fatz
Acting Deputy Assistant Secretary
of the Army (Environment, Safety
and Occupational Health)
OASA (I, L&E)

<IMG SRC 0395216C>

_____ _____

Date Thomas C. Voltaggio
Director, Hazardous Waste Management Division
U.S. Environmental Protection Agency
Region III

RECORD OF DECISION

INTERIM REMEDIAL ACTION

BUILDING 103 DUMP, OPERABLE UNIT 1

EDGEWOOD AREA-ABERDEEN PROVING GROUND, MARYLAND

SECTION 2

DECISION SUMMARY

This Decision Summary provides an overview of the problems posed by conditions at the Building 103 dump, Operable Unit 1, the remedial alternatives, and the analysis of those options. Following that, it explains the rationale for the remedy selection and describes how the selected interim remedial action satisfies statutory requirements.

2.1 SITE NAME, LOCATION, AND DESCRIPION

2.1.1 General

As shown in Figure 1, Aberdeen Proving Ground is located along the Chesapeake Bay in Harford County, Maryland, about 15 miles northeast of Baltimore. APG is divided into two main areas separated by the Bush River. The area north of the Bush River is referred to as the Aberdeen Area, and the area south of the Bush River is referred to as the Edgewood Area-Aberdeen Proving Ground (APG-EA). The Edgewood Area was established in 1917 as the primary chemical warfare research and development center for the Army with activities including laboratory research, field testing of chemical munitions, pilot scale manufacturing, and filling operations for chemical munitions. During World War I (WWI) and World War II (WWII), APG-EA was also the location of production-scale chemical agent manufacturing. Until the early 1970s, the primary methods of waste disposal at APG-EA were through burial, open detonation, open-air burning, or by discharging untreatud liquid wastes through sewer lines to surface water. Over the years, these operations resulted in contamination of the environment with hazardous materials, including ground water contamination. The U.S. Army is addressing this situation with a program for remedial investigation, feasibility study, and corrective action.

The Building 103 dump is located in APG-EA at the intersection of Williams Road and Hoadley Road in the old chemical plants area of APG-EA (see Figure 2). The dump is defined as the grassy area immediately north of Building E5422, which is bordered by Building, E5422, the Building E5422/E5427 parking lot, Hoadley Road and Williams Road. The site is referred to as the Building 103 dump because old Building 103 was located immediately north of the dump. A geophysical survey performed in 1994 determined the size of the dump to be approximately 350 feet from north to south, and 260 feet from east to west (approximately 1.9 acres). The geophysical work and interpretation of old aerial photographs suggest the dump extends beneath the parking lot to the west/southwest and extends beneath Building E5422 to the south. The dump has a ground surface elevation from 20 to 30 feet above mean sea level (MSL).

<IMG SRC 0395216D>
<IMG SRC 0395216E>

Presently, the existing dump cover is badly scarred with large animal burrows which permit direct infiltration of water. There is extensive erosion of the cover soil into the fill material. Also, settling of the existing cover has resulted in surface depressions.

A hydrogeologic assessment of the Canal Creek Area conducted by the United States Geological Survey (USGS) from 1986-1989 revealed low levels of contaminants in ground water in two ground-water monitoring wells at the Building 103 dump. It is not known if the dump is the source of this contamination, or if the contamination is from another source. However, since the dump is a known disposal site, it must be assumed that it is a source contributing to the ground-water contamination. Based on the findings in the hydrogeologic assessment reports for the Canal Creek Area and the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) the Army decided to accelerate remediation of the Canal Creek Area through an interim action at the Building 103 dump for Operable Unit 1. The Building 103 dump will be investigated further in the Canal Creek RI/FS, and the risks posed by the Building 103 dump further evaluated in an ongoing comprehensive human health and environmental risk assessment for the Canal Creek Area. This investigation/risk assessment will determine if further remedial actions are required to fully address the Building 103 dump. If further remediation is required, the selected interim remedy for Operable Unit 1 of the Building 103 dump will be consistent with those actions. If no further remedial actions are required, then this interim remedial action may be final.

2.1.2 Building 103 Dump Geology

APG-EA is underlain by alluvial and estuarine sands, silts and clays forminx alternating sand and clay layers. The sediments are divided into discrete aquifers and confining units, that from the surface down are called 1) surficial aquifer; 2) upper confining unit; 3) Canal Creek Aquifer; 4) lower confining unit and, 5) lower confined aquifer. The surficial and Canal Creek aquifers are connected hydraulically near the west branch of Canal Creek and in a paleochannel near the east branch of Canal Creek where the upper confining unit has eroded. No known pumping stresses affect the aquifers.

The stratigraphy at the Building 103 dump is based on two borings (Wells 23A and 23B). Soil with roots is present to a depth of approximately 0.4 feet, followed by soils and clayey fill with asphalt and wood debris to a depth of approximately 7.8 feet below grade. This is followed by thin beds of varying stratigraphy to a depth of about 14 feet below ground surface. A thick single layer (15.3 ft thick) of clean sand from 14.0 to 29.3 feet follows. This sand is part of the Canal Creek Aquifer. Underlying this sand layer is a mixed sand/clay layer with coarse cobbles to a depth of approximately 34 feet.

2.1.3 Building 103 Dump Surface Water

The Building 103 dump is not within the 100 year flood plain. Surface water run-on is from the north/ northwest, and through a culvert on the north side of Building E5427 which runs east beneath the parking lot, where it drains into a shallow gully on the dump. There is direct infiltration of surface water through holes in the existing cover, and the gully and several smaller depressions on the dump seasonally contain standing water. Surface water run-off is predominantly to the south/southeast, with drainage flowing between Building E5422 and Hoadley Road, and then south in a ditch along the west side of Hoadley Road for a short distance into a storm sewer that discharges into the east branch of Canal Creek.

2.1.4 Building 103 Dump Ground Water

The surficial aquifer is unconfined and is defined as the saturated part of the uppermost sand and gravel layer (0-35 ft) (USGS, 1989). Ground water-flow in the surficial aquifer is characterized mainly by local recharge and discharge with short flow paths. The surficial aquifer receives recharge from direct infiltration of precipitation, upward leakage from the Canal Creek Aquifer, and infiltration from leaky storm drains. Direct infiltration occurs over most of the aquifer surface area. The surficial aquifer discharges to surface water, leaky sewers and storm drains, and the Canal Creek Aquifer. Discharge to surface-water bodies occurs through streambanks, bottom sediments and marshes where an upgradient exists. The suficial aquifer is believed to discharge to the west branch of Canal Creek.

The Canal Creek Aquifer lies beneath the surficial aquifer with a thickness of 30-70 feet. It subcrops beneath the surficial aquifer where the upper confining unit is absent under the east branch of Canal Creek, and also near the west branch of Canal Creek. The Canal Creek Aquifer discharges vertically upward to the surficial aquifer in the paleochannel and near the west branch of Canal Creek if an upward head gradient exists between the two aquifers. Otherwise it flows to the southeast and down into a deeper confined flow system.

The lower confined aquifer is separated from the two overlying aquifers by an overlying confining unit. The direction of flow in the lower confined aquifer is also east/southeast.

Several residential ground-water wells exist outside of the installation boundary, but they are located upgradient of the dump with respect to ground-water flow, and are unlikely to receive contaminants from the dump under current or probable future use conditions. The aquifer that is tapped by these wells is the deeper aquifer in the lower confined unit. This unit may not be contaminanted and is hydraulically independent of the contaminanted surficial and Canal Creek aquifers. The Army recently sampled several residential wells along the northern boundary of the APG-EA for target compound list (TCL) volatile organic compounds (VOCs), isopropylmethylphosphonic acid, methylphosphonic acid, thiodyglycol, organosulfur compounds, organophosphorous compounds, explosives, and radiologicals. The laboratory analysis did not find any related contamination. The Army is currently sampling and analyzing ground-water from both the Canal Creek Aquifer and the lower confined aquifer in the Northern Boundary Area to determine the distribution of contaminated ground-water, if any is present, and to determine whether it has migrated or is likely to migrate northward across the boundary onto off-post areas. The Army also intends to conduct a ground-water treatability study in the Canal Creek Area.

2.1.5 Building 103 Dump Climatology

Due to the proximity of two large bodies of water (the Chesapeake Bay and the Atlantic Ocean), the climate at Aberdeen Proving Ground tends to be moderate as compared to the inland areas (ESE, 1981). The average unnusual temperature is 54.5 degrees Fahrenheit, with an average relative humidity of 73.8 percent.

Precipitation averaged 44.8 inches/year over the past 21 years, with the maximum rainfall occurring in the summer and the minimum during the winter (WES, 1990). Snowfall averages about 12 inches per year (Sisson, 1985). Prevailing winds average 6.8 knots (Sisson, 1985) in a northwest to north-northwest direction in the winter months, and a south to south-southwest direction in the summer months (ESE, 1981).

2.1.6 Building 103 Dump Land Use

The region surrounding APG-EA is primarily residential, with some farming. The Gunpowder River and the Bush River are used for boating, fishing and other recreational purposes. There is passenger rail traffic on AMTRAK railroad tracks running in a north/northeast direction immediately outside the installation boundary. United States Route 40 runs in a north/northeast direction approximately three miles north of the installation. Interstate 95 runs in a north/northeast direction approximately five miles north of the installation. State Route 24 terminates at the main gate of APG-EA. The primary population centers near the APG-EA are the communities of Joppatowne/Magnolia (population 9,385) one mile west of the installation, Edgewood (population 23,313) directly adjacent to the installation, and Bel Air (population approximately 52,000) about eight miles north of APG-EA on Route 24. The total population of Hatford County is approximately 185,000.

The Building 103 dump is centrally located in an industrial area of APG-EA with nearby roads, parking lots, buildings, residential areas, and recreational areas. The dump itself is partially surrounded by a chain-link fence. Hoadley Road, is located directly east of the dump. Military and civilian DoD personnel work in buildings immediately adjacent to the Building 103 dump. A residential area (barracks and housing for military personnel and their families) is located approximately 2,200 feet east and southwest of the dump. Weide Airfield is located approximately 2,500 feet east of the dump. Horse stables, and grazing and riding areas are located approximately 1,000 feet east of the dump. Playing fields, a picnic area, and a swimming pool are located about 1,800 feet south/southeas of the dump. In addition, playing fields and a picnic area are located about 3,000 feet southwest of the dump. Depending on wind speed and direction, local communities could be potential receptors in the event of a release of hazardous substances caused by remediation activities.

The primary source of water for APG-EA has been from surface water since the installation was established. Ground-water has been a secondary source of water for APG-EA, and wells have been used to supply water when needs could not be satisfied by surface-water supplies. The primary drinking water source for APG-EA is Winters Run. The system which has supplied potable water is the Van Bibber System, which consists of Atkisson Reservoir on Winters Run, the Van Bibber Treatment Plant, a small dam and reservoir at the treatment plant site, and a piping and tank reservoir system (Hanson Reservoir) to deliver the water to APG-EA. This system is unlikely to receive any contaminants from the Building 103 dump since it is located north and upgradient of the dump.

2.1.7 Building 103 Flora and Fauna

Diversity of life at the dump is limited. Some wetlands habitat is located to the west/southwest, however, the dump is not considered to be a wetland. Terrestrial wildlife in the area of the dump includes song birds, ground hogs, field mice, deer, and rabbits. Several ground hogs inhabit burrows in the dump. No endangered protected species live at the dump. No aquatic invertebrates and no fish are present at the dump since water flow to the dump is intermittent and dependent on rainfall. Some small amphibians may live on the dump during periods of standing water however, a significant population is probably not present.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 History of Site Activities

The Building 103 dump is a waste dumping and burial site. It was originally a sand pit from the time during WWI when the chemical and munition filling plants were constructed. After WWI the sand pit became a dump site for junk, construction debris, waste chemicals, and possible ordnance items. Dumping started in the years immediately following WWI and continued until the late 1930s or early 1940s. The dump was probably filled in and covered following a general surface cleanup in April 1937. While later aerial photographs (as late as 1964) continue to show ground scarring in the area of the dump, this was probably the result of activity in the area other than burial. Historical records indicate after dumping ceased, the area was sometimes used to remove insulation from copper wire by open burning.

There are essentially no records as to what was placed into the dump; however, some indication of the contents can be inferred from wastes typical of the processes used in the manufacture of chemical agents, incendiary and screening smokes, impregnite (chemical compound used to make military uniforms chemical agent resistant), and other materials. Thus, the contents of the dump are believed to be

chemical agent residues contained in process vessels, possible chemical ordnance and/or conventional ordnance items, chemical residues, junk and construction on debris. Ordnance items are routinely uncovered during excavation activities in the Canal Creek Area. During a recent voluntary removal action at the Building 103 dump, approximately 50 gallons of organic sludge coutaining bromobenzylcyanide (BBC) residue as the major constituent was removed from a process vessel. This vessel had been exposed because of erosion and settling of the dump cover soil. A fence was constructed around the dump in 1992.

2.2.2 History of Investigation/Remedial Actions

There is little existing documentation which directly addresses waste disposal or the environmental impact of activities prior to the National Enforcement Protection Act (NEPA) in the early 1970s. The potential environmental impact must be inferred from information concerning chemical processes, construction records, manufacturing records, reports detailing research and development activities, and reports concerning worker exposure to chemical materials.

From 1976 through 1979, the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) conducted a surface and ground-water investigation at APG-EA, including the area covered by the Canal Creek Area. In August 1985, APG contracted with the USGS to conduct a hydrogeologic assessment and an investigation of ground-water contamination in the Canal Creek Area. This investigation is on-going. The RCRA Facility Assessment (RFA), documented historical activities at APG-EA related to solid-waste management, and identified potential source of contaminant release in the Canal Creek Area. The Building 103 dump was investigated by AEHA as part of the RFA.

Apart from ground-water monitoring wells installed at the dump by the USGS during the hydrogeologic assessment, relatively little characterization work has been performed to date at the dump. A limited geophysical investigation was performed by Argonne National Laboratory (ANL) in 1992 to assess the extent of the Building 103 dump. No soil and/or ground-water samples were collected during this study instead, non-invasive geophysical techniques including magnetic, resistivity, ground-penetrating radar, and seismic refraction were used to investigate the dump. Results indicated the dump was probably an outcrop of the surficial aquifer, and that headward erosion created a surface depression for the collection of sand, and for the later dumping of waste. Seismic refraction indicated 6 to 12 feet of waste material in the dump. Magnetic and resistivity anomalies suggested a branching pattern of waste disposal. A topographic survey of the dump was performed in June 1994. Additional geophysics also was performed at this time to more fully assess the extent of the dump. A passive soil gas survey was performed in June 1994 to determine if the dump was generating any gas and/or vapors. The following conclusions were drawn from all available data:

- The average depth of buried waste appears to be from the surface to 6 to 12 feet below ground surface (8 to 14 feet MSL). The maximum depth of the buried waste is approximately 19 feet below grade.

- The depth to ground water is variable between 5.7 to 9.5 feet MSL.

- Ground water beneath the dump is contaminated in the surficial aquifer and in the Canal Creek Aquifer. Ground-water contamination beneath the dump cannot be directly correlated with the dump since it is not known if contaminants are the result of waste in the dump or contamination from other sources. It is likely that the contamination is the result of a combination of leaking containers in the dump and other past industrial disposal operations.

- The soil gas survey detected the presence of several organic chemicals at the dump, including trichloroethylene, perchloroethylene (possibly from the passage of surface runoff), ethyl ether, toluene, xylene, limonene, undecane, tridecanone, acenaphthene, ethylmethyl phenol, and two hydrocarbons (C15H24, and C10H16). These emissions appeared to be randomly distributed across the dump area. No methane was detected at any of the locations screened.

- Debris appears to have been deposited in a branching pattern.

- There is extensive erosion of the cover into the fill material, particularly at the northern part of the dump. The integrity of the existing cover has also been damaged by settling of the contents of the dump, and by large animal burrows. There may also be lateral animal incursion underneath Hoadley Road and the parking lot into the dump.

- The extent of the dump is larger than the fenced-in area and extends under Building E5422 and the parking lot.

- It needs to be determined if the Building 103 dump is an ongoing source of contamination.

A recent removal action under Army authority at the dump included a voluntary action in 1992 for the removal of approximately 50 gallons of bromobenzyl cyanide (BBC) residue from a buried process vessel that had surfaced on its own, and the construction of chain-link fence around the dump.

2.2.3 Enforcement Activities

APG-EA has been listed by the EPA as a Federal facility meeting the criteria for inclusion on the NPL established pursuant to CERCLA. APG-EA entered the CERCLA process with Site Notification in January 1980. A Preliminary Assessment was completed in November 1980, and the Site Investigation was completed in December 1984. To facilitate the CERCLA process, APG-EA was broken down into several study areas. The Canal Creek Area is one of these study areas. It is currently in the Remedial Investigation/Feasibility Study (RI/FS) stage. To facilitate this ongoing Canal Creek RI/FS, the Canal Creek Study Area was further subdivided into 50 Installation Restoration Program (IRP) sites, and solid waste management units (SWMUs) or operable units were identified at each IRP site. The Building 103 dump is an IRP site. The Canal Creek Aquifer beneath the Canal Creek Study Area is also a separate operable unit. The results of individual IRP site Remedial Investigation/Feasibility Study will be combined with investigation results from other APG-EA study areas and used to complete an overall ROD document for APG-EA by 1996. In September 1986 EPA issued a RCRA permit to APG which required an assessment of SWMUs at APG. In February 1990, APG-EA was placed on the NPL. Pursuant to Section 120 of CERCLA, 42 U.S.C. §9620, the U.S. Army and EPA signed a Federal Facility Agreement (FFA) in March 1990 which provides for the oversight and enforcement of environmental investigations and remedial actions at selected APG-EA study areas. The Building 103 dump is one of the Edgewood Area study areas specified in the FFA.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The scope and role of this operable unit was described to the APG Technical Review Committee (TRC) on July 29, 1993, and on January 27, 1994. The Focused Feasibility Study (FFS), Proposed Interim Remedial Action Plan, and background docmnentation for the Building 103 dump were released to the public for comment in May 1994. These documents were made available to the public in the local information and administrative record repository at the Aberdeen Public Library, Edgewood Public Library, Miller College Library, and Essex Community College Library. In accordance with the Federal Facility Agreemeat between EPA and APG, APG established an information repository in the TECOM Public Affairs Office. APG issued a press release also announcing the availability of documents to APG's full media list. APG placed newspaper advertisements on the availability of these documents and the public comment period/meeting in the APG News on May 4, 1994, in the Aegis on May 11, 1994, and in the Harford County edition of the Baltimore Sun newspaper on May 8, 1994. APG prepared and published a fact sheet on the Proposed Plan and delivered it to on-post buildings close to the site and on-post libraries; APG also mailed copies to its Installation Restoration Program mailing list. A 45-day public comment period on the scope and role of the proposed interim remedial action was held from May 4, 1994, to June 24, 1994. A poster session and public meeting were held on May 24, 1994, at the Chemical and Biological Defense Command conference center (Building E4810) at APG-EA. Approximately 35 people attended including citizens, advisors and members of the APG Superfund Citizen's Coalition, and Federal, State and local Government representatives. At this meeting, representatives of the Army, EPA and the Maryland Department of the Environment (MDE) answered questions about the proposed interim remedial action at the Building 103 dump and the cap and cover system remedial alternatives under consideration. Responses to comments received during this period are included in the Responsiveness Summary which is part of this ROD. The Responsiveness Summary is based on oral and written comments received during the public comment period.

The above actions satisfy the requirements of Sections 113(k) and 117 of CERCLA, 42 U.S.C. §§ 9613(k) and 9617. The decision for this operable unit is based on the administrative record.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

The Army has organized the remedial effort at the Building 103 dump into two operable units as follows:

- Operable Unit 1: Source of Contamination
- Operable Unit 2: Ground-water Contamination.

The interim remedial action authorized by this ROD addresses Operable Unit 1. Typically, infiltration of water can result in migration of contaminants to ground water. The Building 103 dump poses a potential risk to human health and the environment since infiltration of water can mobilize contaminants which then migrate to ground water, posing a potential health risk when ground water is ingested. In addition, with continued erosion of the cover soil into the contents of the dump, the dump presents a potential dermal hazard, and a potential inhalation hazard from airborne contaminants. The purpose of this response is to minimize infiltration of water into the dump, and to prevent animal intrusion into the dump. This will minimize contaminant migration to ground water. This interim action will also eliminate current and future dermal and

inhalation hazards caused by the erosion of the cover soil into the fill material of the dump. The Army is addressing ground-water contamination (Operable Unit 2) as a part of the ongoing Canal Creek RI/FS which includes a plume definition study, an assessment of the APG-EA Northern Boundary, a ground-water monitoring program and a ground-water treatability study.

2.5 SUMMARY OF SITE CHARACTERISTICS

2.5.1 Building 103 Dump Soil

The extent of soil contamination is unknown, since no comprehensive soil sampling has been conducted at the Building 103 dump. Potential routes of human exposure to any contaminants which may be present in surface soil at the dump include dermal exposure and inhalation of airborne dusts. Potential routes of environmental contamination include the leaching of soil contamination to ground water, and transport of contamination by run-off to surface water. Currently, the likelihood of dermal and inhalation exposure is low since the waste is contained in the dump. The likelihood of dermal and inhalation exposure will increase with continued erosion of the cover soil into the fill material.

2.5.2 Building 103 Dump Ground Water

The USGS installed two ground-water monitoring wells (23A & 23B) in the southern part of the dump in 1987. Well 23A is screened from 16-21 ft in the surficial aquifer, with a boring depth of 21 ft. Well 23B is screened in the Canal Creek Aquifer at a depth of 52-57 ft, with a total boring depth of 57 ft. These two wells are part of the 168 well ground-water monitoring system in the Canal Creek Area.

The USGS reported elevated levels of VOCs, semi-volatile organics (SVOCs), and inorganics in both the Canal Creek and surficial aquifers. Specifically, the USGS reported elevated levels of cadmium, methylene chloride, trichloroethylene, 1,2-transdichloroethylene, 1,2-dichloroethane, and vinyl chloride in the Canal Creek Aquifer. The USGS reported elevated levels of zinc, methylene chloride and trichloroethylene in the surficial aquifer. Other compounds also were detected. Iron and manganese exceeded both the primary and secondary MCL values in both wells 23A and 23B (see Table 1). Organic contaminants are listed in Table 2.

Table 1 Inorganic Constituents with Concentrations that Exceed Federal Drinking Water Maximum Contaminant Levels

Sampling Dates	Sampling Period Nov 86 - Apr 87		Sampling Period Jul 88 - Sep 88		Sampling Period Apr 89 - May 89		Sampling Period Sep 89 - Oct 89	
Constituents (mg/L)	Well 23A	Well 23B	Well 23A	Well 23B	Well 23A	Well 23B	Well 23A	Well 23B
Iron	0.80	30.0	-	24.0	-	24.0	1.40	>0.54
Manganese	0.077	0.29	-	0.26	-	0.32	0.092	0.41

Well 23A - surficial aquifer, Well 23B - Canal Creek Aquifer

It is not known if the dump is the source of this contamination, or if the contamination is from another source. Since there are probably other sources nearby, it is likely the contamination is from several sources. The spatial distribution of ground-water contamination has not yet been determined; however, an overall plume definition study is being performed as part of the Canal Creek RI/FS. Potential routes of human exposure to the contaminants include dermal contact with contaminated ground water, and ingestion of contaminated ground water. Potential routes of environmental contamination include discharge of contaminated ground water to surface water bodies. The likehood of human exposure to contaminated ground water is low under current use scenarios however, human exposure via the ingestion and dermal pathways is possible under future use scenarios.

2.5.3 Building 103 Dump Surface Water

No surface water sampling has been performed at the Building 103 dump. Surface water run-on and run-off is intermittent and dependent on wildlife. Potential routes of environmental contamination include discharge of contaminated surface water to surface water bodies.

Current potential routes of human exposure for surface water include ingestion of, or dermal contact with contaminated surface water, or ingestion of wildlife which has ingested contaminated surface water. Human ingestion of contaminated surface water is considered unlikely. Also, the likelihood of ingesting wildlife which has ingested contaminated water from the dump surface is minimal since the area is fenced and not readily accessible to game animals. Dermal contact with contaminated surface water is considered possible.

Table 2 Organic Compounds Sampled in Wells 23A and 23B

Sampling Dates	Sampling Period Nov 86 - Apr 87		Sampling Period Jul 88 - May 88		Sampling Period Apr 89 - May 89		Sampling Period Sep 89 - Oct 89	
Constituents (:g/L)	Well 23A	Well 23B	Well 23A	Well 23B	Well 23A	Well 23B	Well 23A	Well 23B
Benzene	<0.5	<0.5	-	<5.0	-	-	<2.4	2.4
Toluene	<0.4	<0.4	-	<5.0	-	-	<8.1	<8.1
Ethylbenzene	<0.4	1.0*	-	<5.0	-	-	<9.6	<9.6
Chlorobenzene	<0.6	<0.6	-	<5.0	-	<1.0	<1.4	<10.0
Carbon tetrachloride	<1.5	<1.5	-	<5.50	-	<0.15	<5.9	<5.9
Bromoform	-	-	-	-	-	<0.73	<9.7	<9.7
Chlorform	<0.8	<0.8	-	<5.0	-	<0.73	7.6	<0.84
Methyl chloride	-	-	-	-	-	<0.73	<1.1	<1.1
Methylene chloride	<1.8*	4.4*	-	7.0*	-	<2.4	<5.3	<5.3
Bromodichloromethane	-	-	-	-	-	<1.3	<7.5	<7.5
Chlorodibromomethane	-	-	-	-	-	<0.38	<7.1	<7.1
1,1,2,2 Tetrachloromethane	<1.4	<1.4	-	2.0 est	-	<0.56	<5.0	<5.0
1,1,1 Trichloromethane	-	-	-	-	-	<0.18	<4.5	<4.5
1,1,2 Trichloroethane	<1.6	<1.6	-	<5.0	-	<0.07	<19.0	<19.0
1,2 Dichlomethane	<1.5	<1.5	-	<10	-	0.42	<6.9	12.0
1,1 Dichlomethane	<1.0	<1.0	-	<5.0	-	<0.27	<1.1	<1.1
Chloromoethane	-	-	-	-	-	<0.86	<4.0	<4.0
Tetrachloroethylene	<1.5	<1.5	-	<5.0	-	<0.03	<2.7	<2.7
Trichloroethylene	<1.3	7.5	-	14.0	-	<37.0	11.0	24.0
1,1 Dichloroethylene	<1.9	<1.9	-	<5.0	-	<0.26	<16.0	<16.0
1,2 trans-Dichloroethylene	9.7	160.0	-	120.0	-	13.0	<1.1	<1.1
1,2 Dichloroprorane	-	-	-	-	-	<0.13	<2.8	<2.8
Chloropropene	-	-	-	-	-	<1.0	<5.0	<5.0
Vinyl chloride	<1.3	22.0	-	12.0	-	7.2	<2.4	14.0
Total organic halogen-1	19.0	110.0	-	-	-	-	-	-
Total organic halogen-2	19	100	-	-	-	-	-	-
Total organic halogen, cal.	7	140	-	110.0	-	-	-	-

Well 23A - suficial aquifer; Well 23B - Canal Creek Aquifer; * below blank concentration

2.5.4 Building 103 Dump Air

Long-term ambient air monitoring has not been performed at the Building 103 dump. Some short-term ambient air monitoring was performed in 1992 during the removal action for the BBC residue. No air contaminants were detected during this ambient air monitoring event. Passive soil gas monitoring conducted in 1994 detected the presence of several organic chemicals which appeared to be randomly distributed across the dump area. No methane was detected at any of the locations screened.

Some potential routes of exposure to air contaminants include direct inhalation of contaminants, migration of landfill gases to adjacent buildings with subsequent inhalation, and dispersion of airborne dusts with deposition of contaminants. Currently the likelihood of inhalation exposure is low since the waste is contained in the dump. The likelihood of inhalation exposure will increase with continued erosion of the cover soil into the fill material. Specific monitoring for landfill gases and chemical agent vapors will be performed during the construction phase of the cap and cover system, and after completion of the cap and cover system. Air monitoring inside Buildings E5422 and E5427 will be implemented upon completion of the cap.

2.6 SUMMARY OF SITE RISKS

A Preliminary Risk Assessment was prepared for the Canal Creek Area in January 1991 (ICF, 1991). The Preliminary Risk Assessment was performed in accordance with EPA guidance for human health and ecological assessments, and addresses NCP requirements for baseline conditions at uncontrolled hazardous waste sites. This Preliminary Risk Assessment addressed potential impacts on human health and the environment in the absence of any remediation. It is not site specific to the Building 103 dump; however, the Building 103 dump is included as one of nine potential sources of contamination in the Canal Creek Area. A comprehensive Canal Creek Area human-health and environmental-risk assessment is ongoing. The Building 103 dump will be further evaluated in this ongoing assessment, which will indicate if further remedial actions are required to fully address the Building 103 dump. The Preliminary Risk Assessment concluded that:

- The principal exposure pathways at the dump under current use scenarios are: 1) incidental ingestion and dermal absorption of any contaminants in surface soil; 2) chronic or subchronic exposure by ingesting game that has bioaccumulated contaminants by feeding at the site; and, 3) the acute inhalation and dermal exposure of workers who encounter ordnance during excavation and similar activities at the dump. No complete ground-water exposure pathway exists because nobody consumes the ground water.

- The potential complete human exposure pathways under current land use conditions are: 1) ingestion of game that has bioaccumulated contaminants by foraging at the dump; and, 2) exposure of workers digging shrubs or mowing grass at the dump. Exposure from ingestion of game is unlikely because the fence precludes game from foraging at the site. Acute inhalation and dermal exposure of the workers is unlikely since the waste is still contained in the dump. Chronic dermal exposure to the waste and to contaminated ground water is unlikely.

- Under future land use conditions, ingestion of contaminated ground water is a potential human exposure pathway with a risk greater than the upperbound excess lifetime cancer risk in both shallow and deep ground water. The preliminary risk assessment stated that future use of the ground water beneath the site is unlikely. However, the evaluation of risks associated with the ingestion was performed because some future pumping scenario of off-site wells could potentially result in ground water beneath the site being withdrawn by these wells. Neither the future ingestion of soil particulates from the dump, nor the future inhalation of dump gases was evaluated for this interim action.

- In addition to chronic hazards, grounds keepers or other personnel involved in subsurface excavation activities could be subjected to acute hazards if ordnance items or chemical agents are encountered. No data are available since the contents of the dump are unknown.

In the preliminary risk assessment for the ground-water risk calculation, contaminants were selected for quantitative evaluation. The preliminary risk assessment then evaluated the potential human health risks associated with exposure to these contaminants. Excess lifetime cancer risks were determined by multiplying the intake level with the cancer slope factor. The risks obtained are probabilities that are typically expressed in scientific notation. For example, an excess lifetime cancer risk of 1x10-6 means that, as an upper limit, an individual has a one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Potential concern for non-carcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient. By adding hazard quotients for all contaminants within a medium or across all media to

which a given population may be exposed, the hazard index can be generated. The hazard index provides a useful reference point for gaging the potential significance of multiple contaminant exposures within a single medium or across media. If the hazard index exceeds one (1), there may be concern for potential non-carcinogenic effects. As a rule, the greater the value of the hazard index, the greater the level of concern.

The risks from the Building 103 dump come from: 1) dermal exposure to the waste and to contaminated ground water; 2) burrowing by animals which creates the potential for leaching of soil contaminants into the ground water; and, 3) the acute inhalation and dermal exposure of workers who encounter ordnance during excavation and similar activities at the dump. The estimated human health risks associated with these pathways for current use scenarios are as follows:

- The upperbound excess lifetime cancer risk for ingestion of ground water from the surficial and Canal Creek Aquifers was 4x10-4. This value is greater than the action level of 1x10-4 potential cancer risk. The estimated excess cancer risks are due primarily to 1,1,2,2-tetrachlorothane, carbon tetrachloride, and vinyl chloride. The hazard index for ingestion of ground water from these two aquifers is greater than 1. These numbers are not specific to wells at the Building 103 dump.

- The hazard index for ingestion of ground water from the lower confined aquifer was less than 1. These numbers are not specific to wells at the Building 103 dump.

- For grounds keepers exposed to contaminants in surface soil in the Canal Creek Area, the estimated excess lifetime cancer risk via the ingestion pathway is 3x10-7. The estimated excess lifetime cancer risk via the dermal absorption pathway is 2x10-10. The total risk is the sum of the risks for the incidental ingestion and dermal absorption pathways, which is 3x10-7. The total hazard index for these pathways is less than 1. These numbers are not specific to the Building 103 dump surface soil, but are intended to be representative of the Canal Creek Area as a whole, and have been used here in the absence of soil data for the Building 103 dump.

The risks presented here for exposure to ground water beneath the Building 103 dump, provide an upper bound indication of potential future risks that assume the ingestion of untreated ground water. Capping will eliminate the potential dermal hazard by eliminating dust, and significantly reduce the infiltration of water into the Building 103 dump and the migration of contaminants from the dump into ground water. The Canal Creek RI/FS and ongoing Canal Creek Area Risk Assessment will further address characterization and remediation of the ground water. A Ground-water Treatability Study will address the actual remediation of the ground water.

The cap and cover system will minimize contact with humans and wildlife from being exposed to any potential hazards from the Building 103 dump's contents.

The risks summarized above are addressed by the goals of this interim remedial action, since they minimize contact with the contents of the Building 103 dump, while minimizing the infiltration of water into the dump. Actual or threatened release of contaminants from the Building 103 dump, if not addressed by the preferred alternative, or one of the other alternatives considered, may present an imminent and substantial endangerment to public health, welfare or the environment.

Although not a direct health issue, the risk of adverse chemical interaction between the Building 503 soil/ash contaminants and Building 103 dump contents was assessed since contaminated soil/ash from the Building 503 Soils Operable Unit will be placed under the cap and cover system. The soil/ash at the Building 503 Soils Operable Unit contains elevated levels of metal compounds and organic compounds mixed with the soil. Sample analysis indicated that the major metal constituents in the ash/soil are zinc, lead, iron, and aluminum. Low concentrations of arsenic, barium, cadmium, chromium, manganese, and silver also are present. Elevated levels of organics, mainly hexachlorobenzene and hexachlorothene were also found with other organics preseni at trace levels.

A number of factors reduce the possibility of increased mobilization of the Building 503 soil/ash contaminants once under the cap and cover system, and the possibility of adverse interactions between the Building 503 wastes and the Building 103 dump contents. These factors are: 1) physical isolation of the wastes under the cap; 2) capping to minimize water intrusion 3) the generally low concentration and quantity of contaminants in the Building 503 wastes; and, 4) the stable form of the metals in the Building 503 soil/ash.

When the above factors are considered both individually and collectively, the possibility of an adverse reaction between the contaminants in the Building 503 soil/ash and the contents of the Building 103 dump is remote.

Non-hazardous drill cuttings from other APG-EA study areas will not adversely react with the Building 503 soil/ash or the contents of the Building 103 dump.

2.7 DESCRIPTION OF ALTERNATIVES

2.7.1 General

The general remediation action objectives of the interim remedial action at the Building 103 dump are to prevent infiltration of water through the dump, to prevent direct contact and inhalation and to minimize animal intrusion into the dump. This interim remedial action will also promote surface drainage, minimize erosion, accommodate settling and subsidence, provide for adequate venting for gases/vapors, and ensure the cap and cover system will function with minimal maintenance.

A range of general response actions was considered which significantly reduce the risk to public health and the environment. These general response actions were screened for applicability, then those that appeared to be appropriate for the dump were evaluate in more detail. The Superfund law requires that each remedy selected to address contamination at a hazardous waste site be protective of human health and the environment, be cost effective, and be in compliance with statutory requirements.

Based on current site conditions, waste containment technologies were determined to be the most appropriate interim remedial technology since they minimize the dermal and inhalation risk of the contaminated soil, and reduce the mobility of contaminants by limiting infiltration. Containment is the preferred method for preventing infiltration and often is used when it is unrealistic to excavate a site.

The feasibility of excavating the dump also was assessed. This technology would involve excavation and complete or partial removal of waste and contaminated soil from the dump to another location. While excavation followed by off-site disposal is often a preferred technology when small waste quantifies are involved, it was not retained here as an alternative for the following technical and logistical reasons:

1) Excavation and removal would not signicantly reduce the toxicity, mobility or volume of the excavated waste.

2) Complete or partial removal would provide a low degree of short-term protection since it could not be implemented immediately. In the meantime, there would be continued infiltration of water through the existing cover. Also, even if the dump were excavated and the waste removed, the ongoing ground-water monitoring program would have to be continued, and ground water beneath the Building 103 dump may still require remediation.

3) Complete or partial excavation would take a long time to complete since the total volume requiring excavation is substantial (approximately 16,000-30,400 cubic yards). The total volume may be greater if surrounding soil is contaminated. Also, soil volume typically increases by up to 30 percent after excavation due to loss of compaction.

4) On-site disposal of this excavated waste, either by replacement or placement elsewhere on-site, would require treatment of the excavated waste, short-term containment pending treatment, and possible long-term containment and management of the waste. While containment soil would probably not require any treatment prior to off-site disposal, most other waste and debris would probably require some treatment prior to off-site disposal. This could present a problem if the volume of debris and waste overwhelms existing on-site storage and treatment facilities. Also, there is currently no approved treatment and disposal technology for some of the chemical agent residues which potentially could be buried in the dump.

5) Off-site disposal without treatment is considered inappropriate for the following reasons: a) off-site disposal would increase the short-term risk of public exposure due to the removal, handling, and transportation of the waste and contaminated soil; b) there are no off-site landfills permitted to accept ordnance items and/or untreated chemical agent residue; and, c) Army regulations require the decontamination of chemical agent residue and potentially contaminated debris before they are released to the public sector.

6) Excavation and removal would be difficult to implement since the dump is located adjacent to occupied buildings and Hoadley Road. While excavation activities should not affect nearby communities, APG-EA personnel would be impacted. All personnel working in Buildings E5422, E5427, and E5265 would have to be relocated. Also, Hoadley Road and Williams Road would have to be temporarily closed and traffic rerouted. While excavation-related impacts would be expected to affect mainly workers at the dump, it might be necessary from time to time to evacuate other areas as a result of Chemical/Accident Incident Response Action (CAIRA).

7) In addition to the UXO hazard, other hazardous conditions may be created by disturbing the contents of the dump. The dump is a confirmed chemical agent residue disposal site (50 gallons of bromobenzylcyanide

residue were pumped from a buried process vessel in 1992). Containers of hazardous chemicals could be ruptured, or hazardous dusts could be generated. Excavation and removal increases the risk of contaminating currently unaffected areas. It increases the risk of worker exposure through dermal contact with and/or through inhalation of contaminants during excavation and staging, and increases risk of public exposure through the transport of waste off site.

8) Because of safety considerations, progress would be very slow and take several years to complete, since the dump would be have to excavated by backhoe, or remote controlled backhoe operated from a shelter located upwind of the area being excavated, or by hand. Hand excavation or a combination of hand and mechanical excavation would be required to safely recover suspect debris items or UXO. Suspect metallic debris in the dump, if identified as conventional UXO, would have to be rendered safe by EOD personnel and removed. All unearthed suspect storage containers would have to be drilled, sampled and pumped dry prior to removal from the dump if found to contain liquid. These container pump and transfer operations would have to be conducted inside specially built temporary enclosures with carbon filters and under negative pressure to reduce the chance of emmisions. All suspect chemical ordnance items that are unearthed would have to be secured and removed to a safe holding area and stored pending final disposition. If EOD personnel determined that ordnance items cannot be safely moved, they would have to be detonated in place. All excavated debris and ordnance items would have to be considered potentially contaminated with chemicel agent and would require testing. Agent contaminated items would have to be decontaminated. Staged soil also would have to be screened for chemical agents, agent degradation products, other contaminants.

9) Building E5422, and part of the parking lot have been constructed on the dump making excavation of all the buried waste difficult.

10) Large protected staging areas for the transfer of the excavated debris, chemical waste and contaminated soil would have to be sited and constructed to ensure that wastes can be temporarily stored with minimal potential for release of contaminants to the environment.

11) Excavation and removal are very expensive. The capital cost for implementation of this technology was estimated to be at least $9,534,600 when based on a total volume of 30,400 cubic yards. Treatment costs for ground water were not included, since the ground water is being addressed as a separate operable unit. If the contents of the dump were removed, the ground water may still require remediation. This cost estimate did not include soil treatment.

2.7.2 Statutory Preferences

Section 121(b) of CERCLA mandates that, where possible, EPA select remedies that "utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable." Remedial actions in which treatment "permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, and contaminants as a principal element" are preferred. Also, current EPA guidance for municipal landfill RI/FS activity suggests evaluation of waste removal for small (less than 1 acre) landfills, or elimination of known areas containing containerized liquid wastes. In general, it is not cost effective to excavate landfills with an area greater than 1 acre.

Removal technologies typically involve the complete or partial excavation and removal of waste to another location either on-site or off-site for storage, treatment or disposal. Although removal by itself can disrupt the exposure pathway(s), it has little or no effect on the toxicity or volume of contaminated material and is therefore often specified only in conjunction with treatment. Excavation can greatly increase short-term risk to the public and site workers, since excavation typically increases the mobility of the waste (possible dispersion of contaminated dust during excavation), and since the waste must often be transported off-site for disposal or treatment.

Capping involves covering a site to reduce direct exposure to contaminants and to minimize water infiltration and subsequent vertical migration of contaminants. Maryland hazardous waste management regulations are more stringent than Federal RCRA requirements with respect to the use of capping for the closure of hazardous waste landfills. Federal RCRA regulations allow closure with waste and contaminated soils either removed (clean closure) or intentionally left in place. Maryland laws allow waste or contaminated soil to be left in place only after the owner/operator has made reasonable efforts to conduct a corrective action program to remove or treat in-place any hazardous constituents that result in concentration limits in ground water which exceed limits set forth in COMAR 26.13.05.06E and K).

The preference for contaminant removal was considered, and complete or partial excavation screened as a remediation technology. Excavation of the contents of the dump could have been used in conjunction with ex-situ treatment and disposal technologies. It was anticipated that contaminated soil would be removed to a depth no greater than ground water using conventional equipment. Since complete removal and treatment of waste and contaminated soil would not be practicable, the State requirements for the design and maintenance of landfill caps contained in COMAR 26.13.05.14 and 26.04.07.21 are applicable ARARs. These include the

following:

- Run-on and run-off must be controlled to prevent erosion of or damage to the cap and cover system.

- The cap and cover system must provide long-term minimization of liquid infiltration and have a permeability less than that of the natural sub soils.

- The cap and cover system must function with minimal maintenance.

- The cap and cover system must accommodate settling and subsidence while retaining integrity.

- Postclosure monitoring and maintenance must be provided.

These interim remedial alternatives were developed because they significantly reduce the risk to public health and the environment from exposure to and/or transport of contaminants that may be associated with surface-water run-off or surface-water infiltration and subsequent leachate generation. The Superfund law requires each remedy selected to address contamination at hazardous waste site be protective of human health and the environment, be cost effective, and be in accordance with ARAR requirements. The costs for implementing each alternative include preliminary estimates of capital outlay and estimates for operation and maintenance (O&M), as well as present worth costs.

Taking into consideration the types of waste possibly buried in the dump, the Army felt containment was the best way to safely achieve the interim remedial action goals by preventing the infiltration of surface water and precipitation into the dump with a cap and cover system. The alternatives evaluated included:

- Alternative 1: No Action.

- Alternative 2: Install a cap and cover system in accordance with MDE requirements for industrial landfill closure using off-site clay.

- Alternative 3: Install a cap and cover system in accordance with MDE requirements for industrial landfill closure using a sodium bentonite geocomposite mat.

- Alternative 4: Install a cap and cover system in accordance with MDE requirements for industrial landfill closure using a geosynthetic membrane.

- Alternative 5: Install a cap and cover system in accordance with RCRA requirements for hazardous waste landfill closure using off-site clay and a geosynthetic membrane.

- Alternative 6: Install a cap and cover system in accordance with RCRA requirements for hazardous waste landfill closure using a sodium bentonite geocomposite mat and a geosynthetic membrane.

These alternatives do not address treatment or monitoring of contaminated ground water associated with the Building 103 dump. Remediation of the ground water is complex, requiring a comprehensive risk assessment and long-term RI/FS which will evaluate APG-EA-wide alternatives. Ground-water issues are the subject of an additional investigation by the Army to more completely determine the nature and overall extent of ground-water contamination at APG-EA.

2.7.3 Description and Alternatives

Alternative 1: No Action. Under Alternative 1, no remedial actions would be performed at the dump. Existing institutional controls and maintenance arrangements would be continued. The Army has documented use restrictions in installation records and on installation maps. Ground-water monitoring operations at monitoring wells 23A and 23B would continue, and contaminated ground water would be addressed under the separate Canal Creek Area-wide RI/FS.

The No-Action alternative does nothing to enhance protection of the public health, environment, or future land and ground-water users. The risks posed by the dump would remain at current levels, or increase over time. The No-Action alternative does not minimize the infiltration of water into the dump instead, there would be continued water infiltration and animal intrusion into the dump. There would be continued erosion of the existing cover into the contents of the dump.

In addition, the No-Action alternative fails to meet RCRA and MDE closure requirements for the capping of wastes in hazardous waste and sanitary land disposal units.

This alternative has no capital costs. Costs associated with future potential liabilities or future necessary remedial actions at the Building 103 dump would not include maintaining the fence and posted signs.

Alternative 2: Install a Cap and Cover System in Accordance with MDE Requirements for Industrial Landfill Closure Using Off-site Clay. Alternative 2 would involve the construction of a multilayer cap and cover system in accordance with MDE requirements for industrial landfill closure (COMAR 26.04.07.21). This cap and cover system will cover the full extent of the Building 103 dump as it is currently known. Based on field work conducted to date, this corresponds to an approximate area of 1.9 acres, and includes the grassy area adjacent to Building E5422, south of Williams Road, and west of Hoadley Road. The Building 103 dump would be further investigated as part of the ongoing Canal Creek RI/FS to fully assess the extent of the dump. This investigation would indicate if further remedial actions are required in conjunction with the construction of the cap and cover system to fully address the Building 103 dump. Any additional remedial actions required to fully address the dump would be undertaken. Since waste would be contained on-site, this alternative has a periodic review requirement at which time the effectiveness of this alternative will be assessed and further remedial actions taken if necessary. The design features of this cap and cover system would include:

- An earthen material backfill cover (to include contaminated soil from Building 503 Soils Operable Unit and non-hazardous drill cuttings from other APG-EA study areas) over the existing cover.

- 2 feet of semi-permeable earthen material over the backfill cover, graded to achieve a 4 percent topslope.

- A low permeability cover consisting of a minimum of 1 foot of clay material with an in-place permeability less than or equal to 1 x 10-5 cm/s placed over the semi-permeable earthen material.

- A drainage layer with an in-place permeability greater than 1 x 10-3 cm/sec.

- A compacted cobble/gravel animal intrusion barrier.

- A final earth cover (up to 2 feet thick) with 4 percent minimum slope and vegetative cover.

- Gas collection/filtration system installed at start of construction to control long-term emissions.

- Long-term storm water management (storm water drainage ditches and/or swales around the perimeter of the dump).

Warning signs would be placed at the dump, and use restrictions documented on installation records and maps. The Army would be required to maintain the cap and cover system, which would be inspected at regular intervals to check for erosion, settlement, or invasion by animals and/or deep rooted vegetation. Repairs would be implemented as needed.

The capital cost for this alternative is $1,438,531 with annual O&M costs of $4,730. The present worth is $1,511,243. The time to implement this alternative is 12 months after having a signed ROD (costs and times are estimates).

Alternative 3: Install a Cap and Cover System in Accordance with MDE Requirements for Industrial landfill Closure Using a Sodium Bentonite Geocomposite Mat. This alternative would involve the construction of a multilayer cap and cover system in accordance with MDE requirements for industrial landffil closure (COMAR 26.04.07.21). This cap and cover system will cover the full extent of the Building 103 dump as it is currently known. Based on field work conducted to date, this corresponds to an approximate area of 1.9 acres, and includes the grassy area adjacent to Building E5422, south of Williams Road, and west of Hoadley Road. The Building 103 dump would be further investigated as part of the ongoing Canal Creek RI/FS to fully assess the extent of the dump. This investigation would indicate if further remedial actions are required conjunction with the construction of the cap and cover system to fully address the Building 103 dump. Any further remedial actions required to fully address the Building 103 dump would be undertaken. Since waste would be contained on site, this alternative has a periodic review requirement, at which time the effectiveness of this alternative will be assessed and further remedial actions taken if necessary. The design features of this cap and cover system would include:

- An earthen material backfill cover (to include contaminated soil from Building 503 Soils Operable Unit and non-hazardous drill cuttings from other APG-EA study areas) over the existing cover.

- Two feet of semi-permeable earthen material over the backfill cover, graded to achieve a 4 percent topslope.
- A low permeability cover consisting of a sodium bentonite geocomposite mat with a permeability of at least 8 x 10-10 cm/sec.
- A drainage layer with an in-place permeability of 1x10-3 cm/sec.
- A compacted cobble/gravel animal intrusion barrier.
- A final earthen cover (up to 2 feet thick) with 4 percent minimum slope and vegetative cover.
- Gas collection/filtration system installed at start of construction to control long-term emissions.
- Long-term storm water management (storm water drainage ditches and/or swales around the perimeter of the dump).

Warning signs would be placed at the dump, and use restrictions would be documented on installation records and maps. The Army would be required to maintain the cap and cover system. The cap and cover system would be inspected at regular intervals to check for erosion, settlement, or invasion by animals and/or deep rooted vegetation. Repairs would be implemented as needed.

The capital cost of this alternative is $1,388,805 with annual O&M Costs of $4,730. The present worth is $1,461,517. The time to implement this alternative is 12 months after having a signed ROD (costs and times are estimates).

Alternative 4: Install a Cap and Cover System in Accordance with MDE Requirements for Industrial Landfill Closure Using a Geosynthetic Membrane. This alternative involves the construction of a new multilayer cap and cover system in accordance with MDE requirements for industrial waste landfill closure (COMAR 26.04.07.21). This cap and cover system will cover the full extent of the Building 103 dump as it is currently known. Based on field work conducted to date, this corresponds to an approximate area of 1.9 acres, and includes the grassy area adjacent to Building E5422, south of Williams Road, and west of Hoadley Road. The Building 103 dump would be further investigated as part of the on-going Canal Creek RI/FS. This investigation would indicate if further remedial actions are required in conjunction with the construction of the cap and cover system to fully address the Building 103 dump. Any further remedial actions required to fully address the Building 103 dump would be undertaken. Since waste will be contained on-site, this alternative has a periodic review requirement, at which time the effectiveness of this alternative will be assessed, and any further remedial actions taken if necessary. Design features of this cap and cover system would include:

- An earthen material backfill cover (to include contaminated soil from Building 503 Soils Operable Unit and non-hazardous drill cuttings from other APG-EA study areas) over the existing cover.
- Two feet of semi-permeable earthen material over the backfill cover, graded to achieve a 4 percent topslope.
- A low permeability cover consisting of a geosynthetic membrane over the compacted semi-pervious earthen fill material.
- A drainage layer with an in-place permeability of 1 x 10-3 cm/sec.
- A compacted cobble/gravel animal intrusion barrier.
- A final earthen cover (up to 2 feet thick) with 4 percent minimum slope and vegetative cover.
- Gas collection/filtration system installed at start of construction to control long-term emissions.
- Long-term storm water management (storm water drainage ditches and swales around the perimeter of the dump).

Warning signs would be placed at the dump, and use restrictions documented on installation records and maps. The Army would be required to maintain the cap and cover system. The cover would be inspected at regular intervals to check for erosion, settlement, or invasion intrusion by animals and/or deep rooted vegetation. Repairs would be implemented as needed.

The capital cost for this alternative is estimated to be $1,436,417 with annual O&M costs of $4,730. The present worth is $1,509,129. The time to implement this alternative is 12 months after having a signed ROD (costs and times are estimates).

Alternative 5: Install a Cap and Cover System in Accordance with RCRA Requirements for Hazardous Waste Landfill Closure Using Off-site Clay and a Geosynthetic Membrane. This alternative involves the construction of a new multilayer cap and cover system in accordance with MDE requirements for hazardous waste landfill closure (COMAR 26.13.05.14) and EPA design recommendations (USEPA, 1985). This cap and cover system will cover the full extent of the Building 103 dump as it is currently known. Based on field work conducted to date, this corresponds to an approximate area of 1.9 acres, and includes the grassy area adjacent to Building E5422, south of Williams Road, and west of Hoadley Road. The Building 103 dump would be further investigated as part of the ongoing Canal Creek RI/FS, and any further remedial actions required to fully address the dump would be undertaken. This investigation would indicate if further remedial actions are required in conjunction with the construction of the cap and cover system to fully address the Building 103 dump. Since waste would be contained on site, this alternative has a periodic review requirement, at which time the effectiveness of this alternative will be assessed and any further remedial actions taken if necessary. The design features of this cap and cover system would include:

- An earthen material backfill cover (to include contaminated soil from Building 503 Soils Operable Unit and non-hazardous drill cuttings from other APG-EA study areas) over the existing cover.

- Two feet of semi-permeable earthen material over the backfill cover, graded to achieve a 4 percent topslope.

- A 2-foot compacted clay layer with an in-place permeability of 10-7 cm/s or less placed over the backfill material. This cover would utilize off-site clay.

- A synthetic geomembrane (minimum thickness 20 mil).

- A drainage layer with an in-place permeability greater than 10-3 cm/sec.

- A compacted cobble/gravel animal intrusion barrier.

- A final earthen cover (up to 2 feet thick), with 4-percent topslope and vegetative cover.

- Gas collection/filtration system installed at start of construction to control long-term emissions.

- Long-term storm water management (storm water drainage ditches and swales around the perimeter of the dump).

Warning signs would be placed at the dump, and use restrictions would be documented on installation records and maps. The Army would be required to maintain the cap and cover system. The cover would be inspected at regular intervals to check for erosion, settlement, or invasion by animals or deep rooted vegetation. Repairs would be implemented as needed. This alternative requires from the Army a long-term commitment to perform maintenance on the cover and to monitor the ground water beneath the dump.

The capital cost for this alternative is $1,688,520 with annual O&M costs of $4,730. The net present worth is $1,741,232. The time to implement this alternative is 12 months after having a signed ROD (costs and times are estimates only).

Alternative 6: Install a Cap and Cover System in Accordance with RCRA Requirements for Hazardous Waste Landfill Closure Using a Sodium Bentonite Geocomposite Mat and a Geosynthetic Membrane. Alternative 6 involves the coustruction of a multilayer cap and cover system in accordance with MDE requirements for a hazardous waste landfill closure (COMAR 26.13.05.14) and EPA design recommendations (USEPA, 1985). This cap and cover system will cover the full extent of the Building 103 dump as it is currently known. Based on field work conducted to date, this corresponds to an approximate area of 1.9 acres, and includes the grassy area adjacent to Building E5422, south of Williams Road, and west of Hoadley Road. The Building 103 dump will be further investigated as part of the ongoing Canal Creek RI/FS. This investigation will indicate if further remedial actions are required in conjunction with the construction of the cap and cover system to fully address the Building 103 dump. Any further remedial actions required to fully address the dump will be undertaken. Since waste will be contained on-site, this alternative has a periodic review requirement, at which time the effectiveness of this alternative will be assessed and further remedial actions taken if necessary. The design features of this cap and cover system will include:

- An earthen material backfill cover (to include contaminated soil from Building 503 Soils

Operable Unit and non-hazardous drill cuttings from other APG-EA study areas) over the existing cover.

- Two feet of semi-permeable earthen material over the backfill cover, graded to achieve a 4 percent topslope.

- A sodium bentonite geocomposite mat with an in-place permeability of at least 10-7 cm/sec or less over the backfill material.

- A geosynthetic membrane (minimum thickness 20 mil).

- A drainage layer with minimum permeablility of 10-3 cm/sec.

- A compacted cobble/gravel animal intrusion barrier.

- A final earthen cover (up to 2 feet thick), with 4 percent topslope and vegetative cover.

- Long-term storm water management (storm water drainage ditches and swales).

- Gas collection/filtration system installed at start of contruction to control long-term emissions.

The capital cost for this alternative is $1,507,835 with annual O&M costs of $4,730. The net present worth is $1,580,548. The time to implement this alternative is 12 months after having a signed ROD (costs and times are estimates only).

Appropriate warning signs would be placed at the dump, and use restrictions will be documented on APG records and maps. The Army would be required to maintain the cap and cover system. The cover would be inspected at regular intervals to check for erosion, settlement, or invasion by animals, or deep rooted vegetation. Repairs would be implemented as needed.

2.8 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The six remedial action alternatives developed for the Building 103 dump were evaluated using nine specific evaluation criteria. These criteria are:

Threshold Criteria

1) Overall protection of human health and the environment

2) Compliance with applicable or relevant and appropriate requirements

Primary Balance Criteria

3) Long-term effectiveness and permanence

4) Reduction of toxicity, mobility or volume

5) Short-term effectiveness

6) Implementability

7) Cost

Modifying Criteria

8) EPA/State acceptance

9) Community acceptance

The following section summarizes the relative performance of each of the alternatives with respect to the nine CERCLA evaluation criteria.

2.8.1 Comparative Analysis of Alternatives

Overall Protection of Human Health and the Environment. The overall protection criterion is a composite of

the short-term effectiveness, long-term effectiveness, and compliance with ARARs criteria. As such, it addresses whether or not a remedy will: 1) result in any unacceptable impacts; 2) control inherent hazards (such as toxicity and contaminant mobility) associated with a site; and, 3) minimize short term impacts associated with cleaning up site. This evaluation provides an overall assessment of the relative protection of each alternative of human health and the environment.

The potential complete exposure pathways under current land use conditions are 1) ingestion of game that has bioaccumulated contaminants at the site, and 2) possible dermal and inhalation exposure of on-site workers digging shrubs or mowing grass at the site. The other current human health risks associated with the dump are the hazardous conditions created by disturbing the contents of a confirmed chemical agent disposal site. Under future land use conditions, ingestion of contaminated ground water is a potential human exposure pathway. Future health risks could also result from further degradation of the existing cover, which would expose buried waste, resulting in possible inhalation and direct contact hazards.

Alternative 1 does not enhance protection of the public health, environment, or future land and ground water users. The risks posed by the dump would remain at current levels, and would increase over time. Alternative 1 does not minimize the infiltration of water into the dump, instead, there would be continued water infiltration and animal intrusion into the dump. Water infiltration would most likely increase due to failure of the existing cover, as would animal intrusion. Contaminant mobility would increase due to infiltration of water with increased movement into ground water or into surface waters. There would be continued erosion of the existing cover into the contents of the dump. Further degradation of the existing cover system could expose buried waste, resulting in possible inhalation and direct contact hazards. Therefore, Alternative 1 is not protective of human health and the environment.

Alternatives 2, 3 and 4 provide a moderate to high level of overall protection to human health and the environment. The alternatives eliminate current health risks associated with the dump, and they significantly reduce future health risks since they eliminate future inhalation and direct contact hazards. The cap under each of these alternatives has only a single impermeable layer that would permit some water infiltration over time. Since waste would remain in place, and although the long term risk is greatly minimized, there probably would still be some migration of contaminants into ground water. Alternative 2 would be less protective than Alternatives 3 and 4 in preventing water infiltration, because clay is more permeable than either a geosynthetic membrane or a benonite mat in the long run. Alternative 3 would be slightly less protective than Alternative 4 since a bentonite mat permits more water infiltration than a synthetic membrane. Because waste would remain in place, and although the long term risk is greatly minimized, there probably would still be some migration of contaminants into groundwater.

Alternatives 5 and 6 would provide a high level of overall protection to human health and the environment. They eliminate the current health risks posed by the eroded cover, and eliminate future health risks associated with inhalation and dermal contact. Since the cap contaim two impermeable layers Alternatives 5 and 6 provide a higher degree of reliable long-and short-term protection of human health and the environment than Alternatives 2, 3 and 4. Alternatives 5 and 6 are probably equally protective of human health and the environment.

Compliance with ARARS. This criterion addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other environmental statutes and/or provide grounds for invoking a waiver.

Alternative 1 would result in violations of Federal Air and Water Quality Controls (AWQC) guidelines and State water quality standards in ground water, if further degradation of the existing cap with subsequent leaching of contaminants into ground water were to occur. In addition, Alternative 1 fails to meet RCRA and MDE closure requirements for the capping of wastes in hazardous waste and industrial land disposal units.

Alternative 2 would meet MDE requirements for industrial landfill closure. Alternative 3 does not meet RCRA requirements for hazardous waste landfill closure, but meets MDE requirements for industrial landfill closure. Alternative 4 does not meet RCRA requirements for hazardous waste landfill closure, but meets MDE requirements for industrial landfill closure. Alternatives 5 and 6 would meet both RCRA requirements for hazardous waste landfill closure, and exceed MDE requirements for industrial landfill closure.

In summary, Alternative 1 meets neither MDE closure requirements for an industrial landfill, nor does it meet closure requirements for a RCRA hazardous waste landfill. Alternatives 2, 3, and 4 would meet MDE requirements for industrial waste landfill closure, but do not meet RCRA requirements for hazardous waste landfill closure. Alternatives 5 and 6 meet RCRA requirements for hazardous waste landfill closure.

Alternatives 2, 3, 4, 5 and 6 meet the provisions of the Corrective Action Management Unit (CAMU) rule set forth at 58 Fed. Reg. 8679 which authorizes the on-site consolidation of wastes, and consequently the placement of non-hazardous drill cuttings from other APG-EA study areas, and of contaminated soil from the Building 503 Soils Operable Unit at the Building 103 dump. The Army does not need a permit or waiver from

MDE under any alternative in order to include the drill cuttings or contaminated soil as part of the fill material.

There will be increased run-off with alternatives 2, 3, 4, 5, and 6 since the existing drainage will be upgraded. However, in accordance with Section 121(e)(1) of CERCLA and 40 CFR, Section 300.400(e)(1), no Federal, State, or local permits are necessary for CERCLA response actions conducted entirely on-site. Consequently, a Maryland discharge permit for storm water systems will not be required. However, all substantive requirements of such a permit must be met, and all alternatives would minimize erosion and control sediment run-off as required by Maryland Erosion and Sediment Control Regulations (COMAR 26.09.01.01) and Storm Water Management Regulations (COMAR 26.09.02).

The gas collection/filtration system to be installed under Alternatives 2, 3, 4, 5, and 6 would meet U.S. Army regulations (CRDEC Regulation 385-1) for hazardous chemical air emissions, and comply with the Clean Air Act and Maryland Air Pollution Control Regulation (COMAR 26.11.06 and 26.11.15). There will be no air emissions after completion of the cap and gas collection/filtration system. Land disposal restrictions under RCRA (40 CFR § 268) do not apply to spent filters.

Maryland Discharge Limitations (COMAR 26.08.03) are not applicable since none of the alternatives under consideration result in discharge to surface water from a discrete source. Also, Maryland Water Quality Regulations (COMAR 26.08,02) should not be relevant and appropriate to this interim remedial action since none of the alternatives under consideration will result in the discharge of pollutants to surface water or ground water.

Since all alternatives under consideration involve earthmoving operations which may result in particulate emissions to air and noise, they will all comply with Maryland State Adopted National Ambient Air Quality Standards and guidelines (COMAR 26.11.03), Maryland State Ambient Air Quality Standards (COMAR 26.11.04), Maryland General Emissions Standards, Prohibitions, and Restrictions (COMAR 26.11.06) and Maryland Noise Pollution Regulations (COMAR 26.02.03). There will be no air emissions after completion of the cap and gas collection/filtration system.

Even though portions of APG-EA are considered wetlands, the Building 103 dump site is not a wetland and is not within the 100-year flood plain, therefore 40 CFR Part 6, Appendix A (Response in a Flood Plain or Wetlands), and Executive Orders 11988 and 11990 do not apply to any of the alternatives under consideration.

This interim response action will not affect any endangered species at APG-EA, since no endangered species are present at the Building 103 dump.

Long-Term Effectiveness. This criterion refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Alternative 1 provides no long term protection to human health and the environment. It would not minimize the infiltration of water into the dump instead, there would be continued water infiltration and animal intrusion into the dump. Water infiltration would increase over time due to failure of the existing cover. The continued erosion of the existing cover into the contents of the dump would expose buried waste resulting inhalation and direct contact hazards.

Alternative 2 provides a moderate to high degree of reliable long-term protection to human health and the environment. Alternative 2 reduces the long-term risk of contaminant migration into ground water, or contaminant run-off into surface water. However, a potential for the leaching of contaminants into ground water would still exist under this alternative because the waste would remain in place, and because the clay mat is not totally impervious and would permit some water infiltration. Proper maintenance and routine inspection of the cap and cover system would minimize the magnitude of water infiltration due to failure of the clay mat, and animal and plant intrusion. This alternative requires that the Army make a long-term commitment to maintain the cap and cover system to ensure its future integrity.

Alternative 3 provides a moderate to high degree of reliable long-term protection to human health and the environment. Sodium bentonite geocomposite mats are typically assumed to have a useful life of 25 years, provided they are not physically damaged in some way during installation. Therefore, this alternative would have a design life of at least 25 years. A potential for leaching of contaminants would still exist with this alternative because waste material would remain in place, and because the bentonite mat is not totally impervious and would permit some infiltration of water. However, infiltration of water would be minimal.

Alternative 4 provides a high degree of reliable, long-term protection to human health and the environment. Synthetic membranes typically have a useful life of approximately 20 years, meaning that a synthetic liner would allow virtually no liquid penetration for 20 years. Synthetic liners can be damaged by soil microbes, rodents and, to a small extent, by vegetation. For example, certain grass species may penetrate through synthetic membranes, and insects and burrowing rodents can severely damage plastics. In

general, however, roots will not penetrate through geomembranes. Also, the cobble/gravel barrier would provide protection against roots, insects, and burrowing animals. This cap and cover system would significantly reduce long-term risks due to the leaching of contaminants into ground water. Since the waste would remain in place there probably would still be some migration of contaminants into ground water when the liner begins to fail with age, and prior to this some migration might occur through puncture holes put into the liner during installation. Proper maintenance and routine inspection of the cover system would significantly minimize the magnitude of infiltration.

Alternatives 5 and 6 provide the highest degree of reliable long-term protection since there are two impermeable layers in the cap and cover system. The design life of a cap is generally in excess of 100 years when a synthetic liner is supplemented by a low permeability base, when the underlying waste is unsaturated, and when proper maintenance procedures are observed. In both alternatives, the cobble/gravel barrier would protect the synthetic liner from animals and roots, which in turn would protect the underlying clay layer or bentonite mat. A limited potential for leaching would still exist since waste materials would remain in place. Infiltration would be minimal, however.

In summary, Alternative 1 offers little or no protection against long-term infiltration of water and animal intrusion into the dump. Erosion of the existing cover would continue with continued migration of contaminants to ground water. Alternatives 2, 3, 4, 5, and 6 all significantly reduce the potential for future migration of contaminants by limiting water infiltration, animal instruction and cover erosion. Each of these alternatives contains a drainage layer to ease the flow of water, thus minimizing infiltration through the low permeability layer(s). Each contains a barrier to prevent animal intrusion, and subsequent water infiltration through animal burrows. Alternatives 3 and 4 would probably provide more effective long-term protection than Alternative 2, since a day liner is more permeable. Alternative 4 would probably provide slightly more protection against long-term infiltration than Alternative 3, because a synthetic liner is typically less permeable than a bentonite mat. Alternatives 5 and 6 are expected to provide the highest degree of long-term protection against water infiltration. Alternative 6 is probably slightly superior to Alternative 5 and would provide better protection against the infiltration of water for the design life of the synthetic liner and bentonite mat. Migration of contaminants could occur under all alternatives with time since the contents of the dump would be left in place, and because the cap and cover system would fail over time. However, proper construction and continued maintenance of the cap and cover system would maintain its integrity.

Reduction of Toxicity, Mobility, and volume. This criterion refers to the anticipated performance of the treatment technologies that may be employed in a remedy.

Alternative 1 would not achieve a reduction in toxicity, mobility or volume of the contaminants. Alternatives 2, 3, 4, 5, and 6 all minimize the infiltration of water into the Building 103 dump, thereby reducing the mobility of the contents of the dump. None of the alternatives would reduce the toxicity or volume of the contaminants since the waste would remain in place. Alternatives 5 and 6 are expected to reduce contaminant mobility and water infiltration more than Alternatives 2, 3, and 4 because two impermeable liners are used in the design. Since alternatives 5 and 6 contain two impermeable layers (a synthetic liner which is essentially impermeable, supplemented by a low permeability base) there would be almost no infiltration of water through the cap. Alternative 4 is more effective than Alternative 3 in reducing contaminant mobility, since a synthetic liner is less permeable than a bentonite mat if properly installed, and consequently would permit less water infiltration. Alternative 3 is more effective than Alternative 2 in reducing conteminant mobility since the high swelling ability of the bentonite mat provides for extremely low permeability, and exceptionally uniform permeability. None of these alternatives should be considered irreversible because waste treatment is not associated with any alternative.

Short-Term Effectiveness. This criterion refers to the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until clean-up goals have been achieved.

Alternative 1 has no short-term impacts because no remedial actions would be performed under this alternative. Alternatives 2, 3, 4, 5, and 6 would all require approximately the same amount of time to implement after signing of the ROD. The time to implement depends on factors such as contractor availability, availability of equipment, and weather conditions. Alternatives 3 and 4 would require the least time to complete, followed by Alternative 6. Because they have a clay layer, Alternatives 2 and 5 would take the longest time to complete.

There would be no short-term impacts to nearby communities under any of the alternatives due to the location of the site. Short-term impacts to government employees, military personnel, on-site workers, and the environment are expected to be minimal under Alternatives 2, 3, 4, 5 and 6. Personnel at or near the site could be subjected to construction-related impacts such as noise, dust, and particulates under all alternatives. This exposure is expected to be minimal. Exposure of personnel to site contaminants would be

controlled with protective clothing, spraying of work areas with water to minimize dust generation, appropriate training, and through the use of air monitoring devices. Personnel exposure through dermal contact and/or inhalation of contaminants is not anticipated since there will be no excavation of the dump. No protected species or sensitive land areas are expected to be affected during remediation.

Transportation of hazardous materials is not expected to be necessary under any of the alternatives.

Personnel working in Buildings E5422, E5427, and E5265 would experience construction-related impacts (such as noise, dust and particulates) under all alternatives. For these reasons, it will be necessary to relocate the Technical Escort Unit while construction is taking place. Also, it may be necessary to close both Hoadley Road and Williams Road at certain times during construction.

Implementability. This criterion describes the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Alternative 1 has no technical feasibility considerations. The technical implementability of Alternatives 2, 3, 4, 5 and 6 is excellent. Capping is a well developed technique that has been used at many sites as both a final and as an interim action. The required labor, materials, and equipment necessary to implement all these alternatives is readily available. Conventional construction equipment and techniques would be used to implement all alternatives.

Alternatives 2 and 5 would be more difficult to implement than Alternatives 3, 4, and 6 since they require the construction of a compacted clay layer. Alternatives 3, 4 and 6 require either a synthetic liner and/or bentonite mat, both of which are quicker and easier to install than compacted clay liners under all weather conditions. Extreme weather conditions might cause delay in in implementation of Alternatives 2 and 5, since compacted clay should not be installed during wet and/or freezing weather. This restriction does not apply to geosynthetic membranes, since they are much more resistant to freeze/thaw and hydration/desiccation cycles.

An important technical consideration for this site is the final height of the cap with respect to the surrounding terrain. Height must be minimized due to the close proximity of roads and surrounding buildings. This is best achieved by using bentonite and/or a synthetic membrane in the cap, since these materials minimize the infiltration of water and thickness. Alternatives 3, 4, and 6 are superior to Alternatives 2 and 5 from a design standpoint since they result in a thinner cap than Alternatives 2 and 5. Alternatives 3 and 4 are superior to Alternative 2 since they are somewhat thinner. Alternative 6 is thinner than Alternative 5. Alternative 6 is superior to Alternatives 3 and 4 since it provides double the protection for almost no increase in thickness.

With respect to administrative feasibility, Alternative 1 would be the most difficult to implement because of its unacceptability to regulatory agencies and the public. Alternatives 5, and 6 would probably be more acceptable than Alternatives 2, 3, and 4, because they provide more protection to human health and the environment. Therefore, alternatives 5 and 6 have a slight overall advantage over Alternatives 2, 3, and 4.

Cost. This criterion addresses the capital for materials, equipment, and the O&M costs. Revised comparative costs are as presented in Table 3.

Table 3 Comparative Cost of Alternatives

Alternative	Capital Cost ($)	O&M Costs ($)	Present Worth ($)
Alternative 2 (1 foot of clay)	1,438,531	4,730	1,511,243
Alternative 3 (bentonite)	1,388,805	4,730	1,461,517
Alternative 4 (geosynthetic)	1,436,417	4,730	1,509,129
Alternative 5 (2 foot of clay and geosynthetic)	1,668,520	4,730	1,741,232
Alternative 6 (bentonite and geosynthetic)	1,507,836	4,730	1,580,548

Regulatory Agency Acceptance. This criterion indicates whether, based on their review of the Focused Feasibility Study, Proposed Plan, and the Record of Decision, the EPA and Maryland Department of the Environment concur with, oppose, or have no comments on the Selected Remedy. EPA, Region III and MDE both concur that Alternative 6 is protective of human health and the environment.

Community Acceptance. Community interest in this proposed action at Building 103 has been moderate compared to other actions at APG. Most of the interest and comment were from one community group, the Aberdeen Proving Ground Superfund Citizen's Coalition (APGSCC). APGSCC preferred that APG conduct additional studies and gather supplemental information before proceeding with an action. APGSCC proposed APG take limited action with respect to the groundhogs at the site. While not agreeing with APGSCC's conclusion that APG should delay action, APG will be addressing APGSCC's concerns. APGSCC's comments and APG's responses are contained in Section 3, Responsiveness Summary.

APG's community involvement program has shown that citizens are concerned about ground water quality and migration of substances from APG into off-post ground water. Therefore, APG does not believe Alternative 1, No Action, would be acceptable to the community.

In general, comments from the community expressed no preference for one type of cap and cover system over another (Alternatives 2, 3, 4, 5 and 6). Again, APG has received input from the community that they are concerned that cleanup funds be spent prudently. While the cost of Alternative 6 is higher than other capping alternative, APG believes the community would accept the higher cost of Alternative 6 because it offers a high level of protection of public health.

The community is concerned about the existence of unexploded ordnance at APG and the handling of ordnance during cleanup activities. APG believes the community will accept the short -term risks associated with the capping alternatives as a trade-off for the long-term protection offered by the new cap and cover system, provided that APG implement adequate safety procedures to protect site workers, employees and residents.

The community would prefer a permanent solution which removes the buried waste to an off-site location. They recognize, however, that current limited technology, high cost and human health risks associated with the excavation of the waste materials and possible buried ordnance currently precludes implementation of these options.

Selection of Remedial Alternative. The selected alternative is Alternative 6.

2.9 DESCRIPTION OF THE SELECTED REMEDY

Based on the requirements of CERCLA and the detailed evaluation of the alternatives, the Army has determined that Alternative 6 (Install a Cap and Cover Systam in Accordance with RCRA Requirements for Hazardous Waste Landfill Closure Using a Sodium Bentonite Geocomposite Mat and a Geosynthetic Membrane) is the most appropriate alternative for the Building 103 dump operable unit, and is therefore the selected remedy (see Figure 3). This alternative was selected because it is protective of human health and the environment, feasible, and cost effective.

Alternative 6 involves the construction of a new multilayer cap and cover system in accordance with MDE requirements for hazardous waste landfill closure (COMAR 26.13.05.14) and EPA design recommendations (USEPA, 1985). The time to implement Alternative 6 is 12 months after having a signed ROD. This cap and cover system will cover the full extent of the Building 103 dump as it is currently known. Based on field work performed to date, this corresponds to an approximate area of 1.9 acres, and includes the grassy area adjacent to Building E5422, south of Williams Road, and west of Hoadley Road, and east of the Building E6427 parking lot. Building E5422 and the parking lot will be tied into the cap and cover system.

The Building 103 dump will be further investigated as part of the on-going Canal Creek RI/FS to more fully characterize the risks posed by the dump. This investigation will indicate if further remedial actions are required to fully address the Building 103 dump. Since waste will be contained on-site, Alternative 6 has a periodic review requirement, at which time the effectiveness of this alternative will be assessed and further remedial actions taken if necessary.

The design features of this cap and cover system will include:

- An earthen material backfill cover (to include contaminated soil from Building 503 Soils Operable Unit and non-hazardous drill cuttings from other APG-EA study areas) over the existing cover.

- Two feet of semi-permeable earthen material over the backfill cover, graded to achieve a 4 percent topslope.

- A sodium benonite geocomposite mat with an in-place permeability of at least 10-7 cm/sec or less over the backfill material.

- A geosynthetic membrane (minimum thickness 20 mil).

- A drainage layer with minimum permeability of 10-3 cm/sec.

- A compacted cobble/gravel animal intrusion barrier.

- A final earthen cover (up to 2 feet thick), with 4 percent topslope and vegetative cover.

- Gas collection/filtration system installed at start of construction to control long-term emissions.

- Long-term storm water management (storm water drainage ditches and swales).

The earthen fill material used to backfill over the existing cover will include excavated soil/ash from the Building 503 Soils Operable Unit and non-hazardous drill cuttings from other APG-EA study areas. Due to the shallow burial depth of the waste and possible ordnance items, there will be no grading of the existing dump cover. The additional fill material, when placed on the existing cover, will permit the grading of a suitable slope without disturbing the contents of the dump, and will also dissipate pressure and vibrations which might otherwise be transmitted to buried ordnance items, thereby reducing the possibility of explosive detonation.

IMG SRC <0395216F>

When the initial fill material (to include the soil/ash from the Building 503 soils operable unit) has been graded, 2 feet of semi-permeable earthen material will be constructed on the backfill. A gas conveyance layer will be installed on the backfill. A sodium bentonite geocomposite mat will then be installed over the gas conveyance layer. A synthetic geomembrane (minimum thickness 20 mil) will then be installed over the sodium bentonite geocomposite mat and anchored, followed by a drainage layer with minimum permeablility of 10-3 cm/sec. A compacted cobble/gravel animal intrusion barrier will then be constructed over the drianage layer. Finally, a pervious cover layer of up to 2 feet of loamy top soil will be constructed over the animal intrusion barrier. This top soil layer will be planted with a vegetative cover to minimize erosion.

A passive gas collection/filtration system and lined perimeter trench will be installed and tied into the gas conveyance layer. Filtration will consist of whetlerite charcoal filters fitted to vent pipes. Any chemical agent residue adsorbed onto charcoal filters is not classified as chemical surety material and will be considered non-recoverable material. Used filters will be disposed of as hazardous waste through an existing hazardous waste contract. Land ban restrictions do not apply to these filters.

Long-term storm water management includes the construction of storm water drainage ditches and swales around the perimeter of the dump. Run-on will be intercepted, and routed around the dump.

Appropriate warning signs will be placed at the dump, and use restrictions will be documented on APG records and maps. An O&M manual will be developed as part of the 90% design. At a minimum, the manual shall include provisions for repairs to the cap and cover system as necessary to correct any settling, subsidence, and erosion effects, the cultivation of natural vegetation on the topsoil to prevent erosion, the gas system, and five-year reviews under Section 121(c) of CERCLA, 42 U.S.C. paragraph 9621(c), because the Selected Remedy will result in contaminants remaining on-site.

The estimated capital cost and present worth for this alternative are $1,507,835 and $1,580,548 respectively, with annual O&M costs of $4,730 (see Table 4).

This interim remedial action will attain the following objectives:

- Prevent infiltration of water into the Building 103 dump.

- Prevent direct contact and inhalation of contaminants.

- Prevent animal intrusion into Building 103 dump.

- Ensure the cap and cover system will function with minimum maintenance.

- Promote drainage of surface water, and minimize erosion of the cap and cover system.

- Accommodate settling and subsidence so that cap integrity is maintained.
- Provide for adequate collection/filtration of any gases produced by buried wastes.

2.10 STATUTORY DETERMINATIONS

The selected remedy satisfies requirements under Section 121 of CERCLA to protect human health and the environment, comply with ARARs, be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Table 4 Capital Cost Estimate for Alternative 6

Item	Cost 1994 ($)
Site Preparation	166,741
Landfill Cap	512,909
Perimeter Drainage System and Barrier Wall	222,398
Vent System	2,471
Perimeter Fence	14,082
Sediment/Erosion Controls	2,791
Storm Water Management System	25,650
Storm Sewer System	35,596
Site Restoration	83,347
Construction Subtotal	1,065,988
Construction Contingencies (20%)	213,197
Subtotal	1,279,185
Health and Safety Equipment (2.5%)	31,980
Total Construction Cost	1,311,165
Engineering and Administration (15%)	196,674
Total Capital Cost	1,507,835

Overall Protection of Human Health and the Environment. Alternative 6 provides an extremely high degree of reliable long- and short-term protection to human health and the environment, and meets or exceeds all ARARs. Since Alternative 6 contains both a bentonite mat and a synthetic membrane, it greatly minimize infilteration of water into the dump, thereby minimizing the migration of contaminants out of the dump and into ground water. Alternative 6 also eliminates current and future dermal and inhalation exposure risks. Currently, extensive settling of the waste and erosion of the cover soil into the fill material is beginning to expose the content of the dump. Also, there is considerable animal intrusion into the dump, which permits direct infiltration of water, and promotes further settling of the contents. Continued settling of the existing cover, erosion of the cover soil into the contents, and animal intrusion increase current and future risks. Alternative 6 does not involve excavation of the Building 103 dump contents; therefore, there will be no risk of human exposure to chemical agent residues in process vessels or buried chemical ordnance (by leak or detonation). Therefore, this alternative is considered to offer an extremely high level of overall protection to human health and the environment.

Compliance with ARARs. Even though disposal activities occurred at the Building 103 dump long before the enactment of the RCRA Subtide C requirements, RCRA and MDE requirements are relevant and appropriate to construction of the cap and cover system. Alternative 6 meets both RCRA requirements for hazardous waste landfill closure, and MDE requirements for industrial landfill closure.

Placement of non-hazardous drill cuttings from other APG-EA study areas, and of contaminated soil from the Building 503 Soils Operable Unit at the Building 103 dump is authorized under the provisions of the CAMU rule set forth at 58 Fed. Reg. 8679, which authorize the on-site consolidation of wastes. The Army does not need a permit or waiver from MDE in order to include the non-hazardous drill cuttings or contaminated soil/ash from the Building 503 Soils Operable Unit as part of the fill material. Continued ground-water monitoring shall be performed at the Building 103 dump in accordance with Maryland Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (COMAR 26.13.05.06)

There will be increased runoff under Alternative 6. In accordance with Section 121(e)(1) of CERCLA and 40 CFR, Section 300.400(e)(1), no Federal, State, or local permits are necessary for CERCLA on-site response

actions. Consequently, a Maryland discharge permit for storm water systems will not be required. However, all substantive requirements of such a permit must be met. Alternative 6 would minimize erosion and control sediment run-off as required by Maryland Erosion and Sediment Control Regulations (COMAR 26.09.01) and Maryland Storm Water Management Regulations (COMAR 26.09.02).

The gas collection/filtration system to be installed would meet U.S. Army regulations (CRDEC Regulation 385-1) for effluent air concentrations for hazardous chemicals, and comply with the Clean Air Act and Maryland Air Pollution Control Regulations (COMAR 26.11.06 and 26.11.15). There will be no air emissions after completion of the cap and gas collection/filtration system. LDR restrictions do not apply to spent gas collection/filtration system filters.

Since alternative 6 may result in particulate emissions to air and noise, it will comply with Maryland State Adopted National Ambient Air Quality Standards and guidelines (COMAR 26.11.03), Maryland State Ambient Air Quality Standards (COMAR 26.11.04), Maryland General Emissions Standards, Prohibitions, and Restrictions (COMAR 26.11.06), the National Emission Standards for Hazardous Air Polutants (NESHAPS) (40 CFR Part 61) and Maryland Noise Pollution Regulations (COMAR 26.02.03). There will be no air emissions after completion of the cap and gas collection/filtration system.

Alternative 6 will meet with all substantive requirements for all ARARs listed in Table 5. There are no chemical-specific ARARs relevant to this remedy.

Long-Term Effectiveness. Alternative 6 provides a very high degree of reliable, long-term protection to human health and the environment. Synthetic liners typically are assumed to have a design life of approximately 20 years. Sodium bentonite mats are generally assumed to have a design life of 25 years.

Containment of the waste with alternative 6 significantly reduces long-term risks due to the leaching of contaminants into ground water. A limited potential for leaching will still exist with this alternative because the waste material will remain in place. However, proper maintenance and routine inspections of the cap system will significantly reduce the magnitude of any damage to the cap. The Army is required to maintain the cap and cover system. Since waste will be contained on-site, Alternative 6 has a periodic review requirement, at which time the effectiveness of this alternative will be assessed and further remedial actions taken if necessary.

Table 5 Review of Potential Action-Specific and Locational ARARs for the Building 103 Dump Selected Remedy

Environmental Laws and Regulations1			Consideration as an ARAR
ACTION SPECIFIC			
I.	RCRA		
	A.	Subtitle C Requirements	
		1. Closure and Postclosure (40 CFR Part 264, Subpart G)	Waste materials will be contained in place, requiring a cover.
II.	U.S. Army Corps of Engineers		
	A.	Clean Water Act Requirements Section 404 Nationwide Permits (33 CFR Part 330, Appendix A #38)	The Nationwide Permit for NPL Site is exempt under CERCLA.
III.	Clean Air Act		
	A.	National Emission Standard for Hazardous Air Pollutants (NESHAPS) (40 CFR Part 61, Subpart M)	The selected remedy involves earthmoving equipment operations that may result in emissions to air.
IV.	U.S. Department of Transportation (DOT) Regulations (49 CFR Parts 170-179)		Contaminated waste materials could be transported off-post under the selected remedy
V.	State of Maryland		
	A.	Maryland Noise Pollulion Regulations (COMAR 26.02.03).	Maximum allowable noise levels shall not be exceeded at the dump property boundaries during contruction and operation.
	B.	Maryland of Water Supply, Sewage Disposal and Solid Waste Regulations (COMAR 26.04.04)	Establishes requirements for well construction and abandonment. Wells at the dump site will have to be either modified or abandoned.
	C.	Maryland Sanitary Landfill Closure Regulations (COMAR 26.04.07.21)	This regulation provides design requirements for the closure (capping) of sanitary and industrial landfills.
	D.	Maryland Erosion and Sediment Control Regulations (COMAR 26.09.01)	Excavation and backfilling activities may cause increased erosion and sediment runoff requiring the application of control measures during the selected remedy.
	E.	Maryland Stormwater Management Regualtions (COMAR 26.11.10)	Stormwater shall be managed during and after construction.
	F.	State Adopted National Ambient Air Quality Standards and guidelines (COMAR 26.11.03)	The selected remedy involves earthmoving equipment operations that may result in emissions to air.
	G.	Maryland Air Quality Regulations (COMAR 26.11.06)	These regulations apply to emissions from the landfill gas collection/filtration system.

Table 5 Review of Potential Action-Specific and Locational ARARs for the Building 103 Dump Selected Remedy

Environmental Laws and Regulations[1]		Consideration as an ARAR
H.	Maryland Standard for Toxic Air Pollutants (COMAR 26.11.15)	The selected remedy involves earthmoving equipment operations that may result in emissions to air.
I.	Maryland Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities. (COMAR 26.13.05.06)	Ground-water monitoring will be performed at the site.
J.	Maryland Standards for Hazardous Waste Treatment, Storage, and Disposal Facilities (COMAR 26.13.05.14J)	Design and operating requirements, closure and post-closure care for hazaraous waste landfills.
LOCATION SPECIFIC		
I. RCRA		
A.	Subtitle C requirements	
	1. Location standards (4O CFR Part 264, Subpart B)	Portions of streams downgradient of the site may be located within the 100-year flood plain, though none are located in a seismic area, as defined by the regulations.
II Statement of Procedures on Flood Plain Management and Wetlands Protection (4O CFR Part 6, Appendix A, and Executive Orders 11988 and 11990)		Site is not located within 100-year flood plain.
III. U.S. Army Regulation (CRDEC Regulation 385-1)		This regulation applies to emissions from the landfill gas collection/filteration system.

1. Note: Substantive requirements must be met.

Reduction of Toxicity, Mobility, and Volume. Alternative 6 will significantly reduce contaminant mobility by greatly minimizing water infiltration. No reduction in toxicity or volume of contaminants will be achieved because all wastes will remain in place. Leakage through the bentonite mat and geosynthetic membrane will be minimal. Sodium bentonite mats typically have a low uniform permeability, depending on surface pressure, while geosynthetic liners are essentially impermeable. While there would be holes caused by installation of the liners and the gas vents. Careful installation will minimize the number of holes. Typically, with stringent quality assurance procedures, it is assumed that there are five holes/acre as a result of installation. There could also be leakage at the seams where two synthetic liners are joined. However, Sodium bentonite is high swelling which means any holes or seams where the bentonite mat is joined would be self-sealing to a great extent resulting in low uniform permeability.

This alternative would not be considered irreversible because waste treatment is not associated with it.

Short-Term Effectiveness. Construction activities associated with this alternative are not expected to affect nearby communities. However, APG-EA employees and military personnel will be impacted to some extent by construction activities. Personnel working in Buildings E5422, E5427, and E5265 will be subject to construction-related impacts. It may be necessary to close both Hoadley Road and Williams Road at certain times during construction and traffic temporarily rerouted. Exposure of government workers to dusts, noise and particulates is expected to be minimal. Construction related impacts on human health would be expected to affect mainly workers at the dump. Worker exposure through dermal contact and/or inhalation of contaminants is not anticipated since there will be no excavation of the dump. No protected species or sensitive land areas will be affected during remediation. Also, transportation of hazardous materials is not expected to be necessary. The time to implement this alternative is expected to be approximately six months after signing of the ROD.

Cost-effectiveness. The estimated capital cost for implementation of Alternative 6 is $1,507,835 with annual O&M costs of $4,730 for the first year. The net present worth of this alternative, evaluated over a period of 30 years at a discount rate of 5 percent is $1,580,548. The total capital cost is shown in Table 5.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable. The Army has determined that the selected remedy represents the maximum extent to which permanent treatment technologies can be utilized in a cost effective manner for remediation of the Building 103 dump.

The most permanent solution would be to remove the source of the waste from the Building 103 dump, and place the waste in a secure landfill. The other alternatives do not address the potential for continued migration of contaminants to ground water. The capping alternatives would reduce the mobility of contaminants at the Building 103 dump, but would not reduce the toxicity or volume of the contaminants because the waste would remain on site. Excavation would remove the waste from the Building 103 dump, thus providing the greatest reduction of toxicity, mobility and volume. However, the responsibility for the waste is merely transferred to another location with this alternative. The size of the Building 103 dump, hazards associated with excavation of the dump, and excessive costs associated with the excavation alternative preclude a remedy in which contaminants can be excavated and treated effectively. The capping alternatives provide a greater level of short term effectiveness than the excavation alternative because the waste would remain in place and would not pose an increased threat to human health and the environment. Also, the capping alternatives are much less costly than the excavation of the Building 103 dump. Of the capping alternatives, alternative 6 is the most cost effective, implementable, and protective of human health and the environment.

Preference for Treatment as a Principal Element. None of the capping alternatives employ treatment because no treatment technologies are currently available that would eliminate the risks in a cost-effective manner. The selected remedy is the most cost effective technically feasible approach to eliminate the risks posed by the dump. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent praticable for this site. However, because treatment of the principal threats for the dump was not found to be practicable, this remedy does not satisfy the statutory preference for treament as a principal element of the remedy. The size of the Building 103 dump, and the risk and excessive costs associated with the excavation of the Building 103 dump, preclude a remedy in which the contaminants could be excavated and treated effectively. The selected remedy is consistent with the Superfund program policy of contaminant (40 CFR § 300.430), rather than treatment, for wastes where removal and treatment is impracticable.

2.11 DOCUMENTATION OF SIGNIFICANT CHANGES

During discussions at the public meeting, the dump was estimated to have an area of about 1.7 acres. Field work described at the public meeting was performed in 1994 at the Building 103 dump as part of the Canal Creek RI/FS. This now completed field work indicates that the Building 103 dump extends under Building E5422, and has an area of about 1.9 acres. The depth of waste in the Building 103 dump varies, with a maximum depth of about 19 feet below grade. A passive soil gas survey conducted at the Building 103 dump

indicated that the dump may be emitting low levels of organic vapors. Since the Building 103 dump is larger than previously thought, and since Building E5422 rest on the dump, the lined perimeter trench and gas collection system will have to be constructed on three sides of Building E5422, so that the building can be effectively tied into cap and cover system. Building E5422 will also have to be shored to prevent collapse. This shoring, and the relocation of utility lines on the east side of the dump will increase the cost of this interim remedial action. The revised costs for all alternatives based on the new field data are provided in this ROD. The selected remedy is still the preferred alternative from the Proposed Plan. If during design and construction of the cap and cover system it becomes necessary to remove Building E5422, this would result in cost savings.

SECTION 3

RESPONSIVENESS SUMMARY

The final component of the Record of Decision is the Responsiveness Summary. The purpose of the Responsiveness Summary is to provide the public with a summary of citizen comments, concerns, and questions about the Building 103 dump and the EPA's and the U.S. Army's responses to these concerns. During the public comment period from May 4 to June 24, 1994, on the Focused Feasibility Study and Proposed Plan for the Building 103 dump in Edgewood Area of APG, written comments, concerns, and questions were received by the Army. No comments, concerns, and/or questions were received by the EPA and/or the MDE. A public meeting was held on May 24, 1994, to present the Proposed Plan, and to answer questions and to receive comments. Several technical questions were answered during the public meeting regarding the conduct of the investigation, and written comments and concerns were received at the meeting and during the Comment Period. The transcript of this meeting is part of the administrative record for this operable unit. Public comments received by the Army are discussed below.

This responsiveness summary is divided into the following sections:

- Overview
- Background on Community Involvement
- Summary of Comments Received During Public Comment Period and Agency Responses
- Panel of experts
- Selected newspaper notices announcing dates of public comment period and location/time of public meeting

This responsiveness summary gives the comments on the Proposed Plan by interested parties, and provides the Army's responses to the comments. All comments and concerns summarized below have been considered by the EPA in making a decision regarding the selection of the selected alternative for the Building 103 dump. Additionally, the Army and EPA are proposing with the issuance of the Record of Decision to continue investigating the Building 103 dump as part of the on-going Canal Creek RI/FS. The results of this investigation will be incorporated into the on-going Canal Creek RI/FS and Canal Creek Area ROD.

3.1 OVERVIEW

At the time of the public comment period, the Army had already endorsed a preferred alternative for the Building 103 dump. Both the U.S. EPA and the MDE concurred that the preferred alternative is protective of human health and the environment, since it will minimize infiltration into the dump, and subsequent leaching of contaminants into ground water. The preferred alternative in this ROD consists of the following: Install a cap and cover system in accordance with RCRA requirements for hazardous waste landfill closure using a sodium bentonite geocomposite mat and a geosynthetic membrane, and a filtration system to collect any vented gas.

3.2 BACKGROUND ON COMMUNITY INVOLVEMENT

APG implemented significant opportunities for public involvement in the Building 103 dump. Major events are summarized below:

- APG briefed the scope and role of this operable unit to the Technical Review Committee on July 29, 1993, and on January 27, 1994. Representatives were also given a tour of the dump site.

- APG released the Focused Feasibility Study (FFS) (Battelle, 1994), Proposed Interim Remedial Action Plan (Battelle, 1994), and background documentation for the Building 103 dump to the public for comment in May 1994. These documents were made available to the public in the local information and administrative record repository at the Aberdeen Public library, Edgewood Public library, Miller College library, and Essex Community College library. APG also established an information repository at the TECOM Public Affairs Office in accordance with the Federal Facility Agreement between EPA and APG.

- APG issued a news release announcing the availability of these documents to APG's full media list.

- APG placed newspaper advertisements on the availability of these documents and the public comment period/meeting in the APG News on May 4, 1994, in the Aegis on May 11, 1994, and in the Hartford County edition of the Baltimore Sun newspaper on May 8, 1994.

- APG established a 45-day public comment period from May 4, 1994, to June 24, 1994,

on the scope and role of the proposed interim remedial action.

! APG prepared and published a fact sheet on each item in the Proposed Plan and delivered it to on-post buildings close to the site and on-post libraries; APG mailed copies to its Installation Restoration Program mailing list.

! APG conducted a poster session and public meeting on May 24, 1994 at the Chemical and Biological Defense Command conference center (Building E4810) at APG-EA. Approximately 35 people attended including citizens, advisors and members of the APG Superfund Citizen's Coalition, and Federal, State and local Government representatives, Representatives of the Army, EPA, and the MDE answered questions about the proposed interim remedial action at the Building 103 dump, and the cap and cover system remedial alternatives under consideration.

! Responses to comments received during this period are included in the Responsiveness Summary which is part of this ROD.
- In a letter dated June 24, 1994, community members expressed concern about the lack of data, and recommended that the groundhogs currently inhabit the dump be removed, that existing holes be plugged to prevent infiltration, and that the dump be investigated further to determine if it is indeed a contaminant source.

3.3 SUMMARY OF COMMENT RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

COMMENT SET 1 received from concerned Joppa, MD citizen.

Note: Comments pertaining to the Building 503 Soils Operable Unit have been included because that soil will be used as fill under the cap for the Building 103 dump.

Ladies and Gentleman, Distinguished Guests, and Concerned Citizens:

Although I agree with the U.S. ARMY's remedial action at BLDG 503 to remove white phosphorous contaminated soil, I have several questions concerning the approach to this decision and the additional hazards that I feel will be created due to these actions.

Comment 1 Will any steps be taken to reduce the dust created during the excavation process (i.e., watering or dampening)?

Response Yes. Various dust control procedures are being evaluated, including foams and biodegradable vegetable gums. A Work Plan and Health & Safety Plan will be written prior to beginning remediation. The Work Plan will detail the procedures which will be implemented to protect the health and safety of on-site workers and off-site personnel during the excavation of the soil and ash at the Building 503 burn sites. The Health & Safety Plan will also specify all measures which will be taken to minimize adverse health effects to on-site workers. It will require activities such as observation and monitoring of dust levels and provide for application of dust control procedures as needed.

Comment 2 Will the contaminated soil be containerized prior to movement to the Bldg. 103 site?

Response The contaminated ash and soil probably will be contained in a roll-off box or truck bed. The current design concept is to excavate the ash and soil with a backhoe or front-end loader, and drop it directly into a track for transport across the road to the Building 103 dump. The truck will be fitted with spray nozzles to dampen the soil and ash as it is being dumped to prevent dust generation. The box or bed will be lined with plastic sheeting. Once the box or bed is filled, the ash/soil will be covered with plastic sheeting so the truck will be covered while in transit. These provisions will control the escape of particulates during the short move from Building 503 to the Building 103 dump.

Comment 3 How will construction personnel know if an existing cylinder or UXO currently buried beneath the surface of Site 103 has been ruptured do to vibration and the weight of heavy equipment.

Response Continuous air monitoring for volatile organic compounds and chemical agents will be conducted during the construction activities at the Building 103 dump to warn personnel of any airborne release.

Comment 4 What safety precautions are being taken to contain any spillage or air release of hazardous materials due to the rupture or detonation of UXO's at the BLDG 103 site?

Response Both conventional and chemical ordnance items are frequently encountered during construction activities at APG. Though historical files were researched, the lack of data make it impossible to determine if ordnance items are present in the building 103 dump, and the possibility of ordnance items being present in the dump cannot therefore be ruled out. Explosive components in munitions include fuzes, supplementary charges such as boosters, and bursters. Fuzes contain the primary and most sensitive explosives that form the explosive train. The fuse may also contain a booster, the second most sensitive explosive that is usually needed to detonate the main fill in an high explosive (HE) munition. In chemical, and smoke munitions, the booster charge is replaced with a burster tube that is used to open the munition casing, scattering the inside fill over a wide area. Fuses are the initiating element of the explosive train that detonates either the booster or the burster charge. A booster charge, as stated above, ignites the main explosive charge in HE filled munitions. The burster charge in chemical munitions is usually shaped like a long cylindrical tube and is found within the longitudinal center of the munition surrounded by the chemical agent fill. The burster is the main explosive charge responsible for scattering the munition contents.

No special safety precautions are being taken to contain spillage since the waste contained in the dump is not being excavated.

A safety precaution being taken to prevent the detonation of possible buried unexploded ordnance items is the spreading of fill dirt on the dump to dissipate the weight of personnel and equipment. Buried ordnance is subject to loads, which depend on munition diameter, depth of burial unit weight, and frictional characteristic of the soil. While heavy equipment and increased backfill height will produce additional loads on buried ordnance, the additional vertical pressure dissipates laterally with depth in underlying soil and is not transmitted directly to ordnance item(s). Thus, only a portion of the additional pressure is transmitted to buried ordnance. The more fill is put down, the more the load is dissipated laterally. To further reduce this load, grading equipment equipped with wide tracks or tires will be used. Since pressure is defined as force per unit area, this will distribute the weight over a wider area, further reducing the point load. The fill material will be placed on the dump starting at the dump perimeter, and then will be graded towards the center.

The additional fill material also has the added benefit of containing detonations which may occur. The detonation may break the surface of the dump, and may affect other buried ordnance causing sympathetic detonation. The main factors in determining whether the explosion will break the surface are the amount of explosive and the depth of the ordnance item(s). If sufficient soil is present to absorb the energy released, then the explosion will be contained. This principle is used in in-situ emergency techniques for the destruction of single munitions. For example, single munitions encased in a plenum chamber filled with vermiculite or some other material can be safely detonated; the explosion is totally contained since the vermiculite absorbs the energy released (shock wave, heat, expanding gas). Another in-situ emergency technique is "massive encapsulation/burial." With this technique, the munition is buried under a mound of soil, which then absorbs the energy of the explosion.

It is unlikely that the additional load transmitted through soil would initiate a burster explosion in a non-fuzed munition since the casing is directly subjected to the load, and not the burster tube. The additional load might crack/deform the casing, however. It is unlikely that an unfuzed burster will detonate due to additional pressure effects caused by earth-moving equipment or the added weight of a cap since the burster requires the fuse to initiate the secondary explosion. Bursters are relatively insensitive to shock.

Considerable corrosion will have occurred in any munitions buried in the dump, which will reduce wall strength, open seams, reduce threads, and allow water to seep in and the contents to leak. Chemical reactions will have occurred between the explosives, surrounding media and metal. Such reactions can form hazardous/sensitive components which are heat-and-shock sensitive. Fuzes in particular may contain small quantities of `sensitized' primers and detonators. It is conceivable that low-frequency vibrations of heavy equipment could be sufficient to detonate such age-sensitized fuzes in shallow buried munitions. Vibratory compaction equipment could have a similar effect. To minimize such low-frequency vibrations, non-vibratory compaction equipment will be

used and the use of heavy grading equipment minimized until sufficient backfill has been put down. Also, since there is waste (such as the BBC tank that was emptied and the void filled with sand) close to the surface, grading will not take place on the original cover, and will commence only when sufficient backfill material is present.

Finally, an EOD team will be standing by during construction activities. All work will be preceded by a magnetometer sweep by EOD personnel of the entire work area. This will reduce the possibility of running over ordinance buried just beneath the surface, and uncovering already leaking rounds or rupturing intact rounds during operations.

Comment 5 What are the trade-offs of depositing the white phosphorous contaminated soil off-post instead of creating or adding to an existing hazard across the street at the Bldg. 103 site?

Response While some white phosphorous munitions were probably tested and/or disposed of at the Building 503 burn sites, the main contaminants of concern at the Building 503 burn sites are lead, zinc, hexachlorobenzene, and hexachloroethane. Placement of the soil and ash from the Building 503 burn sites under the Building 103 dump cap and cover system will not create an additional hazard since the soil and ash will be contained under the cap and cover system. Placement of the soil and ash under the cap will provide a cost-effective way to reduce the potential for adverse effects from the Building 503 soil and ash without transferring the problem, and it allows the Army to retain control of its waste. Also, it will reduce the distance over which the contaminated material must be transported, and will reduce the risk of transportation accidents and public exposure to the contaminants as a result of transportation accidents or release during transportation. Finally, the effectiveness of this action will be monitored as part of the monitoring program of the Building 103 cap and cover system.

This monitoring program will determine if further remedial actions need to be undertaken at a later date.

Comment 6 I feel that the Army's role is to cleanup existing hazardous waste, and not to create or add to others. I also feel that due to the instability of UXO (unexploded ordnance) and buried canisters of unknown substances at Bldg. 103, a more hazardous situation exists, not only for the construction workers who are in direct danger, but the community as a whole.

Response Containing the waste under the cap and cover system at the Building 103 dump is protective of both human health and the environment. The construction of a cap and cover system over the dump will help contain the waste in the dump and will reduce migration to ground water. The contaminated ground water associated with the dump will be addressed separately. By excavating the soil and ash at the Building 503 burn sites and then transferring the soil and ash to the Building 103 dump, the Army is remediating the Building 503 burn sites. The Army is not creating additional waste through this action. The Army is attempting to consolidate waste from different areas into a single waste management unit, at which waste can be more easily contained, and the effectiveness of the remedial action monitored. Moving the contaminated ash and soil from the Building 503 sites to the Building 103 dump and covering it will eliminate the current risks posed by the ash and soil, and will reduce the potential for contaminants to move from the ash and soil to ground water. Capping will reduce the potential for contaminant migration from both the ash and soil and from wastes in the dump.

The Army concurs with the comment that a more hazardous situation would exist for on-site workers and off-site personnel if the dump were to be excavated, since excavation of the dump would greatly increase the risk of detonation of buried unexploded ordnance with subsequent chemical release.

Thank You

COMMENT SET 2 received May 19, 1994, from technical advisors to the APG Superfund Citizen's Coalition who are associated with the University of Maryland Program in Toxicology.

Comments on Assessment of the Potential for Interaction Between Buildiung 503 Ash/Soil and Building 103 Dumps Contents, April 15, 1994.

This brief treatise concludes that the potential for undesirable interactions between the chemicals present in the ash/soil of the Building 503 pilot plant burn sites and the

Building 103 dump is remote. Overall, the conclusions reached in this document are valid, due primarily to the fact that the chemicals in the 503 ash/soil will be present in low concentrations, particularly after they are mixed with uncontaminated soil. It may be possible to further insure that interactions do not occur, however, through consideration of the following comments and questions.

Comment 1 What would be the approximate ratio of the mix of 503 material with compacted earthen material? What would the overall "dilution" of the chemicals of concern be?

Response The approximate expected volume of contaminated soil and ash from the Building 503 burn sites is 470 yd3. The planned thickness for the subbase for the cover over the Building 103 dump is at least 2 feet. The approximate area to be covered by the subbase is 55,600 ft^2. The total estimated volume of subbase fill is approximately 111,200 ft3 (4,120 yd3). The approximate volume ratio of burn area soil and ash to off-site fill is 0.129. This does not include the additional material placed over the subbase to form the cap and cover.

Comment 2 Since the acidity of the soil is an important determinant of the mobility of the metals, will the pH of the soil mix be determined? Could the be added to neutralize the soil if necessary? Would conditions in the dump favor an acidic environment?

Response In general, pH adjustment to neutral or slightly basic conditions will reduce metal mobility. Most metals form positive ions in solution and tend to be more soluble and less well sorbed under acidic pH conditions in soils. However, unless carefully controlled, the addition could actually increase metal mobility. The minimum solubility point occurs at a different pH for each metal. The minimum solubility points for typical metal hydroxides cover a range between 7.5 to 11 (U.S. EPA, 1993). With a mixture of metals, the pH adjustment point must be carefully selected and controlled to ensure optimum immobilization. Immobilization by the addition should not be required and might provide for some metals. Primary containment is provided by the cap and cover system.

Comment 3 The first complete sentence on page 4, paragraph 1 is unclear. What would the volume of the material influence the reducing conditions?

Response The word "volume" was intended to mean space in general, and not the actual measured volume. The sentence should have been more clearly phrased such as "The electrochemical conditions in the material under the cap will not be sufficiently reducing to favor conversion of zinc, iron, aluminium, or cadmium to metals."

Comment 4 What is the temperature under the cap likely to be? Are there any data from other caps that would allow a prediction of what temperature one might expect?.

Response Because of the low degradation rate in a rubble landfill, and because the dump has been covered for about 60 years, the temperature within the dump is most likely similar to inert subsurface environments in this area, or about 55°- 60° F (13°- 16°C). Also, soil within inches of the surface tends to track seasonal temperahire variations. Typically, the ability of soil to transport heat is sufficiently low that soil acts as an insulator. Insulation due to the soil causes temperature variations to decrease as depth increases. For example, a surface variation from 10°C to 30°C is damped to about 15° C to 25°C at 1 meter depth. At depths below 3 meter temperature variation is small, and the soil temperature tends to be close to 20°C (Hillel, 1982). The selection of 25° C for calculation of the Eh-pH diagrams was based entirely on availability of free energy data. However, 25°C should be a reasonably accurate representation of the temperatures under the cap.

Comment 5 Will the concentrations of carbonate and sulfides in the Building 103 dump soil be determined, so Eh-pH diagrams can be constructed? Perhaps the earthen material with which the 503 soil/ash material is mixed can be tested for carbonate and sulfide concentrations and adjusted so as to favor an environment inducive to low mobility and low reactivity of the metals.

Response Immobilization of the contaminants will be provided by the cap and cover system. Additional reduction of mobility of some metals may occur due to a variety of natural precipitation and sorption mechanisms. The carbonate and sulfide levels could be measured and Eh-pH diagrams generated based on the in-situ composition. However,

adjustment of the soil chemistry with carbonate and/or sulfide is unlikely to add significant additional immobilization. Therefore, these measures are not planned.

COMMENT SET 3 received May 19, 1994, from technical advisors to the APG Superfund Citizen's Coalition who are associated with the University of Maryland Program in Toxicology.

Comments on Proposed Plan - Interim Remedial Action for Aberdeen Proving Ground (APG) Edgewood Area, Maryland, Building 103 Dump (Immediately North of Building E5422), April, 1994.

Comment 1 Pre-construction tasks include magnetometer sweeps to assess the presence of ordnance in the Building 103 dump area (Page 8, column 2, para 3). How will the magnetometer "hits" be verified to determine whether they are ordnance? What action will be taken if ordnance are detected? To what extent will this entail digging down into the dump itself? Will items other than ordnance that are uncovered by this digging be removed from the dump area?

Response The purpose of the geophysical survey is to obtain as much information as possible about the extent of the dump and the contents of the dump. The results of the ground penetrating radar survey, when used in conjunction with the magnetometer results, may make it possible to differentiate between buried objects and will give an idea of the contents of the dump and the location of possible ordnance. The location of anomalies will be retained for future reference since this information could be valuable if it is necessary to excavate the dump. Another purpose of the magnetometer sweep is to verify the ground-penetrating radar for delineating the extent of the dump. No excavation will be performed as a result of information obtained during these activities, and no waste will be removed from the dump.

Comment 2 Is there any indication of subsurface/gas/vapor generation at this time. If so, what type of gas or vapor is present. What type might be expected to be released in the future as the material in the dump deteriorates?

Response The only gas monitoring done to date at the Building 103 dump was performed during the removal of bromobenzylcyanide residue from a buried process vessel in 1992. No background gases/vapors were detected at the dump during that removal action. A soil gas survey will be performed during the 30 percent design effort at the Building 103 dump. The types of gases which would be expected to be released would be minimal levels of methane due to the decomposition of previously undecomposed organic matter, and possible vapors from leaking buried process vessels.

Anything from solvent vapors to chemical agent vapors could be released, which is why the soil gas survey is being performed. The soil gas survey will assess the type and concentration. A gas collection treatment system will be installed to collect any gases or vapors which could be released at future date under the cap. Any current ongoing release is venting directly to the atmosphere, which is another reason for constructing the cap and cover system.

Comment 3 How will the extent of the burrow system be assessed? (Page 8, column 2).

Response The extent of the burrow system will be assessed by a biologist who will conduct a visual examination of the dump and the surrounding area. A more detailed assessment is unnecessary since the cap and cover system will be designed to deter rodent invasion.

Comment 4 What are drill cuttings? What areas of APG will they be from?

Response The term "drill cuttings" refers to the subsurface soil brought to the surface when drilling holes in the ground, as for example, when installing wells. Drill cuttings used as fill material will be certified non-hazardous soil from locations in the Edgewood Area of APG.

Comment 5 The zinc and lead in the soil from the Building 503 site are said to be in cationic form and thus are non-mobile (Page 9, Column 1, para. 2). Have leaching experiments with this soil/ash been done? Under acidic conditions?

Response Lead leachability tests were performed on a number of samples as part of the Treatability Study performed in 1992, and as part of further characterization in mid 1993.

The leaching test applied in 1992 was the EP Toxicity Extraction test, and the leachability test applied in 1993 was U.S. EPA SW-846 Method 1311. The commonly used name for this procedure is the Toxicity Characteristic Leachability Procedure (TCLP). The leaching fluid was an acetate buffer with an initial pH of 5. The pH after the extraction period typically ranged from 5 to 6. The TCLP is currently the required method for determining if a solid waste exhibits the hazardous charateristic of leachable toxicity under the RCRA regulations (40 CFR 261.24).

Comment 6 Filters on the gas collection system will be retrofitted if necessary (Page 9, column 1, paragraph 3). What would be the cost of retrofitting compared to installation of an active gas collection system at this time? Perhaps in the future, with further decay of old drums, etc., the release of gas/vapors would significantly increase. Are there any plans to analyze the gas vapors released from the dump on a routine basis after the cap is installed to monitor for the gaseous chemicals not being given off now?

Response A cost benefit analysis of retrofitting the vents versus installing an active system initially will be performed as part of the 30 percent design phase. No data are yet available on this comparison. A preferred option of those being considered for the gas venting system is to install carbon canisters on the vent outlets to adsorb any gases/vapors released from the dump. The carbon filters will be replaced at regular intervals. Apart from possible air monitoring equipment to be installed in Building E5422, there are currently no plans to actively monitor for gas/vapors.

Comment 7 Will the perimeter fence be designed to help keep out groundhogs and other burrowing animals? (Page 9, column 2, paragraph 3).

Response The perimeter fence was originally intended to keep people from walking on the cap and cover system, and is an option for limiting access to the dump area. It may or may not be included in the final design. Whether or not a fence is included will depend on the outcome of further design efforts. If a fence is used, it will not be constructed to deny groundhogs or other animals access to the dump. The cap and cover system will be designed to serve that purpose.

Comment 8 In addition to maintaining the gas collection/treatment system, APG should be responsible for monitoring the gas/vapor released from the dump on a scheduled (perhaps every 6 months) basis.

Response See response for comment 6.

Comment 9 Since the caps proposed in the alternative action plans (#2-#6) have a finite life expectancy of about 20-25 years, thought should be given to the "ease of replacement" of these caps. Is there any significant difference between these caps in terms of what actions would be required to replace them? Will the cap be replaced automatically after 20 years, or will the cap be monitored for signs of deterioration? If so, how?

Response Of the various Alternatives, Alternatives 2-4 are MDE industrial caps with a single barrier layer. Alternatives 5 and 6 are RCRA caps with dual barrier layers. The RCRA cap and cover systems are more protective than the industrial cap and cover systems. Both RCRA cap and cover systems include geosynthetic membranes. A RCRA cap (Alternative 6) is the selected alternative. Although clay layers would be easier to replace than geosynthetics because of the anchoring requirements for geosynthetics membranes, clay alone is not as protective as the dual system with geosynthetic. Therefore, ease of replacement is secondary to protection of human health and the environment, and is not the driving force for the design of the cap and cover system. The cap will not be automatically replaced, but will be monitored on a regular basis for signs of settlement and failure of the cap layer. Ground water under the dump will also be monitored for changes in concentration of the contaminants.

COMMENT SET 4 received May 19, 1994, from technical advisors to the APG Superfund Citizen's Coalition who are associated with the University of Maryland Program in Toxicology.

Comments on Proposed Plan - Interim Remedial Action for Aberdeen Proving Ground (APG), Edgewood Area, Maryland, Building 503, Smoke Pilot Plant Burn Sites Operable Unit, April, 1994.

Comment 1 The proposed plan for excavating and relocating the contaminated soil/ash

from the 503 burn sites to the 103 dump where it would be placed under a RCRA cap is both a cost-effective and human health protective remedial action step. The major drawback to this solution is that its long-term effectiveness is not as great as that of alternatives #2, 3, and 4 since the contaminated soil/ash remains on site at APG and will need to be monitored in future years. Because this monitoring will coincide with that established for the 103 dump site, the additional cost and effort should not be significant.

It is imperative that not only the on-site workers but also APG employees working in the area of the 503 burn sites be protected from the contaminated dust and particles that are dispersed during excavation of this soil and its removal to the 103 dump site. How will this be accomplished?

Response During excavation of the soil/ash, dust control measures will be used to minimize dust dispersion. Some options currently being evaluated include spraying of water, water with a soap-like substance, and water with biodegradable vegetable gum. In addition, when the soil is dumped into plastic-lined trucks for transport, the trucks will be fitted with spray nozzles to wet the soil as it is dumped to prevent dust dispersion. The trucks will also be covered during transport. If the soil is stockpiled (for example in roll-on roll-off containers), it will be covered with plastic sheeting, dust control foam, or some other material to minimize dust generation. Also, this interim remedial action will be conducted under a Health and Safety Plan so as to minimize adverse health effects to on-site workers and off-site personnel. The plan will require established work areas to control the spread of contaminants. The work area, which will have the highest concentrations of contaminants, is called the exclusion zone. The exclusion zone is surrounded by a contamination control zone and a support zone. One or more contamination reduction corridors will pass from the support zone, through the contamination control zone, and into the exclusion zone. The contamination reduction corridors allow controlled movement of personnel and equipment to and from the exclusion zone. Decontamination procedures will be set up in the corridor to minimize uncontrolled movement of contamination out of the exclusion zone. Finally, monitoring will minimize risks to on-site workers and off-site personnel.

Comment 2 What were the conditions used for the TCLP lead analyses? Did they mimic a "worst case" situation as it might occur in the 103 dump site? This information could be useful in predicting the leachability/reactivity of this material in its new environment.

Response Lead leachability tests were performed using both the EPA Toxicity test and the TCLP test. The TCLP is designed to simulate the disposal of solid waste in an uncontrolled multiwaste landfill, and should be a reasonable reflection of worst case conditions in the Building 103 dump. The TCLP analysis method is EPA Solid Waste Procedure 1311 as described in SW-846, Test Methods for Evaluating Solid Waste. The requirements of Procedure 1311 were followed for all analyses. Some specific features of the procedure as applied to the Building 503 ash and soil samples are highlighted below:

> The TCLP includes special provisions for separating liquids and solids in samples. These were not required since all samples were dry solids.
>
> The TCLP includes special provisions for size reduction and screening. These were not required since all samples contained particulates smaller than the maximum allowed size of 9.5 mm.
>
> The TCLP calls for a sample size of at least 100 grams. This is the sample size used for the analyses.
>
> The TCLP extraction requires the use of one of two extraction fluids depending on the alkalinity of the sample. Extraction fluid 1 contains 5.7mL of glacial acetic acid and 64.3 mL of 1 normal sodium hydroxide mixed with water to make 1 liter of fluid. The pH of extraction fluid 1 should be 4.93 ± 0.05. Extraction fluid 2 contains 5.7 mL of glacial acetic acid mixed with water to make 1 liter of fluid. The pH of extraction fluid 1 should be 2.88 ± 0.05. Extraction fluid 2 is used for wastes with a pH over 5 and the ability to neutralize a prescribed quantity of acid. None of the samples tested required the use of extraction fluid 2.

The TCLP calls for the weight of extraction fluid used to be 20 times the weight of the solid material extracted. For all samples this translates to 2,000 grams (or about 2 liters) of extraction fluid. This amount of extraction fluid was used in each extraction.

COMMENT SET 5 received June 23, 1994, from the Executive Director, Aberdeen Proving Ground Superfund Citizens Coalition.

Letter - Proposed Interim Remediation Plans for the 503 Burn Areas and the 103 Dump.

Comment 1 Enclosed please find our comments regarding the Interim Remediation Plans for the building 503 burn areas and building 103 dump site. As you are aware, Aberdeen Proving Ground Superfund Citizens Coalition (APGSCC) consists of concerned citizens who live in close proximity to Aberdeen Proving Ground (APG). As we represent the effected communities, we do hope that the Army will carefully consider these comments during this decision process.

On behalf of APGSCC, I would like to take this opportunity to thank you, John Wrobel and the others involved for the time and effort spent on these sites. It is our sincere hope that the Army will continue to make progress in characterizing the Canal Creek study area, so the best remedial actions can be initiated in a timely manner.

Response The Army welcomes all comments and will carefully consider all comments received.

Comment 2 Aberdeen Proving Ground Superfund Citizens Coalition (APGSC) has carefully considered the available information regarding the Building 503 burn areas and the Building 103 landfill. Supported by our technical consultants, Penniman & Browne and University of Maryland Program in Toxicology, APGSCC has reviewed the Focused Feasibility Studies pertaining to these areas, as well as the Proposed Interim Remediation plans. In addition, several of our representatives attended the public meeting held by the Army on May 24th, and APGSCC convened two additional meetings to discuss our concerns. It is the strong belief of APGSCC that there are too many data gaps to support the financial investment of the recommended interim cap at the present time. The issues behind this conclusion are outlined in the following paragraphs.

The fact the actual dimensions of the landfill are not fully known is a serious concern to APGSCC. At the May 24th meeting, John Wrobel said that recent magnetometry readings confirmed that the dump extends further south than the area to be covered by the cap. It is our recommendation that the Army perform a more definitive delineation of this boundary prior to any initiation of cap construction.

Related to the landfill delineation issue is gas migration. At the public meeting, John Wrobel discussed how the Interim Remedial Action includes the emplacement of monitoring equipment in the basement of building E-5422. Whether or not the cap is constructed, this effort is vital to the protection of those individuals working in this building. Therefore, we believe that the Army should proceed with this initiative without delay, if these steps have not already been taken.

APGSCC has a variety of concerns regarding cap construction. A major concern for APGSCC, as well as the Army, is contaminant migration. The Building 103 landfill cap will have a three-foot gravel and cobble layer, a two-foot compacted soil layer, a one-foot layer of sand and will be covered by a two-foot layer of compacted soil. This cap construction will add many tons of weight to the site and will exert a downward pressure. It is known that the water table aquifer is extremely close to the surface and already contaminated. APGSCC is concerned that the hydrostatic pressure caused by such a cap may push the contaminated water downward and radially outward, thereby expanding the area of contamination and displacing any interstitial gas. Since reducing contaminant migration is the goal of building a cap, we believe this possibility of increasing contaminant migration must be addressed before deciding whether placing a cap on the site is the best action.

A second area of concern regarding cap construction is the ever present concern with UXO. John Wrobel said the Army planned to place a two-foot layer of soil around the site to disperse downward pressure and provide a buffer area should an explosion occur. APGSCC would like to know if the Army has any data available on the effectiveness of this technique based on previous experience at military installations. Not only would an explosion be hazardous to personnel at the site, but the potential that highly toxic gases

may be released from containers in the site substantially increases the dangers.

When and if this cap is contructed, it will have to be maintained. We believe the engineering plans for the cap should contain a very specific Operation and Maintenance (O & M) Plan that includes a procedure for monitoring and repair. In this plan, such issues as the possibility of groundhogs burrowing in from across the street, and damaging the water impermeable layer from underneath, must be addressed. We also feel that the development of this plan should be included in the CERCLA public participation process.

Overall, the lack of information that exists for this site is troublesome. As stated by the Army at the public meeting, RI/FS's are currently being conducted at various SWMUs in the Canal Creek Study Area, including the ground water which is being investigated as a separate operable unit. Although it is known that the ground water beneath the 103 site is contaminated, it is not known whether this landfill continues to be a source of contamination to the ground water, and if so, to what extent. The Army's Installation Restoration Program (IRP) budget is finite. Therefore, we believe that the construction of this cap should be delayed while information is rapidly collected in order to characterize the sources of contamination and discern the overall pattern of ground water contaminant migration in the Canal Creek area. Technologies such as soil gas surveys may help delineate the solvent plumes in a timely manner (since VOCs are a co-occurring contaminant at most of the operable units). A better understanding of this study area would allow the funding available to be more cost-effectively distributed among the areas of highest priority.

While this investigation/characterization process continues, APGSCC feels that a few simple steps can be taken at the 103 landfill to reduce the infiltration of water. The groundhogs should be removed from the site, and their holes filled with dirt and gravel. Once these steps are completed, the Army will have to take active measures in keeping rodents from inhabiting the site in the future.

Lastly, our conclusion to delay cap construction leaves the resultant issue of remediating the Building 503 burn sites. It is the opinion of APGSCC that the contaminated soil should be excavated, stabilized, and transported to an appropriate landfill. Following this step, the Army should continue with its plan to back-fill with clean dirt and plant vegetation.

In closing, we would like to thank the Army for their continued commitment to work with the citizens toward the common goal of installation restoration.

Response The Army performed geophysical surveys on June 28-29, 1994, to better determine the extent of the Building 103 dump. This information provided the basis for delineating the extent of the dump as is currently known. The data from this survey, and from the soil gas survey will be used in designing the cap and cover system which will cover the extent of the dump as currently known.

Existing data gaps will be addressed in the Canal Creek RI/FS, in which the Army will initiate a comprehensive soil, sediment, and ground water sampling event in the Canal Creek area. Under this work plan, soil, sediment, and ground water samples will be collected and analyzed. Soil gas surveys and geophysical surveys will also be performed in an effort to better assess the extent of contamination at APG-EA and to identify sources. However, it will be take time until the data are analyzed and interpreted, and even then, due to the many sources in the Canal Creek area (many of which may still be undiscovered), it may not be possible to determine if the Building 103 dump is an on-going source of contamination. Unfortunately due to the many possible sources, it is difficult to "quickly discern the overall pattern of ground water contaminant migration". Therefore, since the existing cover allows the infiltration of water through the waste, and since the cover soil is steadily eroding into the contents of the dump, the Army has determined that the construction of a new cap and cover system is a necessary interim measure to protect human health and the environment. While it is possible to remove the animals which currently inhabit the dump and to plug the holes, this action by itself will not prevent the infiltration of water into the dump since it does not prevent run-on, and because it does not address the issue of standing water on the dump. Also, it would not prevent continued erosion of the cover into the fill material, and it would net prevent the venting of any gases or vapors to the atmosphere. These issues can be addressed only by plugging the holes in the existing cover, and by grading the cover to a suitable slope.

Grading can only be accomplished by placing additional fill material on the surface of the

dump. For these reasons, the Army has determined that the construction of a new cap and cover system is the best interim solution until completion of the Canal Creek RI/FS and overall Canal Creek ROD.

Currently, no air monitoring is being performed inside Building E5422 because any gas/vapor emanating from the dump is venting freely through holes in the existing cap. It is very unlikely that any gases or vapors are migrating into building E5422 itself because the building is at the low end of the dump, and because a gas/vapor will take "the path of least resistance" and vent through holes in the cap rather than through cracks in the foundation of building E5422. Since Building E5422 has no basement, only leakage through the foundation need be of concern. The monitoring options available, which will be addressed in the design phase of the cap and cover system, are the placement of monitoring equipment beneath the building E5422 slab or within the building itself. This will be addressed in the design.

The cap and cover system cross section presented in the Proposed Plan was a preliminary cross section design concept aimed at minimizing the infiltration of water into the waste. However, during the 30 percent design phase, the design will be refined with the added criteria of minimizing the thickness of the cap and cover system. This is necessary because of the proximity of Williams road and Hoadley road, and adjacent buildings. The cross section to be presented in the 30 percent design will have all the layers of the conceptual design presented in the Proposed Plan, but will be thinner and lighter than the concept presented in the Proposed Plan. The effect of such the cap and cover system on the hydrostatic pressure has already been investigated. Preliminary settlement calculations performed show that the total settlement of the existing cover will be approximately 0.25 inches. Therefore, there is little likelihood that the additional load of the cap and cover system to be constructed will expand the areal and vertical extent of contamination and displace any interstitial gas. If the waste compresses 0.2 5 inches, there should be a negligible effect on the hydrostatic pressure in the surficial aquifer.

The Army recognizes that the explosive detonation of ordnance of any type is hazardous to on-site personnel, and possibly to off-site personnel. To this end, data are available on ways of reducing ground pressure, and on ways of containing the effects of explosive detonation. The main factors in determining whether an underground detonation will break surface are the amount of explosive and the depth of the ordnance item(s). Typically, if sufficient soil is present to absorb the energy released, then the explosion will be contained. This principle is used in in-situ emergency techniques for the destruction of single munitions. For example, single munitions ease in a plenum chamber filled with vermiculite or some other material can be safely detonated; the explosion is totally contained since the vermiculite absorbs the energy released (shock wave, heat, expanding gas). Another in-situ emergency technique is "massive encapsulation/burial". With this technique, the munition is buried under a mound of soil, which then absorbs the energy of the explosion. The additional fill material to be placed on the dump will perform this function, and will also dissipate the weight of personnel and equipment. As stated above, heavy equipment and the cap materials will produce additional loads on buried ordnance, however, the additional vertical pressure dissipates laterally with depth is not transmitted directly to buried ordnance. Only a portion of the additional pressure is transmitted to buried ordnance. The more fill is put down, the more the lead is dissipated laterally. Standard civil engineering handbooks can be consulted for the effects of dissipation of pressure with depth. To further reduce this load, grading equipment equipped with wide tracks or tires will be used. Since pressure is defined as force per unit area, this will distribute the weight over a wider area, further reducing the point lead. There are many examples of this in everyday life. Snow shoes are an example of spreading weight so as to be able to walk on snow without breaking through the crust.

The 100 percent design for the cap and cover system will contain a detailed cap and cover system Operation & Maintenance plan which will include monitoring and repair procedures. If necessary, this O&M plan can be included in the 90 percent design for the cap and cover system. It is unlikely that marmots will damage the cap and cover system from beneath by tunneling under the cap from the perimeter of the dump. Such intrusion would be apparent during O&M operations. Also, field studies have shown that rodents do not appear to be able to penetrate High Density Polyethylene (HDPE). A study cited by EPA titled Requirements for Hazardous Waste Landfill Design Construction, and Closure, dated April 1989, states "In tests done with rats placed in lined boxes, none of the animals were able to chew their way through the [geosynthetic liners]".

The Army concurs that a better understanding of the Canal Creek Study Area is necessary. However, for reasons already stated above, the Army does not believe that construction of a cap and cover system should be delayed until the RI/FS is completed. While ground water data has already been collected during four sampling events by the USGS, additional ground water data needs to be collected during the RI/FS, and new wells installed in an attempt to better characterize the extent of contamination and to identify sources. The installation and monitoring of these wells will be a time consuming process. The collection, analysis, and interpretation of soil and sediment samples during the RI/FS will also be a lengthy process, and several rounds of data may have to be collected before the extent of contamination is characterized, and the sources of contamination identified. It will take time to gather the data and interpret it. The Army intends to cap a potential source of contamination while the time consuming work data collection process is being performed. While the data will be collected and analyzed as rapidly as possible, it can only benefit the aquifer quality to cap the dump at the present time, preventing additional water infiltration through the dump with possible further contamination of the ground water. Soil gas surveys can delineate plumes quickly, but are limited in their usefulness, particularly in an area with many potential sources, and with unexploded ordnance. It is more useful to study the scope of contamination in the study area. Contaminants other than solvents would be missed by a soil gas survey. In addition, a large area of ground water may be contamination from several sources. An area wide study is needed to assess sources and define remedial actions. These questions must be answered by the remedial investigation currently ongoing. The Army believes that it is a proactive action to cap a potential source which will provide cost effective protection to human health and the environment while the investigation is going on.

The Army concurs that an interim action needs to be undertaken at the Building 103 dump. However, for reasons stated above, the Army does not believe that removing the groundhogs and filling the holes present in the existing cover provides sufficient protection to human health and the environment, since this action by itself will not prevent run-on, and because it does not address the issue of standing water on the dump. Also, it does not prevent continued erosion of the cover into the fill material, and would not prevent the venting of any gases or vapors to the atmosphere. This can only be accomplished by a cap and cover system. The Army will maintain the cap and cover system in accordance with the O&M plan to be published, and will take active measures to prevent animals from inhabiting the site in the future.

COMMENT SET 6 Received from Water & Wastewater Superintendent, City of Aberdeen, Maryland, July 18, 1994.

Comment 1 After reviewing the proposed remediation plans for the Building 103 dump and the Building 503 smoke pilot plant burn sites, the following is what I believe to be the best remediation plan.

First you need to combine alternative #3 excavation on-site stabilization using an organic binder with alternative #5 disposal at Building 103 dump and backfill using alternative #6 for the installation of a cap and cover system using sodium bentonite geocomposite mat.

A geosynthetic membrane would guarantee that the pollutants of concern would not escape the dump site by leaching into the groundwater if the liner were to fail.

Response Properly formulated and controlled treatment of the soil and ash from the Building 503 burn areas by solidification/stabilization would decrease the mobility of metals in material. Trace organic contaminants may also be immobilized. Binding materials used for treatment of hazardous waste fall in two broad classes, inorganic and organic binders. Commonly used inorganic binders include portland cement, fly ash, blast furnace slag, and silicates. The most commonly used organic binders are thermoplastics, in particular asphalt. Application of organic binders is more expensive than application of inorganic binders. Organic binders are typically only used in special applications where the waste is unsuitable for treatment by inorganic binders and/or where the treated waste can be reused as paving asphalt. For example, asphalt binder is widely used to treat soils contaminated with petroleum products.

Treatment with either inorganic or organic binders would be implementable and effective in reducing the mobility of metal contaminants. However, the treatment process is not cost effective. The fixed cost for on site treatment is high. Equipment to meter the binding agents and waste and then mix them must be brought to the site, set up, and tested. Treatability testing must be done to establish the proper mixture of binder and

waste. The high fixed cost makes treatment of a small volume of waste, such as the soil and ash from the burn areas, very costly for the performance improvement achieved. Since the soil and ash waste will be effectively protected by a cap and cover system, additional immobilization by solidification/stabilization will not significantly increase protection of human health and the environment and will significantly reduce the cost effectiveness of treatment.

QUESTIONS FROM THE PUBLIC MEETING HELD ON 24 MAY 1994

Question 1 (Page 51) If the Army at some time excavates the contents of the Building 103 dump, will there be additional costs incurred because the Building 503 Burn site ash/soil has been included in the waste under the Building 103 cap and cover system.

Response Some additional costs would probably be incurred if the Army excavates the contents of the dump, and if the Building 503 Burn site ash/soil has been included in the waste under the cap and cover system. However, the additional costs are expected to be minimal since the volume to be put under the cap and cover system is small compared to the volume of fill material required and because all of the fill material under the cap and cover system would most likely have to be removed as hazardous waste.

Question 2 (Page 52) Has the feasibility of covering the Building 503 Burn sites with a cap and cover system been investigated?

Response The feasibility of constructing a cap and cover system over the Building 503 Burn sites was assessed in a Remediation Feasibility Assessment. This remedial alternative was not considered further even though it is technically possible to construct a cap at the Building 503 site. Also, the implementation of such an alternative would have been considerably more expensive since the cap and cover system would have construction costs, and maintenance costs.

Question 3 (Pages 54-56) To what extent will the Army attempt to positively identify items as unexploded ordnance at the Building 103 dump before operating heavy machines on the Building 103 dump? Will the Army excavate suspect items in order to positively identify them as ordnance, and/or will the Army attempt to remove ordnance from the dump?

Response Construction work at the Building 103 dump will be preceded by an unexploded ordnance sweep, in which an explosive ordnance disposal (EOD) team will go over the site with a magnetometer and flag all suspect items. If any items are found on the surface, and if these items are clearly hazardous, they will be rendered safe and removed by EOD personnel. Positive magnetometer responses very close to the surface may be excavated if EOD personnel determine that the items are ordnance items which need to be investigated. No effort will be made to excavate items unless the EOD team leader determines that this is absolutely necessary. In order to permit heavy vehicles to drive onto the dump, fill material will be deposited on the edge of the dump and will be graded to the center so that no heavy equipment will drive onto the dump until sufficient fill is in place.

Question 4 (Page 57) When will the Army determine the full extent of the Building 103 dump? How and when will the issue of not capping the entire extent of the dump be addressed?

Response The dump will be further investigated as part of the Canal Creek RI/FS and during the early stages of the cap design (30% design). The investigation conducted for the 30% design will include a geophysical survey which will more fully determine the extent of the dump. From aerial photographs and work conducted to date, it is likely that the dump extends under Building E5422 to the south, and under the parking lot to the west. Building E5422 probably sits on the edge of the dump. The interim cap and cover system will probably cover the whole dump since Building E5422 will be tied into the cap. In essence, Building E5422 becomes part of the cap, and in this way the entire extent of the dump as currently known will be covered. The cap will extend to the parking lot.

Question 5 (Page 61) After the cap is in place, how will migration of any chemical gas/vapors from the dump into Building E5422 be averted? What will be done to safeguard the health of people who work in Building E5422?

Response A soil gas survey will be performed as part of the 30% design to determine

if the dump is generating any gas/vapors. The cap and cover sys/em will incorporate a gas collection/filtration system which will intercept any gas and prevent it from migrating into Building E5422. The results of thb soil gas survey will help determine the type of gas collection/treatment system to be installed. Also, a monitoring system will be installed inside Building E5422 to safeguard the health of people who work in the building.

Question 6 (Page 62) Is there a data base which addresses the behavior, particularly with respect to burrowing habits, of groundhogs? When will the O&M Plan be completed, and will it address the issue of groundhogs burrossing into the damp through the cap and cover system?

Response The O&M Plan will be published as part of the cap later stages (90% design) of the cap design effort, and address the issue of ground hogs digging their way into the dump through the cap and cover system. Information on rodent burrowing behavior has been addressed in books and biological science journals. In addition, the Department of Energy has done significant research in this area in their uranium tailings work.

Question 7 (Page 69) What is the useful life of the cap under the selected alternative (Alternative 6)?

Response Because of the short time geosynthetics have been available, it is not known what their useful life is. It is conservatively assumed that bentonite geocomposite mats typically have a useful life of about 25 years, and geosynthetic membranes typically have a useful life of about 20 years. The cap and cover system under Alternative 6 has a useful life of approximately 20 years. As required by law (since waste is being contained on site), the protectiveness of this action will be looked at again in no more than 5 years. If it is determined at this time that further actions are required to fully address the Building 103 dump, then those actions will be undertaken.

Question 8 (Page 72) How does this interim action tie into the overall remediation of the Canal Creek Area, and how do all the individual remedial investigations and feasibility studies being conducted at APG-EA tie togther? Are data generated from one remedial investigation being used to supplement other remedial investigations?

Response Currently, in addition to several individual interim remedial actions, the Army is conducting a Canal Creek Area wide RI/FS and a groundwater investigation. All data collected as part of an action and/or remedial investigation are being used in other remedial investigations as much as possible. All data generated are entered into a single large data base. All individual interim remedial actions in the Canal Creek Area will be tied together with the Canal Creek RI/FS by a Canal Creek Record of Decision, or by a Record of Decision for the entire APG-EA. The APG-EA Record of Decision document will also tie in work being conducted in other areas of APG-EA, such as Carroll Island and Graces Quarters.

Question 9 (page 80) Is there technology transfer, cooperation, and exchange of ideas between government agencies, private industry, and foreign countries with respect to the remediation of contaminated sites?

Response There is significant cooperation, and interchange of ideas and technology between the various government organizations, and between the government and private industry. There is some cooperation between foreign countries in this area. Recently, there has been increased cooperation between the United States and the government of Russia in the area of chemical demilitarization and restoration of such installations.

Comment 10 (Page 82) A comment was made that the fact sheet for the interim remedial action at the Building 103 dump did not provide detailed information on the groundwater at the site.

Response The fact sheet on the proposed interim action at the Building 103 dump did not go into detail on the groundwater since groundwater is being addressed as a operable unit. APG has available a more detailed fact sheet on the entire Canal Creek Area, and will be providing additional information on groundwater as the Canal Creek RI/FS progresses.

3.4 PANEL OF EXPERTS

The following list gives the representatives of the Army, State of Maryland, and U.S EPA who participated in the poster session and public meeting held on May 24, 1994.

John Wrobel, Deputy Program Manager for Canal Creek Area for APG

Ken Stachiw, Installation Restoration Program Manager for APG

John Fairbank, State of Maryland Program Manager for the Building 103 Dump and Canal Creek Area

Steven Hirsh, U.S. EPA Region III Remedial Program Manager

3.5 SELECTED NEWSPAPER NOTICES ANNOUNCING DATES OF PUBLIC COMMENT AND LOCATION AND TIME OF PUBLIC MEETING

The announcement for the public meeting to discuss the interim remedial actions for the Building 503 Soils Operable Unit and the Building 103 dump is attached at Appendix C.

APPENDIX A. ANNOUNCEMENT OF PUBLIC MEETING

THE U.S. ARMY INVITES PUBLIC COMMENT ON PROPOSED REMEDIAL ACTION PLANS FOR THE BUILDING 503 SITE AND THE BUILDING 103 SITE AT ABERDEEN PROVING GROUND EDGEWOOD AREA

The U.S. Army invites the public to attend a public meeting on the Proposed Plans for two environmental actions at the Building 503 site and the Building 103 site at Aberdeen Proving Ground:

DATE: May 24

TIME: 7 p.m.

PLACE: APG - Edgewood Area Conference Center, Building 4810

Also, the public can submit written comments during the 45-day comment period which runs from May 4 to June 17. Comments must be postmarked by June 17 and sent to: Directorate of Safety, Health & Environment, U.S. Army Aberdeen Proving Ground. ATTN: STEAP-SH-ER (J. Wrobel), Aberdeen Proving Ground, Maryland 21010-5423.

The Army constructed Building 503 during World War I and used the site for a variety of manufacturing, testing and disposal purposes. Sampling shows the soil in two areas behind the building contains elevated levels of metals (lead and zinc) and two substances used in the manufacturing process (hexachlorobenzene and hexachloroethane). The Army is proposing to excavate the soild and has evaluated different alternatives. The alternatives the Army evaluated are:

Alternative 1: No Action (required by law to provide a baseline for comparison).
Alternative 2: Excavate the soil and transport it to an off-post industrial landfill, backfill the site with clean topsoil.
Alternative 3: Excavate the soil, on-site treatment by stabilization, dispose of the soil at an off-site industrial landfill, backfill the site with clean topsoil.
Alternative 4: Excavate the soil, transport the soil to an off-site hazardous waste landfill, backfill the site with clean topsoil.
Alternative 5: Excavate the soil, dispose at APG's Building 103 site under the final cap and cover system proposed below, backfill the site with clean topsoil.

The preferred alternative at this time is 5. The Army proposes to excavate the soil to a depth of one foot, removing about 470 cubic yards of soil, and to place the excavated soil at the Building 103 site. The Army would use clean topsoil to restore the site to the natural contours of the area.

The Building 103 site is a former waste disposal and burial area. The Army used the site starting in the World War I era until the early 1940s. Since disposal records were not required during this time, there is little information about what was placed at the site. The Army believes the site may contain miscellaneous debris and possibly chemical agent residue and ordnance items. The Army's studies show the site may be contributing solvents to the ground water at the site. There is no direct public exposure to any site chemicals, and the water beneath the site is not a source of drinking water.

The Army evaluated different alternatives to contain the waste and to block rain and surface water from moving through the site and carrying substances into the ground water. The Army also sought an effective alternative to prevent animals from burrowing at the site. The alternatives the Army evaluated are:

Alternative 1: No Action (required by law to provide a baseline for comparison).
Alternative 2: Install a single-liner cap using off-post clay.
Alternative 3: Install a single-liner cap using a higher quality clay and sand (bentonite geocomposite) liner.
Alternative 4: Install a single-liner cap using a rubber-like material (geosynthetic membrane).
Alternative 5: Install a double-liner cap using off-post clay and geosynthetic membrane.
Alternative 6: Install a double-liner cap using a bentonite geocomposite liner and geosynthetic membrane.

The preferred alternative at this time is 6. The Army proposes to construct a multi-layer cap and cover system in accordance with federal requirements for a hazardous waste landfill closure. The cap would cover an area of approximately 1.7 acres and would have a cobble/gravel barrier to limit animal access. Two impermeable layers would limit the movement of water into the site and substances from the site into the ground water.

The preferred alternatives may be modified or new alternatives developed based on public input. The final

remedies selected will be documented in Records of Decision that summarize the decision-making process. APG will summarize and respond to all written comments received during the comment period as part of the Records of Decision.

Copies of the Focused Feasibility Studies and the Proposed Plans are at the APG information repositories located at the Edgewood and Aberdeen branches of Hartford County Library, Miller Library at Washington College, Essex Community College Library, and the TECOM Public Affairs Office at APG.

If you have questions regarding the meeting or proposed Plans are at the APG's 24-hour Installation Restoration Program information line at (410) 272-8842.

APPENDIX B. TRANSCRIPT OF PUBLIC MEETING

COMMUNITY MEETING U.S. ARMY ABERDEEN PROVING GROUND
INSTALLATION RESTORATION PROGRAM

DATE: TUESDAY, MAY 24, 1994

TIME: 7:30 P.M.

PLACE: APG EDGEWOOD AREA CONFERENCE CENTER
BUILDING 4810

REPORTER: BARBARA J. RUTH
NOTARY PUBLIC

** BEL AIR REPORTING * 838-3810 **

MR. MERCER: Welcome to our public meeting here this evening. The purpose of this meeting is to discuss two proposed actions at the Canal Greek Study Area, Buildings 503 and 103, in the Edgewood Area of Aberdeen Proving Ground.

I'm George Mercer from the Aberdeen Proving Ground Public Affairs Office. My role tonight is to act as host and moderator. We also have up front with us Mr. Ken Stachiw, and he is the Chief of the Conservation and Restoration Division and our Directorate of Safety, Health and Environment; and Mr. John Wrobel, who is the Project Officer on the projects we're here to discuss this evening. We also have Mr. Joe Craten, who is the Director of the Directorate of Safety, Health and Environment; Mr. Steve Hirsh of the U.S. Environmental Protection Agency; Terri White from the Environmental Protection Agency; and Mike Toreno of the EPA as well.

From the Maryland Department of the Environment, we have John Fairbank and Fred Keer, and they're all here to help us this evening.

Did everyone here get an agenda, or are you

aware of an agenda, do you need one? Okay. We have -- okay, everybody's got what they need.

After Mr. Stachiw and Mr. Wrobel make their presentations, we will open up the activity for questions. We have index cards, we can take down written questions, or if you are so moved, you can present your questions in person -- we'll just call on you at that time.

I would point out to you that the reason things are covered up out here is there's conferences going on in the building tomorrow morning, so please don't touch any of the covered up items out here in the hallway.

Also, I would like to remind you that we do have at Aberdeen Proving Ground an installation information telephone line, and if you haven't picked one of our pencils that has our number on it, you can just pick it up on your way out, and that will get you -- if you have a question or a problem or any other concern, you can call that telephone number, and we'll get back with you with a response.

We also have cards you can fill out to get on our mailing list out there. So any of you that have any of those things you want to do, you can stop on your way out or grab me, and I'll help you get whatever you need on that -- or Ms. Harris back there, she'll help you get it.

As this is a formal meeting, we are required to have a court reporter record all of our proceedings. This is our court reporter. And the transcript of what we do tonight will be located in repositories in the area libraries, so we can tell you what those are if you want to know. In fact, they are listed on our fact sheets that you may have picked up in the other room when you were looking at our exhibits. If you did not pick up those fact sheets, and you want to have a written down somewhere the areas of those repositories, you can go back in at the end of the meeting and pick them up, rather than me reciting it to you.

With that taken care of, I think that takes care of our introductions and logistics, and other

announcements. And I think we'll just move onto Mr. Stachiw.

MR. STACHIW: Thank you, George. Thanks for coming out this evening and your interest in our project. What I'm going to do is give you an overview of how this fits into everything else that's going on at Aberdeen Proving Ground. For some of you here, I'm going to bore you to tears, okay, because you've heard this so often. Others probably don't know for sure what's happening or know how this fits in with everything else, and so we thought it'd be wise to spend five or ten minutes to go over just the big picture.

What I'll be speaking about is the installation and restoration program at APG. As you can see, we have what we call here at APG the four pillars of our environmental program. We have prevention, conservation, compliance, and restoration. What we're speaking about tonight is restoration. This has to do with the cleanup of past disposal sites. Sites that were closed and done with before much of any kind of environmental regulation existed. We had to do some

historical searches to find out what we did in the past, and to see if there's contamination coming from it. If there is, to find ways to clean it up.

To separate from that is compliance. Although we have a compliance program to do restoration, the normal compliance, you deal with it on a day-to-day basis, that would -- there's another program at APG run by another division chief. Okay? That has to do with water pollution control and air pollution control and the movement of hazardous wastes from existing operations, where they're making hazardous waste as we speak, you know, even now.

So then we have conservation program -- some people that are dedicated to managing the wildlife here at APG and making sure the cultural and historical resources are preserved and taken care of.

And we have a prevention program, and that's a program where we're trying to prevent the problems here from occurring again. We're thinking hard about what we do before we do it. Okay? So things like an EIS would come under this arena. Okay?

Now, things such as the project manager for Chemical Demilitarization is not part of my realm of responsibility. Okay? The stockpile falls more under compliance than it does under, at all, under the restoration program. Hopefully, whatever we do will be done right, and there won't be a need for restoration as far as that's concerned.

So I just want to keep us focused on that. We're going to be talking about the cleanup of -- we're talking primarily about the program we have for cleaning up the past activities.

As most ot you might be familiar, we have a map of Aberdeen Proving Ground here. This is the Aberdeen area, this is the Edgewood area, Grace's Quarters and Carroll Island, all this area here, part of Aberdeen Proving Ground. The installation, the Aberdeen area, was founded 1917, 1918, was devoted to the testing of military equipment, vehicles, weapons. The Edgewood area was devoted to the production, research, provides the chemical warfare agent. As you can imagine, I've said many times, because of the kind of activity, the

dealing with lots of hazardous materials, the need to dispose those materials, the fact there was no science or too much science involved in the way things took place at this time, we ended up having a number of different places where waste may have been disposed of inappropriately in accordance with modern approaches to doing things.

We spent three years searching records upon records looking for past activities, and came out with a 1000-page document, and another one about 500 pages -- the 500-page for the Aberdeen area, the 1000-page document for the Edgewood area -- and enumerated what we termed 318 solid waste management units for the total post. 270 roughly for the Edgewood, another 50 or so from the Aberdeen area.

Now, the numbers are impressive, but a solid waste management unit may be something maybe the half the size of this room where they stored drums. It may be something as large as the Michaelsville Landfill, a 31-acre landfill, where we had municipal refuse disposed.

Because of the immensity, the size of this, we worked with the regulators as well as collaborated in collecting them into 13 study areas for the sake of the ease of management.

Here's the traditional map we use for this, although one of the study areas is missing here, the western boundary. But the color code breaks the whole post into 13 different study areas. Of these 13 study areas, this area here, Grace Court of Carroll Island are on the national priority list. Also Michaelsville Landfill is on the national priority list. There is some concern, and people are raising the issue, whether the rest of the Aberdeen area should be on the national priority list. That's not the subject for tonight's meeting. Okay? We'll be talking more about this area here, the Edgewood area.

Now, in concert with confining things to 13 study areas, we worked with the regulators for the State EPA, and we entered into an interagency agreement with EPA, which develops the structure for how we are to manage the study and the cleanup of these sites. The

fact that we've identified 318 units doesn't mean there are pollutants. All we're saying is that this is a place where waste was managed, it was stored, not necessarily disposed, where there may have been a release of hazardous materials in the environment. We don't know for sure there were or not. All we knew is of a record that something was done there. Okay?

So what we do is we go back and we research these areas, monitor them, take samples, and see if we can discover anything that may have taken place there -- if there is any release or any evidence of release into the environment from those sites. Is there any evidence the material is somehow still there, about to release? That's part of the study. And the EPA has somewhat criticized, but I think a very, very good approach, to investigating these particular study areas.

Once you've identified, said, here we have a site -- this is the diagram, the flow diagram for it. The first think you would do is a preliminary assessment, site investigation. You'd go out to the site, take a look at it, maybe like a soil sample or two, and make a

determination as to whether this thing doesn't even exist anymore, or whether or not there's something maybe here, we'd better look into it. If it gets nominated past this, okay, it moves into the RI/FS stage.

If we have enough data, there may be enough data to rank it. Okay? Say, gee, we can measure a release. We think it's near a water supply. With this ranking system, it can be put on a national priority list. Okay? A national priority list is not done by someone wanting it to be there because they don't like it. It's got to do with a ranking system with regards to the degree of hazard it imposes to health and environment. Their chance of release in a pathway contaminants into man or to the ecology.

If there's enough information, it can be placed on a national priority list. But putting this aside, whether it's on it or not, this is a nice phase in terms of where we study this. The next stage would be a remedial investigation. This is where we would actually put wells around, maybe take more soil samples, and determine if there's a release at this site of something

to the environment -- either to the groundwater, to the air, wherever. And then make a determination as to how far is it going, where will it get to by when, to see if there's any particular risk associated with it.

A risk assessment is done at this stage as well. And then we would also do a feasibility study. And with this information and remedial investigation, we make determinations as to what we should do with this. What is the best way to manage this particular site? Do we do nothing? Do we put a fence around it? Do we dig it up? Do we suck groundwater out from underneath it? Or do we put a cap on top of it? What do we do in order to remediate this site?

Sometimes this process takes a long time to develop the information that you normally need to stand up in court and say, this is final. And sometimes it makes no sense to let something continue to release into the environment while you're trying to come up with definitive information to allow you to stand in court with this piece of information and say this is without a doubt the final decision, and everyone around agrees with

it.

Sometimes when you get data, sometimes instead of getting answers, you get more questions with more data. It doesn't always provide all the answers as you need them. Okay? So in the meantime, we do a thing called an early action ROD. This normally, once you complete the RI/FS, you lead to a record of decision. This record of decision will lead to remedial action, and then eventual monitoring. We are allowed, under our interagency agreement, to do what's termed an early action ROD. An early action ROD is where something makes common sense to do now and is not likely to be contradictory to a final solution. And you're allowed to go in and say, okay, public, we want to do this now. It's not the last thing we plan to do here, but we will plan to continue studies some more, but we think we want to do this now to stop continuing release into the environment. Okay? We want to stop this release now, so we have a little more relaxed time to study and come to the right answer in this particular problem.

Tonight we'll be talking about an early

action ROD. This ROD, a game plan for a ROD for all 13 study areas, early -- maybe as many as 20 early RODs for all the study areas totally. But right now we're going to be focused in this study area here called the Canal Creek area. We're right about here, probably no more than a driver and a three wood from one of the sites right now. Okay? The 503 and 103 -- well, maybe a Jack Nicklaus' drive and a three wood, in the old days.

And we're going to focus on these two sites, and John is going to talk about that. We're not going to be talking about O-Field or various other sites or Grace's Quarters and Carroll Island. You know, they each are problems which will have their own day. Okay? But today, today is for the 503, 103. These are two -- one's a disposal, where things were burned, disposed of; the other was a small landfill. And we're trying to combine an economic solution there that John's going to describe right now. So before I get him up here, are there any questions about the overview of what we're doing? We're here to make a decision about an early action -- not a final action, but an early action about

one site in one of the study areas. There are other sites in the study area besides the 103, 503, but we're just focusing on one particular segment of the study area. Any questions?

(No response from the audience.)

MR. WROBEL: Good evening. As Ken indicated, my name is John Wrobel. I'm environmental engineer and Ken Stachiw is my mentor, supervisor for these projects here. Like he said, we're going to be talking about two sites, the Building 503 and the Building 103 sites. I'm using the old building number system in this program. There is, right now, no Building 503. There hasn't been a Building 103 in many, many decades here. I'm just using them as -- because in the information in the library, identified, many of these refers to it as the sites. Actually Building 503 is Building E-5265 right now. As I said, Building 103 was demolished decades ago. It doesn't even exist anymore. I'm just those as sort of a context to kind of focus in with where and when the activities occurred. Building 5265 does not do what it had done prior. It's not that

type of facility anymore.

(Whereupon, slides were presented with the following narrative.)

Again, I'd like to reiterate, these are earmarked, these aren't finalized, and these are early things that we think make sense to do at this point. We will look at these decisions again based on your input, based on more information we gather as part of remedial investigation, to see if these things actually make sense in the final context of the whole remediation, the whole cleanup, of the study area we call Canal Creek and Edgewood Area.

We've got a comprehensive study. It's going to take several years to do. It's a big site. It's a complex site. A lot of people say it's one of the most complex sites in the country. These actions are very obvious. I think they make sense to do at this point, but we're here to talk about them with you, present the information, listen to what you have to say about them. We may alter our decision based on your input. Right now, we've discussed things with the

Environmental Protection Agency and the Maryland Department of the Environment. They have agreed with, have a consensus there this thing has been -- these projects have been briefed to the technical review committee, which comprise of a group of citizens that meet on a quarterly basis to talk about the remediation projects at APG. We seem to have a consensus from that particular group, technical assistance grant folks, the people that represent the Aberdeen Proving Ground Citizens' Coalition have received these documents, we provided briefings with them. I've gotten preliminary response from then all indicating that these things seem to make sense at these sites at this time.

Where these sites are located -- when you came to this meeting today, you probably drove by both of these sites. We're located here in the conference center. The first site I'll be talking about is the Building 503, Building 5265, it is right here. If you came down Hoadley Road, it was this building here, the fenced-in complex on your left-hand side. When you leave, it's going to be on the right-hand side.

Building 503 was constructed in World War I as a chemical agent filling facility. Between the war years, it was used as a miscellaneous shop, carpentry facility. Again in World War II, it was set up as a fill plant for incinerary conditions, things that -- a bomb that would cause a fire is what incinerary is. After the war and during the war periods, it was used to manufacture and produce experimental smoke material. What a smoke munition is, it creates a screen that prevents the enemy from seeing what you are doing. It provides a big cloud of smoke. So some of the off specification material may have been burned at this site. There is no burial on this site based on what we have seen from the site records and from the sampling that was done at this particular site. As you can see, it stopped at about 1976.

And again, what some of these smokes are, you've seen some of the different documentaries and what not, it could be red smoke, green smoke, used to signal purposes.

This is what the site looks like currently.

This is the north burn area, and it's an area devoid of vegetation. It is very clearly defined where these activities took place.

This is a view of the south burn area. Again you can see, very well defined, the extent of where those activities occurred.

This is to give you an overview diagrammatically of the area. This is old Building 503, current Building 5265. The north burn area comprised of about 10,000 square feet. The south burn area consists of about 2,000 square feet. The volume of contaminated soil based on our soil sampling program is about 470 cubic yards of soil. The extent of contamination seems to be just in the areas that are devoid of vegetation at this point, nothing grows there, and it goes about a foot deep. That seems to be about where most of the contaminants are.

To give you some kind of perspective what 470 cubic yards of dirt is, a dump truck, a normal dump truck you see on the highway is about 20 cubic yards. So this is about 20, maybe 22, dump truckloads full of

contaminated soil.

As part of that study that Ken was talking about where we identified -- there is 318 solid waste management units -- we did some preliminary sampling at the site back in 1986. And that's what allowed to have this ranking score and the listing of the whole Edgewood area as a national priority list site. In 1989, based upon the results of that particular study, and the obvious that this site is a contaminated area, we brought in the EPA Environmental Response Team out of Edison, New Jersey. They did a special study for us to see if there's any way we could stabilize this waste. In other words, was there anything we could do -- and what we mean by stabilization is mix it up with concrete, make it so that it doesn't release anything, make it into cinder blocks and maybe dispose it at some other location. We did that.

Subsequent to that in 1993, we had Battelle organization, which is a not-for-profit organization, running the Canal Creek remedial investigation for us, take additional soil samples, look for the extended

contamination. In the year '86 was just a small study to identify areas of concern. This '89 study was just to see if the waste could be stabilized. In '93, it was more of a what you would call an investigative kind of study where you could see what the exact extent of the burn area was. And as I say, we found most of the substances, the contaminants, in the top foot.

I'm just going to throw this up, and I don't want to spend -- but this is not at that site. But this is what a soil sampling team looks like here in the Edgewood area. And this is typical of any Superfund hazardous waste workmen taking soil samples. What you see here is that typically all the site workers are wearing white, what we call a Tyvek, it's a trademark, it's a garment to keep dust off of them so they don't bring it home. It's disposable. You can see that the shirt and the boots are taped to prevent -- primarily it's to prevent jiggers and ticks from crawling up into their skin. There's an air monitoring device located that's sampling air at the worker's breathing zone. And these workers right now are unprotected and don't have

any respiratory protection. But what happens when this reaches a certain level that's defined by the Occupatlonal Safety and Health Administration, OSHA, reaches a certain level, these workers would back off, put on appropriate respiratory protection. All this work is governed by health and safety plans that talk about contingencies for these guys and also for people in the immediate surroundings of the project, what would happen if this reading went off. And this is how they collect the soil samples. And he's got gloves on to protect any germal contact. Very typical. You'll see that more and more as all the projects get accelerated here. You'll see these type of people doing these type of activities on Aberdeen and Edgewood.

Again, these are charts showing north burn area, the location of some of the soil samples that we take. And similarly, I have a chart of the south area.

But most importantly is what we found. We found that these were primarily the contaminants. Everything else seemed to be below detection levels. In other words, the instruments did not see any other types

of contaminants. We found lead, zinc, hexachlorobenzene, hexachloroethane, which are components of the different smoke mixtures that were burned at this particular site. The highest concentrations in parts per million in dead areas and also in the grassed areas surrounding the site.

As part of our decision-making process here where we came up with the rationale for why this made sense to do at this time, we did a risk assessment. And a couple things to remember about a risk assessment, is just because you have chemicals, doesn't necessarily you have risk on site. You have to have -- it's like that triad the fire departments talk about. In order to have a fire, you need to have an ignition source, you need to have something that will burn, you need to have oxygen. If you break one of those legs of that triad, you're not going to have fire. The same thing with risk assessment. You have to have chemicals present. They have to be in a significant concentration. You have to have an exposure. In other words, it has to get either to a person or to the environment. If you don't have any of those things, you really don't have risk as such. You may have

something you have to deal with, but you don't necessarily have a risk until you have one of those three legs in that particular.

What we found is, because the site is fenced, the only people on that site are the people that work in that particular building, so there's no public exposure to the site. There's very limited exposure to water. It doesn't -- the site has been inactive since 1975. It has basically looked the same since 1975, so it's not really migrating off that site that well. But there is a small air pathway. In other words, when dust blows off the site, you can get some contaminated soil moving off that site.

What we found is the greatest, based on our assessment we did, that people working on that site are at the greatest risk. And the goal is to eliminate this particular risk to the workers on this particular site.

And what we found when we did the risk assessment, we identified, okay, it's the workers on this site. Well, what are the workers doing? Well, they are still working on smoke mixtures in that particular

facility. I can't give a lot of details. I don't know a lot of details what they're doing. But it's industrial work. They work with chemicals. They work with vehicles and maintain things in that area. So it's an industrial-type of scenario. So what we based our risk assessment for, is based on cleanup goals for that type of industrial activity occurring at the site, which is what people would use for a site in Baltimore or people would use in Hatford County for an industrial site. These are the types of cleanup goals they would have in that particular site. If this was a residential use, the levels would obviously, you know, be lower. And this is comparing the cleanup goals versus the concentrations.

You can see that we exceed our goals just in the burn area, but not outside that burn area. Keep in mind, this is an interim action. We haven't fully defined -- I don't know if Congress has fully defined what the ultimate use of the Edgewood Arsenal is going to be, whether it's going to be converted to a residential use, or whether it's going to continue to be a military -- you know, part of a military industrial complex. I have no

idea, but again, this is an interim action. This would be reevaluated if the scenario, the use, of this particular area or all of Edgewood Arsenal would be determined. And as we would go back in and cleanup or remediate those acceptable levels. At this point, this is what makes sense.

Now any -- when we're at this stage, we are ready to make a decision or non-criteria. We evaluate all the alternatives that we have to evaluate for. All the alternatives we go through go through the screening process. We look to see, and number one is protection. Are we proposing something that's going to be protective? Is it going to meet laws that exist today? Does it have any long-term effect? Is it going to be long-term permanent? Those are the type of criteria. There's a few more. There's six more actually.

Does it reduce the toxicity of the waste? Does it reduce the volume of the waste? What does it do to reduce hazards? Can it be done short-term, or is it something that needs a lot of work to implement? In other words, it's just a pilot scale project or something

that may need some technology development to implement. You know, how quick can you do the fix? How technically feasible the fix is? Is it something that can work now, or something that we have to develop something to do something with?

And the last three we look at, and the reason why you're here; you know, we look at the cost. We look at, you know, if the State agrees with what the particular alternative we select. And number nine, and this is why you're here, we're here to solicit your input from the community to see if we have selected an alternative that's feasible to you all. And this is why we're here, and I really appreciate you all coming out here. This is very good. There's a lot of competing interests not to be here tonight, and I really appreciate that.

As part of this, we looked at five alternatives. Now, the focus feasibility study, which is in the Edgewood Area Library -- we also have copies of it in the poster section. You can look at it. If anybody's interested in receiving a copy of it, we'll gladly

provide a copy if you like. Leave a card with Katrina Harris down there, and we'll attempt to get you that particular study.

But what we have here in the focus feasibility study is we looked at, not only these alternatives, but other alternatives. And we screened those out earlier on before we applied the nine criteria I just talked to you about. So there are some other types of technologies that we looked at, but were screened out for one reason or another. It may have been too experimental. It had never proved itself in an actual field condition or that type of thing. So we looked at those. So there are other ones that aren't here, and I'd be glad to talk to anybody about those.

But we looked at these. No action alternative. The law requires us to carry that through with the nine-step criteria evaluation. We looked at excavating the soil, bringing it to an industrial landfill, sampling results seemed to indicate this is non-hazardous, so it could go to an industrial landfill that was permitted to accept it.

We looked at on-site treatment and solidification, remembering that the environmental response team proved that this waste material could be stabilized with portland cement and fly ash, and it could be, you know, landfilled in an industrial landfill.

Another alternative, we could bring it to a hazardous waste landfill and bring it there. It's perfectly acceptable.

And the fifth alternative is bring it and consolidate our waste at another site that I'll be talking about in a few moments, this Building 103 landfill.

To diagrammatically depict this, I have what I call the measles chart. What the measles chart does, the black circles means it meets the criteria. The gray is partially meets. And zeroes, it doesn't meet the criteria evaluation factors. No Action 1, you see is a big zero. It's not protecting us, so it's not carried through the rest of the analysis. It's not protective. Leaving the site as it is, is not protective. To a degree, we can all see that.

And these are the other alternatives, and the costs associated with implementing those alternatives.

This Alternative 3 where we have a partial gray here with short-term effectiveness, yes, the Environmental Response Team study did show it could be stabilized, but there would be some additional work actually stretching out the time frame. It wouldn't be a short-term thing. It is feasible. It can be done. It's proven technology, but it would not be as quickly implemented as some of these strictly excavate and move type of options.

Based on our analysis, we chose Alternative No. 5. It's protective. It can be done fairly quickly. Twenty to twenty-five dump trucks would move this particular waste out. It wouldn't have to be moved over any public highways. And any continued releases into the environment would be stopped.

And in summary, it's 470 cubic yards that we propose to move and incorporate -- in the next part I'm going to talk about the 103 Landfill -- to

incorporate in the 103 Landfill.

I'd like to go into the 103 Building. Again, you drove past it on your way in. There's the 503 site. The burn area is located in this area. The 103 was this brick building here on your right-hand side where you were coming on post. It's this fenced area here, the 103. The old Building 103 is actually located here. It's a fenced area. It's got some vehicles parked on it. That was the old Building 103 which was a, what was termed, a miscellaneous fill plant that filled different types of ordnance, bombs, with chemical warfare agents, high explosives, that type of thing. And for lack of a better term, it's called the 103 site, because some of the process equipment, some of the waste from that 103 facility could have been placed in this particular landfill.

The site was a sand pit when they were building Edgewood, building up Edgewood Arsenal. They used it as a burial pit. They took the sand and used it to make concrete. They used it as construction material. So that excavation that resulted was filled in from

miscellaneous junk and possibly ordnance items. This probably was one of the first landfills here at Edgewood Arsenal. Probably till about the late 1930s, early 1940s, this area was used for disposal:

We believe, based on some records of 1937, some type of cleanup occurred at the site. And the present cap, which has eroded away significantly, was placed on the site. And the site was used sometimes as an early recycling effort to remove insulation off of copper wire. But we don't know, there were no records kept, there were no requirements to keep records of what was placed in this particular dump.

Again, when you came on post, this is what you saw as you came down Hoadley Road. This is the current building occupied by the Technical Escort Unit. It's their headquarters. As you're looking at the site, you can see there are some holes and some bare areas here where the existing cap, cover system, is widely eroded away. The site has a chain-link fence around it.

This is what it will look like when you leave tonight. It will be on your left-hand side. There

are two monitoring wells located what might be down gradient. Building 103 was located up in this area. Again, you can see it's a depressed area. The lot has subsided and is settling in this particular dump.

As part of our remedial investigation, hydrogeologic assessment, the U.S. Geologic Surveyor came in and installed those wells I showed in the previous slide. We detected same contaminants in the groundwater that were sampled in 1987, 1989. As part of the whole remedial investigation, additional wells are being planned to be put in here to better define the contaminated aquifers associated with this. We don't know at this point whether contaminants we're seeing right now at these wells are from the dump or they're from another source, because there are over 45, maybe 50, different sites -- some may be large, some may be very small -- in this whole Canal Creek Study Area.

I want to spend a few minutes on showing how the groundwater monitoring was conducted here at APG. You see two workers at the 103 site. What they're doing is they're sampling a well. The well is right here.

This is the protective casing. They're drawing up through a pump. And what you'll see is a lot of these drums here. And what these drums are doing are collecting the purged water. In other words, the water that's standing in the well is not really representative of what's in the aquifer. We purge up that water, the water that's been standing there, to get a better representative sample of what's in that aquifer that we want to sample. And that water that we don't analyze for is placed in a drum and is analyzed for proper disposal. So the water drums, you'll see around a lot of our wells. We are containerizing this type of material.

What this gentleman is doing, he's monitoring the water coming up from the well to see if it meets certain parameters that were established with the Environmental Protection Agency and Maryland Department of the Environment that say that is a representative sample. At that point, the sample is collected, sent to an off-site lab for chemical analysis.

Again, we did a risk assessment for this 103 site. We found that there was no exposure to the

public from the contaminated groundwater at the site. The contaminated groundwater is not a drinking water supply either on-site or off-site. Current monitoring that has been completed by the U.S. Geological Survey seems to indicate that the groundwater is flowing away from the installation boundary in a southeasterly direction flowing towards the Bush River. Complete extent of contamination, we don't mind. That's part of the remedial investigation of the site. But that's what the current mottling and monitoring that were conducted to date. We haven't stopped, though. We haven't got all the answers. But we're investigating that further.

What are goals were on this site are a little bit different than the 503 site. We want to continue to contain the wastes, and apparently the waste is not being contained very well, because that cap, the current cover system, is eroding. It's deteriorating. We want to minimize precipitation on the site. Like, right now what we have on this particular site is -- if you can best relate it to -- is a coffee filter. Rain water, surface water, is allowed to percolate right

through the cap, right through these big holes that the animals, groundhogs, have created in the current system, and react possibly with the material, junk and debris buried in the dump. So our goal is to minimize, to stop that from occurring, and also to prevent the aimals from coming back in and eroding the current, the cap as it is today.

So those are our goals. They are very limited in scope for this site, because it's early action; it's not final.

We looked at six alternatives that are depicted in the focus feasibility study. Again, No Action, has to be carried through that nine criteria that we described -- like I described earlier. All these essentially are variations on theme, putting a cap on the site. There are different types of caps. Some will meet State requirements, some don't meet State requirements. Because we don't have a real good idea of what type of contaminants, the debris and junk that were buried in this particular landfill, some of these may not be applicable. Because some of these, like the industrial

landfill, we have a handle on what was disposed of and it's protective enough for that.

So these five alternatives that we looked at are essentially variations on the same theme. I can go into a lot of detail about these in our focus feasibility study, but essentially it's different layers of protection to prevent surface water and rain water from infiltrating through the debris in the landfill.

And again, we evaluated these against the nine criteria, to see which ones they meet. Again, the same scheme, black being meets, gray is partial, zero doesn't meet. Again, No Action, does not meet any of the alternatives.

You see that the first three do not meet either a federal or a state law for landfill capping, and this was determined with discussions with Maryland Department of the Environment.

As part of the focus feasibility study, we looked at all kinds of alternatives. We selected those five that carried on to the nine-point analysis. As part of the focus feasibility study, we had to look at

excavation. These are some of the points to consider when considering excavation. Because we don't know the extent of what could be buried there, we'd have to err on the safe side, 150 percent safe, and we have a lot of safety precautions. It's been done in the past. It can be done in the future. It can be done today with the existing technology. It would be slow and time consuming. We'd have to relocate the people around the vicinity, possibly regroup the traffic and stuff like that, because we didn't want to exposure anybody to any possible accidents that could happen during the construction or excavations.

And then one of the bigger problems we have, and if you've been around EPG for awhile and discussions about the mustard incinerator, if there are any types of wastes that have been identified that when we pull up don't have a location that they would go to, an off-site location, there would have to be stockpiles here at APG or stockpiles someplace. We couldn't just take them out of the ground and put them back in, and say, we don't have any place to go with them.

So that was one of the things that we looked at. We don't know but it's something that in the excavation you have to plan for, that some type of storage that we'd come across, a chemical warfare item or agent that would have to be stored long-term until the nation gets ahold of what to do with all these chemical warfare agents.

More on the feasibility, I would like to add that in the alternative versus excavation, that we looked at the particular cost and rough order of magnitude you can see it could range as high or even higher than $9 million to do an excavation. This does not count disposal. This is just taking the stuff, the debris and junk out of the landfill and characterizing it for disposal. Disposal would depend on what you found and the cost varies greatly in what you find.

So based on that, we decided to elect for Alternative No. 6, where it is installing a hazardous waste landfill cap system over the current exposed 103 dump. It will prevent the water filtration, which is one of our goals. The animal intrusion, it will prevent.

This is using well developed technology. This is not something that has to be developed. Hazardous waste landfills are being enclosed, several a year probably in this country. And a little bit higher cost than the industrial cap system that we talked about, but that low cost is not -- it's more protective. We ought to go with it.

And very conceptually, this is what it would look like. And as I was talking about previously, the 503 ash, that contaminated soil, would probably go in this -- not probably, it would go in this layer of cover soil which would bring the site up to grade and provide a good stable platform to build these other layers on. If this meets acceptance from the public, we've got the regulatory concurrenoe on these particular actions. The next stages are to design, bring this thing beyond concept into actual design and develop the specification that actually how this thing is going to be put together.

And everyone here, your neighbors, everyone is welcomed to get involved in this design process. We make the documents, the design documents publicly

available. We can have subsequent meetings on a design to see if there are any other concerns, things we've missed on this. We've got a very competent design engineer working on this project, but sometimes our focus is a little narrow. Your input is really important and critical for us to do these things the right way.

For both of these actions, the public comment period, we'll receive your comments in, public comment period ends on June 24. We will review those, and what we have, come up with a Record of Decision, which is a legal document signed by representatives from the Army, Environmental Protection Agency. It becomes how we conduct ourselves in this site. It's up for review in five years. It's an automatic five-year review on all of these projects when you have a Record of Decision. I also, if anything occurs during the design of this project or if anything happens while we're constructing the cap, if that's the chosen alternative, obviously the Record of Decision gets reopened, maybe another public hearing is held, but it doesn't end right here. It could go on. The design step, which I want to

encourage you to participate in, would be a fall/winter project with hopefully getting the project going sometime in the early spring of next year.

As part of this project, and these actually supplement and complement the remedial investigation, is that we prepare a health and safety plan, a plan to ensure that the workers and the community and the people that work in that building are safe based on our activities. We do topographical surveys to define the topography so we can engineer the cap and pick up the elevations. A soil gas survey to see if there are any gases. Old landfills tend to produce methane. We do a survey to determine whether there was any methane generation and design into the design features to eliminate any methane accumulations in the building. Develop vents, maybe charcoal filter the gases that may be coming up out of the landfill. We have to collect some data and design that in the process.

We'd borrow sources, this would be off-site clean fill. We would have to test it to make sure it meets certain parameters so we wouldn't have this

subsidence problem that we see today.

Thirty percent design. I said the concept, it's got a lot of elements in it. It has these type of things listed in it. We talked about storm water management and erosion control. We talk about possibly designing in a gas methane system. Cost estimate, schedules, that type of thing, and all these roll up into a 30 percent design package. A big sheet of documents.

And after that, the 60/90/100 percent designs obviously incorporate any comments received on the previous design submissions which may involve any other inputs that we receive. In the schedule, it would have an engineer report. These are all standard. When you build a building, this is typically the type of thing that goes on in a 30/60/90/100 percent design. It's not atypical.

And in the Edgewood Public Library, the Aberdeen Public Library, Washington College Library, these are the documents that are available on the 503. They're available for your inspection there. They're

available in the poster section so you can see what these documents look like. If anybody needs a copy of these documents, we can try to get those to you.

Building 103 consists of these documents here.

And common documents that relate to both projects and relate to the whole Canal Creek area are listed here. Again, they're available. I'll just go through them rather quickly, just listing them. I'm not going to read them to you, but they're available. We can talk about those if anybody is concerned how to find them, how to get access to them.

At this point, I'm done my presentation on the particular proposed actions at 503, 103. I guess we open it up to comments and questions.

MR. MERCER: Do we have any questions or comments? Okay, if you would please say who you are and where you're from, so our court reporter --

MS. RICE: I'm Sue Rice, and probably most people here know I'm the president of the APG Superfund Citizens' Coalition. We have a few people who have

written comments prepared, and I think they'd like to present them. And for anyone here that doesn't know who we are, we're a nonprofit group that's been monitoring and studying all the activities, environmental activities, at APG. We have two TAG grants that allow us to hike technical advisors to help us understand all these documents that you keep sending for us.

But first, I'd like our vice president, John Taylor, to give his comments. He's probably, even more important than anything we can say, one of the citizens directly in the affected area, and I think he would like to present his. And he has them in written form as well.

MR. TAYLOR: My name's John Taylor. Although I agree with the Army's restoration action at Building 503, to remove these residual white phosphorous contaminated soil, I have several questions concerning the approach to this decision and the additional hazards that I feel would be created due to these actions.

Number one, will any steps be taken to reduce the airborne dust created due to the excavation at

Building 503, such as watering it down or using some substance that would keep the dust down from going off into the atmosphere?

Number two, will the contaminated soil be containerized prior to moving it to Building 103 site? Or is it just going to be dumped into this site just like dirt into a pit?

My third question is, how will construction personnel know an existing cylinder or UXO currently buried beneath the surface of the 103 site has been ruptured due to vibration and the weight of all this heavy equipment vehicles running back and forth on the site? This has to do with their safety also. You could have a small explosion under the surface and heavy equipment operating, you wouldn't, you may not realize it happened. But then the substance could come up through the surface, and be very hazardous to them or anyone else in the area.

Number four, what safety precautions are being taken to contain any spillage or air release of hazardous materials due to rupture or detonation of UXOs

at the Building 103 site? And there is some, possibly there are some UXOs there, and some canisters of perhaps unknown substances. So I think we have to take some steps to protect, not only the workers, but the community also within the area, not knowing what this stuff is.

Number five, what are the tradeoffs the disposing of the contaminated soil off post instead of creating or adding to an existing hazard across the street, at the Building 103 site? In other words, you know, if we know there is a hazardous condition exists at the 103 site, so by moving this material across the street, we're just adding to it. So I go along with your capping idea -- I think the action was Action 6 -- except for the material from 103 going into that.

And the final comment, I feel that the Army's role is to clean up the existing hazards and hazardous wastes and not to create or add others, which I think we would be doing by moving the material across the street. I also feel that due to the instability that UXOs in buried canisters of unknown substance at 103, a more hazardous situation exists, not only for the

construction workers who are in direct danger, but the community as a whole, not just the Aberdeen/Edgewood area, but perhaps the civilian population within the area, not knowing what's buried under that site and what could happen when they start disturbing it or running heavy material over top of it, heavy equipment. That's all I have right now.

MR. WROBEL: I can say a few things about those. I can address your comments in a lot more detail, you know, as a response of this paragraph. I can send you a letter. I can send it to --

MR. TAYLOR: Certainly.

MR. WROBEL: -- your group. But let me just draw a few points. Okay? I wrestled with these same issues. I have the same concerns of, do you want this hazard on this Site. Okay? We did a calculation, which has been sort of proven out on other sites here at Edgewood that when you place two feet of that first initial cover, that will reduce any pressure of heavy vehicles running on the site. In other words, you're not going to have a point. It's going to be spread out, so

we do not feel that we're going to create a detonation or a spontaneous detonation once we place that first two-foot cover just to kind of bring it to grade so we can provide a stable platform. And the reason why we're putting that stable is so we won't have subsidence of this layers on top of it to move that force, that weight out. It would move out as an aerial type of thing.

We've looked at it. I wrestled with that for a long time, because I had the same concern. I talked to our design people and said, you know, go find the experts and have them calculate this. And we do have some calculations where we looked at that in one of the studies, and I could share that with you at the poster section. I could bring that out and show you where it is. But we'll address your comment in writing at the end of the comment period. So I did wrestle that, and I agree that that is one of the big concerns here about any kind of landfill capping here. But based on looking at the information that we've developed -- our people are in Columbus, Ohio out at the Battelle organization. They've done explosives work across the country. They're

considered experts by the Army. They feel that this two foot of cover will spread out the force not to cause a spontaneous detonation, and it will prevent that.

MR. TAYLOR: Well, this two foot of cover, I'm sure you're going to do regardless, you know, whether you use that two foot of material coming from the 503 site or if you bring in external materials to provide that cover.

MR. WROBEL: Well, this 470 cubic yards that I'm talking about is just a small fraction of the total number of yardage associated with that two-foot cover, just a small portion of it. We plan on just putting it -- we're not putting it in a container -- we plan on just putting on the site. We feel, you know, based on looking at the different costs and the implementability, all those things are implementable. We take that, it's feasible, it's 20, 25 dump trucks or a couple roll-off those large, you know, cubic-large containers, we could handle this, move it off the site. We looked at the cost figures. You know, basically we looked at, we could do this particular action at a

significant cost savings and still be protective.

MR. TAYLOR: That's today.

MR. WROBEL: That's today.

MR. TAYLOR: But tomorrow when the site, when the 103 site has to be -- when there comes a time when the 103 site has to be cleaned up, you're going to have additional cost now of removing that additional waste material other than what's already there.

MR. WROBEL: But the law requires, the Resource Conservation Recovery Act, requires us -- we own that waste whether it's here or whether it's in another landfill in Alabama, we own that waste. That is not someone else's problem. It's still the Army's problem. That waste is still ours, whether we remediate it as part of that cover, if we ever excavate that particular landfill, or whether we go down to Alabama where that big landfill is down there and remediate it there, we still own it. Whether we put it as part of a bigger problem in Alabama, or we leave it here, try to manage it here on our site. My call is that, you know, we're still responsible for it. We have it significant cost savings

to do it this way. But that's how I balanced it. The EPA looked at it, too. We don't lose custody of this particular waste. It's still ours.

MR. TAYLOR: Has anything been looked into, the possibility of perhaps covering the 503 site, putting a cap on that area over there?

MR. WROBEL: That was one of the very early things.

MR. TAYLOR: Rather than moving the soil.

MR. WROBEL: What I talked about earlier, one of the very early things we looked at when we were screening out technologies, you do like a big brainstorming session. Here's the problem. You get all the guys around -- engineers, scientists -- they all sit down and they brainstorm the ideas. This sort of stuff you'd do on any other project. And you throw out ideas, and you don't throw out anyone's until everyone's got their ideas listed. Then we look at them to see, you know, which ones make sense. We do some, a little bit of analysis, some calculations. And we did look at that. We looked at stabilization and leaving it on-site,

putting a cap on it. It seemed to be more feasible since we're building one cap, doesn't it make sense, why not just put it all in one cap instead of building two cap systems. Because it would have to be the same type of cap. It would have to be this six-foot, what looks like be a four to six-foot cover system. So we would have a cover system here, and two cover systems across the street. I'm not saying that that's not feasible to do; it's very feasible to do.

But going with a cap system goes the maintenance cost. You can't just let it go. It has to be maintained. Whatever vegetative cover you put on that, it has to be mowed, so you're increasing your maintenance cost down the road.

We looked at that, and in short order, that's kind of why it was not screened further as part of our alternatives.

MR. TAYLOR: Along with that, when you removed the material from 503, then that's going to be restored, so it's going to have maintenance cost --

MR. WROBEL: Yeah, but it's not going to be

this big six foot, it's going to be to grade to the natural contours of the area. Clean backfill will be put on, vegetative to the natural contours. Okay. This is a flat area. It's not compressed. It's relatively at grade for that particular area. So that's what we would do to site restore that particular area. We wrestled with all of those things, and I think we kind of see a light on those things when we evaluate them.

But like I say, your comments, we have a reporter -- if you want to hand those to us, so we're sure we don't make a mistake on them, and we'll get back to you personally and to the president of the committee. We really appreciate you coming out.

MR. TAYLOR: And if you'll see that Sue here gets the comments; she's our president.

MR. WROBEL: Yes, we'll do that. Thank you. Thanks for coming out.

MR. MERCER: Any other comments, questions?

MS. SQUIBB: Katherine Squibb, University of Maryland, and I'm working as an advisor with APG SCC. Just to follow-up on your action at 103, if you -- when

you first go in, you're going to take all your magnetometer readings and try to determine where you have pits and things like that. It talks about that in your reports.

Obviously, you'll probably come up with some just because there's metal and everything else in there. To what extent will you perhaps just start getting in and opening that Pandora's box, when you start going after to determine whether or not, you know, they are surface things that you need to take care of before you start running over it with heavy equipment, or are you really going to try to identify them?

MR. WROBEL: We don't really plan at this point to do any excavations at all, period. The magnetometry which is -- you see the people on the beach with metal detectors -- that's essentially what magnetometry is looking for, metal objects. There's a couple other techniques, we call them geophysical techniques that evaluate what could be in the subsurface. Those type of things we're going to do that's going to supplement the remedial investigation. In other words,

see if we can map out the extent of this thing, so that when we get to the final answer to this particular site -- site closure -- the whole Canal Creek area and this particular site -- we'll have kind of an idea of what we're dealing with, what we have there. There are no plans.

MS. SQUIBB: So you're not going to worry about trying to take off surface munitions or --

MR. WROBEL: There are no plans. Now in the 503 site, previously we have found fuses laying on the surface. Those obviously would be recovered and you know properly disposed. They would not be put -- you know, there would be some sort of screening prior to moving. Get out any hazardous ordnance that may remain on that 503 site.

MS. SQUIBB: Put you'll be digging?

MR. WROBEL: Yeah, there will be actually digging. So there will be some -- we don't envision finding any UXOs there, but we have in the past found fuses which are about the size of this pencil that can take your hand off, is about what happens.

MR. SQUIBB: Well, as you define this site, and I know you said before something about, you know, this dump actually going perhaps under the building or under the parking lot, is that going to be studied later? Or in other words, when is that going to come up and be an issue, the extent of, you know, what you're not covering?

MR. WROBEL: Well, as part of the design effort, we're going to try to define using these different geophysical tools, magnetometry, metal detecting, to define the extent of it. Obviously, where the building is, you can't do a whole lot, because there's a building there. We're going to try to go around the area.

We've got a couple of aerial photographs that were taken in the late 1930s when the landfill may have been -- as a dump, may have been inactive. It doesn't show the Technical Escort building that's there. You can looked at the planned view of this particular map, and kind of see that there's a depression. It's deepest in the middle and it kind of goes out to the

sides. What appears is that the building may exist on a portion of the excavation. Whether there was any waste placed on these fringes, we don't know. There may be a little shelf here. It's hard to look, you know, based on this. You can look at the small picture, and you can kind of make it out.

You look at some of the planned views, you can see a little shelf and they went down deeper to make the burrow, to get the soil, and then to place the debris and waste in this particular unit.

It seems to be, you know, there's another road down here -- I can't recall its name, but it seems like it's limited to that area, but it may extend a little bit under the Technical Escort Unit and maybe under the parking lot. But that would be investigated as part of a remedial investigation. We do the first step as part of the design process and carry that through.

You know, the final solution, you know, I don't have a crystal ball. It might be to demolish this and extend it to where we can better define it. The final solution may be an excavation. I don't know. I

don't have that crystal ball. But right now, from this short term, early act interim, seems like this area here, the cap doesn't exist. We have rain water, surface water, protruding into it. Put something in place, put a cork on it essentially, and try to look at the whole picture, see what we're going to do for the whole site.

MR. STACHIW: Just to add to what John's saying, the final solution could all involve in situ type treatment as well. That's something we're looking at so we're not transporting -- like Mr. Taylor was saying, just moving the problem here. Even if it wasn't moving it off post to someplace else, we'd like to eventually as we get into final solutions to be doing stuff on site, fixing it right there so it doesn't bother anyone again. That's what we'd like to do. That's in the final phase. Right now, we're just trying to make sure it doesn't, while we're developing the solutions, that we can prevent any further contamination.

MR. WROBEL: I had always hoped in my heart or hearts that the landfill is just this area in here. As more evidence is accumulating, it does not appear that

way. Like I said, this is an interim action, it seems like it is going to take care of some immediate potential problems we have right now. But I feel that down the road, this definitely will have to be revisited. It's going to take a lot of real smart engineers and scientists, and also you folks here that came to this meeting, and anybody else, neighbors, friends, that need to he involved with this process, that need to be here, so we can figure out what is the best thing to do here for the Army, for the nation, that type of thing, for this particular site.

The evidence seems to be mounting, it probably does extend a little bit more than southward than what I had really hoped to believe it had. But we'll address them as the data comes in, more information comes in. But we'll try to do an action now that seems to make sense, knowing that we're going to get to other things in the future. We shouldn't just wait for all the cards to come in and all the cards on the table. Let's see what we can do early on to resolve some potential problems.

MS. SQUIBB: We were talking earlier about how you were going to assure that the people in the building may not be exposed to gas that is released after it is capped and forced out. If you know, if you have just a minute to go through that, and I think that's an important issue.

MR. WROBEL: That is an important issue, very important. I mean, the people that work here, it is very important. The Directorate of Safety, Health and Environment would not allow us to do anything unsafe. What we plan doing, we have in the chart, a soil gas survey. In other words, we would put probes, things about this size, that have some kind of gas collection absorbent material, within the landfill, to existing animal burrows. We leave them in there for a time period, let them accumulate the gases. Then we'll take these particular tubes that have absorbent material in it, run it through a chemistry lab, and determine what determine what types of compounds may be present in the gases. And then based on that, we can get an estimate, yes, it's a problem, no, it's a problem, and then design

accordingly.

There are a couple of alternatives that we can look at and get involved in the design process. We can install instrumentation within that building, when a certain concentration is detected -- this is stuff that exists, it's off the shelf -- an alarm goes off, everyone leaves. We could do that.

It could be, I think we're really leaning right now conceptually, into putting some kind of gravelly type of gas collection. You know, gas would collect in the gravel, and a lot of it would vent off, and then maybe do an active, pull it and run it through some charcoal filters.

That's all, you know, we recognize it as a problem. We're going to do some investigative work to see what the extent of the problem is, and we're going to design something to deal with it. But it is important to us, and we definitely don't want anybody to unnecessarily. And on the flip side of it, if we do have a gas generation problem, it's going up into the air right now as we speak. So this cap will prevent that.

But we'll have to watch where the gas is --

MS. SQUIBB: And then filter it out.

MR. WROBEL: -- make sure it filters out before it comes out. So if we're getting presence of the chemicals does not necessarily mean there's a problem. You've got to have those three elements -- you have to have chemicals, the concentration, and also personal.

MR. FEENEY: I'm Brian Feeney. I'm with Penniman & Browne. And as I never tire of saying, I'm not only a technical advisor, but I live within two miles of APG. And I have several questions.

One of my questions is about whether or not the sheer weight of the cap is likely to cause hydrostatic pressure, a downward pressure. The water table is quite high, as the US Geo Study indicates, and it's known to be contaminated. Is there any data available on the fact of hydrostatic pressure, a downward pushing; onto that groundwater so that it would be contaminated, the water table would be spread out?

MR. WROBEL: I exactly know -- what I picture in my head is that -- I might say right now we

have a coffee filter. What you're talking about is we have like a tea bag that the groundwater reacts to pressure squeezing out contaminants? Is that what you're talking about?

MR. FEENEY: If you put a weight on top of your tea bag or on top of a filter, would it push out and say that you had a water table leading up to the bottom of your filter, would the weight on top of it push downward, the fluid grading push downward and then push out laterally in all directions, radial expansion? You don't have to answer it right now. It's a hydrogeologist's question. It's not an engineer's question.

MR. WROBEL: I'll tell you right now, I'm an engineer. I really don't have an answer. We have a couple of hydro people that would talk to you about that, will definitely respond to that in our records. I don't have a feel for it. I mean, the geologists are brought here, but we will definitely address that.

MR. FEENEY: We'll put the question on the record.

MR. STACHIW: Right. We will do the calculations.

MR. WROBEL: We'll do the calculations. We'll look at that. That's a good point.

MR. FEENEY: Okay. Another question I have, as I was reviewing the documents, I didn't see any specific information on the O&M Plan, Operations and Maintenance Plan, for the cap at Building 103. And my concerns are with failure in the cap, failure due to groundhogs, because while a cobble gravel barrier is pretty good, it isn't state of the art in caps. I know from cruel experience how pernicious and persistent groundhogs can be, and I'd like to know if there is a data base out there, there is data available on the tenacity of these buggers and what you might -- what you could be expected to anticipate. And should you have failures, either due to groundhogs or some other cause, I'd like to know how specific your O&M Plan is for addressing these failures.

MR. WROBEL: Well, the reason that the Operations and Maintenance, O&M in the engineering world,

wasn't addressed, was because these are proposed, you know, I think it is appropriate to mention those. Obviously, there would be some maintenance to insure that the cap's integrity would be there. The Department of Energy, who we've got as part of the design team on this particular project, has had experience of putting long-range planning and thinking on their sites as to how prevent animal intrusion. They've got sites that are all over the country, have all kinds of critters, and they've done that, and I rely on their expertise that, you know, we can definitely get together and talk about those specific references.

MR. FEENEY: In essence, I'm interested in the scope.

MR. STACHIW: It would have to be in operation. This goes to the solution, there's going to be operation and maintenance with any cap we put here.

MR. FEENEY: At which stage will it appear, the 30%, 60%?

MR. WROBEL: No. Probably later like around 60, 90%.

MR. STACHIW: In the design phase.

MR. WROBEL: Somewhere in the design phase. In fact, I had a meeting with the stake holders today -- people that actually occupy that particular building, and we discussed that particular issue today. We talked about what the final cover is going to look like, what kind of vegetation we're going to put it. Obviously, they have to look at it every day, outside their windows, so we had a meeting with those particular stake holders to talk about that type of concerns. Obviously, we want to have something that is maintainable, has a little bit of esthetics to it, that kind. of thing. We've got a landscape architect as part of the team, we could bring in as part of the team, to develop a cap that would do -- relatively low maintenance. But that would be addressed in the design process.

I think Dr. Montgomery here -- he's with the Battelle organization, done a lot work in capping landfills -- maybe can give us a little bit on this animal intrusion thing.

DR. MONTGOMERY: On the question dealing

with is this a proven technology. We work, I work for Battelle, Pacific Northwest Laboratory. We are run under the auspices of the Department of Energy, Richland Operations, in Hanford, Washington. One of the tasks that we have is to try to identify repositories that will last for the lifetime of radioactive materials. So we were looking for natural materials, manmade materials, plastic liners, things like that.

We don't really have an experience with how long do they last. Are they going to last 20 years? Are they going to last 50? Are they going to last 100 years? So that's why we went looking for technologies that utilized natural materials.

So this program was started approximately in the mid-'80s. And one of the documents that we have next door relates the experiences from that program. And we found that a layer of a gravel material does not maintain its stability when the animals dig down into it, and it keeps collapsing around. So the they go move off and find some other place. So for these caps, we're looking at trying to maintain these things for 10,000

years. And so that's why they went to the natural materials.

And part of my job is to take that technology and then to distribute it out to the general public and to other government agencies. And so that's one of the reasons that we looked at it, because for this project, I think it's applicable.

MR. FEENEY: That leads me into my next question about the length of the cap. The cap has about a 20-year life?

MR. WROBEL: I don't have any kind of --

MR. FEENEY: But at any rate --

MR. WROBEL: It's probably at least 20 years.

MR. FEENEY: At any rate --

MR. WROBEL: 50 or 100.

MR. FEENEY: The point I'm trying to make is that these measures are interim by definition. And what you said earlier that it will be revisited, it will certainly be revisited. And I guess what my question comes down to, does the Army acknowledge that all options

are on the table for the final remedial action. That it may be that removal, drastic and complicated as it is, it certainly is a very real possibility.

MR. HIRSH: I'm Steve Hirsh for the EPA. Back to the question on, do we have a reference. Terry Grim back there from Battelle gave me a book, because I was interested what are these animals doing. And you might want to get ahold of this. It's called Deserts and Dump Sites. And it gives a lot of information about burrows, and they track these burrows, and filled with the foam, what the animals do. That's a good reference for that.

MR. FEENEY: That's the University of New Mexico perhaps or someplace?

MR. HIRSH: One of those -- that's the best resource I found about what the animals actually do, and what can they get through and can't they get through.

This is a containment remedy, because the waste remains in place. Any time one of those, there's a ROD for containment remedy, there's a five-year review. It's required, absolutely required, whether it's a final

action, interim action; it doesn't matter. You leave waste in place, five years later, you come back and you take a look at it. You look at all the technologies that are currently available at that time, five years from your decision, and you reevaluate the decision. It's necessary. It's part of the law. You have to do it.

Since it is interim, there needs to be a follow-up ROD, and of course, you know, anything -- everything's fair game in terms of a final ROD. This -- you know, what you need for an interim action is to do your best and insure that it will not be incompatible with a final option.

It's not likely -- I guess John brought up the point, that yeah, we may have an additional cost down the road because we're bringing in additional material, and that's true. The entire cap may become a waste. I don't know. We don't know about that. That could be. But it's not incompatible with the final remedy. If we're hauling waste out of there, and we have an increased volume in the future, then so be it.

But review is required by law.

MR. FEENEY: I only have one question remaining then. And that is, I'm a little fussy on how the various RI/FS fit together. There's the groundwater under Canal Creek, which is -- if I have my nomenclature correct -- it's a mini study area.

And then eventually the Canal Creek's 49 operable units will he divided into clusters; is that correct?

MR. WROBEL: Yeah, it's how you're going to study different packets of sites. Now, whether we use the term "sites," "operable units," "areas of concern."

MR. FEENEY: Well, going back to your analogy, there may be data generated from one remedial investigation on the contents of the filter, and another remedial investigation dealine with the operable unit of the water at the site. And how would the two remedial investigations fit together? Would it be like at Westwood, where you have a large generic RI/FS, and then clusters or some other subdivision being formed under that umbrella?

MR. WROBEL: It's fairly confusing, but how

I envision it is that the whole Canal Creek area is going to have a remedial investigation, feasibility study, what to do with the whole site -- soil, the groundwater, sediments in the creek. It's all going to be studied in detail in the feasibility study.

To get to that point, we may have a few more meetings like this, where we've said, well, we've got enough information on this, we ought to propose an interim action.

But as part of the final solution, we will have a record of decision quite possibly for the Canal Creek area, and most definitely for the whole APG area. That would all tie all those things in and be probably a two-day public meeting to do all of that.

MR. FEENEY: And obviously, the point I'm driving at is that I wouldn't like to see different aspects of one larger phenomenon being disjointed by different RI/FS.

MR. STACHIW: That's a good point. Eventually, the whole thing's got to come together. And to make it even more precise, it's got to come together

at Grace's Quarters and Carroll Island as well. The whole thing has got to be one nice seamless garment is what it comes down to.

And in the process now, these study areas were put together for the sake of geographical convenience more than anything else. But we're trying to break them down into hydrogeological reality as to what influences what. Because decisions made for Canal Creek are going to influence basically what's going to be done at Gun Powder River, and it's going to impact on what kind of decisions you make for Grace's Court. So the decisions eventually all have to gel together so that risks in the entire area is mitigated.

So eventually, in the very beginning stages of trying to put together the big complicated situation, which you can see our work plan is a huge series of curved diagrams -- like trying to land someone on Mars -- and then eventually having the whole thing come together into one ROD of the entire base. So that's the process. We're not trying to separate them independently of one another.

But sometimes you can go and see something that makes sense to do now, instead of just letting it go until you come up with a solution that might take ten years to come up with. There's things you can do now, and that's what we're trying to do. Does that help?

MR. FEENEY: That's very helpful.

MR. WROBEL: Another question?

MS. RICE: I think a good bit of ours are written, and we'll submit them. But I think Dr. Squibb, did you want to go over some of your other written ones?

BR. SQUIBB: No, I think a lot of my others are actually ones to be addressed during the design phase, the way I'm hearing you. Actually the specifics on how you do things, like what filters and --

MR. WROBEL: Right, that all comes out in the design. That's correct.

MS. RICE: I think we have one set of written remarks to give you tonight, though, right, that they don't previously have.

DR. SQUIBB: Yeah, I can hand them in, with sort of detailed questions, and you can decide --

MR. STACHIW: All these questions will be included in the transcripts. A transcript of this meeting will be in the library. It won't be part of the record of decision, but will be part of administrative record. Everything that you heard today will be -- that's why we have a court reporter.

MR. HIRSH: This is Steve Hirsh again. The other thing that happens is, you know, these kind of comments that we gave you, too, become part of the record of decision, so the decision makers that actually sign these documents get that. It is actually three pieces -- the declaration gets signed by Deputy Assistant Secretary of the Army, the APG Commander, and my Regional Administrator. So there's that -- not the signature page -- there's essentially a "what's going on" section and it describes the alternatives, what's being done, what it alleviates, what the future is, and then the third part is called "response and summary," and all the questions are written down in there along with the written responses. So the decision makers get that as well.

DR. SQUIBB: Just one more question. You

said that eventually it would be nice to do this remediation in situ and clean this all up, and that's what we're looking for. Who's funding some of the work that will actually make that possible? Who's looking into bioremediation of, you know, chemical agents and --

MR. STACHIW: That would be part of the feasibility studies that we'll do, which will include pilot studies and things of that nature, when we start getting to the point of that-- like Brian was talking about, you know, for Canal Creek -- you may have two problems. You have the stuff that's buried and in the soil in this landfill, or other stuff that may be in sewer lines or whatever throughout the whole area, which would be problematic to dig up, and you have the groundwater.

So we're looking upon those things, it's the source and groundwater is two separate problems. Okay? Groundwater is something we're pursuing a solution to, and then -- and for the most part, groundwater is the vector that's causing contamination to leave. Whereas the stuff that's in the ground is either

going to the groundwater or venting into the atmosphere, one or the other -- or maybe not one, maybe the other.

Then we would look at, what do we do with that stuff? Do we dig up the entire base, or do we find ways to treat it right in the ground itself, so it doesn't release into the groundwater anymore, it doesn't release into the atmosphere. Those are the kinds of things we would at least look at as one of the alternatives to digging up, or not doing anything, or something else. And part of what we need to do is pilot studies as part of the feasibility.

Survey existing technologies, see what's working, and then try it here and see if it works, and then with that, proposing that to the group.

MR. HIRSH: There are also other organizations. The entire issue of how you dispose of chemical weapons doesn't fallon Aberdeen's shoulders. There are other Army organizations and DoD organizations that are working on things, such as, how do you get the liquid fills out of the munitions? There are other agencies out there that are working on parts of the

problem. It's not just an Aberdeen issue. These things are in other places.

MR. WROBEL: And part of the resources that we've used is Department of Energy resources. They've got problems, in some ways dissimilar but some ways similar to us, so by establishing linkages with the Department of Energy National Labs, we get access to a lot of the information as it is learned. I've learned a lot from Dr. Montgomery about, you know, well, we tried that ten years ago, or three years ago, and it didn't work then. The technology hasn't improved. So that kind of information sharing between two big organizations -- the Department of Defense, the Department of Energy -- we've tried to do here at APG to kind of work together. Why should the taxpayers pay twice for the same type of research done someplace else?

So we're trying -- I'm trying to do that here, because I, you know, I acknowledge that there's a lot of information. Like Steve said, there are other Department of Defense activities looking at us, so we try to keep abreast by going to conferences and whatnot, try

to see what's out there, trying to bring in the best people we can find to work on these particular situations.

MR. FEENEY: That brings to mind another question. Not long ago, we had our counterparts in Russia come to the Joppa Library, and they live -- they're neighbors of APG's counterpart in Russia -- whose name I forget. Has there been any communication, maybe you both inventing the wheel in isolation?

MR. STACHIW: They spent the day with us here at APG. And they've asked for numbers of documents, which we've sent over to their point of contact in Kentucky -- the kinds of things we had that they were interested in. So, however, they didn't make known to us anything that they had that was of interest to us.

MR. FEENEY: Technology transfers.

MR. HIRSH: And we have sent delegations over there, and there's work, but in general, the technology transfer is that way.

MR. STACHIW: I think Battelle just announced last week, it was successful in receiving a

contract to support the Russian demil effort. They've been working this for several years, and we're one of the many organizations that is going to help them to clean up their problems over there. So this is a global thing and technology sharing, and what's going on throughout the states and throughout the world today. Battelle is involved in Canal Creek, and so therefore, we will continue --

MR. WROBEL: Because it's such a complex site, we're trying to find -- well, I tried to find for the Army an organization that had that kind of reach. Battelle is a very large organization. It's a not-for-profit organization. It has access to a lot of information. They've been in this business of chemical warfare, and so there's going to be some kind of information exchange on that particular aspect.

So what I've tried to do is assemble a team of people. And why I'm here today to talk you all, is to bring you guys into the team also, have some sessions like this, technical meetings, look at the design, so we can come to grip with this kind of complex problem that

needs some kind of resolution in the future. And I'm hoping to establish that with the Department of Energy through Battelle. I have access to their incredible amount of information, lessons learned, and bring you all folks in to design projects, look at the remediations. I will send you copies of everything that Steve and John receives, you receive copies of all the work plans, the schedules, time frames, and that type of thing, for all the types of things that we're doing. That information is voluminous, but that's what we have to wade through, too, to get to the bottom of this.

MR. MERCER: Any other questions or comments? Yes, sir.

MR. HESSELTON: Ken Hesselton from Harford County. Anyone that's concerned that their public representatives aren't here tonight, there happens to be a County Council meeting. Your council representative of District 8 and the Edgewood Area, Mrs. Hesselton is at the council meeting and regretfully not here. Also Mr. Barker who represents the Edgewood Arsenal is also there.

Now, if I can associate myself from that,

because there's one thing about this report that has disturbed me just looking at it. I haven't been getting involved here for several years. John and a few others will tell you I have been trying to be with the Citizens Coalition, citizens committees on this. I have a lot of respect for the people who work with the Army. But I am bothered by this for a couple of reasons.

You've described the site at 503 Building. You identified materials, lead, zinc, hexachlorobenzene, hexachloroethane. Then we come over to the site 103, which is obviously much larger. There's no statement as to the number of yards it involves. And there's statements like simply "there were groundwater samples found several solvents in the groundwater below the site." Nothing else describes the extent of materials on this particular site.

You conducted a study to determine that there's no direct public exposure to any site chemicals. And the water beneath the site is not a source of drinking water.

Well, I can go out in the woods and say,

that big old rotten land isn't going to hurt anybody, because there's no one standing under it. I'm somewhat concerned there's nothing that defines the speed of movement of the groundwater off that site, any indications as to what you're undertaking to determine exactly how far the contamination has been transported, and there's no indication you did any study to determine if compressing the water table at that point would tend to retain the materials in the vicinity.

It's just my impression that the toxins and the chemicals in the drinking water has been treated -- just looking at this document, nothing else -- very casually. That's all I'm going to say. I'm not saying you didn't treat it properly, but I read this, I get that impression. And that's a comment. It doesn't deserve an answer.

MR. STACHIW: You're right, okay, this doesn't attempt to address itself to groundwater problems, although i think Brian raised an interesting issue as to with this hastening in the ground. We know there's groundwater problems underneath, and we're

studying the groundwater overall in this area, with hopefully an interim solution be proposed for at least to start get feelings for what we think is a good solution and what you think is a good solution maybe about a year from now.

It's not moving that fast that you've got to be concerned about it in a year's time. We know that much. We have computer models of the groundwater below all of Canal Creek. But we're moving toward a solution. This is not attempting to address the groundwater as a problem per se. We will be -- that doesn't mean we're not trying to address groundwater. We are, and that's one of our -- that's our next highest priority in the Canal Creek area. So we'll be heading toward that one in about a year's time or so.

DR. MONTGOMERY: Another response to that, Mark Montgomery, with the compounds at 503, there are known health effects, there are standards, OSHA standards, for lead and zinc, and compounds like that. And so we have a good handle on, how do we protect ourselves if we're going to go on and sample it? So that

allows us to get in and get information on it.

In 103, because things could have been dumped there, chemical agents, could be munitions. At 503, you could go in and we can protect ourselves and do our sampling. At 103, how do you protect yourself against that one bomb that is six inches underneath the surface? You hit it, and it pops. And so what we're doing in our design is using remote non-invasive technologies to try to determine what's coming, what's being emitted out of it, as opposed to going in and physically taking the samples out of it.

So that's why there's a lot of information on 503, but there is not a lot on 103. And through the monitoring that we're doing with the groundwater there and through the vapors coming off, we're going to determine what's in there.

MR. WROBEL: I probably breezed by this too quickly when I did my presentation, but there are common documents within the administrative record that deal with the types of things that you're talking about -- groundwater chemistry report, hydrological data,

hydrodology of the Canal Creek area, talks about where's it going, how it's going. I'm sorry, I breezed through that very quickly.

MR. HESSELTON: All I'm saying is, this document glosses over it. I'm not saying you didn't do something. This thing makes it sound like you didn't. That's what I'm saying. You don't have to explain all this to me. I'm saying, this document makes it sound like, there's no problem there, nobody's going to drink it, and that's not a good clear concise comment that you should use when you've got toxic chemicals in water. When you found them there, and then you just say, well, it's no problem, because nobody's drinking it, is not -- is a poor comment to put in a document. You should say, it's contained, it hasn't migrated beyond this point, and we're studying it further. That, I could have bought. But this seemed to be a very careless statement in the document. That's all I'm trying to point out.

I'm not telling you what's there and you're not doing these things. I'm saying that this is what this thing says.

MR. WROBEL: I just threw this up, that we did look at, based on operations that may have occurred at Building 103, these are the type of things that could be expected to be found possibly in the dump. We did do a search based on particular processes that would have occurred. They're in the '20s and '30s, when that building would have been operated as a fill area -- the types of things that could possibly be there.

MR. PAUL: I just want to say that we can address that comment by making a revision to the package, putting out another revision.

MR. MERCER: Any other comments, questions? I would like to remind people that the public comment period for these projects runs to June 24th. They can call the information line, and that number is 272-8842. Or you can write, you can send written comments to John Wrobel. That address is in the fact sheets, however I will read it to you. That's Directorate of Safety, Health and Environment, U.S. Army Aberdeen Proving Ground, Attention: STEAP-SH-ER (J. Wrobel), Aberdeen Proving Ground, Maryland 21010-5423.

That's is on the fact sheets. We will be going for a period of time, we can go back into the room where the displays are, and you can pick up a fact sheet or ask questions there as is necessary. But the public comment period does run to June 24th.

We also want to ask you on your way out, there are evaluation forms on the table out there. If you would please do us a favor and fill out an evaluation form and make any comments or whatever concerning this particular meeting and its conduct, and what changes, suggestions, whatever you might have; we would appreciate it. You can leave them, there's a box on the table out there.

In the meantime, if there are no other comments or questions, thank you very, very much for coming and participating. It makes everybody's job a lot easier by having your participation. Please feel free to go into the other room, now that we've gone over things, and look and see what we have. Thank you.

(Meeting concluded at 9:10 p.m.)

COMMUNITY MEETING - MAY 24, 1994

STATE OF MARYLAND)
) C E R T I F I C A T E
COUNTY OF HARFORD, SS:)

I, BARBARA J. RUTH, Notary Public, do hereby certify that the foregoing public meeting held May 24, 1994 at the APG Edgewood Area Conference Center, Building 4810, Edgewood, Maryland, was taken and transcribed by me; and that the foregoing pages constitute a true and accurate transcript of the said public meeting.

I do further certify that I am not of counsel for or in the employment of any of the parties.

In Witness Whereof, I have hereonto subscribed my name this the 8th day of June 1994.

<IMG SRC 0395216G>

BARBARA J. RUTH
NOTARY PUBLIC

MY COMMISSION EXPIRES: 04/07/96

(RECORDED TAPES ARE RETAINED FOR 30 DAYS FROM DATE OF CERTIFICATE.)

APPENDIX C. REFERENCES

ICF Kaiser Engineers, January 1991. Baseline Risk Assessment for Eight Selected Study Areas at Aberdeen Proving Ground, Maryland. Draft Report, Vol I, Chap 1-7, prepared for U.S. Army Corps of Engineers Toxic and Hazardous Materials Agency, Task Order No. 11, Contract No. DAAA15-88-D-0009, January 1991.

Oliveros, J.P.; Gernhardt, P.; 1989. Hydrogoelogic Data for the Canal Creek Area, Aberdeen Proving Ground, Maryland, April 1986 - March 1988. Open-file Report 89-387, U.S. Geological Survey, Towson, Maryland, 1989.

Oliveros, J.P.; Vroblesky, D.A.; 1989. Hydrogeology of the Canal Creek Area, Aberdeen Proving Ground, Maryland. Water-Resources Investigations Report 89-4021, Towson, Maryland, 1989.

Lorah, M.M.; Vroblesky, D.A.; 1989. Inorganic and Organic Ground-Water Chemistry in the Canal Creek Area of Aberdeen Proving Ground, Maryland. Water Resources Investigations Report 89-4022, U.S. Geological Survey, Towson, Maryland.

Nemeth, G. et al; 1989. RCRA Facility Assessment, Edgewood Area, Aberdeen Proving Ground, Maryland, report No. 39-26-0490-90, U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland.

Nemeth, G., J.M. Murphy Jr., and Zarzycki, J.M., 1983. Environment Survey of the Edgewood Area of Aberdeen Proving Ground. Report No. DRXTH-AS-FR-82185, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland.

Jacobs Engineering Group, January 1992. Program Development Report, Canal Creek Area IRP Sites. prepared for Battelle Environmental Management Operations, January 1992.

U.S. Army Toxic and Hazardous Materials Agency, 1976. Installation Assessment of Aberdeen Proving Ground. Volume I and II, Report No. 101, Aberdeen Proving Ground, Maryland.

Federal Facility Agreement, March 1990, between the U.S Department of the Army, Aberdeen Proving Ground and the U.S. Environmental Protection Agency, Region III.

Personal communication with Dr. L. McGinnis, Argonne National Laboratories, Argonne, IL.

USEPA, 1989. Technical Guidance: Final Covers on Hazardous Waste Landfills and Surface Impoundments, Report No. EPA 530-SW-89-047, Office of Emergency and Remedial Response, Washington D.C.

USEPA, 1988. Draft Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, Office of Emergency and Remedial Response, Washington D.C.

USEPA, Handdbook: Remedial Action at Waste Disposal Sites, Report No. EPA/625/6-85/006, Office of Emergency and Remedial Response, Washington D.C.

USEPA, 1982. Draft RCRA Guidance Document - Landfill Designs, Liner Systems, and Final Cover, Report No. PB87-157657, USEPA Office of Solid Waste, Washington D.C.

Dames and Moore, 1992. Focused Feasibility Study for the Michaelsville Landfill Cap and Cover System, Final Report, prepared for U.S. Army Corps of Engineers, Baltimore District, Contract # DACA31-91-D-0031, Baltimore, MD.

Dames and Moore, 1994. Building 103 Dump and Building 503 Burn Sites, Final Work Plan, Supporting Activities prepared for Battelle

Personal communication with Ms. L. Miller, Dames and Moore, Linthicum, MD.

Reith, C.C., Caldwell, J.A., 1990. Vegetative Covers for Uranium Mill Tailings, Jacobs Engineering Group, Inc. Albuquerque, NM.

Personal communication with Dr. C. Reith Jacobs Engineering Group, Inc. Albuquerque, NM.

McGinnis, L.D. et al. 1992. Geophysical Study of the Building 103 Dump, Aberdeen Proving Ground (Draft Report).