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FINAL

ENVIRONMENTAL ASSESSMENT

PRESCRIBED BURNS AT ABERDEEN AND EDGEWOOD AREA TEST RANGES FOR AIR MONITORING OF RANGE FIRE EMISSIONS

Prepared For

U.S. Army Garrison,
Directorate of Safety, Health and Environment
Aberdeen Proving Ground

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Final
Environmental Assessment

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ABBREVIATIONS AND ACRONYMS

ADNL	A-Weighted Day-Night Sound Level
AMC	U.S. Army Materiel Command
APG	Aberdeen Proving Ground
AR	Army Regulation
ARL	U.S. Army Research Laboratory
ATC	U.S. Army Aberdeen Test Center
ATSDR	Agency for Toxic Substances and Disease Registry
BTD	Bomb Throwing Device
CDNL	C-Weighted Day-Night Sound Level
CWM	Chemical Warfare Materiel
DSHE	Directorate of Safety, Health and Environment
DU	Depleted Uranium
ECBC	U.S. Army Edgewood Chemical Biological Center
ECD	Environmental Compliance Division
ECRD	Environmental Conservation and Restoration Division
EPA	Environmental Protection Agency
FFA	Federal Facility Agreement
ICUZ	Installation Compatible Use Zone
IRP	Installation Restoration Program
MDE	Maryland Department of the Environment
NAAQS	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
PAHs	Polycyclic aromatic hydrocarbons
PAO	Public Affairs Office
PCBs	Polychlorinated biphenyls
PPE	Personal Protective Equipment
RAB	Restoration Advisory Board
REC	Record of Environmental Consideration
RFA	RCRA Facility Assessment
SBCCOM	U.S. Army Soldier and Biological Chemical Command
SWMU	Solid Waste Management Unit
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compounds
WES	Waterways Experiment Station

SECTION 1.0

PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Background

The Aberdeen Proving Ground (APG) Installation Restoration Program (IRP) has identified the need to conduct a limited number of controlled burns at test ranges in the Aberdeen and Edgewood Areas to support a study to sample emissions produced by range fires occurring over potentially contaminated vegetation and soil. This air monitoring study will assess the potential impact to human health from range fire emissions and determine if additional measures are necessary under the IRP to prevent or mitigate the potential airborne release of hazardous or toxic materials during future fires at potentially contaminated APG test ranges. This Environmental Assessment documents APG's proposal to conduct prescribed burns at APG by evaluating the proposed action in accordance with the National Environmental Policy Act (NEPA, 40 CFR 1500-1508) and Army Regulation (AR) 200-2, Chapter 5, and addressing the environmental impacts associated with the stated proposed action.

Aberdeen Proving Ground lies along the northwestern shore of the upper Chesapeake Bay, in southern Harford and eastern Baltimore Counties, Maryland (Figure 1). Kent County, Maryland, is across the bay to the east, and Cecil County, Maryland is north of APG. The Bush River divides APG into two non-contiguous areas: the Aberdeen Area and the Edgewood Area. The Aberdeen Area, east of the Bush River, is three miles southeast of the City of Aberdeen. The Edgewood Area, to the west of the Bush River, lies adjacent to the towns of Edgewood and Joppatowne. Baltimore, the nearest major city, is about ten miles west of the northwestern boundary of APG.

Aberdeen Proving Ground is an active U.S. Army Soldier and Biological Chemical Command (SBCCOM) installation within the U.S. Army Materiel Command (AMC). The installation maintains a long history as a major U.S. Army testing facility for artillery and other ordnance, military vehicles, and a variety of other military equipment. Since APG's establishment in 1917, the Aberdeen Area has been the site of intense research and development, large scale testing of munitions, weapons, and materiel, and a training school for ordnance officers and enlisted specialists. Firing ranges, impact areas, vehicle test tracks, and other test facilities extend southwest to Bush River and include Spesutie Island and Pooles Island. The Edgewood Area was the site of chemical warfare materiel (CWM) laboratory research and field testing programs, extensive pilot- and production-scale manufacturing operations, and related disposal programs, as well as a major receiving and packaging center for low-level radiological wastes. Test areas within the Edgewood Area include: Gunpowder Neck, extending south into the Chesapeake Bay between Bush River and Gunpowder River, Graces Quarters, a peninsula between Gunpowder River and Saltpeter Creek, and Carroll Island, a peninsula between Saltpeter Creek and the Chesapeake Bay. In total, the firing ranges at APG cover approximately 33,000 acres, of which 12,000 acres are covered by water, 4,000 acres are swampy, and 17,000 acres are vegetated uplands.

Because of the hazardous substances contamination from past disposal practices and the testing activities, the U.S. Environmental Protection Agency (EPA) placed the entire Edgewood Area on the National Priorities List on February 21, 1990. As a result, the Department of the

Figure 1 – Location of APG, Md

Army developed the APG IRP to identify locations and contents of past disposal sites within the Aberdeen and Edgewood Areas, and eliminate hazards to public health and the environment. The Environmental Conservation and Restoration Division (ECRD) of APG's Directorate of Safety, Health and Environment (DSHE) administers the installation's IRP. On March 27, 1990, the U.S. Army and the EPA signed a Federal Facility Agreement (FFA) outlining mutual responsibilities in regard to this cleanup program. One major purpose of the FFA is to initiate appropriate actions to mitigate effects of potential release of hazardous or toxic materials into the environment.

The following subsections provide descriptions of the Aberdeen and Edgewood Area test ranges and summarize the potential contaminants of concern within these areas.

1.1.1 Aberdeen Area

The Aberdeen Area of the installation was established as the Ordnance Proving Ground in December 1917 and became a permanent military post, designated APG, in January 1919. Testing of ammunition and materiel began in January 1918. Ordnance officer training began in 1919 with the activation of the Ordnance School of Application. Prior to World War II, APG activities involved intense research and development, and large-scale testing of a wide variety of munitions, weapons, and materiel. In 1940, the U.S. Army consolidated enlisted specialist training with the officers' training. On July 1, 1940, the Ordnance School became operational.

During the Korean and Vietnam conflicts, the U.S. Army performed smaller-scale increases in munitions and materiel development and testing activities at APG. During the Korean conflict, the government established the Ordnance Training Command and placed the Ordnance School under this Command. In 1962, the U.S. Army discontinued the Ordnance Training Command with the advent of AMC. The U.S. Army Test and Evaluation Command, organized in 1962, operated until 1999. In February 1999, SBCCOM assumed operational control of APG.

The Aberdeen Area includes approximately 25,000 acres and consists of three major functional areas: the headquarters and research area, the training and support area, and the test range area. The test range area comprises about 80-85% of the Aberdeen Area and consists of relatively flat lands with wooded tracts. There are approximately 110 different firing positions at the Aberdeen Area from which test activities can be performed on weapons ranging in size from small arms up to 280-mm artillery. Firing consists of all types of conventional ammunition. Table 1 lists the major active and inactive test ranges and impact areas within the Aberdeen Area and Figures 2, 3, and 4 depict the approximate locations of these ranges and impact areas.

Table 1
Aberdeen Area Test Ranges
Aberdeen Proving Ground, Maryland

Southwest Aberdeen Area	
New Bombing Field	Old Bombing Field
Chillbury Point	Poverty Island Fragmentation Test Area
12,500 Yard Impact Area	Locust Point Impact Area
Abbey Point	16,000 Yard Impact Area

Figure 2 – Southwest Aberdeen Area Potential Range Locations for Prescribed Burns

Figure 3 – Northeast Aberdeen Area Potential Range Locations for Prescribed Burns

Figure 4 – Spesutie Island Portion of APG, Potential Range Areas for Prescribed Burns

Table 1 (Continued)
Aberdeen Area Test Ranges
Aberdeen Proving Ground, Maryland

Northeast Aberdeen Area	
Brier Point Impact Area (15,000 YD Impact Area)	Romney Creek Range
Fordš Farm Artillery Test Range	9,600 Yard Impact Area
Small Arms Range	Light Rifle Ranges
Michaelsville Range Area	Transonic Range
M Range	9,500 Yard Impact Area
7,600 Yard Impact Area	Bomb Throwing Device (BTD) Range
Recoiless Rifle Ranges A & B	Optimum Caliber Ranges 1-6 and 9
Range 8 (Explosive Effects Range)	Range 7 (Suspended Target Range)
Trench Warfare Range	Main Front Ranges B-1 through B-4
Light Armor Range	High Velocity Range
Black Point Land Range Area	Water Ranges (Range B/Recall Range B and Plate Range/Barricade B)
Mulberry Point Range	Ballistics Range
Spesutie Island, Aberdeen Area	
Air to Ground Rocket Range	Range 16 (Nike X Shock Tube Facility)
Range 7	Range 7A
Range 12	Range 13 (Variable Time Fuse Range)
Range 17/17A	

Under the IRP, the Aberdeen Area is broken into two major areas of investigation, the Other Aberdeen Areas and the Western Boundary. The Other Aberdeen Areas comprises at least 61 solid waste management units (SWMUs) where releases of numerous types of hazardous materials occurred in the past. These sites, identified in the *RCRA Facility Assessment (RFA) of the Aberdeen Area* (U.S. Army Corps of Engineers [USACE], Waterways Experiment Station [WES], 1990), are mostly former storage and disposal facilities (e.g., pit and trench fills, burning grounds, disposal pits, spill areas, underground tanks, sumps, pits, and areas of dispersed contamination). Depending on the site, potential contamination occurs in various media, with contaminants of potential concern that include heavy metals, pesticides, polychlorinated biphenyls (PCBs), solvents, phthalates, unexploded ordnance (UXO), propellants, explosives, and petroleum hydrocarbons. Twelve of the 61 SWMUs fall within the Aberdeen Area test ranges.

The Western Boundary, approximately 10,000 acres, encompasses the area along the northern installation boundary, extending from the northeast corner of the installation to the Bush River in the west, southwest to Romney Creek, and then east to Swan Creek. Western Boundary is a composite of five individual sites located in the northwest corner, one of which is a SWMU under the IRP. The Aberdeen RFA identified the Fire Training Area as a potential source of chemical contamination of various media in the Western Boundary area. Materials handled at the Fire Training Area included

diesel fuel, gasoline, kerosene, and jet fuels. In 1991, trichloroethylene was detected in the Harford County Perryman Well Field located outside of the APG installation boundary and downgradient of the Fire Training Area. Appendix A provides a description of the Aberdeen Area test ranges containing IRP sites with potential contaminants of concern.

Testing and training activities are still ongoing at active Aberdeen Area test ranges. The U.S. Army Aberdeen Test Center (ATC) and Army Research Laboratory (ARL) conduct the majority of the testing and training activities at the Aberdeen Area test ranges. ATC conducts outdoor testing and training activities on much of the Aberdeen Area and ARL conducts most of its outdoor testing on Spesutie Island and on the Transonic Range. Recently, the U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM) and ARL performed interim evaluations of environmental releases to soils from these activities (ANL, 1997). Preliminary results of their studies indicated the potential for environmental contamination at the ATC firing points, ATC firing range impact areas, and ARL Spesutie Island test ranges. Potential contaminants of concern include explosives and polycyclic aromatic hydrocarbons (PAHs) at the ATC firing points and metals at the ATC impact areas and ARL Spesutie Island range areas. At the Transonic Range, Ford's Farm Artillery Range, Bomb Throwing Device (BTD) Range, and Main Front B-3 test range, depleted uranium (DU) is a potential contaminant of concern. Results of risk assessments using this data indicated no unacceptable risks to human health and the environment from test range activities (CHPPM, 1996 and 1998).

Table 2 summarizes the Aberdeen Area test ranges which contain significant amounts of potential contaminants of concern based on reviews of the Aberdeen Area RFA and CHPPM/ARL environmental studies.

Table 2
Aberdeen Area Test Ranges Containing
Significant Amounts of Potential Contaminants of Concern*

Test Range	Depleted Uranium	Unexploded Ordnance	Explosives	Solvents	White Phosphorus	Metals
Transonic Range	✓	✓	✓			✓
Ford's Farm Artillery Test Range	✓	✓	✓			✓
BTD Range	✓	✓	✓			✓
Main Front (B-1,2,3,4) Ranges	✓ (B-3)	✓	✓			✓
Old Bombing Field			✓		✓	
New Bombing Field			✓			
Abbey Point			✓			✓
Spesutie Island Ranges			✓	✓		✓
High Velocity Range	✓					
West of the Optimum Caliber Ranges				✓		

* Due to the extremely limited number of CWM munitions tested at the Aberdeen Area, it is not anticipated that CWM would be on any test ranges.

1.1.2 Edgewood Area

In October 1917, by Presidential Proclamation, the U.S. government appropriated land southwest of the Aberdeen Area for use as a military reservation, known as the Gunpowder Reservation. In May 1918, the U.S. Army officially designated this reservation as Edgewood Arsenal. Edgewood Arsenal remained an Ordnance installation until July 1, 1918, when the U.S. Army transferred it to the newly-created Chemical Warfare Service. During the 1920s, the U.S. Army established the Chemical Warfare School. The Fort Hoyle Military Reservation became part of Edgewood Arsenal in 1940, adding 5,000 acres to the Edgewood Area. In 1942, the U.S. Army designated the installation as the Chemical Warfare Center, and changed the name again in 1945 to Army Chemical Center. In 1962, with the organization of AMC, the Army Chemical Center once again became Edgewood Arsenal. On July 1, 1971, Edgewood Arsenal became a part of APG.

Historically, military chemical warfare research, development, and related activities at APG occurred primarily in the Edgewood Area. Since 1917, the Edgewood Area has been the site of laboratory research, field testing of chemical materiel and munitions, pilot-scale manufacturing, production-scale chemical agent manufacturing (during World War II), and related test and disposal operations. The Edgewood Area has also been a center for the storage of chemical warfare materiel and a major receiving center for low-level radiological waste.

The Edgewood Area includes the Gunpowder Neck peninsula between the Bush and Gunpowder Rivers, comprising about 9,600 acres. Land use in the Edgewood Area is less structured than in the Aberdeen Area and major functional areas include the test range area, a cantonment area, an industrial area, a training area, and a research and development area. The test range area, located south of the cantonment area on the Gunpowder Neck peninsula, covers more than 6,000 land acres. Since World War I, APG has used large areas of the Gunpowder Neck for extensive testing and disposal operations. The testing operations involved the use of chemical munitions, high explosives projectiles and bombs, armor piercing antipersonnel mines, and many types of grenades, rockets, and incendiary munitions. C-Field, D-Field, E-Field, F-Field, G-Field, H-Field, I-Field, J-Field, K-Field, L-Field, M-Field, N-Field, O-Field, P-Field, and Maxwell Point comprise the Edgewood Area test ranges. Figure 5 depicts the approximate locations of these fields.

Under the IRP, the Edgewood Area test ranges are broken into three major areas of investigation: Other Edgewood Areas, O-Field, and J-Field. The Other Edgewood Areas comprises at least 84 SWMUs. These sites, identified in the *RFA of the Edgewood Area* (U.S. Army Environmental Hygiene Agency, 1989) and grouped into 33 clusters, are mostly testing and storage/disposal areas. Testing operations resulted in areas contaminated with military ordnance such as high-explosive projectiles and bombs, armor-piercing and antipersonnel mines, grenades, rockets, and chemical munitions. Sites used for disposal by dumping, burning, demolition and detonation, and landfilling contain numerous burial pits filled with obsolete munitions, contaminated scrap, chemicals, and demilitarized/decontaminated materials. The water bodies and sediment surrounding Gunpowder Neck contain numerous UXO. Depending on the site, various media are contaminated. Preliminary site investigations indicate contaminants of concern at these sites include chlorinated solvents, heavy metals, explosive chemicals, chemical agents and their degradation products, and UXO.

Figure 5 – Edgewood Area Potential Range Locations for Prescribed Burns

The entire O-Field area is approximately 260 acres in size, bounded by Watson Creek and its associated marsh to the north and east, and to the west by Watson Creek Road and the Gunpowder River. O-Field consists of two smaller, separate areas, Old- and New-O-Fields, which the U.S. Army used for chemical disposal. During the early 1940s to 1953, the U.S. Army prepared unlined and uncovered pits and trenches at Old O-Field for the disposal of bulk chemical agents, munitions, contaminated equipment, and miscellaneous hazardous waste. Disposal materials within the 4.5 acre Old O-Field landfill included: lethal chemical agents such as mustard, lewisite, phosgene, hydrogen cyanide, tabun, sarin, soman, and VX; incapacitating agents such as adamsite, CN, CS, and PS; smoke incendiary materials such as phosphorus and napalm; and explosive compounds such as TNT, 2,4-DNT, 2,6-DNT, RDX, HMX, and picric acid. Recent installation of a permeable infiltration unit over the Old O-Field disposal pits and trenches minimized the risk of a hazardous air pollutant release. In the 1950s, the U.S. Army excavated disposal pits at New O-Field as part of cleanup efforts at Old O-Field. Located south of Old O-Field and adjacent to the marsh that borders the southwestern portion of Watson Creek, wastes disposed at this site included mustard, VX, white phosphorus, explosives, research laboratory wastes, acids, and veterinary wastes. Contamination of potential concern at New O-Field includes heavy metals, chemical agents, solvents, and UXO.

J-Field, approximately 460 acres in size, lies at the southern tip of the Gunpowder Neck. Since the late 1940s, J-Field has been the location of many ordnance open burning/open detonation activities. In addition, the U.S. Army used J-Field for disposal of solvents, chemical warfare agents and chemical-filled munitions, and related wastes by open-pit burning. To a lesser extent the U.S. Army used the area for testing of munitions and chemical agents during the Korean and Vietnam conflicts. Remedial investigations at J-Field determined that the soils are contaminated with many inorganic compounds (mostly metals such as lead and arsenic) and organic compounds.

The U.S. Army Aberdeen Test Center and the U.S. Army Edgewood Chemical Biological Center (ECBC), formerly the U.S. Army Edgewood Research, Development, and Engineering Center, conduct the majority of the testing and training activities still underway at the Edgewood Area test ranges. ATC conducts outdoor testing and training activities on several Edgewood Area ranges (i.e., C-Field, H-Field, I-Field, J-Field, and M-Field) and ECBC conducts its outdoor testing at M-Field.

Table 3 summarizes the test ranges within the Edgewood Area which contain significant amounts of potential contaminants of concern. Appendix A provides a description of the Edgewood Area test ranges containing IRP sites with potential contaminants of concern.

Table 3
Edgewood Area Test Ranges Containing
Significant Amounts of Potential Contaminants of Concern

Test Range	Chemical Agent	Unexploded Ordnance	White Phosphorus	Explosives	Solvents	Poly-chlorinated Biphenyls	Metals
C-Field		✓		✓	✓		✓
D-Field	✓	✓		✓	✓		✓

Table 3
Edgewood Area Test Ranges Containing
Significant Amounts of Potential Contaminants of Concern

Test Range	Chemical Agent	Unexploded Ordnance	White Phosphorus	Explosives	Solvents	Poly-Chlorinated Biphenyls	Metals
E-Field		✓		✓			
G-Field		✓			✓	✓	✓
H-Field	✓	✓		✓	✓	✓	✓
I-Field				✓			✓
J-Field	✓	✓	✓	✓	✓	✓	✓
K-Field				✓			✓
L-Field				✓	✓		✓
M-Field	✓	✓		✓	✓	✓	✓
N-Field		✓		✓			✓
New O-Field	✓	✓	✓	✓	✓		✓

1.2 Need for the Proposed Action

Ordnance firing, other test activities, residual white phosphorus in subsurface soils, or lightning strikes occasionally cause accidental fires in the test range areas at APG. Because of APG's long history of weapons testing and disposal practices, there is concern that contaminants have accumulated in the surface soils and vegetation at these locations and could be transported in the smoke plumes produced by such fires, posing a health risk to exposed individuals on and off the installation. Sources of contamination include residues in and on vegetation and surface soils from previous weapons testing and disposal of hazardous materials; chemicals released from burning uncontaminated vegetation; and detonation or rupture of UXO.

Due to the public's expressed concern about the health implications of emissions from the range fires, APG plans to conduct air sampling of range fire emissions to assess the potential impact and determine if additional preventive or mitigation measures during future occurrences of range fires are necessary. APG proposes the use of prescribed burns, also known as controlled or planned burns, at selected test ranges to generate measurable air emissions adequate for assessing whether potential risks to human health exist during range fires.

1.3 Purpose of the Proposed Action

The proposed action is to conduct a limited number of prescribed burns at test ranges in both the Aberdeen and Edgewood Areas of APG. The purpose of the prescribed burns is twofold: (1) to generate air emissions that are quantifiable and as much as possible representative of fires occurring in contaminated APG test ranges to allow assessment of potential human health impacts; and (2) to perform the prescribed burn under specific meteorological conditions which minimize the impacts on civilian or military communities. Conducting prescribed burns gives sampling personnel the opportunity to select ranges with the most potential contamination

(providing a worst-case sampling event), collect air samples under prearranged meteorological conditions, and place sample equipment downwind of the fire and in the plume. Prescribed burns also eliminate opportunities for injury to or potential exposure of sampling personnel from UXO detonations or toxic substances in the air emissions. APG proposes selection of four test ranges for the prescribed burns: two test ranges at the Aberdeen Area and two at the Edgewood Area. One test range burn in each area will occur in an upland grass and shrub environment and one test range burn in each area will occur in a wetland and marsh environment. The data from the sampling of these prescribed burns will be evaluated to determine if additional prescribed burns are needed to obtain more data. The selection of specific ranges for performing the prescribed burns will be in consultation with APG personnel and public stakeholder groups.

SECTION 2.0

DESCRIPTION OF THE PROPOSED ACTION

2.1 General

A prescribed burn involves the controlled application of fire to live vegetation or dead organic material (combustible fuels) under specified environmental conditions which confine the fire to a predetermined area. This section briefly describes the various tasks proposed for conducting prescribed burns at test ranges in the Aberdeen and Edgewood Areas of APG. All proposed activities will be performed in compliance with applicable federal, state, and local regulations and in a manner that minimizes impact to the environment and civilian and military communities. The APG IRP will prepare a written burn plan for implementation of the prescribed burns at the Aberdeen and Edgewood Areas. Upon coordination by APG, EPA, the Maryland Department of the Environment (MDE), Harford County, and public stakeholder groups and given the notice to proceed, the prescribed burns will begin. The burn plan will include step-by-step procedures for managing each of the prescribed burns.

The general approach to accomplishing each prescribed burn includes the following:

- Selection of Test Ranges for Prescribed Burns
- Planning and Coordination
- Prescribed Burn Procedures
- Meteorological Conditions
- Prescribed Burn Monitoring
- Air Emissions Sampling
- Soil and Ash Sampling
- Mobilization

2.2 Methodology

The written burn plan will contain the specific details and procedures for managing the prescribed burns at APG. All prescribed burn activities at the Aberdeen and Edgewood Area test ranges will be conducted in accordance with this document and approved by the DSHE Environmental Compliance Division (ECD), DSHE Fire and Emergency Services Division, Installation Safety Division, and APG range control personnel.

2.2.1 Selection of Test Ranges for Prescribed Burns

Prescribed burns at APG are proposed at two test ranges at the Aberdeen Area and two at the Edgewood Area. One test range burn in each area will occur in an upland grass/shrub environment and one test range burn in each area will occur in a wetland/marsh environment. Based on the results of the air emissions monitoring conducted at the four test range areas, more additional prescribed burns may be conducted to assess potential impacts to human health. The selection of specific ranges for performing the prescribed burns will be in consultation with APG personnel and public stakeholder groups. Numerous criteria will be examined for determining which test ranges are acceptable for conducting the four prescribed burns in the context of implementing air monitoring of worst case range fire emissions. Upon selection, the burn plan for

implementation of prescribed burns at these chosen Aberdeen and Edgewood Area test ranges will be prepared.

Criteria for selection of the APG test range(s) include:

- High potential for contamination, i.e., worst case air emissions
- Away from military and civilian populated areas (e.g., 10 mile buffer zone)
- Good upwind and downwind sampling locations, i.e., established roads if possible
- Adequate upland grasses/shrubs and marsh/wetland vegetation to burn
- Large enough area for sufficient burn time
- Low mowing frequency and limited history of range fire occurrences (i.e., none in the last 12 months)
- No impact to historical or archeological sites
- Minimal impact on sensitive ecological receptors (i.e., endangered or threatened species and critical waterfowl refuge areas)
- Accessible to fire fighting personnel

At the Aberdeen Area, the test ranges considered to have the highest potential for contamination are those used for testing involving DU and/or other types of toxic compounds. Aberdeen Area test ranges considered potential candidates for worst-case air emissions during a fire include the Transonic Range, Ford's Farm Artillery Test Range, BTD Range, the Main Front Ranges, and the Spesutie Island Ranges (Figures 2, 3, and 4). Edgewood Area test ranges considered as candidates for the worst-case air emissions are those historically used for testing chemical agent and other toxic compounds. Potential prescribed burn candidates for the Edgewood Area include D-Field, H-Field, J-Field, M-Field, and the New O-Field portion of O-Field (Figure 5). Appendix A provides a summary of the test ranges/fields at the Aberdeen and Edgewood Areas and associated IRP sites with potential contaminants of concern. The DSHE Fire and Emergency Services Division range fire records will also be reviewed to ensure that range fires have not occurred at these locations within the last 12 months.

The size of the test range will also be considered. The test range must contain a large enough area of upland grasses and shrub vegetation or marsh/wetland vegetation so that the burn duration is long enough to allow adequate collection of air contaminants for analysis. To achieve the lowest contaminant detection limits possible, prescribed burns at the APG test ranges need to burn for a sufficient length of time. The prescribed burns will be limited to no more than four hours, but will last at least two hours if possible.

The frequency of test range mowing activities will be reviewed as part of the selection process. A low frequency of mowing (i.e., once per year) at a test range permits more biomass to accumulate and increases plant exposure to soil contaminants. Finally, prior to final approval of a test range for prescribed burning, aerial photographs will be reviewed and site visits performed to ensure the test range fully meets the requirements of a worst case source of air emissions during a fire.

2.2.2 Planning and Coordination

The key to a safe and effective prescribed burn is planning. Before fire is applied to the land, a rigorous planning process will be undertaken to determine the acceptable conditions under which a prescribed burn will be conducted. The conditions will be documented in a burn plan

which includes expected fire intensity, wind speed and direction, and dryness of vegetation; along with a plan describing how the fire will be ignited and contained. If weather conditions are unacceptable on the day of a planned burn, they are considered "out of prescription," and the burn will be postponed. Contents of the written burn plan will include:

- Purpose and objectives of the IRP prescribed burns.

- Map of the prescribed burn areas to show the boundaries of each planned burn, topography, control lines, anticipated direction of the smoke plume, smoke-sensitive areas, holding details, and other essential information.

- Equipment and personnel needed onsite and on standby.

- Fire prescription: Specified minimum requirements for the atmospheric capacity for smoke dispersal such as minimum surface and upper level windspeeds, desired wind direction, minimum height, and dispersion index. The amount of fuel, weather conditions and desired intensity of the burn will determine the firing technique and ignition pattern to use.

- Season and time of day for each of the prescribed burns (e.g., burns during ozone season will be limited to days of good air quality).

- Firing plan which includes the firing technique, ignition pattern, planned ignition time, manpower and equipment needed; planned distribution for setting, holding, and patrolling the fire; and managing the smoke.

- Preparation work to describe the fire lines to be constructed, special features to be protected, and the installation of air monitoring and meteorological equipment.

- Notification of Intent to Burn which lists the names and telephone numbers of all local and State fire protection officers and APG officials who should be contacted prior to the burn.

- Applicable regulations, plans, or policies that might apply and compliance with requirements that the prescribed fires are conducted in a prudent and professional manner.

- Safety and Contingency Plans to identify and minimize potential fire escapes and specify actions to take should such occur. Other contingencies include actions that will be taken during a fire to reduce the exposure of people if smoke intrusions occur.

- Control and mop-up procedures to specify necessary safeguards to confine the fire to the prescribed area and correct procedures for putting out the fire.

Prescribed burns at APG will be conducted by trained fire management professionals to ensure the safety of the burn crew, air sampling personnel, and potentially exposed populations on and off the installation.

Planning for the prescribed burns will also include coordination with APG organizations, regulatory agencies, and the public. Coordination with the DSHE Fire and Emergency Services

Division, the APG Public Affairs Office (PAO), ATC Range Control Branch, ARL, ECBC, APG Directorate of Plans, Training, and Mobilization, the Harford County Health Department, the DSHE ECD, Emergency Operations Centers of surrounding counties, and potential impacted communities will be performed. The DSHE ECD will inform the Harford County Health Department and obtain any required permits. The APG PAO will be informed so they can answer questions from the public. The meteorological conditions for conducting each prescribed burn and operational support will be coordinated with the DSHE Fire and Emergency Services Division. The ATC Range Control Branch, ECBC, and ARL will provide information on potential hazards at the test ranges and grant access to the ranges for activities associated with the prescribed burns project.

2.2.3 Prescribed Burn Procedures

Prescribed burning will be conducted within the limits of the approved burn plan and prescription that describes both the acceptable range of weather, moisture, fuel, and fire behavior parameters, and the ignition method to achieve the desired effects.

All prescribed burns will occur during daylight hours. Prescribed burns may also be performed on the weekend. Burning conditions are usually better during the day than at night because wind speed is higher and wind direction is steadier. Ignition of the fires is anticipated to occur after sunshine has evaporated any early morning dew and end prior to night time. The designated portion of the test range will be allowed to burn for at least two hours if possible. The fire will be extinguished as soon as possible after the sampling is completed, i.e., maximum of four hours sampling.

Prior to the prescribed burn, either natural or man-made fire breaks around the designated portion of the test range to be burned will be employed to reduce the chance that a fire becomes uncontrolled. All continuous fuels such as leaves, grass, logs, and trees whose canopies overlap the burn area will be removed to prevent the fire from traveling onto adjacent land. Where possible, a location will be chosen in which natural fire breaks, such as streams or a recently burned area, can stop the spread of fire. Where natural fire breaks do not exist or need to be augmented, man-made fire breaks such as a 10-foot wide road or mowed, or plowed line will be used. The mowed area will be no taller than four inches in height where possible. Water or fire retardant foam may also be sprayed down to create a firebreak. During the burn, the burn crewmembers using specialized fire tools, backpack water sprayers, and water-carrying pump trucks may patrol the fire breaks upwind to ensure the fire does not cross the fire break. Additional fire suppression support will involve the use of helicopters equipped with fire buckets to patrol the prescribed burn area.

Preceding ignition, the DSHE Fire and Emergency Services Division personnel will discuss their assignments, planned ignition pattern, expected fire behavior, potential hazards, location of emergency equipment and vehicles, escape routes, and contingency plans. Hand-held portable radios connected to the APG radio network shall serve as a means of instant communication among all the essential personnel during the prescribed burn activities. In addition, all prescribe burn personnel shall don the proper personal protective equipment and maintain the necessary safety equipment in a continual state of readiness to respond to emergency incidents.

Various firing techniques can be used to accomplish a prescribed burn. The DSHE Chief, Fire and Emergency Services Division will chose the technique which best correlates with burning objectives, fuels, topography, and weather factors to prevent damage. The amount of fuel, weather conditions, and desired intensity of the burn will determine the firing technique and ignition pattern to use.

The firing process starts by using a drip torch containing a diesel and gasoline mixture. The wind speed and direction will be closely monitored throughout the prescribed burn. The DSHE Fire and Emergency Services Division personnel will stay alert to any changes in the fire's behavior, smoke dispersal or the weather. If a spot fire occurs, several members of the holding crew may leave the line to attempt to suppress it with fire council rakes, shovels, beaters, and a backpack water pump. If unsuccessful, a standby pumper unit or helicopter support will be called for to put out the uncontrolled fire.

Immediately following sampling of the prescribed burn, the DSHE Fire and Emergency Services Division will use hand tools and water backpack spray pumps or helicopters equipped with fire buckets to secure the burned area and reduce residual smoke by extinguishing all burning or smoldering material. The DSHE Fire and Emergency Services Division will work in coordination with the ATC Range Control Branch, ECBC, ARL, the APG Emergency Operations Center, and the APG Directorate of Plans, Training, and Mobilization to ensure proper control and extinguishment of the prescribed burn.

2.2.4 Meteorological Conditions

Aberdeen Proving Ground will select meteorological conditions for prescribed burns that favor the least impact on civilian and military communities and critical wildlife habitats (e.g., endangered or threatened species). Wind direction is the most important weather element to consider.

Prescribed burns behave in a more predictable manner when wind speed and direction are steady. A prescribed burn of a test range for emissions sampling purposes will not be performed if the wind speed is too fast (in excess of 15 mph). Excessive windspeed will make the fire spread faster, more difficult to control, and shorten the sampling time. Class D meteorological stability conditions will be used for IRP prescribed burns at test ranges. Class D atmospheric stability is the most common day-time stability for fires in grassland areas of APG and presents the most rapid return of range fire pollutant contaminants to ground level (i.e., offering a worst case event for day-time sampling of range fire emissions).

The primary meteorological condition that will be used to minimize impacts from prescribed burns on human populations is wind direction. The wind direction with the least impact on civilian and military communities depends on the location of the range fire and whether the fire is at the Edgewood Area or Aberdeen Area. In general, north-northeast winds (blowing toward the south-south west) and west-southwest winds (blowing toward the east-northeast) appear to be the best winds for sampling at both the Edgewood and Aberdeen Areas since the smoke would have the farthest distance to travel before impacting civilian or military communities. In addition, prescribed burns will not occur if pollution alerts (e.g., ozone action days) or stagnant conditions exist in the area for that day.

2.2.5 Prescribed Burn Monitoring

Monitoring techniques during each prescribed burn shall include visual monitoring of the direction of the fire and smoke plume and continued tracking of meteorological conditions during the fire. These techniques will assess if favorable meteorological conditions continue to exist for the duration of each prescribed burn. A meteorological monitoring station will be set up in the vicinity of each prescribed burn to determine wind direction during the fire.

2.2.6 Air Emissions Sampling

Monitoring of range fire emissions during prescribed burns will involve the collection of upwind (background) and downwind air samples. Upwind air samples will be collected during each prescribed burn to measure background levels of contaminants in the ambient air. The sampling and analysis process and protocols for the air emissions sampling will conform to EPA methods or modified EPA methods when applicable. Upwind and downwind air samples will be collected and analyzed for the following parameters at each of the test ranges selected for prescribed burns: volatile organic compounds (VOCs), explosives, pesticides, PCBs, chemical agents, metals, and radiochemical parameters (i.e., gross alpha, gross beta, and gamma spectral analysis). Several strategies will be used to obtain the most representative sample possible. These include using calibrated equipment, attempting to get a worst case sample, adhering to EPA methods during sampling and analysis, locating the sampling equipment in the plume of the fire, and evaluating background air samples for contaminants. The background air samples will be taken for comparison with downwind air samples to determine if contaminants are from range fire emissions or other sources. The sampling of range fire emissions will be limited to no more than four hours.

Prior to the start of the prescribed burn, the air sampling teams will don modified level D personal protective equipment (PPE) to set up the sampling equipment upwind and downwind of the expected plume. Once the sampling devices are operating, the downwind sampling team will move upwind of the burn area, joining the upwind sampling team, to minimize exposure. Upon completion of sampling, an air sampling team will relocate back to the downwind sampling locations and demobilize the equipment. In the event the fire is still burning or smoldering at the end of the sampling, sampling personnel shall wear modified level C PPE to demobilize the sampling equipment in downwind locations.

Specific upwind and downwind air sampling locations will be determined upon selection of the test ranges to be sampled. The location of the sampling equipment will depend not only on the availability of established roads or cleared areas, but also on the fragmentation hazard clearance zones (provided by the ATC Range Control Branch Safety and Operations Office) and the meteorological conditions. Sampling activities will be performed outside of these established fragmentation zones. To the extent possible, the meteorological conditions will be considered when locating the air monitoring equipment.

Based on a recent Argonne National Laboratory (ANL) modeling study, the optimum sampling locations may not be accessible or located on an established road. The FIREPLUME modeling study concluded that Class D atmospheric stability is the most common day-time stability in the APG area and presents a worst case air emissions scenario during this timeframe that is ideal for conducting a prescribed burn in an upland grass and shrub community. Class D meteorological stability further indicates that the maximum concentrations of plume contaminants will return to ground level approximately 1,000 meters downwind of the fire. The downwind sampling location for each prescribed burn will be chosen to be as close as possible to this plume touchdown point. The distance that the fire will burn will be taken into account and added to the 1,000 meters sampling distance. For example, if the fire is anticipated to burn a distance of 1,000 meters toward the sampling location, the midpoint distance is 500 meters. This 500 meters will be added to the 1,000 meters to get a sampling

location of 1,500 meters from the location where the fire initially starts. The sampling location will be 500 meters from the end, but the "average" distance from the fire to the sampling location is 1,000 meters. Additional downwind sampling locations may be located closer to the fire (e.g., at approximately 250-500 meters) and further from the fire (e.g., at approximately 2,000 meters). If the optimum downwind sampling locations do not fall on established roads, additional APG operations support will be acquired to position the sampling equipment in the correct downwind locations.

2.2.7 Soil and Ash Sampling

Upon selection of the specific test ranges for prescribed burns, surface soil sampling will be performed to more accurately define and characterize the type and extent of contamination within each designated burn area. Laboratory analyses of the surface soil samples collected at the chosen test ranges will include VOCs, explosives, pesticides, PCBs, chemical agents, metals, and radiochemical parameters (i.e., gross alpha, gross beta, and gamma spectral analysis). Samples of the ash remaining in the test ranges after each fire is extinguished will also be collected and analyzed for the above parameters. The analytical results of the soil and ash samples will be compared to the air sample results to determine if there is any correlation.

2.2.8 Mobilization

In coordination with the DSHE Fire and Emergency Services Division, the air sampling teams will transport the calibrated sampling equipment to the designated upwind and downwind sampling locations prior to the start of the prescribed burn. Field personnel will set-up equipment on established roads or cleared areas to minimize or eliminate physical and UXO hazards if possible. Once the DSHE Chief, Fire and Emergency Services Division approves the meteorological conditions under which the prescribed burn will occur, the fire will be started and the sampling equipment will begin operation. The air sampling teams and all other nonessential personnel will move to a designated safe, upwind location until the sampling is completed and the fire extinguished.

2.3 Public Involvement

Discussions at the APG Restoration Advisory Board (RAB) meetings have encouraged public involvement in this project since its inception. The RAB is composed of representatives of local stakeholders and various citizens groups, including the citizens' group which has a Technical Assistance Grant from the EPA to monitor the cleanup activities of the APG IRP. The APG IRP also notifies citizens of each RAB meeting and the meeting agenda by newspaper announcements and mailed notification cards. The RAB also formed a special subcommittee to discuss and approve the proposed range fire emissions sampling plans and activities. In addition, a Range Fire Advisory Committee comprised of representatives from multiple counties has met with APG to provide input on community concerns regarding air emissions from APG test range fires.

The APG IRP will publish a Public Notice outlining the details of this Environmental Assessment in accordance with the provisions of the NEPA (40 CFR 1500-1508). This notice will afford the public the opportunity to submit written comments on the proposed action to the APG Commander for a period of 30 days after publication of the notice. The APG IRP will also schedule a public meeting to address any concerns citizens may have regarding this Environmental Assessment.

SECTION 3

ALTERNATIVES CONSIDERED

3.1 General

This section discusses the reasonable alternatives for the proposed action. These alternatives include the No Action alternative, which is required to be an alternative by NEPA, and three additional alternatives in support of a range fire emissions monitoring study: the preferred alternative which is prescribed burning of selected test ranges in the Aberdeen and Edgewood Areas of APG, laboratory-controlled burns, and accidental burns of APG test ranges.

3.2 No Action

In the No Action alternative, accidental burns of potentially contaminated Aberdeen and Edgewood Area test ranges at APG would continue to occur with no planned monitoring of the range fire emissions. The only advantage to this alternative is the cost savings from not implementing a range fire emissions monitoring study. With this alternative, atmospheric dispersion computer modeling would be the only means of evaluating the potential human health impacts from exposure to contaminants that could be dispersed by fires occurring within the APG test ranges. The 1998 FIREPLUME modeling study performed by ANL used data from previous APG studies of soil contamination in conjunction with historical data on the size and frequency of range fires at APG to conclude that the potential for significant human health risks is low. However, with the No Action alternative, the actual health implications from emissions generated by fires at potentially contaminated APG test ranges is not supported by actual ambient air sampling data.

3.3 Laboratory-Controlled Burn

This alternative involves the simulated burning of test range soil and upland grass/shrub and marsh/wetland vegetation in a laboratory to develop emissions dispersion data for various APG potential contaminants of concern. A laboratory-controlled burn provides an estimate of average emissions during the flaming and smoldering phases of the fire. With this alternative, all of the laboratory burn emissions can be captured and channeled through a large stack where particulate matter and gases are then collected for analysis. The advantages of performing laboratory controlled burns are the savings to be realized by reducing the number of personnel involved in conducting the burn and the elimination of potential exposures of sampling and fire department personnel to detonations or toxic substances in the air emissions. Complete capture of all burn emissions also occurs with this alternative. On the downside, emissions data from a laboratory-controlled burn may not be representative of burning large areas of upland grass/shrub and marsh/wetland environments where vegetation is more varied and a wider range of combustion conditions would be experienced. In addition, a fire may occur at an APG test range containing a wider range of contaminants and the presence of UXO filled with CWM. Such an environment could not be replicated in a laboratory environment.

3.4 Prescribed Burn (Preferred Alternative)

A prescribed burn involves the controlled application of fire in accordance with an approved burn plan within at least four selected Aberdeen and Edgewood Area test ranges. This technique will generate measurable emissions supporting a timely assessment of the actual human health impacts from APG range fires. Specified environmental conditions will allow each fire to be confined to predetermined areas and at the same time produce the intensity required to attain a worst case sampling event. This alternative eliminates the potential exposure of sampling and fire fighting personnel to detonations or toxic substances in the air emissions. The preferred alternative will also be conducted when meteorological conditions favor a wind direction that reduces the potential impacts to communities on and off the installation.

3.5 Accidental Burn

An accidental burn refers to the use of unplanned, inadvertent fires occurring in the Aberdeen and Edgewood Area test ranges to assess the potential human health risks from range fire emissions. Nature (lightning) or man-made activities (testing operations) are the usual causes of accidental burns at the APG test ranges. Accidental burns usually occur at APG during the late summer and early fall months. Since 1994, the DSHE Fire and Emergency Services Division has been able to manage these burns within more established perimeters with the use of helicopters. The duration of typical range fires at APG is usually one hour and 84 percent of the range fires occurring in the last seven years have been less than five acres in size. Although the location of accidental burns are not as definable as prescribed burns, historical records of APG test range fires and knowledge of the locations of primary fuel resources at these range areas can be used to estimate where the majority of accidental burns are likely to occur. This information would be used to plan approximate air sampling locations in the event of an accidental fire.

One of the major disadvantages to using accidental burns to support the range fire emissions sampling study is that burning occurs under unfavorable weather conditions and the amount of fuel and acreage burned can not be controlled. In addition, the right test range may not be burned (i.e., to provide a worst case burn). This in turn affects the conditions under which emissions sampling can occur and the quality and nature of the samples (i.e., worst case sampling is not possible). Furthermore, meteorological conditions may create wind directions that transport range fire plumes towards residential communities. Finally, accidental burns tend to spread unpredictably and are often uncontrollable, posing a significant threat to the health and safety of personnel on site during the accidental burn (i.e., DSHE Fire and Emergency Services Division and sampling personnel).

SECTION 4

AFFECTED ENVIRONMENT

4.1 Introduction

This section provides the baseline data for those aspects of the natural and man-made environment that could be affected by the proposed action and the alternatives described in Sections 2.0 and 3.0 of this document. The baseline description focuses on the significant features present within APG and provides those involved in the decision process with the background data necessary to evaluate the effects of the proposed action and alternatives.

Most of the information presented here is extracted from documents developed by the U.S. Army and its consultants at APG. Section 7.0 of this Environment Assessment lists the reference documents.

4.2 Topography, Soils, and Geology

The proposed APG test ranges for prescribed burns lie within the Atlantic Coastal Plain Physiographic Province. The province is low lying with gently rolling to flat terrain. The overall slope of the terrain is toward the Chesapeake Bay. Elevations within the Aberdeen Area and Gunpowder Neck portion of the Edgewood Area of APG range from sea level to approximately 60 feet above mean sea level. The majority of the APG test ranges contain one or all of the following features: extensive forests, wetlands, fields, and shoreline.

In general APG soils consist of unconsolidated sand, silt, and clay of the Coastal Plain. Soils at APG fall into 21 series: Beltsville, Chicone, Codorus, Corsica, Elkton, Fallsington, Hambrook, Indiantown, Kentuck, Klej, Lenape, Longmarsh, Manahawkin, Mattapex, Nassawango, Othello, Pone, Puckum, Romney, Woodstown, and Zekiah (USDA, 1998).

The geology of the APG test ranges and surrounding areas is characterized by bands of Coastal Plain sediments that parallel the Fall Line, or geologic boundary, that runs northwest of APG. The Fall Line represents the boundary between the older crystalline rocks of the Piedmont Plateau and the younger sediments of the Coastal Plain. These sediments, which date to the Cretaceous and Quaternary periods, consist of sedimentary beds of clay, silt, sand, and scattered gravel lenses. The beds and lenses dip to the southeast at an angle of less than one degree; thickness of the beds varies. Crystalline rocks underlying the Coastal Plain sediments are Precambrian to lower Paleozoic in age and consist of schist, gneiss, gabbro, granite, marble, and quartzite.

The following stratigraphic units, starting from oldest to youngest, divide the Coastal Plain sediments underlying the APG test ranges: the Potomac Group of Early Cretaceous age, the Talbot Formation, and recent alluvium. The Potomac Group sediments are the continental deposits of rivers, lakes, and swamp floodplains. The Potomac Group is subdivided into the Patuxent, Arundel, and Patapsco Formations. The Talbot Formation of Pleistocene age consists of a series of gravel, sand, and silt river terraces occurring between 10 and 35 feet above mean sea

level. Erosion has stripped away most of the Talbot Formation deposits, and what is left is primarily silty sands. Alluvial deposits consist of silts and clays and occur adjacent to and within drainage ways and topographic lows.

4.3 Water Resources

4.3.1 Groundwater

In the region of APG, the principal water-bearing formation in the Coastal Plain is the Patuxent Formation, which is an important water-bearing formation for the Baltimore area. The Patapsco Formation also contains beds of sand and gravel that yield large quantities of water but is often in direct hydrologic contact with the Chesapeake Bay making brackish water intrusion a potential problem. The Arundel clay is considered to be a confining layer, but it can yield small quantities of water for domestic supplies. Clear differentiation of these Potomac Group formations in Harford County is reportedly difficult. The Pleistocene age deposits can yield significant quantities of water where the sand and gravel beds are thick. The Potomac Group and the Pleistocene age formations all provide, or have provided, water for use at APG.

Groundwater wells on APG have been used as a secondary source of supply water when facility needs could not be satisfied by surface water supplies. In 1984, APG discontinued all on-post consumptive uses of groundwater when VOC contamination occurred in their six Edgewood Area wells. Two more recently installed groundwater supply wells, located in the Edgewood Area (H-Field test range and Westwood Study Area) are presently used only to produce water for vehicle washing, well drilling, and equipment decontamination conducted under the APG IRP.

Off-post public water supply well fields exist near both the Aberdeen and Edgewood Area installation boundaries. Ten City of Aberdeen and eight Perryman Well Field (Harford County) wells lie within three miles of the Aberdeen Area boundary. The City of Aberdeen wells lie approximately two miles northeast of Aberdeen Area Test Ranges 8 (Explosive Effects Range) and 9 (Optimum Caliber Range) and 1.3 miles east of the Optimum Caliber Ranges 1-6. Four of the nine Perryman wells lie along the Aberdeen Area boundary, approximately 1.25 miles northwest of the Optimum Caliber Ranges and one mile northwest of the Fire Training Area. In the Edgewood Area, five Joppatowne Well Field (Harford County) wells and four Trimble Road Well Field (Harford County) wells are within one mile of the installation boundary. Currently, these well fields are inactive. The nearest Edgewood Area test ranges in relation to the Joppatowne and Trimble Road well fields are C-Field and F-Field at a distance of three miles away.

4.3.2 Surface Water

Regional surficial drainage in Harford County is from the Piedmont uplands of the north, flowing toward the east into the Chesapeake Bay. Surface drainage at APG flows toward the Gunpowder and Bush Rivers or to creeks that discharge to these bodies, which ultimately drain into the Chesapeake Bay. The surface waters at APG consist of rivers, estuarine and freshwater creeks, estuarine and freshwater marshes, freshwater ponds, and ephemeral ponds. Surface waters on APG tend to be shallow and sluggish, with tidal estuaries forming the mouths of the waterways, and marshes bordering their lengths.

Three major bodies of water surround the Aberdeen Area; the Chesapeake Bay to the east,

the Bush River to the west, and Swan Creek to the north (Figures 2, 3, and 4). The major drainage within the Aberdeen Area is the Romney Creek watershed. Nearly all of the northern, southern, and western portions of the Aberdeen Area drain into Romney Creek. The eastern portion of the Aberdeen Area drains into Mosquito, Woodrest, or Delph Creeks. The southern tip drains into either Cod or Abbey Creeks. Three large bodies of water border the Gunpowder Neck portion of the Edgewood Area: the Chesapeake Bay to the south, the Bush River to the east, and the Gunpowder River to the west (Figure 5). There are several drainage pathways in the Gunpowder Neck, all of which eventually drain to the west into the Gunpowder River (Wright Creek, Swaderick Creek, and Watson Creek) or to the east into the Bush River (Coopers Creek and Boones Creek).

Aberdeen Proving Ground operates two water treatment plants: the Chapel Hill plant supplying water to the Aberdeen Area and the Van Bibber plant supplying water to the Edgewood Area. Both plants obtain water from off-post surface water sources, Deer Creek at Chapel Hill and Winters Run at Van Bibber, respectively. The Chapel Hill Water Treatment Plant, located on the northern edge of the City of Aberdeen, draws surface water from a pumping station located along Deer Creek ten miles north of the Aberdeen Area of APG. The treatment plant has a capacity of 4.2 million gallons per day. The Van Bibber Water Treatment Plant, located approximately 5.5 miles northeast of the Edgewood Area of APG, has been the Edgewood Area's primary source of potable water since 1918. The treatment plant has a capacity of 4.0 million gallons per day.

4.4 Ecological Resources

The ecology within APG is based on a region that contains extensive woodlands, fields, wetlands, and shoreline bordering the Chesapeake Bay. Ecosystems within this region include forest types in different successional stages, fields and disturbed areas, fresh and brackish water marshes, and aquatic systems. Although substantial areas of the installation have been affected by past operations, APG currently supports a diverse assemblage of wildlife (e.g., more than 40 species of reptiles and amphibians, nearly 250 species of birds, and more than 40 species of mammals). APG also supports the largest concentration of bald eagles in the northern Chesapeake Bay area. The waters on APG provide high-quality habitat that support about 50 species of fish. In addition, APG waters provide important nursery areas for several commercially and recreationally important fish species and are also heavily used by waterfowl, colonial waterbirds, raptors, and other wildlife.

4.4.1 Wildlife Habitat

The availability of a wide variety of habitats on APG has contributed to the presence of an abundant and diverse wildlife population. With 72,500 acres, and limited development, APG has extremely large wetland and upland habitat areas. The plant communities and the availability of food, shelter, water, and nesting habitats largely determine the diversity of wildlife at APG. In general, six different community types exist at APG: lawn/landscaped, old field, marsh/wetland, shrub/scrub, transitional/mature forest, and bare soil. Of the 23,162 acres of range and test track areas in the Aberdeen Area (excluding Spesutie Island), lawn/landscaped communities comprise 1,148 acres, old field communities comprise 3,426 acres, marsh/wetland communities comprise 8,848 acres, shrub/scrub communities comprise 574 acres, transitional/mature forest communities comprise 8,154 acres, and bare soil communities comprise 389 acres. Buildings and roads

constitute the remaining acreage. Spesutie Island contains 512 acres of lawn/landscaped communities, 1 acre of old field, 1,006 acres of marsh/wetland communities, 209 acres of transitional/mature forest, and 1 acre of bare soil. The test ranges in the Edgewood Area of APG are comprised of the following communities: 720 acres of old field, 2,343 acres of marsh/wetland, 694 acres of shrub/scrub, 2,423 acres of transitional/mature forests, and 120 acres of bare soil.

The portions of APG test ranges selected for the proposed action will contain only wildlife habitats indicative of upland grass, shrub/scrub, and marsh/wetland communities. APG old fields or upland grass and shrub/scrub are an early stage of plant community succession and tend to have large plant diversity and an open nutrient cycle. The high grasses typical of the old field habitat provide cover and food for small mammals. Several mammals, both large and small, including the white-tailed deer and the meadow vole, use grasses for bedding and nest material. Red and gray foxes often build their dens in soft banks of streams near old fields. A variety of small mammals, voles, shrews, mice, rabbit, and weasels also utilize old fields. Several grassland bird species have been observed in the old field habitats of APG, including two sensitive species. Grasshopper sparrows (sensitive), field sparrows, and meadowlarks (sensitive) are common during avian breeding season. Old fields are popular hunting grounds for a variety of raptors (e.g., American kestrels, red-tailed hawks, barred owls, etc.) and amphibians and reptiles frequent the grasses. Large areas of upland grass and shrub/scrub habitat types occur in the vicinity of Phillips Airfield, Perryman, Old Bombing Field, Chillbury Point, Ford's Farm Artillery Test Range, 9,600 Yard Impact Area, BTD Range, Light Armor Range, the Trench Warfare Range, and the Main Front Ranges in the Aberdeen Area. In the Edgewood Area, only H-Field and M-Field contain large areas of these habitats.

The marsh/wetland community also hosts a large diversity of wildlife species. Large mammals including white-tailed deer, raccoon, opossum, beaver, muskrat, and fox frequent wetlands in search of food and cover. The tidal marshes serve as feeding grounds for a variety of shorebirds, raptors, warblers, sparrows, waterfowl, and webless migrants (e.g., spotted sandpiper, northern harrier, yellow warbler and swamp sparrow, mallard and American black duck, and Virginia rail). APG established six waterfowl refuge areas in response to initiatives originating from the North American Waterfowl Management Plan because of its potential benefit to Atlantic Flyway waterfowl resources. These areas, referred to as the APG Waterfowl Sanctuary System, provide waterfowl refuge and nesting and feeding areas. Four waterfowl refuge areas exist in the Aberdeen Area (Spesutie Narrows, Woodrest Creek Bald Eagle Roosting Area, Range 7 (Suspended Target Range), and a wetland area north of the Maryland Gate) and two exist in the Edgewood Area (Watson and Swaderick Creeks). Extensive areas of emergent wetland exist on Cod Creek, Abbey Creek, Romney Creek, Delph Creek, Mosquito Creek, Woodrest Creek, Back Creek, and Dipper Creek in the Aberdeen Area test ranges and on Wright Creek, Watson Creek, Boone Creek, Coopers Creek, Leges Point, Fords Point, Robins Point, and Ricketts Point on the Edgewood Area test ranges.

Breeding season for neotropical bird migrants, including grassland species, lasts from April through August, but the majority of breeding activity occurs between early May and mid-July.

The structure and composition of the upland grass/shrub and marsh/wetland communities with the Aberdeen and Edgewood Area test ranges provide significant protective cover and

abundant food resources. The quality of wildlife habitat in these communities is expected to be good.

4.4.2 Vegetation

The vegetation within the selected APG test ranges for the proposed action will be indicative of either upland grass/shrub or marsh/wetland communities. APG will not conduct the proposed action within lawn/landscaped, forest, or bare soil communities in the APG test ranges.

Herbaceous plants and short grasses characterize infrequently mowed areas and the upland grass/shrub community. Common herbaceous species include Queen Anne's Lace, Indian Hemp, common milkweed, butterfly weed, ragweed, New York aster, yellow thistle, sweet goldenrod, and slender vetch. Woody species such as blackberry, honeysuckle, and grape often invade these areas. Grasses and forbs dominating this community grow to 1 to 3 feet in height.

Emergent wetlands, classified as tidal, estuarine, or nontidal, are the most abundant wetland type at APG. Emergent wetlands are dominated by persistent herbaceous vegetation; most are marshes dominated by aggressive species such as cattails and common reed. Other species common in emergent wetlands include soft rush, pickerelweed, sedges, bulrush, nuphar, switchgrass, common boneset, spikerush, wool-grass, asters, swamp milkweed, and stiff marsh bedstraw (ANL, 1997).

Table 4 provides information on the estimated percentage of upland grass/shrub versus marsh/wetland vegetation types for the Aberdeen and Edgewood Area test ranges.

4.4.3 Threatened and Endangered Species

One Federally-listed species and eight State-listed species are known to inhabit APG. The bald eagle is the only identified Federally threatened and state endangered species at APG. Each of the APG test range locations for the proposed action were reviewed for impacts to bald eagle habitat (Table 4). Habitat considerations included nesting, roosting, and foraging areas.

The number of bald eagle nesting sites is dynamic at APG, but there are currently 15 active sites in the test range portion of the Aberdeen Area and four active sites in the Gunpowder Neck portion of the Edgewood Area. Figures 2, 3, and 4 depict the approximate vicinity of the bald eagle nests in the Aberdeen Area. Figure 5 shows the approximate vicinity of the Gunpowder Neck nest sites. Peak nesting season for bald eagles extends from December 15th through May 15th. Eagle roosting sites are preferred areas where non-nesting eagles congregate at nightfall to roost. Presently, only four communal bald eagle roosting areas have been identified at APG; all of them exist in the Aberdeen Area (Figures 2, 3, and 4). During nesting season and at all known roosting areas, a 500-meter protection zone has been established by APG to prevent impacts. Prime foraging habitat for bald eagles can be described as wooded shorelines of water bodies with abundant fish populations. Eagles forage

Table 4
Vegetation Types and Threatened/Endangered Species
For the Aberdeen and Edgewood Area Test Ranges

Test Range	Vegetation Type* (%)		Threatened/Endangered Species	
	Upland Grass/ Shrub	Marsh/ Wetland	Flora	Fauna
Aberdeen Area				
New Bombing Field	15	75		Bald Eagle Nest Site (FT,SE)
Old Bombing Field	75	5		
Chillbury Point	95	5		
Poverty Island Fragmentation Test Area	25	25		Bald Eagle Roost Area (FT,SE)
12,500 Yard Impact Area	50	10		
Locust Point Impact Area	10	5		
Abbey Point	70	15	*Iris prismatica*, Headwaters of Abbey Creek (SE)	
16,000 Yard Impact Area	60	40		Bald Eagle Nest Site 1,200' to the northwest (FT,SE)
Brier Point Impact Area	0	80		
Romney Creek Range	10	80		
Ford's Farm Artillery Test Range	90	10		2 Bald Eagle Nest Sites & 1 Roost Area (FT,SE)
9,600 Yard Impact Area	95	2		Bald Eagle Nest Sites 0.85 mi. to the south and & 2,200' to the east (FT,SE)
Small Arms Range	5	65	*Hottonia inflata* (SE)	
Light Rifle Ranges	60	10		
Michaelsville Range Area	0	20		
Transonic Range	10	80		
M Range	95	5		
9,500 Yard Impact Area	30	20		
7,600 Yard Impact Area	5	90	*Iris prismatica* (SE)	Bald Eagle Nest Site 1,500' to the south (FT,SE)
BTD Range	95	5		
Recoiless Rifle Ranges A & B	95	5		
Range 8 (Explosive Effects Range)	5	20		Bald Eagle Nest Site (FT,SE)
Optimum Caliber Ranges 1-6 and 9	60	0	*Lysimachia hybrida*, 2,600' to the west (SE)	
Range 7 (Suspended Target Range)	0	5		
Trench Warfare Range	75	5		
Main Front Ranges B-1 through B-4	80	20		2 Bald Eagle Nest Sites & 2 Roost Areas (FT,SE)
Light Armor Range	100	0		

Table 4 (Continued)
Vegetation Types and Threatened/Endangered Species
For the Aberdeen and Edgewood Area Test Ranges

Test Range	Vegetation Type* (%)		Threatened/Endangered Species	
	Upland Grass/ Shrub	Marsh/ Wetland	Flora	Fauna
Aberdeen Area (Continued)				
High Velocity Range	30	40		1 Bald Eagle Nest Site Within & 1 Nest Site 2,600' to the east (FT,SE)
Black Point Land Range Area	0	100		Bald Eagle Nest Site (FT,SE)
Water Ranges	0	20		
Mulberry Point Range	0	100		
Ballistics Range	0	30		
Air to Ground Rocket Range	0	0	*Pedicularis lanceolata* 0.5 mi. to the east (SE)	
Range 16 (Nike X Shock Tube Facility)	0	20		
Range 7	0	40		
Range 7A	0	75		
Range 12	0	0		
Range 13 (Variable Time Fuse Range)	0	2		2 Bald Eagle Nest Sites 2000' to the southwest (FT,SE)
Range 17/17A	0	80		
Edgewood Area				
C-Field	55	5		Bald Eagle Nest Site (FT,SE)
D-Field	15	15		
E-Field	5	90		
F-Field	5	35		
G-Field	40	20		
H-Field	80	10		
I-Field	30	30		Bald Eagle Nest Site (FT,SE)
J-Field	20	60	*Iris prismatica* (SE)	
K-Field	5	70		
L-Field	35	20		
M-Field	90	10		
Maxwell Point	10	90		Bald Eagle Nest Site (FT,SE)
N-Field	5	80		
O-Field	25	45		
P-Field	0	95		Bald Eagle Nest Site (FT,SE)

*Estimated vegetation type, based on ANL, 1997. Excludes forest and bare soil habitat communities.

FT=Federally Threatened SE = State Endangered

most intensely within one hour of sunrise, with a smaller peak in foraging activity during the early afternoon.

Other Federally-listed species which have not been identified at APG, but for which

suitable habitat exist at APG are the peregrine falcon, the Maryland darter, the short-nosed sturgeon, the northeastern beach tiger beetle, and the puritan tiger beetle.

Seven plant species on the State of Maryland endangered species list have been found at APG. Three of these plant species exist in areas of APG not associated with the test ranges. Of the remaining four endangered plant species, three species (*Hottonia inflata, Lysimachia hybrida,* and *Pedicularis lanceolata*) have been identified only in the Aberdeen Area. The fourth endangered plant species (*Iris prismatica*) has been found in both Aberdeen and Edgewood test range locations.

Four distinct groupings of *Hottonia inflata* exist within a wetland area east of Romney Creek Road and 2,000 feet west of the Small Arms Range in the Aberdeen Area. Two small, isolated populations of *Lysimachia hybrida* have been identified along the Perryman Test Highway, 2,600 feet west of the Optimum Caliber Ranges. This species prefers habitats with moist or saturated sandy clays and mud and exists at the Perryman location within man-made wetland pockets. *Pendicularis lanceolata* occurs at only one location on Spesutie Island, 0.5 miles west of the Air to Ground Rocket Range. This particular species exists in a wet shrub meadow west of Morgan Road and north of Range 17/17A. Abbey Point Road and Delph Creek (Aberdeen Area) and Robbins Point (Edgewood Area) contain large populations of *Iris prismatica* (Slender Blue Flag). This state endangered herbaceous species occurs in wet meadows and woods. In the Aberdeen Area, several clumps of *Iris prismatica* occur in seepage areas in the forest and in wet channels between the forest and the marsh at the headwaters of Abbey Creek, due south of Abbey Point Road. Two populations of *Iris prismatica* also exist within the 7,600 Yard Impact Area in the Delph Creek portion of the Aberdeen Area. Within the Edgewood Area test ranges, *Iris prismatica* occurs only in J-Field. One population has been found along an old canal that runs east to west, north of Robbins Point.

4.5 Meteorology, Air Quality, and Noise

Aberdeen Proving Ground lies on the western shore of the Chesapeake Bay, near the Atlantic Coast. Its climate is influenced by both continental and offshore maritime air masses. Prevailing winds are from west to northwest during the winter and bring cold, dry weather from across the Appalachian Mountains that tend to shelter the area from the severity of the cold air masses. The Chesapeake Bay and Atlantic Ocean also tend to moderate winter weather. In the summer, winds are primarily from the south, bringing warm, moist air off the Chesapeake Bay, contributing to high levels of humidity. The annual average windspeed is approximately 10 miles per hour (mph). Occasionally, during severe thunderstorms, hurricanes, or intense winter storms, the sustained windspeed may reach or exceed 50 mph.

The climatic summary records from the ATC Meteorological Division have meteorological data which has been averaged for a period of over 20 years. These records are the best available long-term weather data for APG. These records show that the warmest period of the year is during July when mean daily temperatures of 86°F occur. The coolest temperatures occur during January with mean daily temperatures of 25.9°F. The average annual temperature is 54.5°F and the average annual relative humidity is 73.8 percent. Precipitation occurs somewhat evenly throughout the year, with the heaviest rainfalls occurring in late summer and early fall. The annual snowfall averages 12 inches, but varies considerably from year to year.

Maryland is divided into six air quality control regions. The statewide air monitoring network measures concentrations of the six criterion pollutants so that comparisons can be made to the levels allowed by the National Ambient Air Quality Standards (NAAQS). Harford County is located in Region III which is in attainment with the NAAQS's for particulate matter, nitrogen dioxide, sulfur dioxide, lead, and carbon monoxide and nonattainment for ozone. There are two air monitoring stations, managed by the Air and Radiation Management Administration of MDE in Harford County; one is near the Aberdeen Area at Aldino and one is near the Edgwood Area at Edgewood. MDE only monitors ozone concentrations at these two monitoring stations.

Because there are no monitored data for the ambient concentrations of criteria pollutants within the APG site boundary except for ozone, ambient concentrations of the five criteria pollutants in and around APG have been estimated by performing air quality modeling based on emissions estimated for the point sources (ANL, 1997). Results of the modeling and other studies show that existing APG activities cause minor impacts on ambient concentrations of sulfur dioxide, and moderate impacts on ambient concentrations of nitrogen dioxide, carbon monoxide, particulate material, and ozone. Occasionally, test firing of ammunition at the APG test ranges or natural causes can start brush fires in target areas. On some occasions the smoke generated from range fires at APG extends some distance and causes only local nuisance and impairment of visibility impacts. The modeling also showed that releases of global warming gases (e.g., carbon dioxide), and ozone-depleting chemicals are estimated to cause negligible impacts.

The U.S. Army Test and Evaluation Command prepared an Installation Compatible Use Zone Program (ICUZ) for the entire APG in 1989. The ICUZ study identified potentially adverse effects of noise and presented facts and recommendations for land uses that would allow APG's mission to proceed while protecting local communities from the ill effects of noise. The ICUZ described three noise zones for noise sensitive land use consistent with Federal Law: Zone I - an area with noise levels acceptable for residential housing, schools, and churches (below 65 ADNL or 62 CDNL), Zone II - an area normally unacceptable unless implementation of engineered noise controls to reduce noise impacts occurred (65-75 ADNL or 62-70 CDNL), and Zone III - an area with unacceptable noise levels (above 75 ADNL or 70 CDNL). ADNL is the A-weighted Day-Night Sound Level for helicopters, small arms, and vehicles. CDNL is the C-weighted Day-Night Sound Level for artillery, armor, and demolition activity. The ambient noise levels at the APG test ranges are generated by road construction and repair; aircraft flying operations using Phillips Army Airfield and Weide Airfield; the movement of Army vehicles and civilian automobiles; and testing of weapons, munitions, and vehicles. During certain periods of the day, sounds from ordnance testing can be heard. The APG test ranges are located within the Zones II and III noise contours.

4.6 Socioeconomic Setting and Land Use

Aberdeen Proving Ground is located along the western shore of the Chesapeake Bay, 12-15 miles northeast of Baltimore, Maryland with most of the installation lying within Harford County. Major rail and road corridors run through southern Harford County, paralleling the bay, and include U.S. Interstate 95, U.S. Route 40, Maryland Route 7, the main north-south Conrail corridor, the main north-south Amtrack line. State Route 22 and U.S. Route 40 are the primary access routes to the Aberdeen Area and State Routes 24 and 755 provide direct access to the

Edgewood Area of APG. The expansion of metropolitan Baltimore has been the impetus behind recent intense residential, commercial, and industrial development in the primarily agricultural and rural setting of Harford County. Employment in the area is primarily associated with sales, service, and light industrial businesses.

The communities located in the Harford County area surrounding APG include Aberdeen, Havre de Grace, Perryman, Belcamp, Abingdon, Van Bibber, Edgewood, and Joppatowne. In Baltimore County, Chase and Bowley's Quarters communities are more than three miles from the Gunpowder Neck portion of the Edgewood Area. In addition, communities in Cecil County lie across the Susquehanna River from Harford County on the northern end of Chesapeake Bay. Kent County, located on Maryland's eastern shore directly across Chesapeake Bay from APG, is the least developed of the four counties. All of the APG test ranges are separated from these communities by a distance of at least one mile. The 1980-1990 population growth trend showed a pattern of increase in population in the towns and cities of Harford County, with most of the increase of the county population occurred along the Route 24 corridor, especially on the fringes of the towns and cities. APG has been a major employer in Harford County with a total of 12,100 employees.

According to the 1990 census, approximately 6,900 persons reside within APG, of which approximately 5,300 persons live in housing within the Aberdeen Area and 1,600 live in Edgewood Area housing. The residential areas for on-site military personal include single family housing and group barracks. In the Aberdeen Area, the majority of the family housing and group barracks are located in the northwest portion of the cantonment area, along either side of Harford Boulevard and along Maryland Boulevard. All of the Aberdeen Area test ranges are located at least one mile away from these residential areas. Family housing and group barracks in the Edgewood Area are more spatially separated across the cantonment area. The closest residential areas to the Edgewood Area test ranges are group barracks located north of Beal Road and officer single family housing and bachelor's quarters located along Austin and Parrish Roads. The Edgewood Area test ranges are at least one mile south of these two residential areas and two miles away from the remaining Edgewood Area military housing.

Land use in the northeastern portion of the Aberdeen Area is developed with offices, industries, training schools, and post housing. The Aberdeen Area test ranges lie in the relatively undeveloped northwestern and southern portions of the Aberdeen Area. Most of the land here is used primarily for ordnance firing and impact ranges, vehicular test courses and munitions storage areas. The northern portion of the Edgewood Area is developed with offices, laboratories, research centers, and training schools, as well as other buildings used for storage, manufacturing, warehousing, and other associated uses. Land use in the southern portion of the Edgewood Area is for the 15 test range fields. Under the APG IRP, investigation and remediation of portions of the Aberdeen and Edgewood Area test ranges are being performed.

There are numerous sites and amenities within APG for various types of recreational activities including: hunting, trapping, shoreline fishing and crabbing, boating, swimming, and picnicking. There are many recreational facilities for post personnel (civilian, active, and retired military personnel and families) including golf courses, boat club, boat rental, camping, a bowling alley, horse stables and riding club, swimming pools, and gymnasium and sport areas. Commercial and recreational fishing from boats is also permitted in all navigable waters (Gunpowder River, Bush River, and Chesapeake Bay) unless an area is restricted because of testing. Normally, all recreational activity within the restricted water zone of APG is prohibited from 7:30 a.m. to 5:00 p.m. on week days.

Hunting and trapping are popular activities that take place on many parts of APG. Hunting activities include seasons for deer (bow and shotgun), upland game, and waterfowl. Furbearing animals and snapping turtles are also trapped. Deer may be hunted with bow from September 15th through the second week in November and from mid December through mid January. Shotgun season for deer starts the second week in November and ends the second week in December. Hunting and trapping season for upland game extends from September 1st through March 15th. Migratory game birds and waterfowl are hunted during State seasons. Snapping turtle trapping season opens the 1st Monday of April and closes the 4th Saturday of June. Hunting and trapping is allowed at most of the Aberdeen and Edgewood Area test ranges with the exception of J-Field, M-Field, N-Field, O-Field, and P-Field in the Edgewood Area where these activities are not permitted at all. Shotgun deer hunting is allowed only from stands in the direction of designated fan-shaped fire zones. Hunting and boating activities will be restricted or halted during prescribed burns associated with the APG IRP.

4.7 Cultural Resources

The region surrounding APG has both a rich historical and archaeological heritage. Historical sites include many from early colonial settlement times. Native American occupation of the region has been verified through archaeological records. Early colonial settlement was based mostly on farming, with the Chesapeake Bay and river systems providing excellent access to the region. As of November 1997, APG located and catalogued 1,059 historic structures, 46 prehistoric archaeological sites, and 14 historic archaeological sites (ANL, 1997). APG's Cultural Resources Management Plan, dated 1996, identifies the process for locating the historic sites and contains an archaeology predictive model for potential archaeological sites throughout APG. Two historic structures (Presbury Meetinghouse and the Gunpowder Meetinghouse) are currently listed on the National Register of Historic Places (NRHP), and numerous properties on APG, such as Quiet Lodge, Pooles Island Lighthouse, and Plumb Point Historic District, have been recommended as eligible for the NRHP. APG test ranges have low potential for prehistoric and historic archaeological sites, and all test ranges have been subject to past disturbance from testing activities.

Other cultural resources at APG include visual or scenic areas viewable from both the Chesapeake Bay and land vantage points. The tidal plain that APG occupies features mildly rolling terrain that slopes toward the Chesapeake Bay. The irregular shorelines on APG offer a variety of views of both the Chesapeake Bay and other landforms. Some of the shorelines are open; others are wooded. Some stretches of shore are elevated; others are at sea level. Visual resources in the vicinity of the test ranges include expansive views between woods and across low marsh areas to the open waters of the creeks, rivers, and bay. The APG test ranges are located well within restricted areas of APG and can only be viewed from the roadway or adjacent buildings by APG personnel working in those areas. In addition, APG test ranges adjacent to the Chesapeake Bay, Bush River and Gunpowder River shorelines can be viewed from these water bodies. Figures 2 through 5 depict the Aberdeen and Edgewood Area test ranges adjacent to these shorelines.

4.8 Environmental Justice

In the areas surrounding APG there are minority and low-income populations. Activities on APG have the potential to impact these populations as well as other demographic groups. Since there is a diversity of socioeconomic groups living in the vicinity of both the Aberdeen and Edgewood Areas

of APG, the impact of the proposed action would not be disproportionately higher for any populated areas including minority and low income populations. The proposed action would involve the controlled burning of at least four potentially contaminated test ranges at APG in support of a study to conduct air sampling of range fire emissions. This study will benefit all populations near the boundary area including minority and low-income populations since the results will be used to assess the potential impact to human health from range fire emissions. The results of the air sampling study will determine if preventive or mitigation measures during future test range fires are necessary, resulting in a beneficial, long-term environmental impact for all populations surrounding APG.

SECTION 5.0

ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND THE ALTERNATIVES

5.1 Introduction

This section provides an assessment of the environmental impacts of the proposed and alternative actions discussed in Section 3.0 upon the affected environment described in Section 4.0. Potential impacts during the proposed action and for the alternatives considered are distinguished as either adverse or beneficial and short-term or long-term. Since prescribed burns at the selected APG test ranges will not be conducted during the same time period, an evaluation of the cumulative impacts of the proposed action on the environment will not be performed. Table 5 summarizes the impacts on natural and man-made environments as a result of the four considered alternatives.

Upon selection of the specific test ranges for the proposed action, initial decisions made on the significance of the proposed action on the environment at these ranges may need to be modified and documented. Thus, additional NEPA documentation identifying further environmental consequences will be prepared as warranted. Such documentation could include a Record of Environmental Consideration (REC) tiered to this Environmental Assessment, a supplement to this Environmental Assessment, or some other type of documentation. In addition, documentation to satisfy the requirements of the Clean Air Act Conformity Rule will also be required.

5.2 No Action

The No Action alternative would allow accidental fires at APG test ranges to continue with no planned monitoring of the range fire emissions. With this alternative, only computer modeling of the atmospheric dispersion of contaminants released during range fires would provide information on the estimated potential for human health risks from these emissions.

Continued unplanned accidental fires at APG test ranges with no planned emissions air monitoring would not gather actual air quality information to determine impacts. Although accidental test range fires are currently managed by APG from existing roads or by helicopter, the primary environmental impacts from these fires could be potential short-term threats to air quality and human health and safety. However, data would not be available to determine these short-term impacts. Range fire smoke consists of small particles of ash, partly consumed fuel and liquid droplets. Other combustion products include gases such as carbon monoxide, carbon dioxide, hydrocarbons, and small quantities of nitrogen oxides. Smoke generated from fires at range areas with potentially contaminated soil and vegetation may also contain heavy metals, VOCs, pesticides, and radiologicals. At some APG test ranges, UXO containing CWM may also be present with the potential to detonate or rupture during fires.

Table 5
Impacts on Natural and Man-Made
Environments As A Result of the Four Considered Alternatives

Impacts On:	Proposed Alternatives			
	No Action	**Laboratory-Controlled Burn**	**Prescribed Burn (Preferred Alternative)**	**Accidental Burn**
Soils	ST	N	ST	ST
Groundwater	N	N	N	N
Surface Water	ST	N	N	ST
Wildlife Habitat	ST	N	ST	ST
Waterfowl Refuge Areas	ST	N	N	ST
Vegetation	ST	N	ST	ST
Endangered/Threatened Species	ST	N	N	ST
Air	ST	N	ST	ST
Noise	N	N	N	N
Socioeconomic	N	N	N	N
On-Post Residents	ST	N	N/ST	ST
Off-Post Residents	ST	N	N/ST	ST
APG Employees	ST	N	N/ST	ST
Site Workers	ST	N	N/ST	ST
Cultural	ST	N	ST	ST
Historical	TBD	N	TBD	TBD
Archeological	TBD	N	TBD	TBD
Hunting	N	N	N	N

N = No
ST = Short-term impact during range fire depending on severity of the fire. Shortly after the fire no further impacts will result.
N/ST = Wind direction will be chosen to minimize the impacts from prescribed burns.
TBD = To be determined.

Under limited management, inadvertent test range fires still create intense or extended periods of smoke, that during unfavorable meteorological conditions, can transport pollutants unavoidably towards human populations on and off the installation. The Agency for Toxic Substances and Disease Registry (ATSDR) concluded in their 1993 Public Health Assessment of the Edgewood Area of APG that an air pathway route for contaminant migration would create only incidental, short-term exposure. Furthermore, ATSDR did not identify any past or current exposures of people to hazardous substances in the environment at APG that could result in illness or disease, including cancer. The 1998 ANL range fire emissions modeling study also evaluated atmospheric dispersion of contaminants and predicted ground-level concentrations resulting from release of hazardous materials from an APG test grassland range fire. The results of this modeling effort suggest that the risk of adverse health effects from range fires at APG is extremely small. The ANL study also indicated that the best estimate of the actual exposure levels would be several orders of magnitude below those presented in the study due to conservative assumptions. However, these are projected rather than actual measured human health risks. With the No Action alternative, the extent of release of air contaminants and impact on the environment and human health can not be determined without actual air quality data.

Accidental burns, typically of short duration at APG, have only limited potential for negative impacts to soil and surface water. Accidental range fires that occur when fuel or soil moisture conditions are extremely low may elevate temperatures long enough to ignite organic matter in the soil as well as alter the structure of soil clays, preventing regeneration of vegetation on a short-term or long-term basis. This situation is not expected to occur over large portions of an accidental burn area due to the short durations of the burns. Since APG lies in the Coastal Plain, areas of steeper topography are limited within the test ranges. Therefore, only limited surface runoff and soil erosion may occur and only in those areas where the fire removed litter layer down to the bare soil. Increased surface water runoff from these nonvegetated areas may transport disturbed soil particles, dissolved inorganic nutrients, remaining soil contaminants, and other material into adjacent streams, creeks, and rivers, but the reduction in water quality will be minimal.

Anticipated impacts upon ecosystems arising from the No Action alternative are expected to be minimal and short-term. Once the fire is over, ecosystems begin the rebuilding process. Burning typically increases biodiversity and replenishes biomass. The short-term negative impacts on wildlife are indirect and pertain to reduced food resources and cover. Since the frequency and seasonality of range fires are uncontrolled variables, other deleterious effects of accidental fires on wildlife can include destruction of nesting sites and possible killing of birds, reptiles, or mammals trapped in the fire. Severe burns that remove organic matter can impair forest and ecosystem health, resulting in loss of habitat for a longer period of time.

Accidental burns at APG test ranges could have limited negative, short-term ecological impacts to threatened and endangered species by disturbing nesting bald eagles or eliminating state-endangered plant populations. Inadvertent fires occurring in marsh/wetland portions of the APG test ranges have the greatest potential to impact bald eagle nesting and roosting areas. However, the long-term impacts from accidental burns are usually beneficial since burning of wetland environments may enhance habitats preferred by endangered and threatened species, promoting new occurrences of these populations.

The potential for impact from the project-related noise will be minimal since the APG test ranges are exposed to other noise sources, including frequent ordnance test activities, road traffic,

etc. Since historical and archaeological sites exist throughout APG a small potential exists that sites within APG test ranges will be impacted (i.e., disturbed or destroyed) during inadvertent fires.

Because the No Action alternative will not provide actual air quality information to determine impacts on the environment and human health this alternative is not considered a viable option.

5.3 Laboratory-Controlled Burn

The environmental impacts associated with simulated burns of a test range in a laboratory setting will be negligible. Any air pollutants generated during the burning of contaminated soil and vegetation will be channeled and collected for analysis. Thus, outside air quality will not be affected and the potential exposure of laboratory personnel conducting the burns to the emission pollutants is minimal. Construction of a laboratory is not required under this alternative since numerous facilities for conducting this type of activity already exist on the installation. Therefore, no impacts to water, ecological, and cultural resources from this alternative are expected.

The laboratory-controlled burn does have the following disadvantages. Emissions data collected using this alternative may not be representative of large areas of upland grass/shrub and marsh/wetland burns where vegetation is more varied and a wider range of combustion conditions would be experienced. In addition, laboratory facilities are not equipped to simulate a burn capable of detonating or rupturing a UXO containing CWM. Therefore, this alternative would not provide emissions data that could be used to perform a proper assessment of whether potential risks to human health exist during actual range fires at APG and is not recommended.

5.4 Prescribed Burn (Preferred Alternative)

The beneficial effects to the environment from prescribed burns at APG test ranges outweigh possible detrimental impacts. The environmental impacts from this alternative would be from the activities associated with the burn operations only and would be considered relatively small and short-term. In general, the long-term impacts of prescribed burns on the environment and human health will be beneficial because the objectives of the proposed action are aimed at assessing potential human health impacts. Emissions monitoring from the fire will assist in determining if future preventive or mitigation measures are warranted to reduce any potential adverse impacts to human health.

To estimate air quality impacts and actual adverse risks to APG personnel and the public from future range fires, each prescribed burn will be representative of a conservative, yet realistic consequence of a fire started by lightning, artillery firing, or other accidental means. Prescribed burns will accomplish the objective of generating the highest average concentrations for the contaminants of concern expected to occur downwind of a fire (i.e., worst case scenario). However, unlike accidental burns, an approved burn plan as discussed in Section 2.0 will be in place and complied with during the execution of the proposed action. Also, an approved Health and Safety Plan will be prepared for the proposed action, mandating stringent control of all burn activities to insure protection of the environment and human health. Proper planning and execution of a prescribed burn at any of the APG test ranges will involve the use of favorable meteorological conditions and controlling the amount of fuel and acreage burned to minimize the

potential for air migration of contaminants and smoke to populated areas. The results of ATSDR's public health assessment and ANL's dispersion modeling further predict that the risk of adverse human health effects from APG range fires is expected to be low.

Under such controlled conditions, the impacts to water resources and noise are expected to be negligible. Minor topographic disturbances may occur as a result of the creation of fire breaks around the predetermined location for each burn. However, this disturbance is expected to be minimal and short-term since every attempt will be made to establish fire breaks that follow natural breaks in the topography. When feasible, existing gravel or hard surface roads will be used for fire breaks to further reduce impact to topography and soil.

Impacts to ecology are expected to be small since controlled burns accomplish fire hazard reduction and wildlife habitat improvement. The most probable impacts on wildlife inhabiting the upland grass/shrub and marsh/wetland environments of the test ranges would be behavioral modifications resulting from disturbances associated with personnel presence, air monitoring, and vehicle and equipment movement during preparations for the prescribed burn. Temporary, limited loss of habitat associated with the destruction of upland grass/shrub and marsh/wetland vegetation may also occur, but will be beneficial to wildlife in the long-term. The intent of prescribed burns is to also reduce the buildup of flammable fuels in grassland and wetland environments, minimizing the future occurrence of fast spreading accidental fires. Prescribed burns encourage biological diversity and are vital to the propagation of native species of plants. Burns can also restore habitat to help prevent the extinction of species. Thus, overall long-term impacts on wildlife habitat at the prescribed burn areas will be minimal and the ecosystems would be expected to resume normal activities after the fires, within a generally improved habitat.

Each APG test range was reviewed for potential impacts to critical migrant and grassland bird species habitats, bald eagle and state-endangered plant habitats, and waterfowl refuge areas. Prescribed burns at upland grass/shrub and marsh/wetland portions of some of the Aberdeen and Edgewood Area test ranges have the potential to impact several of these critical habitats. Figures 2, 3, 4, and 5 portray the locations of the APG test ranges and their proximity to known active bald eagle nest sites and roosting areas on the installation. Likewise, Table 4 lists the APG test ranges and their estimated distances from the bald eagle nest sites and roost areas. The four selected APG test ranges for prescribed burns will not disturb critical wildlife habitat areas and nesting locations, and all burns will be scheduled to avoid peak breeding seasons. Consequently, the prescribed burns are expected to have little or no impact on threatened or endangered species and other critical wildlife.

The proposed action at the APG test ranges will have no adverse impacts on land use in the vicinity of the burn area. Proposed burn and air monitoring activities may disrupt operations at some of the test ranges still actively used by ARL, ATC, and ECBC for the short duration of the burn. However, prior planning and coordination of the prescribed burn activities at affected test ranges will involve these organizations, eliminating any impacts to their daily mission activities and reducing the potential for a future accidental fires to occur, bringing a halt to future mission activities. Further, the proposed action will have no adverse impact to on-post military housing and APG employees. Prescribed burns will occur only under meteorological conditions favoring transport of range fire emissions away from residential areas and office buildings at APG.

The potential exists for impacts to historical and archaeological sites as a result of the proposed prescribed burns at the APG test ranges. Proper coordination with the APG Cultural Resources Manager and the State Historic Preservation Office will be performed during the planning process for selecting the specific test ranges for the proposed action. If there are any potential impacts, they will be mitigated as required.

A prescribed burn is the preferred alternative for supporting the assessment of the potential human health impacts from range fire emissions at APG.

5.5 Accidental Burn

The environmental impacts from this alternative would be similar to the environmental impacts discussed in Section 5.2 (No Action). Inadvertent or accidental burns described in both alternatives are managed by APG to a limited extent. However, under this alternative air monitoring of the burn emissions will be performed and the data used to estimate actual human health risks. The results of this monitoring will in turn help APG determine if preventive or mitigating measures during future occurrences of range fires are warranted.

With this alternative, the potential for short-term air quality and human health and safety impacts may still remain. The meteorological conditions, amount of fuel and acreage burned continue to be uncontrolled variables which occasionally cause range fire plumes to migrate towards human populations. ATSDR's public health assessment and an atmospheric dispersion modeling study indicate that the potential for adverse human health impacts may be low, but actual measurements of fire plume emissions are still needed. However, this alternative does still pose a significant threat to the safety and health of DSHE Fire and Emergency Services Division and other personnel present during the burn for air monitoring purposes. These types of fires tend to spread unpredictably and may jeopardize the safety of on site personnel. Historically, accidental burns at APG test ranges only occur for one to two hours, burning approximately three to five acres. This type of burn does not allow collection of an adequate number of air samples of 'worst case' air emissions. Due to the short burn periods, low sample detection limits for the contaminants of concern also can not be reached. The use of this alternative will require burns to continue for an indefinite period (with no employment of additional management practices) until enough data is collected to adequately assess actual human health risks from APG range fire emissions.

For these reasons, the accidental burn alternative is not recommended.

SECTION 6.0

CONCLUSIONS

The APG IRP has identified the need to implement a technique which will generate airborne emissions comparable to or worse than emissions generated during accidental APG range fires. Data acquired from monitoring these emissions will be used to assess actual potential human health risks from all APG test range fires. This Environmental Assessment addressed a proposed technique and three alternatives for generating range fire emissions. The alternatives considered included: No Action; laboratory-controlled burn; prescribed burn (preferred alternative); and accidental burn. The environmental impacts from implementing the preferred alternative and each of the three alternatives were also considered in this Environmental Assessment.

Of the four alternatives considered, only the No Action and accidental burn alternatives have additional environmental impacts. These consist of potential short-term air quality and human health and safety impacts. Both the No Action and the accidental burn alternatives would allow inadvertent fires at APG test ranges to continue under the limited fire management practices currently employed by APG. Under the No Action alternative, only modeling of plume dispersions would provide data for assessment of human health risks from range fire emissions. The accidental burn alternative includes air monitoring of the range fire emissions to support characterization of the human health impacts. In addition to potential short-term impacts to air quality criteria from these two alternatives, potential short-term human health risks may exist when unfavorable meteorological conditions disperse unplanned range fire emissions in the direction of on- and off-post residential communities. Using the accidental burn alternative in support of the range fire emissions monitoring study also places the health and safety of DSHE Fire and Emergency Services and air sampling personnel in jeopardy due to the fire's unpredictable nature and ability to quickly spread out of control. Furthermore, the accidental burn alternative does not generate range fire emissions that are representative of a worst case fire event because only small portions of the range burn, burns last for only one to two hours, and unplanned burns may not occur in contaminated areas. Although no significant environmental impacts result from the laboratory-controlled burn alternative, the limitations of conducting a small-scale range fire in a laboratory setting prevent this alternative from providing emissions data that will fully assess actual potential human health risks from APG range fires.

The preferred alternative or proposed action, prescribed burns of Aberdeen and Edgewood Area test ranges, has a potential short-term impact to air quality during and shortly after the burn operations and negligible long-term impacts to the remaining environmental resources. The proposed alternative offers a method to safely measure worst case airborne emissions during a range fire, eliminating the potential exposure of sampling, fire management personnel, and on and off installation populations to UXO detonations/ruptures or toxic substances in the air emissions. The proposed alternative also offers the opportunity to select ranges with the most potential contaminants and the best upwind and downwind sampling points.

Because the environmental impacts from the proposed action are not significant based on this Environmental Assessment and the proposed action fully meets the objectives of the range fire emissions monitoring study, this Environmental Assessment concludes that a Finding of No Significant Impact is appropriate for the proposed action. Therefore, an Environmental Impact

Statement will not be warranted.

Selection of the four specific APG test ranges for prescribed burns will be conducted prior to finalizing the work plan for air monitoring of range fire emissions. The impacts to cultural resources, specifically historical and archeological sites, from the proposed action will be evaluated and may be considered in a REC tiered to this Environmental Assessment, a supplemental environmental assessment, or other environmental documentation as necessary.

Within 30 days of publication of the Public Notice, APG will arrange a location for a public meeting to address any community concerns for this proposed action. DSHE will chair the meeting.

SECTION 7.0

SOURCES OF INFORMATION

7.1 Agencies and Persons Consulted

The following agencies and persons have been consulted on the subject of this Environmental Assessment. Records of contacts and conversations are in the project file.

- Mr. Kenneth Stachiw, Chief, Environmental and Conservation Restoration Division, DSHE, APG, MD
- Mr. Donald Green, Environmental Conservation and Restoration Division, DSHE, APG, MD
- Mr. Bud Keesee, Environmental Conservation and Restoration Division (NEPA), DSHE, APG, MD
- Mr. James Pottie, Environmental Conservation and Restoration Division (Endangered Species), DSHE, APG, MD
- Dr. James Bailey, Environmental Conservation and Restoration Division (Wetland Specialist), DSHE, APG, MD
- Mr. David Blick, Environmental Conservation and Restoration Division (Cultural Resources), DSHE, APG, MD
- Dr. Deidra DeRoia, Colorado State University Land Condition Trend Analysis Coordinator
- Mr. John Wrobel, Environmental Conservation and Restoration Division (Noise), DSHE, APG, MD
- Mr. Brent Steury, National Parks Services (Maryland Threatened and Endangered Plant Species), U.S. Department of Interior
- Mr. Harmon Hash, Chief, Range Control, Aberdeen Test Center, APG, MD
- Mr. Charles Jones, Chief, Fire and Emergency Services Division, DSHE, APG, MD

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