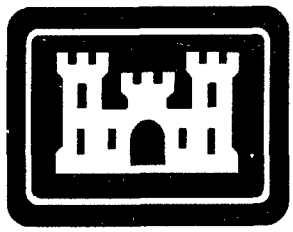

US Army Corps of Engineers

Toxic and Hazardous Materials Agency

Task Order No. 18
Remedial Investigations/ Feasibility Studies
Contract Number DAAA15-88-D-0009

USATHAMA

TECHNICAL REPORT FOR PROPOSED ORDNANCE CLEARANCE AT FORT GEORGE G. MEADE

TECHNICAL REPORT

FINAL DOCUMENT

March 1991

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY (*Leave blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 1991	Final, July 1990 to March 1991

4. TITLE AND SUBTITLE
Technical Report for Proposed Ordnance Clearance at Fort George G. Meade

5. FUNDING NUMBERS
U.S. Department of Defense Contract No. DAAA15-88-D-0009

6. AUTHOR(S)
Margaret Boryczka, Andrea Fogg, Audrey Orndorff, Andy Peters, John Sherman, Robert Lanza

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

ICF Technology
9300 Lee Highway
Fairfax, VA 22031

8. PERFORMING ORGANIZATION REPORT NUMBER
MD18EREFI196

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

US Army Toxic and Hazardous Materials Agency
CETHA-BC-B
Base Closure Division,
Aberdeen Proving Ground, MD 21010-5401

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
CETHA-BC-CR91027

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
See DoDD 5230.24, "Distribution Statements on Technical Documents."

Distribution Unlimited:
Approved for Public Release

12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 words*)

ICF Technology Incorporated has prepared a technical report for the proposed clearance of vegetation and unexploded ordnance (UXO) at Fort George G. Meade (FGGM), located in Anne Arundel County, Maryland, under contract to the U.S. Army Toxic and Hazardous Materials Agency. The Defense Authorization Amendments and Base Closure and Realignment Act of December 1988 identified approximately 9,000 acres of FGGM for closure. Because previous studies determined that UXO contamination was possible on the entire 9,000 acres scheduled for closure, the need for an ordnance survey was identified. This technical report presents the findings of a study evaluating the environmental effects of the proposed actions and will be included as part of an Environmental Impact Statement (EIS) prepared under a separate contract by the U.S. Army Corps of Engineers to fulfill the requirements of Army Regulation 200-2.

14. SUBJECT TERMS
Fort George G. Meade, FGGM, unexploded ordnance, UXO, vegetation clearance, ordnance clearance, Environmental Impact Statement, EIS, base closure, wetlands, endangered species, technical report

15. NUMBER OF PAGES

16. PRICE CODE

19. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	None

TECHNICAL REPORT FOR PROPOSED ORDNANCE CLEARANCE AT FORT GEORGE G. MEADE

FINAL DOCUMENT

Prepared By: ICF KAISER ENGINEERS

March 28, 1991

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

Section **Page**

TABLE OF CONTENTS
(continued)

Section **Page**

LIST OF EXHIBITS

Page

TECHNICAL REPORT FOR PROPOSED ORDNANCE SURVEY AT FORT GEORGE G. MEADE

1.0 PURPOSE AND NEED FOR PROPOSED ACTION

On December 29, 1988, the Defense Secretary's Commission on Base Realignments and Closures delivered recommendations to the Secretary of Defense on over 100 Army installations which will be closed or realigned under the provisions of the Defense Authorization Amendments and Base Closure and Realignment Act. The U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) has been assigned the responsibility for conducting the environmental evaluation and restoration portion of the Base Closure program.

USATHAMA conducted an enhanced Preliminary Assessment (October 1989) of 9,000 acres scheduled for closure at Fort Meade. One of the findings was that an ordnance survey was required for the entire 9,000 acres since there is a potential for unexploded ordnance (UXO) to be present anywhere on the installation. The report concluded that UXO exists beneath the training and range areas of Fort Meade and poses a serious human safety concern because of its explosion potential.

The 9,000 acre base closure parcel has been subdivided into two parcels (Exhibit 1-1). Parcel 1 consists of approximately 1,400 acres and is planned to be released for unrestricted use. Parcel 2 consists of 7,600 acres which by House Resolution 5313, passed by the U.S. House of Representatives, is required to be transferred to the Department of the Interior for use as a wildlife refuge.

In accordance with Army Regulation 385-64, Ammunition and Explosives Safety Standards, the Army is required to render innocuous property transferred to agencies outside of the Department of Defense by removing live ammunition or explosives that constitute an unacceptable risk to the general public. The ordnance clearance operations planned for Fort Meade are designed to meet these requirements for the intended end use of the two parcels while minimizing environmental impacts.

The proposed action involves locating, identifying and retrieving unexploded ordnance located on Fort Meade. Two distinct ordnance surveys related to future intended use of the property are proposed. Separate ordnance surveys will be conducted on all accessible portions of both the 1,400 acre parcel and the 7,600 acre parcel. The surveys will result in the accessible portions of the parcels being free of surface UXO at the time of the survey. It is possible, especially in the 7,600 acre parcel, that during the ordnance location phase of the survey, impact areas may be encountered which are too costly to clear requiring the Army to reevaluate disposal options.

2.0 DESCRIPTION OF PROPOSED ACTION

Two separate and distinct ordnance clearance surveys will be conducted on the Fort Meade 9,000 acre base closure parcel. A 100% surface and a 5% subsurface survey is proposed for the 1,400 parcel, comprised of training areas V, W, Y, and portions of U as well as Tipton Airfield, a pumping station, and a landfill (see Exhibit 1-2), which the Army intends to release for unrestricted use. In order to conduct such a survey, selective vegetation clearance is necessary to safely and effectively locate, identify, and dispose of explosive hazards. For the 7,600 acre parcel which the Army has been directed to release to the Department of Interior for use as a wildlife refuge, only a 100% surface survey of accessible areas is proposed to be conducted. In order to conduct an ordnance survey of the 7,600 acre parcel in a manner which will minimize the impact to the environment, no vegetation clearance will be conducted. If suspected ordnance impact areas or disposal grounds are discovered during survey efforts of either parcel, additional subsurface clearance survey may be authorized by USATHAMA. The description provided below describes both vegetation (for the 1,400 acres) and ordnance clearance as well as mobilization and demobilization activities.

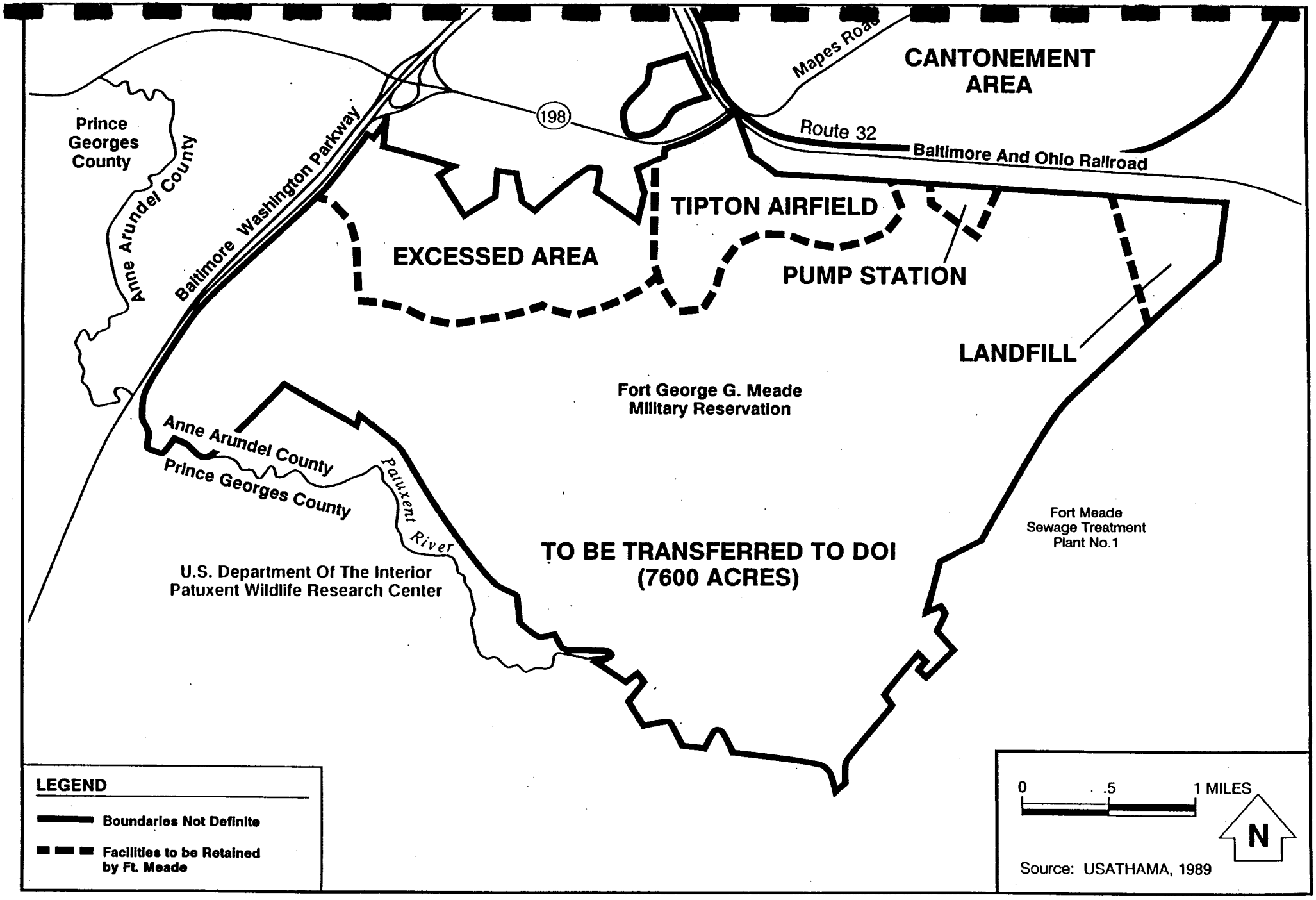

Exhibit 1-1 Study Area

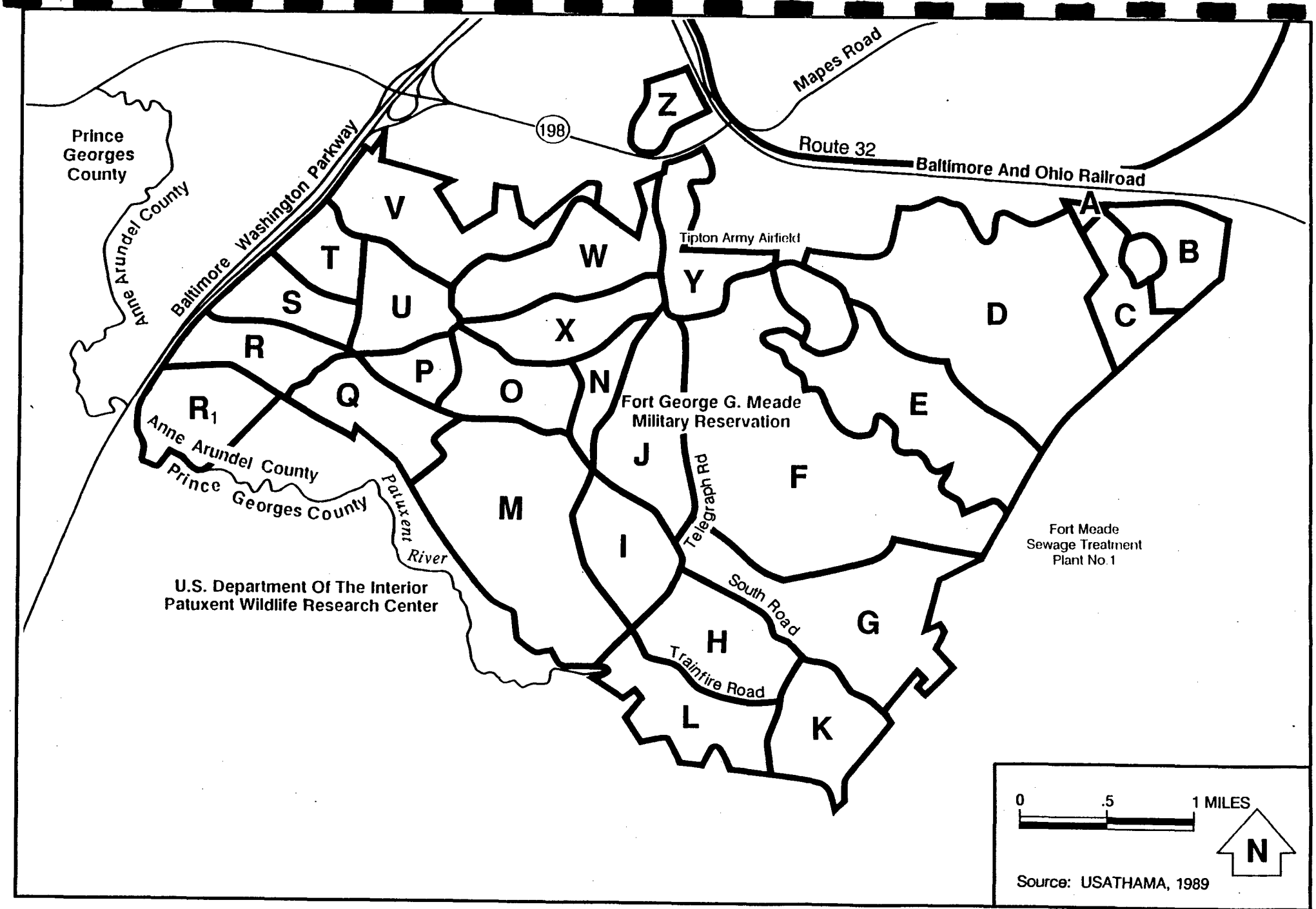

Exhibit 1-2 Fort Meade Training Areas

2.1 VEGETATION CLEARANCE

Vegetation clearance will take place within the 1,400 acre parcel but not within the 7,600 acre parcel. Vegetation clearance will be conducted by approximately 11 personnel for each of the areas and will take place only in those areas where the density of vegetation restricts safe access to and observation of UXO. To minimize adverse effects of clearing, the following restrictions will guide which areas are to be cleared:

- Wetlands will not be cleared of vegetation.
- Trees larger than 7 inches in diameter will not be cut except as necessary to allow access by forestry equipment.
- A protective buffer zone surrounding endangered plant species will be left uncut.
- Where possible, habitat used for nesting or foraging by endangered bird species will not be cut.

A forester, accompanied by UXO contractor personnel to locate and avoid areas of obvious UXO contamination, will identify and mark the areas that fall into these restricted categories. The areas will be marked with either biodegradable spray paint or engineering/surveying tape. A preliminary visual clearance will be conducted to locate UXO visible on the surface so that they can be removed prior to cutting operations.

In addition to the measures described above, clearance procedures have been tailored to different types of forest areas on Fort Meade in order to keep the vegetation clearance to a minimum. Forest areas have been divided into three types. Type 1 is characterized as an area of predominantly seedling and sapling vegetation from 0 to 10 feet high containing no overstory. Type 2 forest is characterized as an area with mature overstory of pines, hardwoods, or a mixture of both and a light understory. Type 3 areas are a mixture of Type 1 and 2 areas ranging from successionally maturing Type 1 to successionally mature Type 2.

Type 1 areas have approximately 0-25 percent mature overstory canopy closure and very dense seedling/sapling size regeneration from recent clear-cutting activities. Type 1 areas are completely inaccessible to ordnance survey crews and thus they will be completely mowed of vegetation.

Since most, if not all, Type 1 areas have relatively flat topography associated with them, runoff and soil erosion will be minimal. Through the use of either an articulated rubber-tired four-wheel drive brush mower or a swing boom mower, Type 1 areas will be left with a heavy mulch covering on the forest floor. This method of brush mowing will minimize impacts from clearing Type 1 areas.

The residual mulch from mowing will be slightly impregnated into the upper soil horizons as a result of machine weights. Therefore, between the natural properties of mulch and the slight bonding formed from machine compaction, soil stabilization and rapid regeneration of vegetation should occur.

To complete vegetation clearance in Type 1 areas, continuous mowing will be done in 8-foot wide swaths, continued until the vegetation in each Type 1 area is completely removed. The mowing pattern will utilize slope, aspect, time of season, and topography to accomplish low impact results in regeneration and soil erosion. This allows ordnance clearance to occur immediately following vegetation clearance. Trees larger than 7 inches in diameter will be left uncut, providing an additional seed source for natural regeneration.

Type 2 areas will have little or no disturbance from a vegetation clearance operation. Type 2 areas are comprised primarily of mature overstory with 75-100 percent closure with very light understory density. They are also more characteristic of the climax stage in the forests' successional pattern. Most, if not all, ordnance clearance can be completed in these areas without vegetation clearance.

Density Type 3 areas at Fort Meade are the largest in total area of the three types. Type 3 areas typically range from a successionally maturing Type 1 area to a successionally mature Type 2 area. Since there is a wide variety of size classes within the Type 3 areas, the vegetation clearance operation has to

be versatile enough to remove only the vegetation necessary for ordnance clearance. Therefore, the equipment used must be capable of removing heavy understory vegetation without damaging the residual stand of vegetation.

To minimize impacts from vegetation clearance in the 1,400 acre parcel, a selective mowing method will be used. Mowing of understory vegetation will be done only in those areas where the density is too heavy to perform ordnance clearance. This type of mowing leaves a park-like visual effect when clearing is completed. Trees larger than 7 inches will remain uncut unless machine access to an area requires the removal of larger trees. If necessary, larger trees will be cut by chainsaws and bucked-up leaving the felled tree parts in a pile no higher than 4 feet in height. The mulch from selective mowing will provide a protective ground cover and stabilize the soil surface to protect against soil erosion.

Selective clearing of the understory in Type 3 areas will not remove large areas of the overstory canopy, and therefore, light conditions similar to those prior to clearance will be maintained. Light conditions on the forest floor will probably be increased as a result of mowing. This, however, should not change the characteristics of current succession.

2.1.1 Field Office/Support Areas

A construction trailer will be used as a field office and will be sited at a convenient central location on or near the 1,400 acre parcel for the duration of field operations. It will be hooked up to electrical, telephone, and sewer lines if available. If a sewer hookup is not available, a portable chemical toilet will be used. If a telephone hookup is not available, cellular telephones will be used. Access to electrical utilities is expected to be available. An office manager will occupy the field office on a full-time basis during field operations; the forestry supervisor will occupy the office on a part-time basis.

Support areas will be used for equipment maintenance and overnight parking. Waste oil generated from vehicle and equipment maintenance activities will be stored in 275-gallon tanks marked "waste oil" and then recycled. Dumpsters will be used for the collection of sanitary and miscellaneous waste.

2.1.2 Cleanup

When vegetation clearance has been completed, utilities will be disconnected and the field office trailer will be removed from the site. Because it is a mobile structure, minimal cleanup, (e.g., reseeding areas worn by foot or vehicle traffic) is expected. The portable chemical toilet will be removed if one has been used at the site.

Wastes generated from vegetation clearance activities will be removed from the site. Waste oil, drummed from vehicle and equipment maintenance activities, will be shipped back to oil suppliers or recyclers. Dumpsters used for the collection of sanitary waste and miscellaneous debris will be removed by a licensed trash removal company.

2.2 ORDNANCE CLEARANCE

Ordnance clearance of the 1,400 acre parcel is composed of two elements -- surface clearance of the entire parcel and subsurface clearance of five percent of the parcel to a depth of five feet; the five percent area must be a statistically representative sample of the entire parcel. Ordnance clearance of the 7,600 acre parcel is composed of a single element -- surface clearance of 100% of the portion of the parcel that is accessible by foot.

The surface ordnance clearance will be conducted using redundant methods to ensure that 100% of all UXO on the surface and immediately below the surface are located. UXO contractor personnel will walk through all areas clear of vegetation to visually locate UXO on the surface, while, at the same time, using a low sensitivity magnetometer to locate metal objects near the surface of both vegetated and unvegetated areas.

The subsurface clearance will be conducted along one-meter wide paths spaced 20 meters apart using a high sensitivity magnetometer to detect ferrous metals the size of a 20 mm projectile or larger. In areas where vegetation was cleared, the subsurface clearance will be conducted immediately adjacent to the uncleared strip of vegetation when the location of the one-meter wide path falls in an uncleared strip. Data concerning the type and location of UXO found will be used to identify areas likely to contain additional UXO.

UXO located during either surface or subsurface clearance will be rendered safe to eliminate explosive hazards. Prior to the start of field operations the UXO contractor and the commander of the Army EOD unit designated to provide support to the project will determine which types of munitions can be collected. UXO which are determined to be inherently safe by design will be removed from the area and placed in a temporary collection point. UXO determined not inherently safe will be rendered safe by Army EOD personnel by detonation in place. UXO will be removed from temporary collection points and transported to a central demolition ground for destruction. Overnight storage in installation ammunition magazines will be allowed only if permitted in accordance with the Resource Conservation and Recovery Act (RCRA) for storage of hazardous waste.

If UXO are encountered which are known or are suspected to contain chemical agents, all contractor personnel will evacuate the area and the USATHAMA Health and Safety Branch and the Fort Meade Safety Office will be immediately notified.

Fifteen to thirty persons will be required for the ordnance survey. The specific number of personnel will depend upon the density of vegetation and how quickly the clearance must be accomplished to comply with deadlines established by Congress.

2.2.1 Field Office/Support Areas

A construction trailer will be used as a field office and will be sited at a convenient central location for the duration of field operations. It may be collocated with the field office used for vegetation clearance and will be hooked up to electrical, telephone, and sewer lines if available. If a sewer hookup is not available, a portable chemical toilet will be used. If a telephone hookup is not available, cellular telephones will be used. Access to electrical utilities is expected to be available.

The vehicle staging and maintenance area is expected to be located with the ordnance clearance field office. Waste oil from vehicle and equipment maintenance activities in support of the ordnance clearance will not be generated onsite. Dumpsters will be used for the collection of sanitary and miscellaneous waste.

2.2.2 Ordnance Clearance Procedures

Procedures for clearing ordnance will vary with the amount of vegetation present in an area. Areas naturally clear of vegetation will be traversed in straight transects in a grid-like pattern. Areas which have been cleared of vegetation, will be traversed along the length of the cleared strips.

Ordnance clearance will take place during daylight hours only except as approved by USATHAMA. It will not occur during thunderstorms or when snow deeper than four inches is on the ground. Seasonal changes or climate will not otherwise affect operations.

2.2.2.1 Surface Clearance Procedures

Because some UXO may be covered by leaves, a thin layer of soil, etc., low sensitivity magnetometers will be used during the surface sweep to ensure that all UXO on or near the surface are located. A low-sensitivity magnetometer can be used to detect ferrous metal up to two feet below the surface of the soil. This device is completely nonintrusive and does not emit any electromagnetic radiation which could accidentally detonate some types of ordnance.

In areas of either parcel which are lightly vegetated or naturally clear of vegetation, UXO contractor personnel will form a surface sweep line with a distance between individuals of approximately 6 feet. A senior UXO contractor technician will anchor the outer-most point of the line and trace the team's clearance trail using a hip chain which records distance travelled and trails a biodegradable bright orange thread that tracks the course of the sweep line. Existing surface features, such as roads, streams, or impenetrable brushy areas, will be used as appropriate as sweep boundaries.

In areas of the 1,400 acre parcel that are mechanically cleared of vegetation, a surface sweep line will also be established. Senior UXO contractor technicians will anchor each side of the sweep line adjacent to the uncut strips of vegetation to ensure that all portions of an area are covered. A guide technician will anchor the inner-most point of the sweep line, following a pre-established course to maintain continuity with the adjacent previously swept area so that all portions of an area are covered.

Personnel on the sweep line will mark suspected UXO by placing a pin flag with an attached blaze orange streamer into the ground at a safe distance from the suspect item. Additional technicians following behind the sweep team will investigate suspected UXO individually. The nomenclature, type, size, location, and "safe/unsafe" condition will be determined, if possible, and recorded in a field logbook. The location of UXO will be recorded on a map or sketch of the work area. Ordnance fragments which are free of explosive residue may be collected at this time for subsequent disposal. Ordnance fragments with explosive residue will be treated in the same fashion as UXO. Non-ordnance items will not be collected.

In heavily vegetated areas of either parcel that are less than 10 feet across, the surface sweep will be conducted by two UXO contractor personnel working in tandem, beginning at one end and on opposite sides of the uncleared area. Each UXO technician will kneel or crouch while carefully inserting a magnetometer approximately 5 feet into the vegetation; the probe will be withdrawn and reinserted while progressively moving along the edge of the uncleared area until it has been completely searched. Contacts will be immediately investigated because of the difficulty of relocating the suspect UXO in the dense underbrush. The UXO technician will cut away brush as necessary to allow adequate room for maneuvering while investigating the contact. The location of UXO found in a vegetated area will be marked by placing a pin flag at right angles to the contact at the edge of the cleared strip. Suspected subsurface UXO will be excavated at a later time. Vegetation will be cleared from the area using shears, brush saws, or other appropriate hand tools.

Areas of either parcel which are inaccessible for any reason, e.g., wet, marshy, or densely vegetated terrain, will be surveyed and mapped to record which areas have been cleared of ordnance. Topographic survey procedures are described in Section 2.2.9.

2.2.2.2 Subsurface Clearance Procedures

The subsurface clearance will be conducted using a high sensitivity magnetometer. In areas where vegetation clearance was previously conducted to allow access, subsurface clearance will be conducted immediately adjacent to the uncleared strip of vegetation when the location of the one-meter wide path should fall in an uncleared strip. The location of UXO will be recorded on a map or sketch of the work area.

In expanses naturally clear of vegetation, the one-meter wide paths will run in straight transects in a grid-like pattern. In areas which have been cleared of vegetation, the one-meter wide paths will run along the length of the cleared strips, parallel to the uncleared edges. The center of each path will be marked by a UXO contractor supervisor using biodegradable spray paint or wooden stakes. Each path will be cleared by a magnetometer team composed of an operator and at least one assistant. The assistant will mark all suspected UXO by placing a pin flag with an attached blaze orange streamer into the ground at a safe distance from the suspect item. He will also determine and record the location of the suspect UXO in a field logbook. The location of UXO will be recorded on a map or sketch of the work area.

The percentage of area covered by the subsurface clearance may be increased at the direction of the USATHAMA Project Officer if a high concentration of UXO is discovered. Additional subsurface clearance may then be conducted in concentric circles from the center of the suspected impact area or ordnance disposal area. Additional vegetation clearance may be necessary to effectively conduct this additional subsurface clearance. Unless the initial survey concludes that the 1,400 acre parcel was never used as an impact area (no UXO found), subsequent subsurface surveys may be required to a depth below which any future soil disturbance is expected to be performed.

2.2.3 Excavation of UXO

At the discretion of the UXO contractor, UXO may be excavated manually or by a combination of manual and mechanical methods. Manual excavation will be performed by carefully using a trowel or shovel to allow identification and possible removal of the object. Backhoes or other mechanical means will be used to supplement manual excavation only when the depth of the object has been identified by remote detection methods, (e.g., ground penetrating radar). Mechanical means will be used no closer than two feet either laterally or vertically to the subsurface contact. Excavations shall meet the requirements of 29 CFR, Part 1926, Subpart P. Suspected UXO located below or entangled in the roots of a tree stump may be uncovered by securing a chain to the stump and pulling it with heavy equipment at a distance determined safe by the UXO contractor.

2.2.4 UXO Render Safe Procedures

UXO which require rendering safe will be handled by Army EOD personnel only. All render safe procedures will be conducted in accordance with procedures prescribed by the 60 series EOD publications.

2.2.5 Retrieval of UXO

UXO which has been determined safe and ordnance fragments containing explosive residue will be retrieved for temporary storage at a daily collection point. It will be carried in the same position as it was found by one person, if practicable, directly to the daily collection point or to a vehicle for subsequent transportation thereto. The collection point will be sited no closer than 1,000 feet from a public highway or inhabited area. The UXO contractor will maintain an area within 50 feet of the collection point free of dried vegetation or other flammable or combustible material. The total explosive weight contained in UXO collected at any one point will not exceed 100 pounds. Each collection point will be sited in an area free of surface water run-on. Smoking, fires, or open flames will not be permitted within 100 feet of the collection point. UXO and ordnance fragments containing explosive residue will be collected separately from ordnance fragments free of explosives and will be protected from contact with precipitation.

2.2.6 Transportation of UXO

UXO and ordnance fragments containing explosive residue will be transported in accordance with applicable Army, DoD, and installation regulations from the daily collection point to either the installation demolition ground for immediate destruction or to installation ammunition storage magazines for subsequent disposal at a later date. Only UXO determined to be safe will be transported. During transportation the load will be blocked and braced in a vehicle compartment constructed of non-sparking materials. Vehicles will not be refueled while loaded with explosives. No persons will be allowed to ride in or on the truck body or van where explosives are carried. Routes from the daily collection point to the disposal or storage area will be selected by the Fort Meade Safety Office.

2.2.7 Disposal of UXO

UXO and ordnance fragments containing explosive residue will be disposed of either in-place or at a central demolition ground as determined on a case by case basis. Only Army EOD personnel will conduct disposal operations. Disposal operations will be conducted in accordance with installation, state, Army, DoD, and federal regulations. Disposal operations will occur during daylight hours whenever possible and will not occur during thunderstorms.

2.2.8 Storage of UXO

UXO not disposed of the same day of retrieval will be stored in installation ammunition storage magazines in accordance with Army and DoD regulations.

2.2.9 Topographic Survey

A topographic survey will be conducted to document the location of areas in which the UXO clearance survey has been performed. The topographic survey may be conducted using a surveyor's transit, compass and line, or a global positioning navigation system (GPS) receiver, as required by USATHAMA. USATHAMA will determine the accuracy to which the topographic survey must be conducted.

2.2.10 Closure Activities/Site Cleanup

Voids such as holes or craters may result from the excavation, retrieval, or disposal of UXO. Such voids will be back-filled with soil to restore the topography of the area to that existing prior to the conduct of operations.

When ordnance clearance has been completed, utilities will be disconnected and the field office trailer will be removed from the site. Because it is a mobile structure, minimal cleanup is expected. The portable chemical toilet will be removed if one has been used at the site.

Wastes generated from vegetation clearance activities will be removed from the site. Dumpsters used for the collection of sanitary waste and miscellaneous debris will be removed by a licensed trash removal company.

Monumented triangulation points will remain in place.

2.2.11 Personnel Safety Measures During Ordnance Survey

Personal protective equipment will be selected by the site health and safety officer. This personal protective equipment will routinely include a hard hat, safety glasses/goggles, safety shoes, snake guards, hearing protection, work gloves, and coveralls. Additional protective equipment may be determined by the site health and safety officer.

The primary risk to workers during the ordnance survey would be due to detonation of UXO and machinery accidents. Thus level "D" protective clothing is required. If ordnance items are found that are known or thought to contain chemical agents, the UXO contractor will not handle these materials, and Army EOD will be called in to handle these munitions. If any hazardous material is found or suspected to be present at the site during the ordnance survey, the area will be evacuated and work will cease until the source of the toxic is removed.

2.2.12 RCRA Permit Requirements

During the ordnance clearance operation, unexploded ordnance will either be moved to the Range 12 demolition area on Fort Meade (for ordnance under 5 lbs.), stored at Fort Meade until transported off-site for disposal, or exploded in place. The demolition range on Fort Meade is a RCRA permitted facility. It is unclear whether or not exploding ordnance in place will require personnel at Fort Meade to obtain a RCRA Subpart X permit. Based on discussions with the Maryland Department of the Environment and U.S. EPA personnel it does not appear that such a permit will be necessary since the RCRA permit is specific to "facilities that treat, store, or dispose of hazardous waste" (40 CFR 264.600) (Zalinsky, 1990). Non-routine in-place detonation does not meet this description.

A letter will be submitted to the Maryland Department of the Environment describing the proposed action and the rationale for not applying for a RCRA Subpart X permit for the in-place detonation. A

response from the Maryland Department of the Environment will be requested before any in-place detonation takes place.

3.0 BASELINE ENVIRONMENTAL SETTING

3.1 SITE DESCRIPTION

Fort Meade is located in the Baltimore - Washington metropolitan area in Anne Arundel County. Exhibit 3-1 illustrates the base location in relation to the surrounding area. For purposes of analyzing vegetation clearance and ordnance cleanup impacts, the study region is defined as both the 1,400 and the 7,600 acre parcels and immediately adjacent areas outside of the installation. A study region is typically defined as the area that is likely to experience impacts as a result of the proposed action. In this case, the impacts are expected to be confined primarily to the two parcels, comprising a total of 9,000 acres. These 2 parcels contain the range and training areas, disposal facilities, woodlands and wetlands of the base.

3.2 GEOLOGY

Fort Meade lies along the western edge of the Atlantic Coastal Plain Physiographic Province and just east of the Fall Line that separates the Coastal Plain from the Piedmont Province.

The series of thick, unconsolidated sediments underlying Anne Arundel County are subdivided into the Potomac Group (including the Patapsco, Arundel Clay, and Patuxent Formations), the Magothy Formation and the Patuxent River terraces and associated alluvium. The youngest geologic unit in the stratigraphic sequence underlying Fort Meade is the Magothy Formation of Late Cretaceous age. This formation occurs as an isolated erosional remnant that underlies areas of higher elevations. The sediments of this formation consist of light gray sand with interbedded thin, black, clay layers containing organic materials and pyrite. Gravel layers have been reported in the basal layers of this formation (Department of the Army, 1981). The Magothy Formation unconformably overlies the sediments of the Lower Cretaceous Potomac Group.

The formations of the Potomac Group were deposited under fluvial and lacustrine conditions; sand, silt, and clay layers that make up the group are commonly limited in lateral extent. Sand lenses 25 feet thick at specific points have been found to be much thicker, thinner, or absent as little as 25 to 100 feet away.

The Patapsco Formation consists principally of thick clay layers with interbedded sand and gravel. Some of the clay layers are brightly colored and variegated while others are dark, and contain lignitic and fossilized matter (Cloos, 1964). It has an average thickness of 500 feet, and unconformably overlies the Arundel Clay.

The Arundel Clay consists of red and brown carbonaceous clay containing nodules of siderite. Oxidation of the siderite nodules causes the red coloration that occurs in the upper section of the unit. Fossil tree trunks and dinosaur remains have also been reported to occur in this formation (Department of the Army, 1981). The average thickness of this unit is approximately 250 feet and it unconformably overlies the Patuxent Formation.

The Lower Cretaceous Patuxent Formation unconformably overlies a crystalline bedrock complex forming the basement of both the Piedmont and Coastal Plain Provinces. The formation thickens rapidly toward the southeast through Anne Arundel and Prince Georges Counties but barely extends westward into Montgomery and Howard Counties due to erosion. The formation is composed of arkosic sands with clay lenses throughout. In addition, these sands may be crossbedded and may contain gravel and ferruginous sands. Organic remains such as silicified tree trunks have also been reported from this formation.

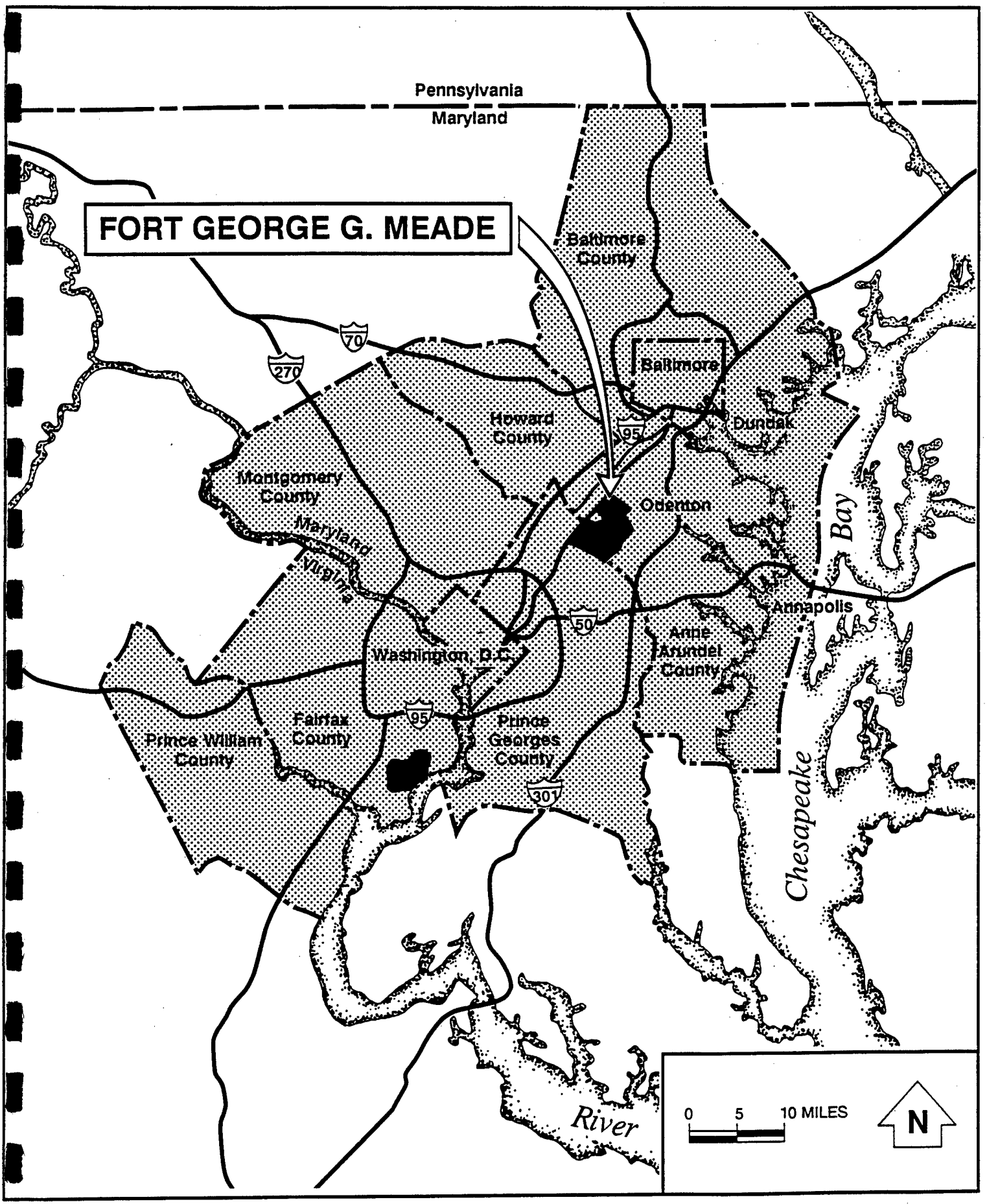

Exhibit 3-1 Fort Meade and Surrounding Area

3.2.1 Physiography and Topography at the Site

Fort Meade lies within the Patuxent River watershed which contains several surface water bodies including streams, small lakes, and ponding areas. The Patuxent River flows along the south side of the installation draining only land immediately adjacent to its course; however, the Little Patuxent River, the major tributary of the Patuxent River, flows southeast across the midsection of the installation and drains most of the area. The northern portion of the installation drains southeastward into Midway and Franklin Branches. Franklin Branch flows south through Burba Lake and unites with Midway Branch; the combined stream flows through Soldier Lake en route to the Little Patuxent River. Numerous intermittent streams drain the southern portion of the installation.

3.2.2 Soils at the Site

The soils at Fort Meade belong to two major associations. Eighty percent of the area soils are classified by the Soil Conservation Survey of Maryland (Kirby, 1973) as loamy and clayey Land-Muirkirk-Evesboro soil association. The remainder is classified as the Evesboro-Rumford-Sassafras association.

The loamy and clayey Land-Muirkirk-Evesboro soils are found mainly in the area to be cleaned up which includes the undeveloped forest land and some portions of the developed section. These soils are nearly level to steep, well-drained, and consist of a thick, loamy, sand surface layer underlain by an unstable red and white clay. This subsoil allows the water to move slowly through it and primarily supports a mixture of pine and hardwood vegetation.

The Evesboro-Rumford-Sassafras association is found in the northern part of Fort Meade, where heavy development has taken place. These soils usually have an unstable substratum with permeability that seasonally supports a high water-table. The Evesboro series is characterized by coarse, loose, and droughty soils also with a clayey substratum of low permeability. The Rumford series is composed of loose, loamy soils with a sandy, loamy subsoil; and the Sassafras series consists of fine, sandy, loamy material overlying sandy-clayey-loamy subsoil.

3.3 WATER QUALITY AT THE SITE

3.3.1 Groundwater Hydrology

Significant quantities of water are stored in the Coastal Plain sediments. However, only the more permeable units of the formations can yield enough water to be productive aquifers (USATHAMA, 1989). Coastal Plain groundwater occurs under both unconfined (water-table) and confined (artesian) conditions. Water levels of an unconfined aquifer fluctuate with recharge, causing the water-table to rise and fall in an annual cycle (USATHAMA, 1989). Water levels are highest in early spring and lowest in early fall. Unconfined aquifers may be severely affected by drought. In comparison, artesian aquifers receive recharge from both their outcrop area and from vertical leakage through confining beds and other aquifers. Water levels in artesian aquifers usually do not fluctuate due to drought conditions.

Fresh water may discharge from Coastal Plain aquifers in several ways. Unconfined waters may discharge through evapotranspiration and by direct seepage into streams, tidal water, and the ocean. Artesian aquifers, on the other hand, discharge much less efficiently because they are confined at depth. Their discharge may only occur through vertical flow across semipermeable or confining layers into other aquifers. In proximity of oceans or estuaries confined and unconfined aquifers mix with intruding seawater. However, the degree to which coastal plain aquifer water quality is degraded decreases with depth in the hydrostratigraphic sequence because salt water encroachment is limited. Therefore, Coastal Plain artesian aquifers may contain fresh waters even if the overlying aquifers are saline.

At Fort Meade, subsurface stratigraphic thicknesses and depths vary considerably throughout the installation. This variability is primarily caused by southeastward thickening and dip characteristics of the Coastal Plain sediments. The depth to groundwater also varies considerably throughout the installation. In areas adjacent to major streams, marshes, and lakes, the depth to groundwater is approximately one foot below the ground surface, while at points of higher elevation the depth to groundwater is as much

as 40 feet (USATHAMA, 1989). The direction of shallow groundwater flow generally follows the local topography at the site. Regional groundwater flow is generally to the southeast. Several springs have been reported at the installation; one is located at the former Walter Reed Institute Research Farm and another in the sanitary landfill area (USATHAMA, 1989). Some perched water-table conditions have also been reported at various locations on the installation.

Chemical analysis of groundwater samples indicate that the water quality is acidic (pH between 4.9 and 5.0), with an iron content between 0.77 and 2.7 mg/L (attributed to hematite, siderite and other iron-bearing minerals). In general, iron removal is required for water withdrawn from the Patuxent aquifer at Fort Meade (Department of the Army, 1981). High levels of manganese may also be expected in wells located near rivers and streams in outcrop areas. The groundwater in the area meets Federal drinking water standards with a low chlorine content (between 5 and 8.4 mg/L), is soft (hardness between 6 and 8.4 mg/L of calcium carbonate), and has relatively low total dissolved solids (38 mg/L) (Maryland Department of Natural Resources, 1987).

3.3.2 Surface Water Uses

The primary water bodies at Fort Meade are the Patuxent and Little Patuxent Rivers. Most of the surface water drains to the Little Patuxent River from the surface water divide that is approximately parallel to the two rivers and roughly equidistant from them; however, the area immediately adjacent to the southern boundary of Fort Meade drains to the Patuxent River. Thomas Branch is the major named tributary providing drainage to this area. The drainage at Fort Meade also includes several other natural drainages and man-made lakes. Midway and Franklin Branches drain the northern portion of the installation. Water that flows in these streams collects in two small impoundments, named Burba and Soldier Lake, before continuing southward to join the Little Patuxent River. There are a number of small ponds and swampy areas in the poorly drained southern portion of Fort Meade.

The Little Patuxent River is a source of water for the Fort Meade Water Treatment Plant, and is the receiving body for effluent from the Fort Meade Sewage Treatment Plant Number 2. Fort Meade uses surface water from the Little Patuxent River for 80 to 90 percent of its water needs. Other surface water bodies on the 9,000-acre parcel are used for fishing and duck hunting. The favored fishing spot on the base is Soldier Lake, which is stocked with catfish, bluegill, and large-mouth bass. There is no boating allowed on the installation.

The State of Maryland Water Resources Administration maintains water quality records for locations on the Little Patuxent River adjacent to Fort Meade Sewage Treatment Plant Numbers 1 and 2, and at three other locations on the Little Patuxent River in the Fort Meade area. Based on data collected at these stations from 1961 to 1975, the Little Patuxent River, from Savage to its confluence with the Patuxent River, has been classified as "stressed" with respect to bacteria (Maryland Water Resources Administration, 1976). A significant source of such bacteria is wastewater treatment plant effluent. Suspended solids, turbidity, phosphorus and nitrogen loading also contribute to the degradation of Little Patuxent River water quality. Non-point sources of bacteria include faulty septic tank systems and stormwater runoff from urban and agricultural areas.

3.4 METEOROLOGY AND CLIMATOLOGY

The closest location to Fort Meade for which complete meteorological data are collected is Baltimore-Washington International Airport (BWI), located 3 miles northeast of Fort Meade. The following discussion is based on data from BWI Airport.

The average monthly temperature in the area ranges from a high of 76.6°F in July to a low of 33.4°F in January. Recorded extremes of temperature range from 102°F recorded in both July and August, to -7°F recorded in January. Heating degree days range from a normal of 980 in the month of January to a normal of zero in July. The value for each day is obtained by subtracting the mean temperature for that day from 65°F.

The Atlantic Ocean and Chesapeake Bay, located to the east of Anne Arundel County, and the Appalachian Mountains to the west, exert a moderating influence on the climate of the area, leading to humid summers and relatively mild winters. The average length of the growing season in the area is about 194 days. The average date of the last freezing temperature in spring is April 15, and the average date of the first freezing temperature in fall is October 26.

Precipitation in the area is fairly uniformly distributed throughout the year, and averages 40.46 inches per year. The lowest recorded amount of annual precipitation was 27.89 inches, and the highest was 53.33 inches. The highest daily rainfall recorded was 7.82 inches. Moisture deficiencies for crops occur occasionally during the growing season, however, severe droughts are rare. Snowfall may occur from October to April, with most of the snowfall occurring from December through March. The highest daily snowfall recorded was 15.5 inches, and snowfall occurs on average 22 days per year. Annual extremes have been exceeded at other locations near BWI as follows: highest temperature of 107 degrees F in July, maximum 24-hour snowfall of 24.5 inches in January.

Much of the rain in the summer months comes from thunderstorms. Atlantic hurricanes can cause heavy rains during the summer months, although winds rarely reach hurricane force in the area. Hurricane force winds (> 74 mph) occur on rare occasions due to strong cold fronts or severe thunderstorms (Ruffner, 1983).

The annual prevailing wind direction for the Baltimore-Washington area is from the west. Monthly prevailing winds are from the west, northwest, or west-northwest except in September, when prevailing winds are from the south. Since the region is near the average path of the low pressure systems that move across the U.S., changes in wind direction are frequent and contribute to variability of the weather. The average wind speed is approximately 9.5 mph, with short term gusts up to about 50 mph.

3.4.1 Background Ambient Air Quality

Information in this section is primarily adapted from the 1988 and 1989 Maryland Air Quality Reports. The State of Maryland reports air quality by Air Quality Control Regions comprised of one or more Maryland counties and Baltimore City. Anne Arundel County is located in the Metropolitan Baltimore Intrastate Air Quality Control Region (Area III), one of six Regions classified by the State of Maryland for the purposes of monitoring and reporting air quality. Prince Georges County, adjacent to Anne Arundel County is located in the National Capital Interstate Air Quality Control Region (Area IV).

Ambient air quality monitoring locations in Anne Arundel County and Prince Georges County are listed in Exhibit 3-2. With the exception of the Fort Meade station in Anne Arundel County and Laurel station in Prince Georges County, the closest monitoring stations in Anne Arundel and Prince Georges counties are 15 kilometers from Fort Meade. Ambient air quality data from these relatively remote monitoring stations are not necessarily representative of conditions in Anne Arundel County in the area near Fort Meade, but provide general information on ambient air quality in the Baltimore-Washington area.

3.4.2 Federal and State Attainment Status for Criteria Pollutants

The air quality in Anne Arundel County in the area near Fort Meade is classified as better than National and Maryland Ambient Air Quality Standards (NAAQS) for total suspended particulate (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), and lead (Pb). Federal and Maryland air quality standards are presented in Exhibit 3-3. Parts of Anne Arundel County bordering Baltimore City exceed Federal and Maryland secondary TSP standards. Ambient concentrations of ozone (O_3) in the Metropolitan Baltimore Intrastate and National Capital Interstate Air Quality Control Regions exceed both Maryland and Federal primary ambient air quality standards. Baltimore City and Baltimore County are classified as Group II areas with respect to the Federal PM-10 (the fraction of total particulate with a particle size of less than 10 microns) ambient air quality standard, meaning that the area may or may not meet the standard. The remaining areas of Maryland are classified as Group III areas, indicating that it is likely to meet the PM-10 standard.

EXHIBIT 3-2

SUMMARY OF AMBIENT AIR QUALITY MONITORING STATIONS IN THE VICINITY OF FORT MEADE

Station	County	Air Quality Region	Pollutants Monitored
Annapolis	Anne Arundel	Metro Baltimore	TSP
Glen Burnie	Anne Arundel	Metro Baltimore	TSP, Pb
Davidsonville	Anne Arundel	Metro Baltimore	TSP, O_3
Fort Meade	Anne Arundel	Metro Baltimore	NO_x, O_3
Riviera Beach	Anne Arundel	Metro Baltimore	TSP, SO_2
Bladensburg	Prince Georges	National Capital	CO
Cheverly	Prince Georges	National Capital	Pb
Greenbelt	Prince Georges	National Capital	O_3
Hyattsville	Prince Georges	National Capital	TSP. Pb
Laurel	Prince Georges	National Capital	TSP

Maryland Department of the Environmental, Air Management Administration. Draft 1989 Maryland Air Quality Data Report.

EXHIBIT 3-3

MARYLAND AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Period	Ambient Standard ($\mu g/m^3$) (Primary)	(Secondary)
SO_2	Annual	80	None
	24-Hour	365	None
	3-Hour	None	1300
NO_x	Annual	100	100
CO	1-Hour	40,000	40,000
	8-Hour	10,000	10,000
TSP[1]	Geo. Mean	75	60
	24-Hour	260	150
PM-10	Arith. Mean	50	50
	24-Hour	150	150
Pb	3-Month	1.5	1.5
	24-hour	1.5	1.5

[1] Maryland State guideline, but not a regulatory standard. Although former Federal standards for TSP have been replaced by PM-10 standards, Maryland continues to monitor TSP and uses the former TSP ambient air quality standard as a comparative guideline.

3.4.3 Ambient Air Quality Data for Criteria Pollutants

Exhibit 3-4 summarizes available ambient air quality data for criteria pollutants at monitoring locations in Anne Arundel and Prince Georges Counties in the vicinity of Fort Meade. Ambient concentrations of all pollutants with the exception of ozone are well below applicable standards. With the exception of TSP, which is monitored at the Fort Meade and Laurel stations, criteria pollutants are not monitored in the immediate vicinity of Fort Meade. It is expected that ambient concentrations of all criteria pollutants with the exception of ozone (O_3) meet applicable standards in the vicinity of Fort Meade. Although ambient concentrations of O_3 are not monitored in the immediate vicinity of Fort Meade, it is expected that ambient concentrations exceed applicable standards, based on air quality monitoring data from other locations throughout Maryland. Ambient concentrations of carbon monoxide have exceeded the NAAQS in Baltimore City and Washington, D.C. High ambient concentrations of carbon monoxide in such urban areas are generally attributed to mobile sources, and it is expected that carbon monoxide concentrations in the vicinity of Fort Meade meet applicable standards.

In 1988, EPA promulgated ambient air quality standards for PM-10 to replace the primary ambient air quality standards for TSP. Federal standards for ambient concentrations of PM-10 have been incorporated into the Maryland Air Regulations, and will be incorporated into the revised Maryland State Implementation Plan (SIP), which outlines air quality control strategies for the state.

It is expected that areas in compliance with present ambient air quality standards for TSP will also be found to be in compliance with PM-10 standards. Data on ambient concentrations of PM-10 in Anne Arundel and Prince Georges Counties and the Metropolitan Baltimore Intrastate Air Quality Control Region are not available. It is expected, based on recent data, that PM-10 concentrations in the vicinity of Fort Meade meet applicable standards.

3.5 ECOLOGY[2]

This section describes the environmental setting at Fort Meade, with emphasis on the plant and animal communities occurring in the 9,000 acres to be excessed. The land surrounding Fort Meade is a mixture of residential, commercial, and undeveloped areas. Population growth in the Baltimore-Washington metropolitan areas has resulted in a shift in local land use patterns from natural resource-related activities to commercial and manufacturing uses, with a corresponding decrease in the amount of undisturbed natural areas. The majority of the land area within Fort Meade boundaries has been minimally developed and maintains significant physical and natural features, including one of the last remaining expanses of contiguous forest in the Baltimore-Washington area. Principal human disturbances in the natural areas of Fort Meade consist of military training activities, selective small scale logging for forest management, seasonal hunting, and occasional construction activities.

3.5.1 Vegetative Communities

Fort Meade lies in an Oak-Pine Forest Region of the Atlantic Coastal Plain Province (Braun, 1950). The original forest cover of this area was comprised of mesophytic species characteristic of hardwood regions to the north. However, the existing second and third growth forests contain species more characteristic of the Oak-Pine Region. The primary vegetative communities represented within the Fort Meade study area are upland forests, fields and other open areas (e.g., maintained portions of firing ranges, mowed lawns), and wetlands. Most of the resource management areas at Fort Meade contain a mixture of these communities.

---

[2] Common species names are used throughout this section. Scientific names for all species mentioned in this section have been presented previously in other sections of the EIS.

EXHIBIT 3-4

SUMMARY OF 1989 AIR QUALITY MONITORING DATA IN THE VICINITY OF FORT MEADE

Pollutant	Monitoring Location	Averaging Period	Ambient Standard ($\mu g/m^3$) (Primary)	(Secondary)	Concentration ($\mu g/m^3$)*
SO_2	Riviera Beach	Annual	80	None	28
		24-Hour	365	None	103/101
		3-Hour	None	1300	170/165
NO_x	Fort Meade	Annual	100	100	NO 15/NO_2 33
CO	Bladensburg	1-Hour	40,000	40,000	N/A
		8-Hour	10,000	10,000	
O_3	Davidsonville	Max. 1-Hr	235	None	N/A
	Fort Meade	Max. 1-Hr	235	None	
	Greenbelt	Max. 1-Hr	235	None	
TSP	Annapolis	Geo. Mean	75	60	39
		24-Hour	260	150	84/72
	Davidsonville	Geo. Mean	75	60	32
		24-Hour	260	150	84/69
	Glen Burnie	Geo. Mean	75	60	47
		24-Hour	260	150	102/94
	Riviera Beach	Geo. Mean	75	60	43
		24-Hour	260	150	97/88
	Hyattsville	Geo. Mean	75	60	41
		24-Hour	260	150	127/93
	Laurel	Geo. Mean	75	60	41
		24-Hour	260	150	97/82
Pb**	Cheverly	Max. 24-Hr	1.5	1.5	0.066
		Annual Avg.	None	None	0.024
	Glen Burnie	Max. 24-Hr	1.5	1.5	0.042
		Annual Avg.	None	None	0.025
	Hyattsville	Max. 24-Hr	1.5	1.5	0.033
		Annual Avg.	None	None	0.019

Sources: Maryland Department of the Environmental, Air Management Administration. Draft 1989 Maryland Air Quality Data Report.

N/A = Not Available

* Annual averages are for calendar year. Highest and second highest values (highest/2nd highest) are shown for 24-hour, 8-hour, 3-hour, and 1-hour averages.

** Primary and secondary standards for lead are averaged over a calendar quarter. Monitoring is conducted on a 24-hour basis and monitoring data are reported as 24-hour average concentrations.

As discussed in previous sections of this report, the vegetative communities of Fort Meade have been classified based on the types of clearing activities that are needed to prepare the areas for ordnance survey. Upland forests were classified as either Type 1, 2, or 3 based primarily on the density of understory vegetation. Clearing activities within each of these types will vary, with Type 1 areas being cleared the most and Type 2 the least. Although the vegetative communities are described for the entire 9,000 acre base closure parcel, selective clearing shall occur only within the 1,400 acre parcel. Permanent and seasonal wetlands and other areas regarded as too wet to support the use of heavy forestry equipment were classified as wetlands and will not be cleared. Fields will be cleared completely.

Exhibit 3-5 shows the distribution of the various vegetation types observed at Fort Meade during the field survey conducted in September 1990. The acreage of each resource management area and the percentage of the vegetation types occurring within each area are presented in Exhibit 3-6. It should be noted that the vegetation types for several restricted areas that could not be accessed during the survey were obtained from personal communication with the Fort Meade Fish and Wildlife Office. These areas are the ammunition supply points (ASP#1 and ASP#2) in areas B and W, ranges 11 and 12 which are fenced and marked off limits, and firing ranges 3 through 8 which were active during the period of the field survey.

The Fort Meade vegetative communities are described briefly below.

3.5.1.1 Forests

Forests are the predominant vegetative community at Fort Meade, comprising the majority of the 9,000 acres to be excessed. These forests are primarily second or third growth mixed pine/hardwood stands, estimated to be 40 to 60 years old. Common forest species are listed in Exhibit 3-7.

The forests of Fort Meade join with those of adjacent areas to create a contiguous forest system of over 9,000 acres. This tract is one of the last large parcels of forest left in Maryland's Piedmont and Coastal Plain Provinces. Most other forested areas in these regions have been highly fragmented as a result of commercial and residential development. In 1989, the Maryland Natural Heritage Program designated the forested area of Fort Meade a Geographical Area of Particular Concern (GAPC). The ecological value of the contiguous forest at Fort Meade has been detailed in the report on the Beltsville Federal Master Plan Area (Committee of Biologists for Preservation of Natural Areas, 1976).

Three vegetation types (Types 1, 2, and 3) described in the Proposed Action in Section 2.1 are used to describe the forested areas at Fort Meade. Each of these is described briefly below.

Type 1. Vegetation in Type 1 areas consists of very dense shrubs, saplings, and young trees up to 6 inches in diameter at breast height (DBH) and typically less than about 15 feet tall. A review of the forest management timber sale records indicated that most of the areas classified as Type 1 at Fort Meade were clearcut within the past 10 years as part of wildlife habitat enhancement or normal military range activities. Trees in these areas are generally in young, impenetrable stands of pine (pitch pine or Virginia pine) or young hardwood species such as maple and sweetgum.

Type 2. Type 2 areas contain mature canopy species characteristic of eastern deciduous (oak-hickory and beech-maple) forests. In these stands, the canopy species are generally over 50 feet tall with a DBH of 20 inches or more. In Type 2 stands, the canopy is closed, permitting very little direct sunlight to reach the forest floor. Consequently, understory vegetation is sparse, creating an open, park-like setting. Other areas classified as Type 2 have a sparse understory because of past or ongoing disturbances. For example, in some areas currently or formerly used as bivouac areas for military exercises, the sparse understory is largely due to trampling of the shrub and subcanopy vegetation. In other areas, this appearance has been attributed to overbrowsing by deer (Robbins, 1990).

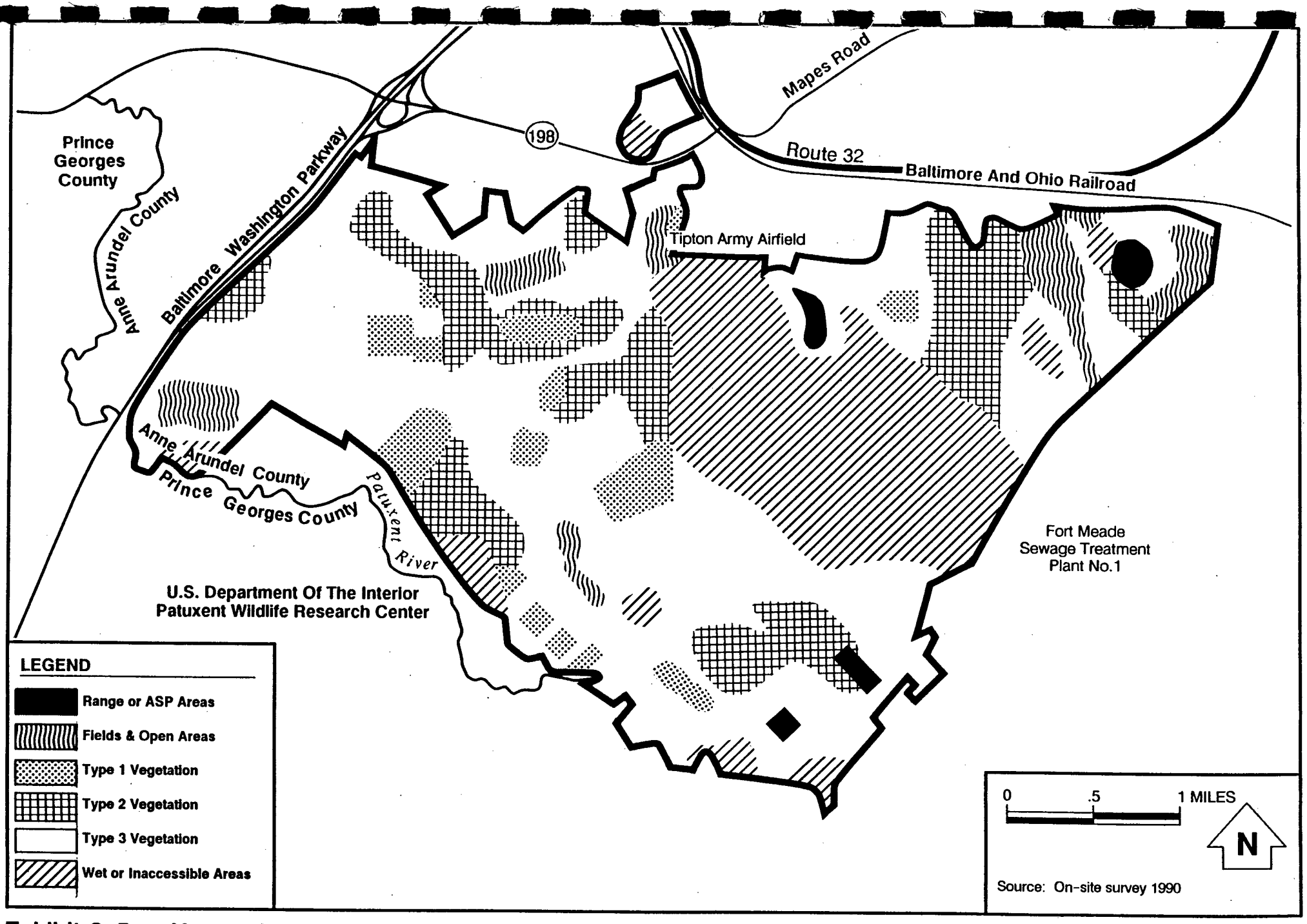

Exhibit 3–5 Vegetation Types at Fort George G. Meade

EXHIBIT 3-6

CLASSIFICATION OF VEGETATION TYPES OCCURRING AT FORT MEADE[a]

Resource Management Area	Total Acres	Acres and Percent of Vegetation Type Within Management Areas									
		Type 1 (b)		Type 2 (c)		Type 3 (d)		Wetland (e)		Fields and Open Areas (f)	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
A	19.3	0	0	0	0	6.4	33	0	0	12.9	67
B	201.4	0	0	0	0	100.7	50	0	0	100.7	50
C	159	0	0	63.6	40	79.5	50	15.9	10	0	0
D	992.2	19.84	2	396.88	40	456.412	46	19.844	2	99.22	10
E (inc. ASP)	589.7	0	0	0	0	117.94	20	471.76	80	0	0
F	1158.6	0	0	0	0	347.58	30	811.02	70	0	0
G	571.4	0	0	171.42	30	399.98	70	0	0	0	0
H	307.7	0	0	123.08	40	153.85	50	6.154	2	24.616	8
I	219.9	21.99	10	171.522	78	0	0	4.398	2	21.99	10
J	334.1	66.82	20	133.64	40	133.64	40	0	0	0	0
K	214	0	0	0	0	149.8	70	64.2	30	0	0
L	225.1	0	0	0	0	180.08	80	45.02	20	0	0
M	707.5	176.9	25	141.5	20	318.375	45	70.75	10	0	0
N	123.6	0	0	61.8	50	61.8	50	0	0	0	0
O	219.4	21.94	10	21.94	10	175.52	80	0	0	0	0
P	105.3	21.06	20	0	0	84.24	80	0	0	0	0
Q	234.4	58.6	25	0	0	175.8	75	0	0	0	0
R (R + R1)	420.2	0	0	0	0	315.15	75	21.01	5	84.04	20
S	168.2	0	0	50.46	30	117.74	70	0	0	0	0
T	118.3	0	0	0	0	118.3	100	0	0	0	0
U	185.1	37.02	20	0	0	148.08	80	0	0	0	0
V	303.9	0	0	121.56	40	182.34	60	0	0	0	0
W	332.6	0	0	99.78	30	166.3	50	0	0	66.52	20
X	251.6	75.48	30	125.8	50	50.32	20	0	0	0	0
Y	197.6	19.76	10	0	0	39.52	20	98.8	50	39.52	20
Z	83.1	0	0	0	0	49.86	60	33.24	40	0	0
Totals:	8443.1	519.4	6	1683.0	20	4129.2	49	1662.1	20	449.5	5

(a) Based on field surveys conducted in September 1990.
(b) Type 1 areas have dense growths of shrubs, saplings, and young trees and will be mowed completely.
(c) Type 2 areas consist of mature forests with sparse understory. Little (if any) clearing will be required in these areas.
(d) Type 3 areas have an open canopy and heavy understory. Understory in these areas will be mowed.
(e) Wetland areas will not be mowed. Survey will be completed on foot to the extent possible.
(f) Fields and open areas will be mowed.

EXHIBIT 3-7

PLANT SPECIES TYPICALLY FOUND IN UPLAND FORESTS AND FIELDS OF FORT MEADE[a]

UPLAND DECIDUOUS FOREST

northern red oak	mountain laurel
white oak	highbush blueberry
American beech	fox grape
chestnut oak	poison ivy
black cherry	Japanese honeysuckle
pitch pine	greenbriar
Virginia pine	fragrant bedstraw
ground pine	partridgeberry

FIELDS[b]

orchard grass	barnyard grass
sweet vernal grass	dogbane
bull thistle	false indigo
horse nettle	panicled-tick-trefoil
clearweed	false nettle
ragweed	broomsedge

[a] As reported in USACE, Draft EIS, March 1990.

[b] Based on common species occurring in resource management area R1.

Type 3. Type 3 forests are the most common areas at Fort Meade. These are comprised of eastern deciduous tree species, generally younger and smaller in size than those in Type 2. Because canopy closure is either incomplete or relatively recent in these areas, understory vegetation is abundant. The resultant forest structure is a combination of the dense vegetation structure of Type 1 areas and the tall canopy species of Type 2. Dense thickets of greenbriar also occur frequently in Type 3 areas, rendering some of the areas virtually impenetrable by foot. In some of the areas surveyed, the vegetation was a mix of Types 2 and 3; for the purposes of this impact assessment, these areas were conservatively classified as Type 3.

3.5.1.2 Fields and Open Areas

Fields and open areas at Fort Meade consist mainly of a large field in Area R, fields at the sanitary landfill in the northeastern portion of the installation, maintained portions of firing ranges, the area surrounding Tipton Airfield, and mowed lawns associated with buildings. The fields are predominated by herbaceous species, but several areas of scrub/shrub vegetation exist within the fields as well. Orchard grass, barnyard grass, and broomsedge are common herbaceous species found in many of the fields at Fort Meade. These and other common field species are listed in Exhibit 3-7. Currently, the fields are managed by mowing, typically every other year. Forage plots of sorghum, soybean, sunflower, and millet are planted to provide food for songbirds, game birds, and other terrestrial wildlife.

3.5.1.3 Wetlands

Palustrine emergent and forested wetlands comprise a large portion of the land to be excessed at Fort Meade. Exhibit 3-8 shows the extent of wetlands at Fort Meade as defined by the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory Maps for the area (Laurel, MD and Odenton, MD quadrangles). Although a wetlands survey was not conducted as part of this environmental assessment, areas with standing water or visually saturated soils were identified during the field survey in September 1990. These areas generally correspond to the USFWS-identified wetlands. Based on this limited visual survey, approximately 20 percent of the acreage at Fort Meade was classified as wetland. This total excludes the small amounts of seasonal wetlands bordering some of the smaller streams on the site that were dry during the September 1990 survey.

An intensive wetland creation/enhancement program is part of the wildlife management plan at Fort Meade. Under this program, a wetland mitigation area has been established in the southernmost portion of resource management area R1, and wetlands in resource management area F have been enhanced. The wetland in area R1 is a palustrine emergent wetland (wet meadow) adjacent to palustrine forested wetlands bordering the Patuxent River. A State endangered flower, the tickseed sunflower (Bidens coronata), is known to occur here. Other plant species found here are shown in Exhibit 3-9. This exhibit also lists species characteristic of the palustrine forested wetlands of the site.

3.5.2 Terrestrial Wildlife

The extensive forest of Fort Meade in conjunction with the fields and wetlands provide a diversity of habitats capable of supporting a variety of terrestrial wildlife species, including birds, mammals, reptiles, amphibians, and invertebrate fauna. Species present, and their habitat requirements, are discussed below.

3.5.2.1 Birds

Seventy-nine bird species are known to occur at Fort Meade. Along with the adjacent Patuxent Wildlife Research Center, the forested areas of Fort Meade support every bird species found in the eastern deciduous forest of the Coastal Plain of Maryland.

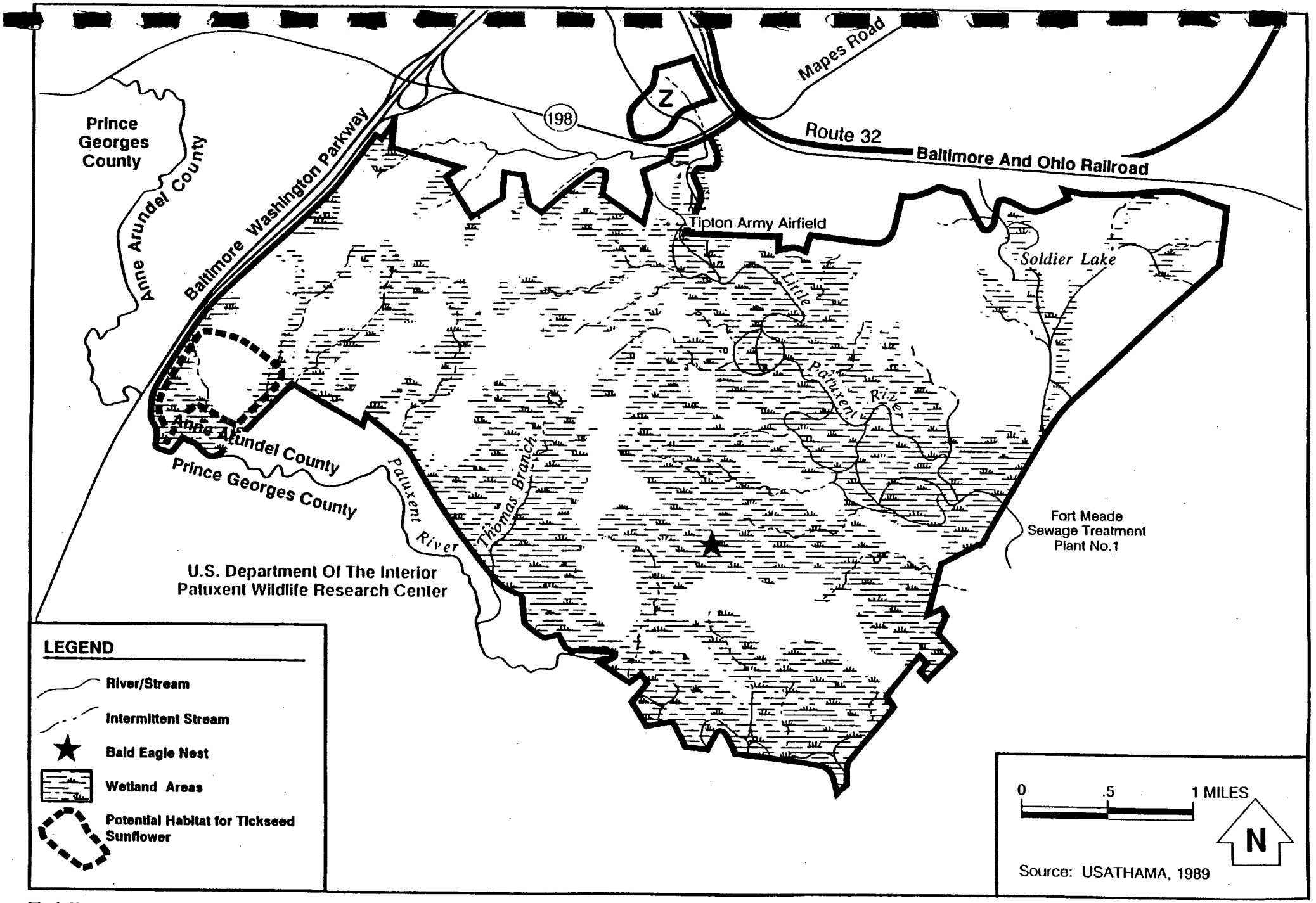

Exhibit 3-8 Wetlands & Surface Water at Fort George G. Meade

EXHIBIT 3-9

WETLAND PLANT SPECIES AT FORT MEADE[a]

Palustrine Emergent Wetlands[b]

soft rush
smartweed
black raspberry
Canada St. Johnswort
dwarf St. Johnswort
bluevervain
sensitive fern
umbrella sedge
mild waterpepper
Maryland meadow beauty
slender yellow-eyed grass
Carolina yellow-eyed grass
white boneset
wood fern
sweet pepperbush
*tickseed sunflower

Palustrine Forested Wetlands

red maple
black gum
ironwood
black birch
tulip poplar
fetterbush
sweetbay magnolia
lowbush blueberry
lady fern
ostritch fern
wood fern
greenbriar
sphagnum
willow oak
sweet gum
yellow birch
American sycamore
northern arrowwood
sweet pepperbush
highbush blueberry
New York fern
cinnamon fern
sensitive fern
wild licorice
water horehound

[a] As reported in USACE, Draft EIS, March 1990.

[b] Based on species found in the riverbank or wetland mitigation area in resource management area R1.

* = state endangered species

Some of Fort Meade's capacity to support such diverse birdlife is due to its position along the Atlantic Flyway, the principal bird migratory route in eastern North America. The variety of habitats occurring at Fort Meade, including the extensive forests, make it an important resting spot for many migratory species. For example, migrating raptors have been repeatedly observed to select the forests of Fort Meade as an overnight resting spot (Robbins, 1990).

The habitat at Fort Meade also provides breeding habitat for various migratory and resident bird species. Seventy-nine bird species are known to breed at Fort Meade, with 27 of these being neotropical migrants. Many of the neotropical migrants are considered forest interior species, and typically require moderate to large continuous tracts of forest, such as those at Fort Meade, in which to nest or forage (Whitcomb, et al. 1981). Other neotropical migrants are considered "area sensitive" species, and typically require undisturbed habitats of 10 acres or more (Whitcomb, et al. 1981). Forty-seven resident and temperate zone migrant species are considered to be field-edge or edge species. The implications of these habitat requirements and potential impacts are discussed in Section 4.3.

Resident and migratory waterfowl utilize the abundant aquatic habitat at Fort Meade, including the Little Patuxent and Patuxent Rivers, and impounded wetland areas. The most commonly observed waterfowl species are mallard, black duck, and Canada goose. Wood duck are also present, and nest boxes have been placed in appropriate habitats at Fort Meade to encourage nesting. Plants such as soybean and millet have been planted to provide forage for waterfowl and other wildlife species.

Exhibit 3-10 presents a list of the bird species that occur at Fort Meade, along with an identification of their migratory status and habitat preference. One federal and state endangered bird species, the bald eagle (Halaieetus leucocephalus), is currently nesting at Fort Meade. Further discussion regarding endangered species is presented in Section 3.5.4.

3.5.2.2 Mammals

Mammal species found at Fort Meade and their habitat preferences are listed in Exhibit 3-11. Of these species, gray squirrel, eastern cottontail, red fox, and white-tailed deer are considered to be important game species. Game populations are regulated by seasonal hunting.

3.5.2.3 Reptiles and Amphibians

Numerous reptilian and amphibian species are found at Fort Meade. These species and the habitats they utilize are listed in Exhibit 3-12 (reptiles) and 3-13 (amphibians). The distribution of reptile and amphibian species is related, to a large degree, to the presence of water or moisture. For example, species such as snapping turtles tend to be found only in or near permanent water sources such as the Patuxent and Little Patuxent Rivers, Soldier Lake, and associated wetlands. More upland species, such as the black rat snake, box turtle, and red-backed salamander escape to cool, moist microhabitats in the forest during hot, dry periods, and hide under logs, leaves, or other forest substrate.

3.5.2.4 Invertebrate Fauna

The diverse habitats at Fort Meade support an abundance of invertebrate fauna. Surveys at the Patuxent Wildlife Research Center adjacent to Fort Meade have estimated that a minimum of 500 species of insects occur in the local ecosystem. Invertebrates are an important part of the food web for most species, and for many birds, reptiles, amphibians, and fish, comprise a significant portion of the diet.

EXHIBIT 3-10

BREEDING BIRDS OF FORT MEADE[a]

Family/Species	Habitat Preference (b)	Migratory Strategy (c)
EAGLES AND HAWKS		
Bald Eagle	I/F/E	T
Cooper's Hawk	I/F/E	T
Red-shouldered Hawk	I	T
Red-tailed Hawk	I/F/E	T
FALCONS		
QUAIL		
Northern Bobwhite	F/E	R
PLOVERS		
Killdeer	F/E	T
PIGEONS AND DOVES		
Mourning Dove	E	R
Rock Dove	B	R
CUCKOOS AND ALLIES		
Yellow-billed Cuckoo	I	N
OWLS		
Barred Owl	I	R
Great-Horned Owl	I	R
HUMMINGBIRDS		
Ruby-Throated Hummingbird	E	N
WOODPECKERS		
Downy Woodpecker	I/F/E	R
Hairy Woodpecker	I	R
Northern Flicker	E	T
Pileated Woodpecker	I	R
Red-Bellied Woodpecker	I/F/E	R
TYRANT FLYCATCHERS		
Acadian Flycatcher	I	N
Eastern Kingbird	F/E	T
Eastern Phoebe	F/E	T
Eastern Wood-Peewee	I	N
Great Crested Flycatcher	I	N
Willow Flycatcher	E	T
SWALLOWS		
Barn Swallow	B	N
JAYS AND CROWS		
American Crow	E	R
Blue Jay	I/F/E	R
Fish Crow	E	T
TITMICE		
Carolina Chickadee	I/F/E	T
Tufted Titmouse	I/F/E	R
WRENS		
Carolina Wren	I/F/E	T
House Wren	I/F/E	T

EXHIBIT 3-10 (continued)

BREEDING BIRDS OF FORT MEADE[a]

Family/Species	Habitat Preference (b)	Migratory Strategy (c)
GNATCATCHERS, THRUSHES, AND ALLIES		
American Robin	E	T
Blue-gray Gnatcatcher	E	N
Eastern Bluebird	E	T
Wood Thrush	I	N
CATBIRDS, MOCKINGBIRDS, AND THRASHERS		
Brown Thrasher	E	T
Gray Catbird	E	N
Northern Mockingbird	E	R
WAXWINGS		
Cedar Waxwing	E	T
STARLINGS		
European Starling	F/E	R
VIREOS		
Red-Eyed Vireo	I	N
White-Eyed Vireo	E	N
Yellow-Throated Vireo	I	N
WOODWARBLERS, TANAGERS, CARDINALS GROSBEAKS, BUNTINGS, SPARROWS, BLACKBIRDS, AND ORIOLES		
American Redstart	I	N
Black and White Warbler	I	N
Blue Grosbeak	E	N
Brown-headed Cowbird	I/F/E	T
Cerulean Warbler	I	N
Chipping Sparrow		T
Common Grackle	F/E	T
Common Yellowthroat	E	N
Eastern Meadowlark	F	T
Field Sparrow	F/E	T
Hooded Warbler	I	N
Indigo Bunting	E	N
Kentucky Warbler	I	N
Louisiana Waterthrush	I	N
Northern Cardinal	I/F/E	R
Northern Parula Warbler	I	N
Ovenbird	I	N
Pine Warbler	I	T
Prairie Warbler	E	T
Red-Winged Blackbird	F	T
Rufous-Sided Towhee	E	T
Scarlet Tanager	I	N
Song Sparrow	E	T
Summer Tanager	I	N
Worm-Eating Warbler	I	N
Yellow-Breasted Chat	E	N
FINCHES AND ALLIES		
American Goldfinch	E	T
House Finch	F/E	R

EXHIBIT 3-10 (continued)

BREEDING BIRDS OF FORT MEADE[a]

Family/Species	Habitat Preference (b)	Migratory Strategy (c)
DUCKS, SWANS, AND GEESE		
American Black Duck	E/A	T
Canada Goose	A	T
Mallard	A	T
Wood Duck	A	T
HERONS		
Green-backed Heron	A	T
RAILS		
Clapper Rail	A	R
OLD WORLD SPARROWS		
House Sparrow	E	R

(a) As reported in USACE, Draft EIS, March 1990.

(b) Habitat Preference (based on Whitcomb, et al. 1981 and professional judgement):

A = Aquatic
B = Buildings
E = Edge
F = Fields
I = Forest interior
I/F/E = Forest interior but utilizes field and edge habitats as well.

(c) Migration Strategy (based on Whitcomb, et al. 1981 and professional judgement):

N = Neotropical migrant
R = Resident
T = Temperate zone migrant

EXHIBIT 3-11

MAMMALS FOUND AT FORT MEADE AND THEIR PREFERRED HABITAT(a)

SPECIES	PREFERRED HABITAT (b)					
	OPEN MEADOW OR FIELD	BRUSHY AREA	FOREST	MARSH/ SWAMP	NEAR WATER	INSIDE CAVES OR STRUCTURES ASSOCIATED WITH MAN
RODENTS						
Meadow Vole	X		X		X	
White-footed Mouse	X	X	X			
Eastern Harvest Mouse	X			X		
Meadow Jumping Mouse		X				
Prairie Deer Mouse	X					
Muskrat				X	X	
Eastern Chipmunk		X	X			
Pine Vole			X			
Red Squirrel			X	X		
Gray Squirrel			X		X	
Southern Flying Squirrel			X			
Woodchuck		X	X		X	
Beaver				X		X
House Mouse						X
Norway Rat						X
INSECTIVORES						
Least Shrew	X	X		X		
Eastern Mole	X					
Star-nosed Mole					X	
Short-tailed Shrew	X		X	X		
Masked Shrew	X	X	X			
POUCHED MAMMALS						
Opossum	X		X		X	
CARNIVORES						
River Otter					X	
Striped Skunk	X	X	X			
Long-tailed Weasel					X	
Mink				X		
Raccoon			X		X	
Red Fox		X		X		
Grey Fox	X		X			
Bobcat			X	X		
RABBITS						
Eastern Cottontail		X	X			
HOOFED MAMMALS						
White-tailed Deer		X	X	X		

EXHIBIT 3-11 (continued)

MAMMALS FOUND AT FORT MEADE AND THEIR PREFERRED HABITAT(a)

SPECIES	PREFERRED HABITAT (b)					
	OPEN MEADOW OR FIELD	BRUSHY AREA	FOREST	MARSH/ SWAMP	NEAR WATER	INSIDE CAVES OR STRUCTURES ASSOCIATED WITH MAN
BATS						
Red Bat			X			
Big Brown Bat			X		X	
Little Brown Bat			X		X	
Evening Bat			X		X	
Silver-haired Bat			X		X	
Eastern Pipistrel			X		X	

(a) Species list as reported in USACE, Draft EIS, March 1990.
(b) As reported by Bart and Grossenheider (1976).

EXHIBIT 3-12

REPTILES FOUND AT FORT MEADE AND THEIR PREFERRED HABITATS(a)

	PREFERRED HABITAT (b)				
SPECIES	FIELD	FOREST	LOGS/ ROCKPILES	MARSH/SWAMP BOG	NEAR WATER
TURTLES					
Common Snapping Turtle				X	
Eastern Painted Turtle				X	X
Red Bellied Turtle					X
Spotted Turtle				X	X
Eastern Mud Turtle	X				X
Stinkpot		X		X	X
Eastern Box Turtle			X		X
SNAKES					
Coastal Plain Milk Snake	X	X			X
Six-lined Racerunner	X	X			X
Corn Snake		X			
Northern Red-bellied Snake	X		X		
Eastern Garter Snake	X	X		X	
Eastern Earth Snake	X	X			
Northern Copperhead		X	X		
Eastern Worm Snake			X		
Northern Black Racer	X	X			
Northern Ringneck Snake		X	X		
Black Rat Snake	X	X			
Eastern Hognose Snake	X	X			X
Mole Snake	X	X			
Northern Water Snake					X
Rough Green Snake		X			X
Northern Brown Snake		X		X	
Eastern Ribbon Snake				X	X
LIZARDS					
Northern Fence Lizard		X			
Five-lined Skink		X	X		
Ground Skink		X	X		

(a) Species list as reported in USACE, Draft EIS, March 1990.
(b) As report in Conant (1975).

EXHIBIT 3-13

AMPHIBIANS FOUND AT FORT MEADE AND THEIR PREFERRED HABITATS (a)

SPECIES	PREFERRED HABITAT (b) IN/NEAR RUNNING WATER	IN/NEAR STANDING WATER	MARSH/ SWAMP	TERRESTRIAL
SALAMANDERS				
Marbled Salamander				X
Red-backed Salamander				X
Spotted Salamander		X		
Northern Dusky Salamander	X			
Four-toed Salamander		X		X
Two-lined Salamander	X			
Long-tailed Salamander	X			X
Eastern Mud Salamander	X	X		
Northern Red Salamander	X			
Red-spotted Newt		X	X	
FROGS				
Eastern Spadefoot				X
Northern Spring Peeper	X	X		X
Gray Treefrog	X	X		X
Upland Chorus Frog	X	X	X	X
Eastern Wood Frog				X
Bullfrog	X	X		
Green Frog	X	X		
Pickerel Frog	X		X	
Southern Leopard Frog				
Northern Cricket Frog		X		
TOADS				
American Toad	X	X		
Fowler's Toad	X	X		

(a) Species list as reported in USACE, Draft EIS, March 1990.
(b) As reported in Conant (1975).

3.5.3 Aquatic Systems

Aquatic habitat at Fort Meade consists of the Patuxent and Little Patuxent Rivers, Soldier Lake, small ponds and impounded areas, and perennial and intermittent streams (as well as the wetlands discussed previously). These water bodies support populations of fish and other aquatic life and provide breeding habitat for amphibian species and waterfowl. Significant water bodies are identified along with wetlands in Exhibit 3-8.

Soldier Lake is stocked with catfish, bluegill, and largemouth bass. Smallmouth bass, striped bass, yellow perch, and fall fish are the most common species found in the Little Patuxent River. Several anadromous fish species have been documented by the Maryland Department of Natural Resources to occur in this river as well, including hickory shad, whose numbers have been declining in recent years. Although this species is not listed as endangered or threatened, it has been illegal to capture hickory shad in Maryland waters since 1981 (US Army Corps of Engineers, 1990).

The Patuxent and Little Patuxent Rivers are tributaries of the Chesapeake Bay, and the tidal reaches of the Patuxent River (including those near Fort Meade) are included in the Chesapeake Bay Critical Area Protection Program initiated in 1984. As part of this program, protection of critical habitats within the region is required. Aquatic resources that are considered to be critical habitats are all tributaries of the Chesapeake Bay, riparian forests in floodplains of these tributaries, water bird nesting areas, and nontidal wetlands within the area. Approximately 1,700 acres, or 20%, of the property at Fort Meade is located within the 100 year floodplain of the Patuxent River and its tributaries. Forests within these floodplains are therefore considered critical habitats under the protection program. In addition to its classification as a critical area, the Patuxent River also was designated a State of Maryland Scenic River under the 1969 Scenic and Wild Rivers Act (Md. Annot. Code, Title 8, Subtitle 4, Sections 8-401 to 8-411).

3.5.4 Endangered and Threatened Species

Two species at Fort Meade are listed as endangered: the bald eagle (Haliaeetus leucocephalus), a state- and federal-listed endangered bird species, and the tickseed sunflower (Bidens coronata), a state-listed endangered plant species.

3.5.4.1 Bald Eagle

In compliance with Section 102 of the National Environmental Protection Act of 1969 (42 USC 4332) and Section 7 of the Endangered Species Act of 1973 (16 USC 1531), a Biological Assessment of Threatened and Endangered Species (BATES) was completed for Fort Meade in August 1989. The survey confirmed the presence at Fort Meade of a breeding pair of bald eagles. The eagles are nesting in resource management area G, located in the southeastern area of Fort Meade (see Exhibit 1-2). They produced a brood of 2 eaglets in 1989 and 3 eaglets in 1990, all of which fledged successfully.

Typically, the foraging area of bald eagles is extensive. At Fort Meade, bald eagles have been observed hunting over the entire property, and probably also utilize a significant area outside the installation. Fish are the primary food item in the bald eagle diet, and are supplemented by carrion, waterfowl, and small mammals. The diet of the eagles at Fort Meade probably includes fish from the rivers and lake, and small mammals from the fields and open areas.

Bald eagles nest in tall trees, often pine if they are available. They utilize additional trees in the immediate vicinity of the nest tree for roosting. Tree perches are also used by the eagles to locate prey.

3.5.4.2 Tickseed Sunflower

The tickseed sunflower (Bidens coronata), a state endangered species, is reported to occur in the lower section of the old field in area R1, in the southwestern portion of the property. This species occurs

in wet meadows, swamps, and lake margins from Quebec to Ontario, south to Virginia and Kansas (Magee 1981). Its exact location in the old field has not been determined.

3.6 NOISE

The site clearing and ordnance detection activities to be performed at Fort Meade will involve two noise-generating activities. The first noise-generating activity is shrub clearance using mobile equipment. The second activity with the potential for noise generation is in-place ordnance detonation which may be required for any unexploded ordnance detected which cannot be safely extracted. Detonation of extracted ordnance will ordinarily occur at the existing ordnance detonation area at Fort Meade. Ordnance detonation will only be conducted in-place if the ordnance discovered is determined to be inherently unsafe.

Site-clearing and in-place ordnance detonation activities in the Fort Meade work areas will be restricted to the hours of 7:00 am to 10:00 pm. There will be a minimum of 200 feet distance between the Fort Meade work areas and significant noise receptor areas. This distance will serve as a buffer zone to attenuate noise emanating from the site-clearing equipment and/or in-place ordnance detonation.

3.6.1 Background Noise Sampling and Equipment Noise Sampling

Ambient noise sampling was conducted at Fort Meade to establish background noise levels within and at the perimeter of Fort Meade. Ambient noise measurements were also taken at a remote location where site clearing work was being conducted, to assess noise generated by site clearing equipment. Noise sampling instruments and procedures used for background and equipment noise sampling conducted for the purpose of this environmental assessment are described below. Background and equipment noise data are also summarized below.

3.6.1.1 Description of Noise Sampling Instruments

The instrument used in measuring equipment noise levels and in assessing the background noise levels at Fort Meade was a Quest Model 215 general purpose sound level meter. The Quest Model 215 is designed to meet or exceed ANSI Standard S1.4-1983 for type 2 instrumentation. ANSI Standard S1.4-1983 is the Maryland Department of the Environment recommended standard . The meter has a dynamic range from 30 to 140 dB (20 $\mu N/m^2$) and a frequency range of 20 to 10,000 Hz. In order to prevent wind blowing across the microphone and causing erroneous sound level measurements, a windscreen was placed over the microphone. The windscreen is made of reticulate polyurethane foam and significantly reduces ambient wind effects. A Quest Model CA-12B sound calibrator was used to calibrate the meter prior to its use.

3.6.1.2 Description of Noise Sampling Methodology

Prior to initial use of the noise meter, the following steps were taken to ensure the accuracy of the noise measurements:

1. the batteries were tested according to the manufacturer's instructions to verify that they were in proper working order; and

2. the unit was calibrated as prescribed by the manufacturer.

The following procedures were used to measure background and equipment noise levels:

1. the dB range selector was set at or above the expected sound pressure level;

2. the weighting characteristic was set to A;

3. the slow response reading was selected;

4. the ON-OFF-BAT switch was moved to the ON position;

5. the meter was held with the analyst's arm extended forward and raised so as to prevent sound reflection off of the analyst's body;

6. when necessary, the dB range selector was readjusted so as to produce a reading between 0 and +10 on the meter;

7. the noise level was calculated by adding the positive scale readings to the dB range level selected. (For example, if the range selector was set at 80 dB, and a meter reading of +8 was indicated, then the sound level measured was recorded as 88 dB.)

3.6.1.3 Summary of Background Noise Data

Background noise levels were measured within and at the perimeter of the Fort Meade work area between September 17 and September 19, 1990, using the equipment and procedures described above. Background noise sampling locations are indicated in Exhibit 3-14. Background noise data are summarized in Exhibit 3-15.

Background noise measurements were taken at 17 locations, 13 within the installation and 4 at the perimeter of the installation. The highest background noise level of 70 dB was measured at three locations adjacent to Maryland Route 198, a major road at the perimeter of the work area. The lowest background noise level of 40 dB was measured in the interior of the installation adjacent to a site road having no traffic.

3.6.1.4 Summary of Equipment Noise Data

Noise level measurements were taken by Arbour Resources Inc. on September 11, 1990 during site clearing operations at a remote location where the Hydro-Ax was in use, to assess the level of noise generated by the Hydro-Ax. The Hydro-Ax is the largest of the type of clearing equipment that will be used at Fort Meade. Two sets of measurements were taken when the Hydro-Ax was operating at full power: while the cutting blades were engaged mowing heavy brush and while the cutting blades were engaged but mowing was not being conducted. Noise measurements were taken at distances of 5 feet, 50 feet, and 100 feet from the Hydro-Ax. Equipment noise measurements are summarized in Exhibit 3-16.

The Hydro-Ax generated a noise level of 94 dBA at a distance of 5 feet when operating at full power. A noise level of 85 dBA at a distance of 50 feet was generated while the Hydro-Ax was clearing brush at full power (the Hydro-Ax cannot be approached within 50 feet while clearing brush).

3.6.1.5 Summary of Ordnance Detonation Noise Data

Demolition noise measurements were made by the U.S. Army Environmental Hygiene Agency (USAEHA) at Fort Meade in 1981. The measurements were made on five pound charges detonated at ground level, however, only one-half to one pound charges are expected to be found at the Fort Meade work area. Exhibit 3-17 contains the ordnance detonation noise data.

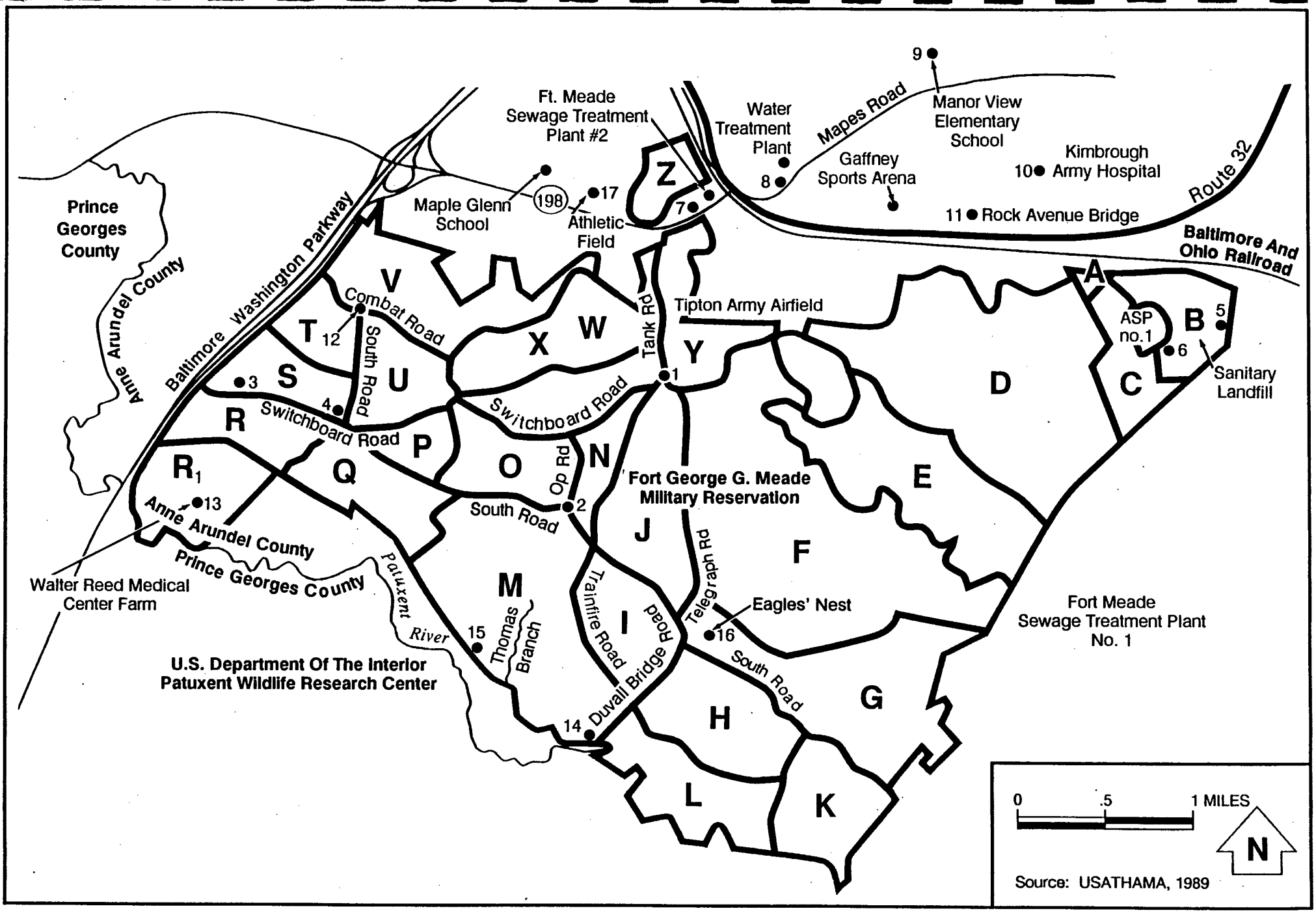

Exhibit 3–14 Background Noise Measurement Locations

EXHIBIT 3-15

BACKGROUND NOISE LEVEL MEASUREMENTS

Location Number	Location	dBA	Comments
1	Intersection of Tank Road and Switchboard Road	40-58	Increase in noise due to helicopter and small arms fire
2	Intersection of Op Road and South Road	< 40	Insect and bird noises
3	On Switchboard Road approximately 100 yards to Baltimore Washington Parkway	64	Road noises
4	Intersection of South Road and Switchboard Road	44	
5	Near sanitary landfill on east side of Fort Meade	50	Crickets, traffic, small arms fire
6	Just south of Ammunition Supply Point (ASP) No. 1	45	Small arms fire
7	Near Route 198 close to Fort Meade Sewage Treatment Plant No. 2	66-70	Close of rush hour traffic @ 8:30 am
8	Near Route 198 close to Water Treatment Plant	60-70	Close of rush hour traffic @ 8:30 am
9	Manor View Elementary School	48	
10	Near Kimbrough Army Hospital	55	
11	Rock Avenue Bridge east of Gaffney Sports Arena	52	
12	Intersection of Combat Road and South Road	48	Distant traffic
13	Walter Reed Medical Center	50	Distant traffic
14	Duvall Bridge Road near Fort Meade perimeter	44-46	Distant gunfire
15	Fort Meade perimeter just northwest of where Thomas Branch of Patuxent River crosses boundary	50	
16	Near intersection of South Road and Duvall Bridge Road (Eagles' nest location)	43	Unusually quiet; no gunfire, small plane flying overhead
17	Near Route 198 close to Athletic Field and Maple Glen School	70-74	Fairly close to rush hour traffic

EXHIBIT 3-16

HYDRO-AX NOISE LEVELS DURING FULL POWER AND SITE-CLEARING OPERATIONS

Mode of Operation	Distance from Hydro-Ax (feet)	Noise Level (dBA)
Full power with Rotary Ax engaged	5	94
	50	79
	100	72
Full power while mowing heavy brush	50	85
	100	77

EXHIBIT 3-17

ORDNANCE DETONATION NOISE LEVELS

Distance from Ordnance (feet)	Noise Level (dBA)
400	149
600	147
1000	128

3.6.2 Background Noise Sampling and Noise Receptor Locations

The following two criteria were used in determining the locations for measuring background noise levels:

- Areas of significant noise generation (e.g., major roads, nearby gun range, airports, etc.); and
- Areas near noise receptors (e.g., bald eagle nest area, other wildlife areas, schools, hospitals, etc.).

Background noise measurements were taken at seventeen areas that were accessible by foot and which fit one of these two classifications. Areas of significant noise generation included major roads and intersections, pistol ranges, airports, municipal treatment plants, and railroad tracks.

Six noise receptor areas were selected for use in calculating noise impacts. Noise receptor areas included residential neighborhoods, hospitals, schools and wildlife areas. The calculated noise impacts in these areas are representative of impacts at other locations within and at the perimeter of the installation. Noise receptor locations are shown in Exhibit 3-18, and are described in Exhibit 3-19.

Background noise sampling locations were selected to allow calculation of the cumulative impact of site clearing and ordnance detonation activities and background noise levels on noise receptors within and at the perimeter of the installation.

3.7 SOCIOECONOMIC CONDITIONS

Fort Meade is located in Anne Arundel County, immediately east of the Baltimore-Washington Parkway and north of the Anne Arundel County/Prince Georges County line. The installation is mid-way between Baltimore, Maryland and Washington, D.C. The description of the socioeconomic setting which follows focuses primarily on Anne Arundel County and Fort Meade itself. Typically, the socioeconomic study area is defined in terms of the area that could potentially be affected by the proposed action. In this case, the socioeconomic impact area will likely be confined to the base itself and to the area immediately surrounding it. Thus, the socioeconomic characteristics of Fort Meade and Anne Arundel County are the predominant focus.

3.7.1 Demography

The population of Anne Arundel County was 298,042 in 1970. It grew to 370,775 in 1980 and 417,600 in 1988. The average annual change in population between 1970 and 1980 was 2.2 percent and 1.6 percent between 1980 and 1988. This is higher than the state of Maryland's average of 1.2 percent for this same period (U.S. Bureau of the Census, 1990).

The 1980 population of Assessment District 4, which surrounds Fort Meade, was 72,430, and was estimated to have increased to 76,578 by 1989 (Anne Arundel County, Office of Planning and Zoning, 1990). This is an average annual growth rate of 0.6 percent which is well below the County-wide rate of 2 percent. In 1989, the total population of Army employees on Fort Meade was approximately 35,000 (Ft. Meade, Sept, 1989).

There were a total of 121,028 households in Anne Arundel County in 1980 with an average household size of approximately 3.0 persons (U. S. Bureau of the Census, 1990). In 1989, the U.S. Census Bureau estimated that there were a total of 147,278 households with an average household size of 2.8 persons. Thus, there was a decrease in average household size over this period which is a demographic trend occurring nationally.

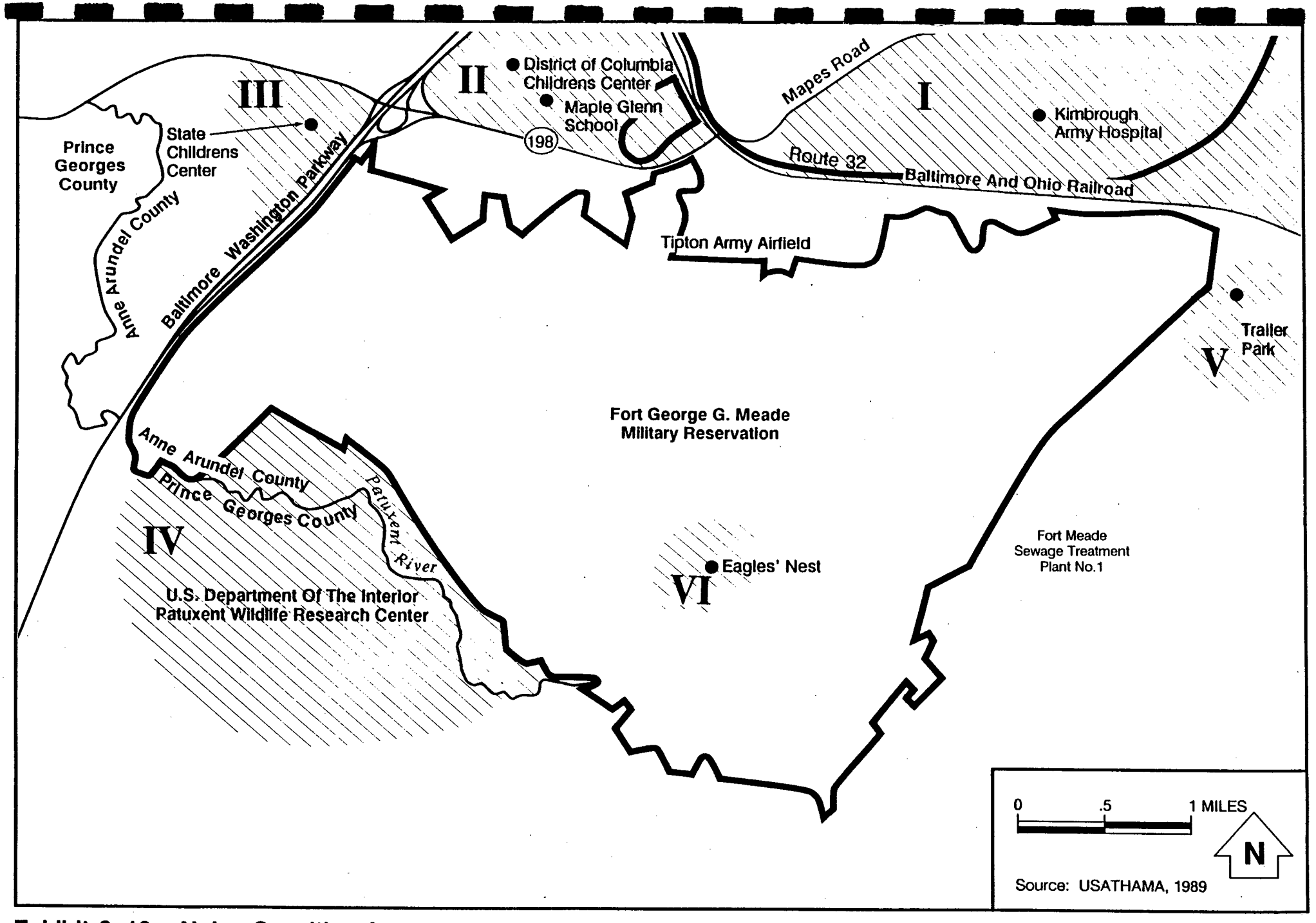

Exhibit 3-18 Noise Sensitive Areas

EXHIBIT 3-19

NOISE RECEPTOR AREAS

Receptor Number	Receptor Location
I	On-base military office and residential neighborhood below Route 198, surrounding Kimbrough Army Hospital
II	Maple Glen School/District of Columbia Children's Center
III	State Children's Center near Baltimore Washington Parkway
IV	U.S. Department of the Interior Patuxent Wildlife Research Center
V	Trailer park near east end of Fort Meade close to Sanitary Landfill
VI	Eagles' nest area near the intersection of South Road and Duvall Bridge Road

The age distribution in Anne Arundel County in 1989 is as shown below (U. S. Bureau of the Census, 1990).

Age	Percent of Population
Under 5	6.5
5 to 14	12.7
15 to 24	17.2
25 to 34	16.9
35 to 44	15.8
45 to 54	11.7
55 to 64	9.3
65+	9.8

The percentage of school-age children (5 to 19) has declined over the past decade from 25.9 percent to 20.4 percent. In addition, the number of people over 65 has increased from 6.8 percent to 9.8 percent.

3.7.2 Housing

In 1980 there were a total of 129,031 housing units in Anne Arundel County. Through the end of 1988, the County had issued building permits for an additional 30,600 dwelling units. Between 1980 and 1989, a total of 2,911 new residential units were authorized in Assessment District 4, approximately 9.5 percent of the total authorized for the County.

3.7.3 Economics

The total civilian labor force in Anne Arundel County in 1987 was estimated at 205,164 persons (US Army Corps of Engineers, 1990). The distribution of employment by major economic sector (i.e., one-digit SIC Code) in the County is shown below.

Industry	Percent Employment in Anne Arundel County
Government	30.9
Federal, Civilian	13.9
Military	7.8
State and Local	9.2
Farm	0.4
Private Employment	68.8
Agric. Services	0.6
Mining	0.6
Construction	7.0
Manufacturing	9.9
Trans. & Public Util.	4.1
Wholesale Trade	2.7
Finance, Ins. & Real Estate	5.4
Services & Other	22.2

The vast majority of employment in Anne Arundel County is concentrated in Government, Retail Trade and Services sectors. This concentration reflects the presence of Federal Government and Military offices around the Washington, D.C. area, and most notably of Fort Meade.

Fort Meade is one of the largest employers in Anne Arundel County. There are approximately 9,500 military personnel assigned to Fort Meade along with another 25,500 civilian employees working at the base (Ft. Meade, Sept, 1989).

Anne Arundel's unemployment rate of 3.3 percent in 1988 compared favorably with the statewide rate of 4.2 percent and the national rate of 6.2 percent for the same period.

3.7.4 Services

Recreation. Fort Meade currently allows public access to the 9,000 acres to be cleared and surveyed. Access for hunting, fishing, trapping, birdwatching, and ecological studies is provided through a Cooperative Management Plan between the Army and the Maryland Department of Natural Resources. The area provides the only major hunting grounds for deer and other game in the Washington, D.C./Baltimore metropolitan area (Maryland Dept. of Natural Resources, 1990). Other recreational opportunities available for military personnel use in the areas to be cleared and surveyed include riding stables, and fishing at Soldier Lake.

Water Treatment and Consumption. There are two water treatment plants in the cantonment area of Fort Meade, outside of the 9,000-acre area. The average monthly water consumption at Fort Meade in 1987 was about 102 million gallons, which is equivalent to 3.3 million gallons per day. A combination of well water and surface water from the Little Patuxent River supplies water to the base (Argonne National Laboratory, 1989).

Police, Fire, and Emergency Services. Two fire stations are located on Fort Meade. The Fire/Crash Station, located at Tipton Airfield, employs a staff ranging from 12 to 19 firefighters. The fire station also houses two firefighting/crash vehicles and a ladder truck. Fort Meade Fire Station No. 45, located in the cantonment area, has a staff of thirty. This station houses two engine pumper trucks, one emergency rescue vehicle, two chief vehicles, and one hazardous materials trailer.

Police protection at Fort Meade is provided by 200 full-time military police officers. There are five police stations at Fort Meade, all located outside of the 9,000 acre area.

Kimbrough Army Hospital, located in the cantonment area of the installation, is a 100-bed facility. The hospital provides complete service to military personnel living off-post as well as on Fort Meade. It is currently operating at 65% of its available capacity.

Utilities. Baltimore Gas and Electric provides gas and electric power to Fort Meade and the surrounding area. A 115 kV transmission line brings electricity to government-owned master substations on the installation. At present the utility has excess load capacity.

Waste Treatment and Disposal. Fort Meade has its own sewage treatment system. The Advanced Wastewater Treatment Plant was completed in August 1983. The plant has an average usage of 4.6 mgd, with a peak design capacity of 12.3 mgd. It discharges to the Little Patuxent River and sludge from the Plant has been used as a soil conditioner at the sanitary landfill.

Fort Meade owns and operates a 53-hectare sanitary landfill near the eastern border of the 9,000 acre area. It is used for disposal of the installation's municipal and domestic wastes. Approximately 525 tons of waste per day are generated on the base. The landfill is expected to reach capacity between the years 1996 and 2001. There are at least five other inactive landfills located on Fort Meade.

3.8 LAND USE

Fort Meade is encompassed by the Anne Arundel County Assessment District 4, a 55,700-acre area in the northwest portion of the county bordered by Howard County to the northwest, Prince Georges County to the southwest, and the Baltimore-Washington International airport on the northeast. The

predominant zoning classification in Assessment District 4 is residential, particularly low-density residential and agricultural/residential. Fort Meade has a corresponding zoning classification, R1 (Residential use at 1 dwelling per acre). Major roadfront parcels are zoned primarily as C4 - Highway Commercial and W1 - Industrial Park. Areas set aside for open space are scattered throughout District 4 and are usually surrounded by residential zones (Argonne National Laboratory, 1989).

The vast majority of the 9,000 acre area is comprised of forest, wetlands and floodplains. Major developed areas include Tipton Airfield, the firing range and training areas, a sanitary landfill and sewage pump station located in the northeast corner of the area, and a fire station next to the airfield. In addition, there is a power line right-of-way running through the 9,000 acre area, 14 known cemeteries, and 4 wells located in the northeast corner of the area (EPA, 1983).

The land uses surrounding Fort Meade include residential, industrial, and government-owned property. Along the southern border, the chief use is governmental, including research acreage for the Patuxent Wildlife Research Center. The eastern border of the area consists of open space, park, and residential space. The northern border is largely governmental and consists of the Fort Meade cantonment area (includes barracks, administrative buildings, athletic facilities, transmission stations and lines, water treatment plants, military police and fire stations, and the Kimbrough Army Hospital). The rest of the northern border is industrial and open space area with a small commercial district on the northeast corner. The western border consists of residential and military space (EPA, 1983).

3.9 CULTURAL RESOURCES

The area which is now Fort Meade is estimated to have been periodically occupied since approximately 7,000 B.C. (US Army Corps of Engineers, 1990). Evidence of a large permanent occupation was found on the east side of Soldier Lake containing artifacts from the Late Woodland period. Historic Indian groups were known to inhabit the general area around Fort Meade but are thought to have been south of the base. Major floodplain areas in the 9,000 acre parcel have not been surveyed. However, floodplain and upland areas adjacent to streams have a medium to high potential for archaeological sites. Since the 9,000 acre area may contain ordnance, traditional archaeological surveys are not prudent.

Fort Meade was opened in 1917 to process draftees for World War I. The southern portion of Fort Meade, the 9,000 acre area, has undergone extensive impact through shelling, military maneuvers, tank exercises, foxhole and bunker digging, and ordnance training (US Army Corps of Engineers, 1990).

The 9,000 acre area to be cleared and surveyed at Fort Meade, presently has few buildings on it. A few buildings erected approximately 40 to 50 years ago comprise the Tipton Army Airfield located in the North-Central section of the 9,000 acres. The tract also includes a modern stable and scattered metal warehouse-type buildings in the training area. There are several prominent historic sites in the area (US Army Corps of Engineers, 1990):

- the Snowden complex, an iron works complex and manor houses occupied originally by the Snowden family.

- the Patuxent Forge which was used to store munitions and weapons in 1777; soldiers were stationed there to guard both the weapons and the forge.

- Gents Tavern/Blackhorse Tavern and other Colonial Era taverns.

- Smith Shop.

There are eleven marked and three unmarked cemeteries known to exist on the 9,000 acre area. The cemetery sites have been maintained by Fort Meade personnel, although some of the sites are privately owned. The Fish and Wildlife Office of Fort Meade have identified two, and possibly three

additional cemeteries. Exhibit 3-20 illustrates the location of the cemeteries (US Army Corps of Engineers, 1990).

3.10 VISUAL RESOURCES

The majority of the 9,000 acre parcel at Fort Meade is vegetated, consisting primarily of trees. Except for the disturbance from training activities and waste disposal that affect aesthetics in the area, there is very little development. In general, the aesthetics of Fort Meade range from poor to high quality, with highly disturbed training areas classified as of low aesthetic value and the pristine areas near floodplains and mixed woods classified as scenic (EPA, 1983).

3.11 TRANSPORTATION

Major regional roads around Fort Meade include the Baltimore-Washington Parkway, Interstate Route 95, State Highway Route 3, Route 175, and Route 197. The location of these roads and other local roads was illustrated earlier in Exhibit 1-1. None of the major paved roads provide direct access to the 9,000 acre area. However, Routes 32, 198, and 175 all provide access to the cantonment area.

There is a network of minor roads in the 9,000 acre area, concentrated primarily in the western portion of the parcel, that provide access to State Highway 198 and other local roads.

4.0 ENVIRONMENTAL IMPACTS

4.1 GEOLOGIC ASSESSMENT

A geotechnical engineering evaluation of slope stability in Potomac Formation deposits is difficult because of variations in the local geology and soil strength parameters. Evaluation of the soil type, history of failure, and groundwater conditions are often used to determine long term and short term soil slope stability. The duration of Army activities in the Fort Meade area may have resulted in minimal impacts to the local geology. However, the soils may contain naturally occurring fractures within the top 2-4 feet of the soil profile, which may be enhanced by weathering processes. Highly fractured soils below four feet may be more susceptible to slide and creep movements especially in areas where drainage is poor and slopes are higher.

It has been demonstrated that the release of energy from high explosives is an effective method of compacting different types of soils (Lee, et al., 1983). High velocity pressure waves are generated within the soil during an explosion. In the region close to the source, shock waves cause the loosely structured or fractured soil to be compacted. As the distance from the explosion increases the pressure gradient diminishes and the soil deformation is essentially elastic (Lee, et al., 1983). A cavity forms at the explosive source as a result of the gas pressure created by the explosion, however, it rapidly collapses. It has also been demonstrated that the degree of compaction is progressively reduced as more explosions occur (Lee, et al., 1983).

Groundwater pore pressure has a significant influence on the effective shear strengths in soils because a major portion of that strength is derived from the normal intergranular forces in the soil. The soils in the Fort Meade area are nearly level to steep and well-drained so the potential of soil liquefaction as a result of a subsurface explosion is not anticipated. Potential impacts from a subsurface explosion would be the creation of an 8-10 foot radius impact crater. Other significant earth movements as a result of a subsurface explosion are not anticipated. Due to the duration of Army activities and the number of explosions that have already occurred within the study area, significant additional soil compaction is not anticipated if a subsurface explosion were to occur during field investigative activities.

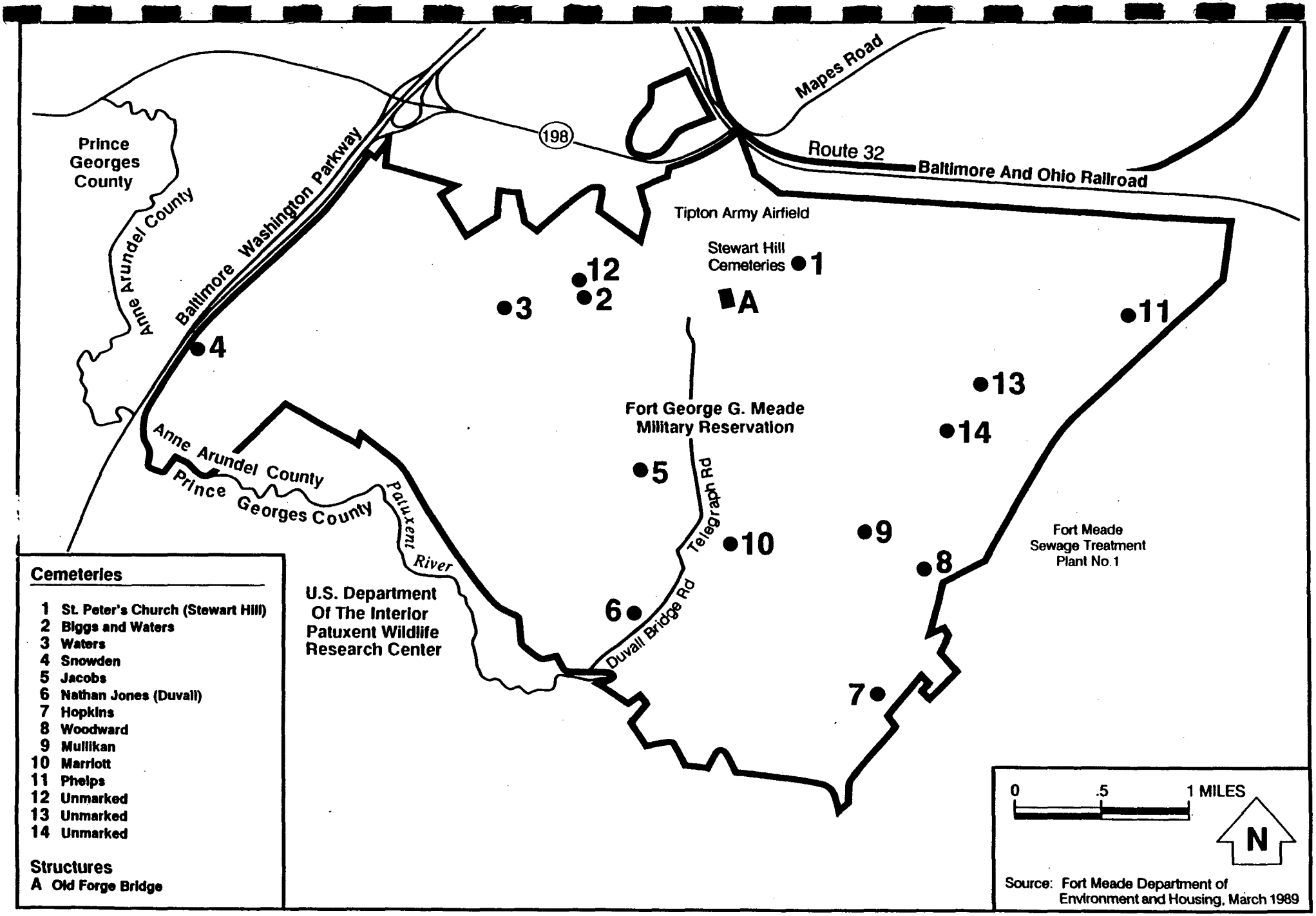

Exhibit 3-20 Historic Resources

Suspended sediment concentrations have a tendency to be relatively high throughout the Patuxent and Little Patuxent River watersheds. Much of the sediment originates from soil disturbance and increased surface runoff caused by urbanization in the sub-basin (Maryland Water Resources Administration, 1976). Additional sediment concentrations due to erosion may occur, in the Patuxent and Little Patuxent Rivers and associated tributaries at Fort Meade, resulting from surface clearing activities that will be conducted as part of the ordnance survey.

4.2 AIR QUALITY ASSESSMENT

Two activities associated with site clearing and ordnance removal to be performed at Fort Meade have the potential to generate air emissions of criteria pollutants. Criteria pollutants include nitrogen oxides (NO_x), sulfur oxides (SO_x), lead (Pb), inhalable particulate matter (PM-10), and carbon monoxide (CO). The first potential air emissions generating activity is heavy equipment operation during brush clearing activities. Heavy equipment operation is required for brush clearing so that ordnance detection equipment can maneuver over the work area. The second activity with the potential to generate air emissions is in-place ordnance detonation. Detonation of extracted ordnance will ordinarily occur at the existing ordnance detonation area at Fort Meade. In-place ordnance detonation will be conducted in rare situations where extraction has been determined to be unsafe.

Background air quality data, including discussions of meteorology, climatology, ambient air quality, and Federal and State attainment status of the Fort Meade area, are presented in Section 3.4.

4.2.1 Air Impact Assessment Methodology

Air dispersion modeling was conducted to estimate air impacts from the exhausts of the diesel engines that power the brush clearing equipment. In order to assess the potential for air quality impacts caused by the operation of this equipment, the EPA-approved air model COMPLEX1 was used. This model requires the specification of emissions rates and exhaust gas characteristics. Emission rates of combustion products from the engines were calculated from the emission factors for miscellaneous heavy-duty diesel-powered construction equipment found in EPA publication AP-42. The emission factors are in units of grams of pollutant emitted per horsepower-hour of operation. The two mowers used for brush clearing will both be powered by 185 horsepower turbocharged diesel engines. Over the course of an eight hour day the two mowers are expected to operate at an average of half of full power. Therefore the work done by the combination of the two mowers over the 8 hour day will be 1480 horsepower-hours, the same as one mower operating at full power for 8 hours. The emissions rates, given in grams per second (g/s) and pounds per day (lb/day), were calculated to be the following (assuming 8 hours of operation per day):

CO	0.236 g/s	or	14.98 lb/day
HC	0.052 g/s	or	3.30 lb/day
NO_x	0.566 g/s	or	35.76 lb/day
SO_x	0.048 g/s	or	3.03 lb/day
TSP	0.046 g/s	or	2.91 lb/day

The exhaust gas parameters that were used are as follows:

Stack Height	6 ft
Stack Inside Diameter	0.5 ft
Exhaust Gas Temperature	150°C
Exhaust Gas Flow Rate	46.12 ft^3/min
Model Options	Valley Option

Next, eleven receptor locations were selected. These locations can be found on Exhibits 3-14 and 3-18 and include schools, a hospital, wildlife areas, and villages in the vicinity of the work area. For each receptor, its distances from the center and from the nearest perimeter of the work area to be cleared were

measured. These distances were then input into the air model and a steady, 2.5 meters per second (m/s), wind was assumed to blow continuously directly at each of the receptors. The model was run using the "Valley" set of regulatory default options and a unit 1 g/s emission rate. The model output, which is an impact in terms of $\mu g/m^3$ per g/s emitted for each of the 22 distances, was then multiplied by the actual emission rate for each of the five pollutants. In this way, the expected impact for the average and maximum cases (modeled for the average and minimum distances, respectively, between the receptor and proposed actions) at each of the receptors for each of the pollutants was determined.

4.2.2 Air Impacts

Exhibits 4-1 and 4-2 present the average and maximum impacts of the brush clearing operation. The results of the air dispersion modeling exercise indicate that the air quality impacts from the two diesel-powered brush clearing machines will be negligible when compared to background levels and ambient air quality standards. As indicated in Exhibit 3-4, background levels of pollutants in the vicinity of Fort Meade far exceed the expected impacts for SO_x and TSP, and are approximately equal to the expected NO_x impact; no background data are available for CO and hydrocarbons (HC). The expected impacts for all pollutants are well below the Maryland and National Ambient Air Quality Standards, as shown in Exhibit 3-3. The only pollutant for which the modeled impact is within an order of magnitude of the corresponding standard is NO_x, but the modeled maximum impact, which is for an 8-hr period, is less than one-half of the annual average standard.

Fugitive dust emissions from brush clearing operations are expected to be minimal since typically the actual mower is in front of the tires or tracks. Consequently the vehicle travels over the coarse, moist mulch generated from mowing. Fugitive dust emissions were not estimated since they are expected to be minimal and no appropriate methodology exists to calculate these emissions.

Emissions from ordnance detonation were not estimated for this study because the combustion during detonations tend to be nearly complete (minimal emissions of compounds of concern), and the specific types and quantities of ordnance to be detonated are unknown.

4.3 ECOLOGICAL IMPACTS

Potential impacts on plants and animals from clearing and ordnance survey activities at Fort Meade will vary around the different habitats that are affected. Short-term and long-term impacts to vegetative and wildlife communities are discussed below.

4.3.1 Vegetative Communities

Vegetative communities will be affected directly by clearance and ordnance survey and removal activities. Clearance will result in the removal of existing groundcover to the extent necessary to complete the ordnance survey in the 1,400 acre parcel. The degree of the impacts will depend largely upon the amount of vegetation that is removed. For forested areas, Type 1 forests will be most affected by clearing and Type 2 the least.

The time over which clearing takes place also will influence the degree of impact. Although the length of time required to complete the clearance and survey operations is unknown, it is likely that the clearing activities will be phased such that many cleared areas will begin to regenerate while other areas are still being cleared.

Ordnance removal also can affect existing vegetative communities. As discussed in Section 2.1, if unexploded ordnance is discovered, it will be examined to determine whether it is safe for removal. If considered safe, EOD personnel will remove it from the ground and transport it to a designated storage area. During removal activities, soil disturbance will be minimized. Ordnance which is determined unsafe for removal is usually blown in place. If ordnance is blown in place, soil and vegetation in the immediate

EXHIBIT 4-1

AVERAGE IMPACT FROM BRUSH CLEARING OPERATIONS

Receptor	Distance (km)*	Projected Increase in 8-hour Average Conc.(ug/m^3) CO	HC	NO_x	SO_x	TSP
Kimbrough Army Hospital	4.42	0.81	0.18	1.95	0.16	0.16
Manor View Elementary School	4.42	0.81	0.18	1.95	0.16	0.16
Maple Glenn School	1.34	4.69	1.03	11.24	0.95	0.92
D.C. Childrens Center	1.82	2.97	0.65	7.10	0.60	0.58
Village of Savage (located off map, NW of work area)	6.95	0.42	0.07	1.01	0.09	0.08
State Childrens Center	2.92	1.47	0.32	3.52	0.30	0.29
Walter Reed Medical Center Farm	4.11	0.95	0.20	2.16	0.18	0.18
Patuxent Wildlife Research Center (Buildings)	4.50	0.79	0.17	1.90	0.16	0.16
Eagles' Nest	3.16	1.31	0.29	3.14	0.27	0.26
Village of Patuxent (located near Sewage Treatment Plant #1)	4.50	0.79	0.17	1.90	0.16	0.16
Trailer Park (Noise Area V)	5.69	0.56	0.12	1.35	0.11	0.11

* Distance from center of work area.

EXHIBIT 4-2

MAXIMUM IMPACT OF BRUSH CLEARING OPERATIONS

Receptor	Distance (km)*	Projected Increase in 8-hour Average Conc.(ug/m^3) CO	HC	NO_x	SO_x	TSP
Kimbrough Army Hospital	1.42	4.31	0.95	10.31	0.87	0.85
Manor View Elementary School	2.76	1.60	0.35	3.82	0.32	0.31
Maple Glenn School	0.72	11.23	2.47	26.88	2.28	2.20
D.C. Childrens Center	1.11	6.17	1.35	14.77	1.25	1.21
Village of Savage (located off map, NW of work area)	5.05	0.67	0.15	1.61	0.14	0.13
State Childrens Center	0.16	19.20	4.22	45.96	3.89	3.77
Walter Reed Medical Center Farm	1.58	3.67	0.81	8.79	0.74	0.72
Patuxent Wildlife Research Center (Buildings)	2.76	1.60	0.35	3.82	0.32	0.31
Eagles' Nest	2.37	2.00	0.44	4.79	0.41	0.39
Village of Patuxent (located near Sewage Treatment #1)	3.16	1.31	0.29	3.14	0.27	0.26
Trailer Park (Noise Area V)	0.16	19.20	4.22	45.96	3.89	3.77

* Distance from point nearest to work area (either perimeter of work area or within work area).

vicinity will be disturbed, with the impact zone depending upon the size and type of ordnance found. Craters in the soil, destruction of smaller shrubs and plants, and shrapnel embedded in nearby trees are all likely impacts. Because possible impacts from ordnance destruction are the same for all vegetative communities, they will not be detailed below. However, impacts on forests, fields, and wetlands as a result of vegetation removal are discussed.

4.3.1.1 Forests

The degree of vegetation removal required for the 1,400 acre parcel will vary among forest Types 1, 2, and 3. Impacts to forest communities will vary depending upon the vegetative density and structure, defined earlier as vegetation Types 1, 2, and 3. Therefore the impacts discussion which follows is organized by these types.

Type 1

Short Term Impacts. The Type 1 forests consist of extremely dense vegetation with no mature canopy trees present. Forests of this type will be mowed completely using the Hydro-ax Rotary Mower. Remaining vegetation will be no greater than 4 inches in height. The short term impact for Type 1 forest is the complete removal of all vegetation above 4 inches in height.

Long Term Impacts. Most of the areas characterized as Type 1 forests were clearcut within the last decade. The result of the proposed clearing in these areas will be a movement of the vegetative community roughly to the same successional stage it occupied immediately following the clearcut, approximately 10 years ago. Regeneration in clearcut areas is generally fast, and is typically more rapid than the successional processes observed in abandoned fields in the Piedmont and Coastal Plain due to the presence of seeds, seedlings, and leftover stumps and roots in the clearcut area. Grasses and broomsedge will invade the clearcut areas the first summer or spring following a clearcut. Approximately 2 years following a clearcut, shrubs and seedling trees will appear, and by the end of 5 years, a thick growth of saplings will become established. Stump sprouting is a significant mechanism of regeneration in clearcut areas and greatly influences the species composition in the regenerated area. If an area was formerly pine, it is likely that pine will be the dominant species in the new growth. Pine trees grow rapidly, and 5 years following clearing may reach 8 feet in height. Hardwoods tend to grow at a slightly slower rate, but in areas that were formerly hardwood, they are the likely dominant species in the new growth.

Type 2

Short Term Impacts. There will be little visible change in the Type 2 areas, which consist of mature forests with little or no understory. It is possible that in some instances, the mowing equipment will need to move through a Type 2 stand in order to access Type 1 or Type 3 areas which are not directly accessible by a road. The equipment requires an 8-foot wide path to maneuver through the forest; therefore it is possible that a few mature trees will need to be removed from Type 2 areas to permit equipment access to Type 1 or Type 3 areas in these instances. These impacts are not likely to be widespread because the road system at Fort Meade is fairly extensive and provides access to most areas.

Long Term Impacts. No significant long term impacts are predicted in the Type 2 areas, because clearing will, at most, be only minimal. If a path needs to be cleared for equipment access purposes, it is possible that the canopy will be opened, permitting sunlight to reach the forest floor which would favor the establishment of sun-tolerant species. During the reconnaissance in September 1990, the open areas similar to those that would be caused from cutting a path in Type 2 forest were comprised of thick groves of greenbriar. It is possible that paths cleared in the Type 2 forests, would also regenerate with greenbriar. This change in the understory community is not likely to be widespread or permanent.

Type 3

Short Term Impacts. Forty-nine percent, or nearly half, of the acreage at Fort Meade consists of Type 3 vegetation.[3] In the Type 3 areas, the canopy will be left intact to the maximum extent possible while the understory will be cleared to allow access by the survey team. However, as stated previously, the mowing equipment requires an 8-foot path to maneuver. If such a path cannot be found without disturbing the canopy trees, then a small number of the trees will be removed. Following clearing, the structure of Type 3 areas will resemble that of Type 2 areas, with an open, park-like appearance.

Long Term Impacts. The understory in Type 3 areas will begin to revegetate the first growing season following clearing. Because numerous seeds will be present prior to clearing, and additional seeds from the mowed understory vegetation will be released, the species composition resulting from regeneration in these areas is likely to be very similar to that which currently exists.

4.3.1.2 Fields and Open Areas

Short-Term Impacts. Mowing the fields and open areas will temporarily alter community structure, again moving the plant community towards earlier stages of succession. However, the impacts will be short-term because fields are early successional communities and will be able to recover to their pre-clearing state quickly.

Long-Term Impacts. No long-term impacts are expected to occur in the fields and open areas, given the rapid regrowth associated with this early successional community. The fields will return to their pre-clearing state within one to two years following mowing.

4.3.1.3 Wetlands

Short-Term Impacts. No areas designated as wetlands on the National Wetland Inventory maps will be cleared of vegetation. The practical reason for this is that the soils in wetland areas cannot support heavy forestry equipment, and most of the machinery would sink in the soft soils. However, even seasonally dry wetlands capable of supporting heavy equipment will not be cleared of vegetation. All wetlands will be surveyed on foot for ordnance to the extent possible without disturbing the vegetation. Provided that no mowing equipment is used in designated wetlands, adverse impacts associated with soil compaction or erosion will be avoided.

In addition to the physical constraints preventing equipment access to many wetland areas, there are legal restrictions on activities which can be conducted in wetlands. According to Section 404 of the Clean Water Act of 1977, areas identified as wetlands cannot be "filled". A 404 permit application must be submitted for any proposed activity which will affect or potentially affect a wetland area. A short-term effect possibly resulting from clearing operations at Fort Meade and which might be defined as "filling" is increased soil runoff and sedimentation in wetland areas. Although significant increases in runoff and sedimentation are not expected to be associated with the proposed action, the potential for some increased erosion or sedimentation exists. Contacts with the U.S. Army Corps of Engineers indicate that a 404 permit application may not be necessary. Plans will be submitted to both the Corps and the state of Maryland as part of a screening process to determine if one is required. If so required, a 404 permit application will be submitted.

The State of Maryland uses a joint federal/state application for the alteration of any floodplain, waterway, tidal or non-tidal wetland. This application should be sent to both the U.S. Army Corps of Engineers (Baltimore District) and to the Maryland State Waterways Permits Division to comply with both federal and state requirements. According to one source at the Maryland Department of the

[3] This figure may slightly overestimate the amount of Type 3 forest because areas that were a mixture of Types 2 and 3 were conservatively classified for this assessment as Type 3.

Environment's Standards and Certification Division, it typically takes 8 months to 1 year to process a 404 permit application (Rychwalski, 1990).

Long-Term Impacts. No long-term impacts are predicted for either the forested or emergent palustrine wetlands at the site, given that no clearing will occur in these areas and that erosion and sedimentation will be controlled. Mitigative measures for any potential soil erosion and sedimentation are discussed in other portions of this environmental assessment and will be presented in the Soil Erosion and Sediment Control Plan required by the State. Provided that these controls are in place and properly implemented, no significant impacts from sedimentation in wetlands are expected.

4.3.2 Terrestrial Wildlife

Impacts on terrestrial wildlife will vary among species depending largely on the habitat and foraging requirements of different wildlife species. Short-term and long-term impacts to terrestrial wildlife are addressed below.

4.3.2.1 Birds

Short-Term Impacts. Short-term impacts to bird species at Fort Meade may result from disturbances during clearing activities and from the loss of ground cover and food.

Noise, human presence, machinery operation, and vehicle traffic could disrupt mating, nest building, egg incubation, and rearing of young. Additionally, during clearing activities, birds that rely on auditory signals for protection or for the pursuit of food may be adversely affected by noise. Background noise can mask vocalizations, and potentially adversely affect processes such as predator detection, prey location, and care of young. Although it is possible that some species could suffer long-term impacts from these types of disturbance, it is most likely that species will be affected only temporarily during the clearing and surveying activities.

Intentional or accidental ordnance detonation could affect birds perching or nesting nearby. Direct injury to the birds or to the nest and eggs could result from an explosion. The noise from an explosion could also cause nest abandonment.

Over the time period required to complete the ordnance survey, the amount of undisturbed forest interior habitat at Fort Meade will decrease. Some forest interior species may be displaced to nearby forests, probably to other locations within the installation and to available habitats in nearby undeveloped areas. This could result in increased bird population densities in these areas, at least in the short term.

Long-Term Impacts. The bird species potentially most affected by the proposed action are neotropical migrant species and area sensitive species. Species utilizing edge and field habitats[4] (e.g., red-winged blackbird, northern bobwhite, song sparrow, and eastern phoebe) and other resident species which are adaptable to a variety of habitat types, are less likely to be affected because suitable habitat for these species will remain. As discussed previously, many neotropical migrant species typically prefer forest interior habitats. Neotropical birds returning to Fort Meade in successive years following initiation of clearance activities will encounter progressively decreasing amounts of undisturbed forest interior habitat as canopies and/or understories are cut. Most of the neotropical migrants in the eastern forests construct open nests on or near the ground. Loss of ground cover may affect the nesting success of remaining species due to a decreased number of available nesting sites and the potential for increased predation by edge species (Whitcomb, et al. 1981).

[4] See Exhibit 3-10 for a list of Fort Meade bird species and their habitat requirements.

Robbins, et al. (1989) and others have shown that neotropical migrants vary in the amount of undisturbed forest interior habitat required for successful breeding. Exhibit 4-3 shows the area requirements for some forest interior species that occur at Fort Meade. The area requirements for most of these species lie between 10 and 250 acres. Only 3 species have area requirements larger than this. The black and white warbler and the worm-eating warbler require approximately 750 acres. Only the ovenbird potentially needs an area larger than this, although recent data (Robbins, 1990) suggest that ovenbirds can occur in plots as small as 10 acres, provided that the plots are not too isolated from other areas of suitable habitat.

Based on these area requirements, it is possible that breeding neotropical migrants may be unaffected or minimally affected by the proposed clearing activities in the forests at Fort Meade. This is because the large tract (~1,000 acres) of forested wetland located along the Little Patuxent River will remain undisturbed and is of a sufficient size to meet the breeding habitat area requirements of many of the neotropical migrants at Fort Meade. This wetland area will, in effect, serve as a temporary bird sanctuary for birds that may have been displaced from other forested areas at the site that are to be completely or partially cleared. The displacement of birds from these other forested areas will result in an increase in the density of birds within the forested wetland, and this increase in density could negatively affect reproduction in the forested wetland area. (Data to support or refute predictions of density dependent reproductive success in these bird species are not currently available.) Even if reductions in reproductive success occur during periods of increased density, it is likely that reproductive success will increase as the forested areas of Fort Meade regenerate and thus provide more forested breeding habitat for sensitive bird species.

Some neotropical migrant species, such as the hooded and Kentucky warblers, may be adversely affected by understory removal. One shrub species in particular, the mountain laurel, is a preferred nesting habitat for the hooded warbler (Robbins, 1990). Removal of mountain laurel from the area, therefore, could result in decreased reproduction by hooded warblers. This impact could be long-term because, unlike many other subcanopy species at Fort Meade, mountain laurel regenerates very slowly.

Another neotropical migrant, the ovenbird, has been shown to prefer areas with reduced subcanopy vegetation, such as those resulting from deer overbrowsing. Since the Type 3 areas will be cleared of much of their subcanopy vegetation, the ovenbird may benefit from the proposed action at Fort Meade provided that habitat area requirements are met.

Several of the neotropical migrant species, including the cerulean warbler, the Swainsons warbler, and the Northern parula, tend to utilize habitat near riverbottoms and streams. Since the extensive wetlands in the floodplain of the Little Patuxent River will not be disturbed, these species and others preferring floodplain habitat may be unaffected or minimally affected by the alteration of the forest habitat in other areas of Fort Meade.

The precise magnitude and extent of impacts on the bird species of Fort Meade are difficult to predict. It is probable that alteration of forest habitat at Fort Meade will result, at a minimum, in a change in the distribution of forest interior species and an increase in the population densities within the large tract of forested wetlands to remain. Such changes could result in temporary reductions in the breeding success of some species, although some species could benefit from the habitat alterations at Fort Meade.

Overall, it is probable that the magnitude and extent of impacts will not be such that neotropical migrants and other area sensitive forest species will be displaced permanently from the Fort Meade area. The maintenance of approximately 1,000 acres of forested wetland associated with the Little Patuxent River in an undisturbed condition is critical to preserving populations of some

EXHIBIT 4-3

MINIMUM FOREST INTERIOR AREA REQUIRED BY SOME NEOTROPICAL MIGRANT BIRD SPECIES FOUND AT FORT MEADE[a]

SPECIES	MINIMUM AREA[b] (acres)
acadian flycatcher	75
black and white warbler	750
eastern wood-peewee	10
great crested flycatcher	25
hooded warbler	75
Kentucky warbler	75
Louisiana waterthrush	250
northern parula warbler	250
ovenbird	6,600[c]
pine warbler	75
red-eyed vireo	250
scarlet tanager	250
wood thrush	250
worm-eating warbler	750
yellow-throated vireo	250

[a] Species listed are only a subset of all neotropical migrant birds that occur at Fort Meade. Minimum area requirements for other neotropical bird species were not found in the literature.

[b] As reported in Robbins (1979).

[c] Recent findings by Robbins (personal communication, 1990) indicate that this number may be inaccurate; ovenbirds have been observed in plots as small as 10 acres provided that the plots are not too isolated from other forested plots.

migratory species at Fort Meade. If this area was not left to remain as a type of preserve, the impacts on migratory bird species would be much more severe. Most resident species are more adaptable to existing in or near areas disturbed by man, and are not likely to be affected by the proposed action.

4.3.2.2 Mammals

Short-Term Impacts. Both large and small mammals will likely be displaced during the clearing activities and ordnance survey as a result of noise and human presence. Animals utilizing Type 1 forests within the 1,400 acre parcel, such as the chipmunk and cottontail rabbit, will experience an immediate loss of habitat when the area is cleared, while animals in Type 3 forests within the 1,400 acre parcel, such as the woodchuck and white-tailed deer, will experience a loss of ground cover and browse. No habitat change is expected to occur in Type 2 forests, and therefore mammals depending upon this habitat type, such as the southern flying squirrel, will not experience loss of habitat. Mammals using fields within the 1,400 acre parcel, such as the meadow jumping mouse, will experience an immediate loss of habitat. Displacement from an area is likely to be only temporary, and it is probable that many species will return after the surveying activity is completed provided the available habitat is still suitable. Portions of Fort Meade, as well as adjacent properties such as Patuxent Wildlife Research Center, will provide refuge for the displaced animals. It is unlikely that any of the effects discussed above would seriously impact mammal populations at Fort Meade, since the survey will occur over a period of time.

During clearing activities, mammals that rely on hearing for protection may be adversely affected by noise. Background noise can mask vocalizations, and potentially adversely influence processes such as predator detection and care of young. However, many mammals may be unaffected by the increased noise. In fact, animals are known to inhabit firing ranges on the property. Woodchuck and small rodent holes and tracks of white-tailed deer and gray fox have been observed directly behind impact berms or in adjacent areas. The frequently loud noise associated with military activities which occur on a continual basis at Fort Meade have not noticeably affected the populations of Fort Meade.

If unexploded ordnance is discovered and must be exploded in place, ground inhabiting mammals such as moles and shrews in the immediate vicinity of the blast may be stunned or killed. Den sites in close proximity to the site may be damaged or destroyed, and any animals inhabiting these sites at the time of the blast may be injured. These impacts are not likely to be significant at the population level.

Long-Term Impacts. Long-term impacts for mammals are not expected to be significant. Revegetation of understory will begin by the following year, creating new ground cover and forage for mammals. White-tailed deer prefer mixed hardwood forest with areas of different age classes, including areas of dense understory with browse lanes and/or open forage areas nearby. They typically have a home range limited to 1 mile or less, and therefore do not necessarily require large tracts of forest. The loss of cover and decreased availability of browse (leaves and succulent shoots) will be temporary, since regrowth of browse is likely to occur very rapidly. It is possible that, given the large numbers of deer at Fort Meade and this scarcity of browse, the newly generated vegetation will be overgrazed. This impact will likely be minimal since the clearance will occur over a period of time, allowing for regrowth in some areas prior to removal of growth in all remaining areas.

Gray squirrel prefer hardwood stands of oak-hickory at least 20 years old, where their primary food source of acorns and nuts are abundant. Since the larger acorn-bearing oaks will remain, food availability for squirrels is not expected to decrease. Given their ability to adapt to human disturbances, as demonstrated by their abundant populations in residential subdivisions, impacts to this species are not expected.

Eastern cottontail and other small mammals prefer an abundance of escape cover interspersed with open field or grassland habitat (US Army Corps of Engineers, 1990), which is the type of habitat that will be created in many places by the clearing and subsequent regeneration, particularly in the Type 1 areas. Therefore these species are likely to benefit from the clearance activity at Fort Meade.

Red fox prefer woodlands with adjacent open areas (US Army Corps of Engineers, 1990), but are also opportunistic in the types of habitat they utilize. They are omnivorous, with a diet consisting of insects, rodents, hares, bird eggs, and berries or other fruits. Active hunting programs at Fort Meade have not been successful in decreasing the overpopulation which currently exists. Given these factors, it is unlikely that the fox population at Fort Meade will be adversely impacted by the clearance activity.

4.3.2.3 Reptiles and Amphibians

Short-Term Impacts. No significant impacts to reptiles and amphibians in the short term are predicted, since the leaf litter, rocks, and fallen logs where they typically hide will generally remain undisturbed wherever possible. Removal of understory vegetation and creation of small openings in the canopy could potentially alter the forest floor microenvironment in places, with increased light and decreased moisture rendering such areas unsuitable to some species. Loss of breeding habitat may occur if vegetative cover is removed from banks of streams. However, any loss of suitable habitat is likely to be very localized, and the overall loss of habitat is not expected to be great relative to the amount of suitable habitat remaining. Therefore significant impacts associated with habitat loss are not expected. Some individuals from various species may be injured or killed during clearing activities or ordnance detonation, but such losses will not be significant at the population level.

Long-Term Impacts. No significant long-term impacts to amphibians and reptiles are expected. Ground cover will begin to regenerate the following year, mitigating many of the potential short term impacts mentioned above.

4.3.2.4 Invertebrate Fauna

In general, invertebrate fauna (such as insects and arthropods) are not likely to be adversely impacted by the proposed action. Some insects which depend upon pollen or nectar as a food source, such as bees, may be temporarily impacted as the flowering herbaceous species, which provide pollen, are mowed. However, this impact will be short term, given the quick regeneration of herbaceous species.

4.3.3 Aquatic Systems

The aquatic systems at Fort Meade are not expected to be severely impacted either immediately or in the long term from the clearing or ordnance survey activities at Fort Meade. Increased sedimentation may result due to soil runoff from mowed areas or areas where understory vegetation has been removed. However, because the mowing machinery generally leaves approximately 4 inches of vegetation stubble and the root systems of the vegetation will be left intact, the potential for significant erosion is small. Also, the mower is designed with impact minimization in mind. The mowing blade is located in the front of the machine, and as material is mowed it is left on the ground, providing a buffer of mowed debris as the machine's wheels with the bulk of its weight pass over an area. Thus design of the equipment significantly decreases the potential for soil runoff. In addition, wetlands occur along and around many of the aquatic systems at Fort Meade. Since vegetation in the wetland areas will not be disturbed, impacts to aquatic systems are not expected to be significant.

If ordnance is discovered near a particular water body, a brief period of increased turbidity or sedimentation may be expected during removal of the ordnance.

4.3.4 Endangered or Threatened Species

Section 9 of the Endangered Species Act makes it illegal to kill, harass, harm, or remove listed species of animals from the wild. Taking of plants is prohibited only on Federal lands. Under Section 7 of the Act, all Federal agencies are required to insure that actions they authorize (by permit), fund, or carry out do not jeopardize the existence of listed species or adversely affect critical habitat (areas of land, water, and air space an endangered or threatened species needs for survival).

The Act states that if an action or a proposed action of a Federal agency may affect a federal listed species or its habitat, that Federal agency must enter into consultation with the Fish and Wildlife Service. Prior to the proposed action, Fort Meade personnel should therefore consult with the Fish and Wildlife Service to determine whether further study should be conducted on the one federal listed endangered species at Fort Meade (the bald eagle). Although not explicitly included in the Act, state endangered species such as the tickseed sunflower should also be considered. Only after a course of action has been approved by the Fish and Wildlife Service, and all necessary precautionary measures have been taken, should the proposed activities at Fort Meade be conducted. Potential impacts are addressed briefly below.

4.3.4.1 Bald Eagles

Short-Term Impacts. During clearance and surveying, the noise and increased human activity likely will deter eagles from foraging or roosting in that vicinity. Bald eagles are most easily disturbed during mating, egg laying, incubation, and the first month after hatching, all of which occur in late winter and early spring. During this period, USDA (1974) recommends that no disturbances such as timber harvesting or construction should be permitted to occur within a 1/2 mile buffer zone around the site defined by the nest and roost trees. If an area near a nest site, such as that in Range G is disturbed during nesting, nest abandonment may result. Although the eagles currently at Fort Meade are probably accustomed to some degree of disruption or noise from ongoing military activities at the installation, the additional noise and disturbances associated with clearing and surveillance activities could impact the eagles at the current nesting site in Area G unless a considerable buffer zone is left undisturbed.

Accidental or intentional detonation of ordnance could impact the eagles if they were roosting in nearby trees. Visual surveys for eagles should be conducted before any intentional detonation occurs.

Long-Term Impacts. Bald eagles use tree perches to locate prey, and as a result they may experience a negative impact if favored perches are removed from their foraging areas. However, large trees which are most likely to be used as perches will be left standing, and therefore eagles probably will not be negatively affected.

4.3.4.2 Tickseed Sunflower

The tickseed sunflower (Bidens coronata), a state endangered species, is reported to occur in the lower section of the old field in area R1. These plants must be located and the vegetation immediately surrounding them should not be disturbed. If these precautionary measures are taken, it is unlikely that adverse impacts to the tickseed sunflower will occur from either clearance or surveying activities.

SUMMARY OF IMPACTS TO PLANTS AND ANIMALS

The greatest potential impacts as a result of clearance and survey activities will be on the forested areas and forest dwelling organisms. Natural revegetation will occur over time, and the species composition of the regenerated forest is not expected to vary from pre-clearing conditions. Impacts in fields and open areas will be short-term and minimal. Wetlands and aquatic systems should not be adversely affected as long as soil erosion and sedimentation are controlled as planned.

It is difficult to predict impacts on animal species. Migratory bird species which have very specific breeding habitat requirements have the highest potential to be negatively impacted. The effects of altering the forest habitat at Fort Meade with respect to neotropical migrant species cannot be predicted definitively. Short-term changes in species distribution, abundance and reproductive success are likely. However, overall, long-term impacts are unlikely to be great enough to result in the permanent displacement of migratory species from Fort Meade. The maintenance of the approximately 1,000 acre wetland along the Little Patuxent River in an undisturbed condition is critical to minimizing potential impacts on the bird species at Fort Meade.

Adverse impacts to the endangered bald eagle and tickseed sunflower are likely unless adequate precautionary measures are taken. In general, long-term effects on most other animals are expected to be minimal.

RECOMMENDATIONS

The U.S. Fish and Wildlife Service should be notified regarding the potential for impacts to endangered species, and mitigative measures must be implemented. To minimize impacts on terrestrial animals, activities should be planned so that they do not coincide with periods critical for breeding and rearing of young (primarily in the spring and early summer).

4.4 HEALTH AND SAFETY

Health and safety considerations associated with the vegetation and ordnance survey are addressed for workers and the general public. For this discussion, the term "public" refers to all people exclusive of those involved with the vegetation or ordnance clearance.

4.4.1 Public Health and Safety

4.4.1.1 Explosive Hazards

Explosive hazards may exist as a result of the intentional or unintentional detonation of UXO. In all cases except for the transportation of UXO, explosive hazards to the public will be prevented by restricting access to blast areas. Access to the public will be denied in one of several ways:

- restricting entry at primary points of access to the entire 9,000 acres;
- stationing military or security police to prevent access by the public in the immediate area of clearance operations; and
- erecting signs, placing barricades on roadways, and locking gates where available to warn and prevent access by the public in the immediate area of clearance operations.

When property not under the control of Fort Meade, (e.g., a public highway or private residence), falls within the hazard area, Fort Meade representatives will coordinate with the owner or controlling authority to evacuate or restrict access to the affected area. Controlled detonations occurring at the installation demolition ground will not affect public highways or private residences. The demolition ground is sited in accordance with established Army and DoD safety requirements designed to safeguard the public.

Safety precautions to be taken while transporting UXO to the installation ammunition storage magazines or demolition ground at Fort Meade are discussed more fully in section 4.4.2.1. The routes used when transporting UXO will be selected by the Fort Meade Safety Office.

4.4.1.2 Chemical Agent Hazards

When munitions believed to contain chemical agents are discovered during ordnance clearance operations, all contractor personnel will evacuate the area and the USATHAMA Health and Safety Branch and the Fort Meade Safety Office will be immediately notified. An area determined by USATHAMA will be evacuated. Fort Meade personnel will notify local civilian authorities as necessary of the need to evacuate the surrounding community. The UXO contractor will provide interim security for any known or suspected chemical agent munitions encountered until government control is assumed. Specially trained and equipped personnel from the U.S. Army Technical Escort Unit (USATEU) will be requested by USATHAMA. Upon their arrival, the safety of the munition will be determined. If the munition is determined to be safe to move, it will be placed in a hermetically sealed container and transported to an approved chemical

surety storage facility. If it is determined not to be safe for transportation, USATEU personnel will destroy the UXO using a sufficient amount of explosives calculated to completely consume any chemical agent present in the munition. Air monitoring of operations will be performed and soil sampled for analysis of chemical agents.

4.4.1.3 Commercial Chemical Hazards

Commercial hazardous material or waste is not known to have been used, stored, generated, or treated in the 9,000 acre area. Therefore, it is not anticipated that hazardous material or waste will be encountered. If containers are found that are suspected to hold hazardous material or waste, the surrounding area within 100 feet will be evacuated and the USATHAMA Project Officer, the USATHAMA Health and Safety Branch, and the Fort Meade Safety Office will be notified. The Fort Meade Fire Department will investigate to determine if hazardous material or waste is present. If a hazard exists, a commercial company will be contracted to contain, cleanup, transport, and dispose of the material as appropriate.

4.4.2 Worker Health and Safety

All onsite contractor personnel will be trained and qualified in accordance with a health and safety plan written specifically for vegetation and ordnance clearance operations conducted at Fort Meade. Additionally, all contractor personnel will be required to comply with all applicable Occupational Safety and Health Administration (OSHA) regulations.

4.4.2.1 Explosive Hazards -- Vegetation Clearance

Mechanized tree cutting methods have been selected over manual labor tree cutting because of the greater degree of safety it provides the worker. Engineering and design controls associated with the equipment can shield the operator from the blast and fragmentation resulting from an explosion. For example, vegetation cutting equipment shields operators with a 3/4 inch steel plate armor and a bullet-proof windshield capable of stopping a 30.06 caliber high velocity rifle bullet. Heavy-duty oversized tires or tracks and the mass of the equipment body itself can further absorb the energy of a detonation and shield the driver. Equipment used for other vegetation clearance activities provides similar protection.

Several safety precautions will be taken by workers regardless of the specific activities in which they are involved. An Accident Prevention Safety Plan meeting the requirements of USATHAMA and 29 CFR 1910.120 will be prepared before beginning field operations and will be followed by all workers onsite. All personnel involved in vegetation or UXO clearance will be trained to recognize explosive hazards and UXO prior to the start of operations. Personnel will not be permitted in areas in which they are not essential to work efforts. Smoking, fires, and open flames will not be permitted during vegetation or ordnance clearance operations or near where explosive material is collected. Vegetation and ordnance clearance operations will be conducted only during daylight hours except on a case-by-case basis as determined by USATHAMA.

Other safety precautions include: surface clearing areas to be used for field offices and support operations, and conducting a preliminary surface sweep of ordnance prior to vegetation clearance. Ordnance identified during the surface sweep will be removed or detonated prior to vegetation cutting.

4.4.2.2 Explosive Hazards -- Ordnance Survey

Only qualified UXO technicians will perform the ordnance survey. Areas traversed by the UXO technicians will have been previously cleared of heavy vegetation, where appropriate, to allow safe access. A magnetometer such as the Schonstedt GA-52B Magnetometer, will be held in front of the operator to detect possible UXO so that they can be investigated and safely avoided. When investigating vegetated strips, the magnetometer will be carefully inserted into the vegetation of the uncleared area while the operator remains in the previously cleared area. If possible UXO is located in vegetated strips, UXO

technicians will carefully clear vegetation by hand to allow closer examination. No more than four magnetometer operators will clear an area at the same time so that a supervisor following behind them can maintain adequate control of the operation. The location of confirmed or suspected UXO will be marked with a pin flag inserted into the ground at a safe distance.

UXO may be excavated manually or mechanically and will meet the requirements of 29 CFR, Part 1926, Subpart P. UXO will be rendered safe using procedures in accordance with the 60 series EOD publications. UXO which has been determined to be safe will be transported to a daily collection point. Established safety regulations and policies will be followed to prevent accidental detonation of UXO during transportation. Vehicles used for transportation of explosives will comply with state and federal regulations, will be maintained in good operating condition, and will be equipped with at least one class 10BC fire extinguisher. During loading and unloading of UXO, the vehicle brakes must be set, when on a grade at least one wheel must be chocked, and the engine must be off. During transportation the load will be blocked and braced in a vehicle compartment constructed of non-sparking materials. Vehicles will not be refueled while loaded with explosives. No persons will be allowed to ride in or on the truck body or van where explosives are carried. Routes from daily collection points to the disposal or storage area will be selected by the Fort Meade Safety Office to avoid densely populated areas.

Hazards from explosion are not anticipated during storage operations. UXO will be stored overnight only when daily disposal is not possible due to factors such as weather conditions or recovering UXO whose total net explosive weight exceeds daily regulatory limits for disposal. Fort Meade facilities which will be utilized are ammunition storage magazines which comply with all Army and DoD safety and physical security requirements.

4.4.2.3 Chemical Hazards

Measures to protect worker safety and health are the same as those described in Section 4.4.1.2 and 4.4.1.3 to protect the public.

4.4.2.4 Physical Hazards

Falling trees and machinery pose the two primary physical hazards to workers. Equipment operators are protected by the equipment itself. All other personnel will be required to maintain a safe distance from the cutting operation -- in the 1,400 acre parcel this will be no closer than 200 feet, twice the maximum anticipated height of trees in this parcel. "Safe distance" specifications will also be used to minimize hazards associated with the machinery (e.g., shredders can throw debris at high velocity).

4.5 NOISE IMPACTS

Hydro-Ax noise impact calculations were made for all six noise receptors identified in Section 3.6. See Attachment A for sample calculations. The maximum calculated Hydro-Ax noise impact of 75 dBA occurs at noise receptor II, the Maple Glen School and Children's Center. This noise level is not significantly different than the background noise in the area, as shown in Exhibit 4-4. Hydro-Ax noise impacts of 62 dBA occurs at noise receptor I. This area is residential and on the perimeter of the installation. These impacts are not expected to be of concern, since they are close to backgound levels associated with that receptor. Hydro-Ax noise impacts of 73 dBA occur at noise receptor V, a residential area on the perimeter of the work area. While Hydro-Ax noise impacts are higher than background noise levels at this receptor location, the impact is not expected to be of concern.

The noise produced by the Hydro-Ax will be attenuated by distance, air absorption, trees and brush as it moves away from the source. However, the attenuation equation used to compute the noise levels at a certain distance from the Hydro-Ax, only accounts for attenuation as a function of distance. Consequently, the calculated noise levels shown in Exhibit 4-4 are higher than actual noise levels expected, since attenuation due to air absorption, trees, and brush has been ignored in calculating these noise impacts.

Since the charges detonated for ordnance noise level measurements are larger than that expected to be found at Fort Meade, the noise levels for ordnance detonation shown in Exhibit 3-17 represent upper limit noise levels. Ordnance detonation noise impacts will be mitigated by moving the ordnance to the existing on-base detonation facility whenever possible. If the ordnance is too unstable to move, then it must be detonated in-place.

4.6 COMPARISON OF NOISE IMPACTS WITH STATE STANDARDS

Exhibit 4-4 contains calculated noise levels for each of the six noise receptors. According to the General Regulations outlined in Maryland Title 26, Subtitle 02, Chapter 03, the maximum allowable noise levels for a residential area during daytime hours (7:00 am to 10:00 pm), is 65 dBA. However, an exception is given which states that a person may not cause or permit levels emanating from construction or demolition site activities which exceed 90 dBA. The intent of this regulation is to provide a reasonable exception for work which is temporary and involves heavy equipment. According to Mr. Michael Caughlin of the Maryland Department of the Environment Air Management Administration, the field activities at Fort Meade fit this description and so the work will be regulated under the construction, demolition exception which allows a 90 dBA maximum noise level. No special permit appears to be required for operating under this exception.

The calculated noise levels shown in Exhibit 4-4 for the six noise receptor areas are well below 90 dBA. Furthermore, these calculated levels are higher than actually expected since the computations did not account for the attenuation caused by air absorption, trees, and brush. Consequently, no significant Hydro-Ax noise impact is expected for noise receptors I, II, III, and V.

Areas IV and VI are sensitive noise receptors due to the presence of certain wildlife. According to Dr. George Gee at the U.S. Department of the Interior Patuxent Wildlife Research Center, a crane breeding colony is located in area IV within one-half mile from the Fort Meade perimeter. This colony is noise sensitive and must be avoided particularly from January 1 to August 31. This area is not expected to receive any significant Hydro-Ax noise impact, since the attenuation provided by the distance from sensitive receptor IV to the work area is sufficient to lower the noise level from the Hydro-Ax to background level associated with that area.

Area VI which is located outside the Fort Meade work area, hosts a pair of eagles which are also noise sensitive. However, the closest point of the work area to Area IV is still far enough away to allow for the Hydro-Ax noise to be attenuated to a level lower than background. The cumulative effect on this receptor will be a noise level only 3 dBA above background.

EXHIBIT 4-4

HYDRO-AX IMPACT ON NOISE RECEPTOR AREAS

Noise Receptor Number	Distance from Fort Meade work area (ft)	Background Noise (dBA)	Associated Background Location [1]	Attenuated Noise (dBA)	Total Noise Impact (dBA)
I	800	52	11	61	62
II	400	74	17	67	75
III	400	64	3	67	69
IV	6,300	50	15	43	51
V	200	50	5	73	73
VI	6,500	43	16	43	46

1 The background noise at the site shown in this column is listed in the column to the left and represents the background noise level of the noise receptor listed in the far left column. See Exhibit 3-14 for location of background noise sampling locations and Exhibit 3-18 for locations of noise receptors.

The American Conference of Government Industrial Hygienists recommends that individuals should not be exposed to impulsive noise levels higher than 140 dB. As shown in Exhibit 3-17, these levels are exceeded in an area around the detonation defined by a radius of between 600 and 1000 feet. Noise sensitive receptors II, III, and V are less than 600 feet from the work area perimeter. Prior to detonation near these areas, it will be necessary to evacuate everyone in those sensitive areas located along the perimeter within 1000 feet of where the in-place detonation will occur.

In-place ordnance detonation could adversely affect the wildlife existing in noise sensitive receptors IV and VI. Therefore, detonation will be restricted to September and October. Prior to in-place detonation, either Dr. George Gee, Mr. Holliday Obrecht, or another representative of the Patuxent Wildlife Research Center will be notified. This will ensure that every effort is made to mitigate the noise impact upon the eagles, cranes, and other wildlife inhabiting noise sensitive receptor locations.

4.7 SOCIOECONOMIC IMPACTS

Impacts on population, employment, income, and housing associated with vegetation clearance and ordnance cleanup are expected to be minimal. A maximum of 26 project personnel are expected to be on-site at any given time. Most of these workers will come from outside the local area and will use housing facilities off-site. No permanent relocation of workers to the area is anticipated as a result of the proposed action.

There will be a nominal increase in the need for services such as electricity, water, and solid waste disposal associated with the mobile offices/trailers for the vegetation clearance and the ordnance survey. These services will be coordinated with Fort Meade and should have no impact on Anne Arundel County.

4.8 LAND USE IMPACTS

There will be temporary impacts on land use in the 9,000 acre area. Much of the land in the 9,000 acre area is currently used for recreational purposes. The areas being cleared of vegetation and surveyed will not be accessible for recreational uses while the activities are underway for safety reasons. Thus, hunting and fishing activities will be curtailed on parcels as they are being cleared and surveyed.

The land clearance activities may also have a short-term negative impact on fish and wildlife populations in the 9,000 acre area, as described in section 4.3. Thus, hunting and fishing may be less attractive in the short run.

Land uses at Tipton Airfield, the active landfill, and other facilities supporting Fort Meade are not expected to be affected by the proposed action. Similarly, wetlands will not be affected since they will not be cleared of vegetation.

4.9 IMPACTS ON CULTURAL AND ARCHAEOLOGICAL RESOURCES

Major floodplain areas in the 9,000 acre parcel have not been surveyed. However, floodplain and upland areas adjacent to streams are known to have potential archaeological sites. Traditional archaeological surveys for these areas are not viable, however, since UXO are likely to be in the floodplain and upland areas. The ordnance removal process could significantly impact potential archaeological resources. Thus, during the ordnance survey, an archaeologist will be on-site and available to work with the survey crew. This will allow early identification of archaeological resources so that appropriate action can be taken prior to decisions about how to handle the found ordnance.

Once the ordnance survey has been completed, the UXO survey data and other information will be reviewed and an archaeological survey strategy will be coordinated with the State Historic Preservation Officer to identify significant cultural resources on the parcel.

Known historic sites identified in section 3.9, such as the Snowden complex and the Patuxent Forge will be avoided. Once the survey is complete, these sites will be further studied to determine their significance (US Army Corps of Engineers, 1990).

Cemeteries identified to date will also be avoided. Vegetation clearance will be conducted near but not on the cemeteries. Similarly, ordnance surveys will be conducted proximate to the cemeteries but not on them. There are no plans to dig in the cemetery areas even if ordnance are found as a result of the survey activities.

4.10 VISUAL IMPACTS

Currently, the U.S.D.A. Forest Service Branch allows 1,000-foot buffer zones between public access areas and timber harvesting areas. These buffer zones are intensively managed to blend the buffer zones into a more visually desirable landscape. This practice will be adopted for the Fort Meade clearing operation.

On August 31, 1990 a visual reconnaissance was conducted around the outer perimeter of Fort George G. Meade Army Installation to assess the visual impacts that may be expected from vegetation clearance. Because no vegetation clearance will be conducted on the 7,600 acre parcel, this assessment concentrated on the visual impacts to motorists traveling along routes adjacent to Fort Meade that border the 1,400 acre parcel.

The Baltimore-Washington Parkway runs north-south (for about 2 miles) along the western edge of the 9,000 acre area. There is dense vegetation on both sides of the highway as well as in the median. Land bordering the Parkway is topographically higher with a steep embankment that is densely vegetated sloping down toward the road. Visual observation of Fort Meade is not possible along 90% of the Parkway that borders the installation. Areas that do not have the embankment are so densely vegetated with deciduous trees, evergreens and understory that a buffer blended into the clear-cut areas of the western portion of the 1,400 acre parcel would make any visual impact to commuters traveling along the Parkway negligible.

The eastern perimeter of the installation is paralleled by the Amtrak rail system and Meyers Branch Road. Just north of the Trinity Church community, on Meyers Branch Road, Fort Meade can be seen from the road. At this particular point, clear-cut Type 1 areas may be noticeable.

The majority of the northern boundary has been developed by the Army. Visual impacts along State Rt. 198 are minimal because the embankment is very steep along the roadway and many small businesses have developed along a portion of this road. State Rt. 32, which has recently been opened to public thoroughfare, is situated along a topographically high area which allows for direct visual observation of the installation. Approximately two miles west of Odenton the highway allows motorists to directly observe the Archery Ranges and points southeast and southwest of these ranges. The ranges are in a topographically low area and the surrounding forested areas rise up along a ridge that encompasses the southern perimeter of the ranges. The forested areas are composed of deciduous trees, evergreens and a dense understory. Type 3 areas, Type 2 areas and wetlands comprise the type of areas that can be seen from Rt. 32. Wetlands, of course, will be left untouched, Type 2 areas will have only selected understory removed, and Type 3 areas may be partially clear-cut depending on its density composition. The areas that will be clear-cut comprise a very small percentage of the area that can be seen from Rt. 32. However, some of the clear-cut may be visible until regeneration takes place.

The vegetation clearance operation at Fort Meade should not leave obtrusive edges, patterns, or shapes. Buffer zone areas will be identified and created where public viewing may be diminished. Forest Types 2 and 3 are not expected to create much of a visual impact. If a Type 1 area falls into a buffer zone, intensive rehabilitation may be required and a landscape plan may be developed/implemented.

4.11 TRANSPORTATION IMPACTS

Transportation impacts are expected to be minimal. The increase in traffic resulting from the additional workers on-site will be negligible. There may, however, be some minor traffic delays associated with bringing in the large, construction-type equipment required for vegetation clearance.

5.0 MITIGATING ECOLOGICAL IMPACTS

Since the proposed clearance and surveying activities involve disturbing plant communities, ecological impacts cannot be prevented entirely. However, measures can be implemented to minimize such impacts. Possible mitigative measures are discussed below for each potentially affected community. Wetlands and aquatic systems may be affected by increased runoff and sedimentation. Mitigative measures such as mulching will be used to minimize such effects.

5.1 VEGETATIVE COMMUNITIES

The impacts to vegetative communities will be naturally mitigated over time. For example, impacts to fields and open areas are expected to be short term and minimal, since these areas will rapidly regenerate to their former condition without intervention. Impacts to forested areas will be naturally mitigated as the subcanopy species regenerate.

Under the current plan, the forester directing the mowing equipment will decide where to mow based on the ordnance survey team's judgement as areas with different characteristics and densities are encountered. A second forester should be present to assist in such decisions and ensure that a minimal amount of mowing and cutting is performed. This forester could be from the Fort Meade Office of Fish and Wildlife, since they are most familiar with the forests at Fort Meade, or from the Patuxent Wildlife Research Center, which has a vested interest in the future condition of the property at Fort Meade. They should know the most efficient way to access any potential areas based on available roads and trails, which will help minimize unnecessary disturbance to vegetation in the area.

5.2 TERRESTRIAL WILDLIFE

The most serious potential impact on terrestrial wildlife is the alteration of forest interior habitat, which is required breeding habitat for many neotropical migrant bird species. These birds, which return year after year to breed in the same area, may be affected from alteration of forest interior habitat at Fort Meade. It appears that adequate breeding habitat for many if not all of the neotropical migrant species will remain provided that the approximately 1,000 acres of wetland associated with the Little Patuxent River are protected.

One shrub species, the mountain laurel, is preferred habitat for the hooded warbler. Unlike other understory species, mountain laurel regenerates very slowly. To mitigate impacts on both the shrub and its use as nesting habitat, some mountain laurel growth should be left undisturbed in all areas where it occurs.

In addition to mitigating potential impacts on neotropical migrants, potential impacts on resident bird species and other terrestrial wildlife may be greatly mitigated by limiting clearing and survey activities to late fall, winter, and early spring, which is a non-breeding season for most wildlife species at Fort Meade. This time period is also a period of inactivity or reduced activity for a variety of terrestrial wildlife, including reptiles, amphibians, and some mammals.

5.3 ENDANGERED SPECIES

All Federal agencies are required by the Endangered Species Act of 1973 (PL 93-205) to ensure that actions they authorize (by permit), fund, or carry out do not jeopardize the existence of listed species

or adversely affect critical habitat. If an action or a proposed action of a Federal agency may affect a listed species or its habitat, that Federal agency must enter into consultation with the Fish and Wildlife Service. During the course of such consultation the involved agency and the Fish and Wildlife Service will try to determine a course of action which will enable the agency to complete its project without jeopardizing the species. Most consultations accomplish this goal. Since the proposed action at Fort Meade may impact the bald eagle and the tickseed sunflower, formal consultation must be initiated prior to any vegetation clearance or ordnance survey activities.

As stated earlier, it is illegal to kill, harass, harm, or remove listed species of animals from the wild. Taking of plants on Federal lands is also prohibited. Therefore, steps must be taken to ensure that impacts to endangered species at Fort Meade, namely the bald eagle and the tickseed sunflower, are prevented or at least mitigated to the maximum extent possible. The mitigative measures for the two species of concern are presented below.

Bald Eagle. The bald eagle nest in resource management area G, and surrounding roost trees used by the eagles, should be protected by a 1/2 mile buffer zone [recommended for bald eagles by USDA (1974)] during the breeding and nesting season to prevent nest abandonment. Further, trees at the installation that are used by the bald eagles as perches, and any additional potential nesting trees at the installation, should be identified and protected.

Ordnance survey and clearance activities in the vicinity of the nesting site should be conducted during late summer and early fall to prevent disrupting the adult birds during the critical mating and nesting period, and to prevent disturbing the young as they learn to fly and hunt. These activities occur over a period from December through June.

Tickseed Sunflower. The exact location of the tickseed sunflower (Bidens coronata) in the old field in resource management area R1 has not been determined. To prevent impacts to this plant, individual plants must be located and identified with flags or tape prior to mowing, and they and the vegetation surrounding them within 5-feet should not be disturbed. Adverse impacts to the tickseed sunflower should be mitigated by taking these precautions.

6.0 PERSONS AND AGENCIES CONTACTED

Tom Filip, Assistant Chief Regulatory Branch
Army Corps of Engineers Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715
(301) 962-3671

David Walbeck
State of Maryland Department of Natural Resources
Nontidal Wetlands Division D-4
Tawes State Office Building
580 Taylor Avenue
Annapolis, Maryland 21401
(301) 974-3871

Valerie Rychwalski, Natural Resources Biologist
Maryland Department of the Environment
Standards and Certification Division
2500 Broening Highway
Baltimore, Maryland 21224
(301) 631-3609

Mark Spencer
Maryland Department of Natural Resources
Land Planning Services; Scenic and Wild Rivers Program
20012 Industrial Drive
Annapolis, Maryland 22041
(301) 974-7656

David Chessler, County Forester
Anne Arundel County Office of Planning and Zoning
Environmental and Special Projects Division, MS 6303
P.O. Box 2700
Annapolis, Maryland 21404
(301) 222-7430

Bill Shrim, RCRA Permitting
EPA Region 3
841 Chestnut Street
Philadelphia, Pennsylvania 19107
(215) 597-9800

Maryland Department of the Environment
Air Management Administration
2500 Broening Highway
Baltimore, Maryland 21224
(301) 631-3215
Contacts: Ms. Cathy Singer
Mr. Michael Caughlin

Patuxent Wildlife Research Center
U.S. Fish and Wildlife Service
Stickel Laboratory
Laurel, Maryland 20208
Contact: Dr. George Gee (301) 498-0359
Mr. Holliday Obrecht (301) 498-0435

7.0 REFERENCES

Argonne National Laboratory. 1989. Enhanced Preliminary Assessment Report: Fort George G. Meade, Fort Meade, Maryland. Prepared by Environmental Research Division, Argonne National Laboratory, Argonne, Illinois 60439.

Anne Arundel County, Department of Public Works, 1976. Phase-I Ground Water Study, Service Area No. 4, Fort Meade West. Prepared by Whitman, Requardt and Associates, Engineers.

Braun, E.L. 1950. Deciduous Forests of Eastern North America. Hafner Press, New York.

Burt, W.H. and R.P. Grossenheider, 1976. A Field Guide to the Mammals of North America. Boston, Massachusetts.

Cloos, Ernst, 1964. Review of the post-Triassic rocks, in: The Geology of Howard and Montgomery Counties, Maryland Geological Survey, 373 p.

Committee of Biologists for Preservation of Natural Areas. 1976. Beltsville Federal Masterplan Area (draft report). Silver Spring, Maryland (as cited in Argonne National Laboratory 1989).

Conant, R. 1975. A Field Guide to Reptiles and Amphibians - Eastern and Central North America. Volume 12 in The Peterson Field Guide Series. Houghton Mifflin Co., Boston, Massachusetts.

Department of the Army, August 1981. Final Overall Installation Environmental Impact Statement, Existing Activities and Conditions, Fort George G. Meade, Maryland, Prepared by The Environmental & Energy Control Office, Directorate of Facilities Engineering, Fort George G. Meade, Maryland.

Environmental Protection Agency, Environmental Monitoring and Systems Laboratory, Installation Assessment Fort Meade, Maryland. Prepared for the U.S. Army Toxic and Hazardous Materials Agency, July 1983.

Fort Meade. 1984. Fort Meade Forest Management Plan. Directorate of Engineering and Housing. March (as cited in Argonne National Laboratory 1989).

Fort Meade. Sept., 1989. Base Realignment and Closure Implementation.

Godfrey, M. A. 1980. A Sierra Club Naturalist's Guide to the Piedmont. Sierra Club Books, San Francisco, California.

Kirby, Robert M., and Earl D. Matthews, 1973, Soil Survey of Anne Arundel County, Maryland, United States Department of Agriculture Soil Conservation Service.

Mack, F.K., and G. Achmad, 1986. Evaluation of the Water-Supply Potential of Aquifers in the Potomac Group of Anne Arundel County, Maryland. Report of Investigation No. 46. Prepared in cooperation with the U.S. Department of the Interior Geological Survey and Anne Arundel County Office of Planning and Zoning.

Mack, F.K., 1962. Ground-water Supplies for Industrial and Urban Development in Anne Arundel County: Maryland Department of Geology, Mines and Water Resources Bulletin 26, 90.

Maryland Department of the Environment, Air Management Administration. Maryland Air Quality Data Report, 1989.

Maryland Department of Natural Resources, 1987. The Quantity and Natural Quality of Ground Water in Maryland. Prepared by the Maryland Water Resources Administration.

Maryland Water Resources Administration, 1976. Patuxent River Basin Water Quality Management Plan.

Magee, D.W., 1981. Freshwater Wetlands - A Guide to Common Indicator Plants of the Northeast. The University of Massachusetts Press, Amherst, MA.

Noon, B.R., V.P. Bingman, and J.P. Noon, 1979. The effects of changes in habitat on northern hardwood forest bird communities. In Proc. Workshop on Management of North Central and Northeastern Forests for Nongame Birds. Eds. R.M. DeGraaf, and K.E. Evans, U.S. Forest Service General Tech. Rep. NC-51, pp 38-48.

Obermeier, S.F., 1979. Slope stability map of Fairfax County, Virginia: U.S. Geological Survey Miscellaneous Field Studies Map MF-1072, 1 pl., scale 1:48,000

Obermeier, S.F., and Langer 1986. Soils and Weathered Rocks of Fairfax County and Vicinity, U.S. Geological Survey Professional Paper 1344.

Robbins, C.S. 1979. Effect of forest fragmentation on bird populations. In Management of North Central and Northeastern Forests for Nongame Birds. Eds. R.M. DeGraaf, and K.E. Evans, U.S. Forest Service Gen. Tech. Rep. NC-51, pp 198-212.

Robbins, C.S., D.K. Dawson, and B.A. Dowel, 1989. Habitat area requirements of breeding forest birds of the middle Atlantic states. Wildlife Monographs No. 103, July (supplemental to J. Wildl. Mgmt. 53(3)).

Robbins, C.S., J.R. Sauer, R.S. Greenberg, and S. Droege, 1989. Population declines in North American birds that migrate to the neotropics. Proc. Natl. Acad. Sci. Vol. 86:7658-7662, October.

Ruffner, James and Frank Bair, "The Weather Almanac"; Gale Research Company, Detroit Michigan, 1983.

U.S. Army Corps of Engineers (USACE). 1990. Draft Environmental Impact Statement - Forts George G. Meade and Holabird, Base Closure/Realignment, Anne Arundel and Baltimore Counties, Maryland (DRAFT). Prepared for U.S. Army March, 1990.

U.S. Department of Agriculture (USDA). 1974. Rare and Endangered Birds of the Southern National Forests. Southern Region Forest Service, Atlanta, Georgia.

U.S. Department of Commerce, Bureau of the Census, Local Population Estimates (1988 Population and 1987 Per Capita Income) Machine Readable Data File. These reports will be published in "1988 Population and 1987 Per Capita Income Estimates for Counties and Incorporated Places," Current Population Reports, Series P-26, to be released in early 1990.

U.S. Department of Commerce; "Climatic Atlas of the United States" USDOC Environmental Science Services Administration, Environmental Data Service, reprinted by National Oceanic and Atmospheric Administration, 1983.

Udvardy, M.D.F., 1977. The Audubon Society Field Guide to North American Birds. Alfred A. Knopf, Inc, New York.

Whitcomb, R.F., C.S. Robbins, J.F. Lynch, B.L. Whitcomb, M.K. Klimkiewicz, and D. Bystrak, 1981. Effects of forest fragmentation on avifauna of the eastern deciduous forest. In Forest Island Dynamics in Man-Dominated Landscapes. Eds. R.I. Burgess, and D.M. Sharpe. Springer-Verlag, New York. pp. 125-205.

ATTACHMENT A

SAMPLE ACOUSTIC IMPACT CALCULATIONS

The basis for computing attenuation as a function of distance is the inverse square law. This law assumes a six decibel reduction for each doubling of distance from its origin. Therefore, it is necessary to know the noise level of the source at some distance in order to calculate the unknown noise level at another distance. Attenuation is given by:

Attenuation = 20 x log(X/Y)
where: X = distance for which noise level is unknown
Y = distance for which noise level is known.

The noise level generated by the source at distance X is given by:

Lx = Ly - Attenuation
where: Lx = noise level at distance X
Ly = noise level at distance Y.

The total noise level at distance X accounts for the background noise as well as the attenuated source noise. Total noise is given by:

Total Noise = 10 x log[inverse log(BNL/10) + inverse log(Lx/10)]
where: BNL = background noise level

Exhibit 3-16 contains noise level data for the Hydro-Ax at full power with rotary ax engaged and full power while mowing heavy brush. The latter of these two modes represents the loudest case and therefore was chosen for the attenuation calculations. Two sets of data, at 50 feet and at 100 feet from the source, are listed in Exhibit 3-16 under this mode. The data at 50 feet from the source was selected for all attenuation calculations since the noise measurement at this distance would have been less affected by air absorption, trees and brush than the measurement at 100 feet. At 50 feet from the Hydro-Ax, the noise level measured was 85 dBA.

1. Attenuation = 20 x log(X/Y)
   X = 2,640 feet (for sensitive area VI)
   Y = 50 feet (as explained above)
   Attenuation = 20 x log(2,640/50) = 34 dBA.

This estimates the amount by which the Hydro-Ax noise will be reduced after traveling 2,640 feet from the source.

2. Lx = Ly - attenuation
   Ly = 85 dBA (as explained above)
   attenuation = 34 dBA (as calculated above)
   Lx = 85 dBA - 34 dBA = 51 dBA.

This estimates the noise level from the Hydro-Ax to be 51 dBA at 2,640 feet from the source.

3. Total Noise = 10 x log[inverse log(BNL/10) + inverse log(Lx/10)]
   BNL = Background noise level = 43 dBA (from Table I)
   Total Noise = 10 x log[inverse log(43/10) + inverse log(51/10)]
   = 52 dBA.

This estimates the noise level which would exist at noise receptor VI with the Hydro-Ax mowing heavy brush 2,640 feet away.