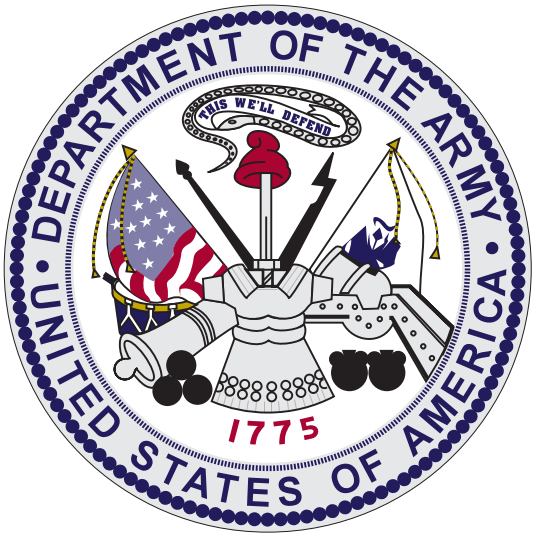
Final

Programmatic Environmental Impact Statement
for
Army Transformation



Prepared by

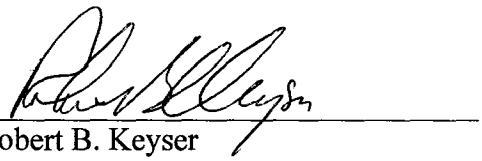
US Army Corps of Engineers
Mobile District

with technical assistance from
Tetra Tech, Inc.
10306 Eaton Place, Suite 340
Fairfax, VA 22030
DACA65-99-D-0065 DO#0097

February 2002

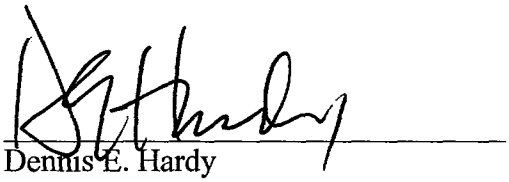
PROGRAMMATIC
ENVIRONMENTAL IMPACT STATEMENT
FOR
ARMY TRANSFORMATION

Prepared by:
Mobile District
U.S. Army Corps of Engineers



Robert B. Keyser
Colonel, Corps of Engineers
Commanding

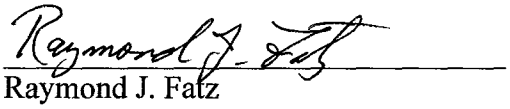
Reviewed and Recommended
For Approval by:



Dennis E. Hardy
Brigadier General, GS
Director of Force Management

David D. McKiernan
Lieutenant General, GS
Deputy Chief of Staff, G-3

Approved by:



Raymond J. Fatz
Deputy Assistant Secretary of the Army
(Environment, Safety and Occupational Health)

EXECUTIVE SUMMARY

INTRODUCTION

In October 1999, the Secretary of the Army and the Chief of Staff of the Army articulated a vision about people, readiness, and transformation of the Army to meet the demands of the 21st century.

The requirement for change within the Army is based on the emerging security challenges of the 21st century. Chief among these challenges is the need to be able to respond more rapidly to different types of operations requiring military action. The strategic significance of land forces continues to lie not only in their ability to fight and win the Nation's wars but also in their providing options to shape the global environment to the future benefit of the United States and its allies. The Army must change to become more strategically responsive and dominant at every point on the spectrum of operations.

The programmatic environmental impact statement (PEIS) evaluates the environmental and socioeconomic consequences of the measures planned to meet the required changes.

PROPOSED ACTION

The Army proposes to undertake a multiyear, phased, and synchronized program of transformation. Over a 30-year period, the Army would conduct a series of transformation activities during an Initial Phase, an Interim Capability Phase, and an Objective Force Phase. Transformation would affect most, if not all, aspects of the Army's doctrine, training, leader development, organizations, installations, materiel, and soldiers.

PURPOSE AND NEED

The purpose of the proposed action is to enable the Army to achieve, in the most timely and efficient manner, and without compromising readiness and responsiveness, the force characteristics articulated in the Army Vision.

Transformation is needed to address the changing circumstances of the 21st century. The Army is assigned the tasks of defending the United States and its territories, supporting national policies and objectives, and defeating nations responsible for aggression that endangers the peace and security of the United States. To carry out these tasks, the Army must adapt to changing world conditions and must improve its capabilities to respond. The Army must shed its Cold War design and prepare to meet the national security requirements of the 21st century.

ALTERNATIVES

The PEIS evaluates in detail two alternatives:

- *Implementation of a coordinated program of transformation.* Under this alternative, synchronized planning for and phased execution of transformation would occur over a period of approximately 30 years. This is the Army's preferred alternative.

- *No action.* Changes in doctrine, technology, and logistics must somehow take place. Under the no action alternative, the Army would not undertake a formal, synchronized program of transformation. Needed changes affecting Army organization, weapons systems, operations, and other matters would, over time, be addressed in an incremental, evolutionary manner.

Two other alternatives were considered but eliminated from detailed analysis. "Partial implementation" of transformation could necessitate that the Army retain for an indefinite period its present heavy forces built around the Abrams tank and Bradley fighting vehicle. Alternatively, the Army might attempt to achieve transformation without establishing an Interim Force. In this case, based on science and technology decisions and production and fielding of new systems, the Army would proceed directly to an Objective Force capability. Neither of these alternatives is reasonable or feasible. These alternatives would not meet the Army's purpose and need, and they are not further evaluated.

TRANSFORMATION PROCESS

Transformation is intended to fulfill the Army Vision which provides for an Objective Force that has the characteristics of being more responsive, deployable, agile, versatile, lethal, survivable, and sustainable. All transformation efforts would proceed in a phased and coordinated fashion to implement changes necessary to achieve these characteristics.

The three major objectives of the transformation process are the Objective Force, Interim Force, and the Initial Force.

- *Objective Force.* The Objective Force would achieve the ultimate transformation objective. It is a future force that would have the seven force characteristics described in the Army Vision, be strategically responsive, and be able to deploy rapidly and to dominate across the full spectrum of operations. Capitalizing on advances in science and technology, the Objective Force would be equipped with leap-ahead technologies that enable overmatching combat power.

- *Interim Force.* The Interim Force would fill the strategic near-term capability gap. It would leverage state-of-the-art technology and a modernized Legacy Force as a bridge to the future. The Interim Force, although organized as a rapidly deployable force for providing the warfighting commanders-in-chief with

increased options for responding to small-scale contingencies, would be available for employment, with augmentation, in major-theater wars. Interim Force units would be highly mobile at the strategic, operational, and tactical levels.

- *Initial Force.* The Initial Force consists of two brigades at Fort Lewis, Washington. These brigades, furnished with off-the-shelf equipment, are being used to evaluate and refine the Operations and Organization concept (O&O) for a brigade combat team (BCT) and to validate tactics, techniques, and procedures.

Transformation would proceed in three phases:

- *Initial Phase.* In this phase, the Army is creating two Initial BCTs at Fort Lewis to validate the organizational and operational model for Interim BCTs.

- *Interim Capability Phase.* The major objective of this phase would be conversion of five to eight existing brigade-sized units to Interim BCTs. The Interim Capability Phase would begin with fielding of interim armored vehicles (IAVs) and would end when the last Interim BCT is fully manned, equipped, and trained to possess the capabilities described in the Interim BCT O&O.

- *Objective Capability Phase.* This phase would begin when the first Objective Force operational unit is fully manned, equipped with a future combat system, and trained to achieve the capabilities described for the Objective Force. The phase would end when the Army has been fully converted to the Objective Force capability.

PEIS METHODOLOGY

Carrying out the proposed action would result in changes designed to meet the characteristics of the Objective Force. The changes would result from a variety of actions of several general types, any of which, depending on the circumstances, could possibly cause adverse effects to the quality of the human environment. In the PEIS, groups of actions that are evaluated are referred to as “activity groups.” They are:

- *Systems Acquisition.* This activity group involves the development, testing, production, fielding, and disposal of the weapon systems and equipment necessary to achieve the seven force characteristics of the Objective Force.

- *Construction.* This activity group involves all types of construction activities, including the erection or creation of buildings, training facilities, and infrastructure, as well as demolition of buildings and facilities.

- *Land Transactions.* This activity group involves three distinct types of real property activities: acquisition, asset management, and disposal.

- *Deployment.* This activity group involves operational deployment of forces, as well as training that is specifically tied to the deployment of forces.

- *Stationing.* This activity group involves distribution of forces across Army installations in a manner that best supports achievement of the Army's mission.

- *Training.* This activity group involves achieving and maintaining readiness to perform assigned missions on both an individual and collective (unit) basis.

- *Institutional Matters.* This activity group involves the entire range of diverse day-to-day activities not otherwise specifically accounted for in the other six activity groups.

The PEIS analyzes implementation of transformation by evaluating the effects activities within each of the activity groups would have on environmental resources and conditions. Aspects of the human and natural environments that have been analyzed are land use, real property and infrastructure, airspace, air quality, noise, water resources, geology and soils, biological resources, cultural resources, hazardous materials and wastes, human health and safety, and the socioeconomic environment.

ENVIRONMENTAL CONSEQUENCES

Implementation of a program for transformation of the Army would result in a variety of adverse and beneficial impacts to the environmental resources and conditions that have been evaluated. The majority would be direct impacts to an affected resource. Many of the impacts would be long-term. The following provides summaries of the impacts for each resource for both the proposed action and no action alternatives.

Land Use

Proposed Action Alternative. Long-term direct adverse and beneficial effects would be expected. Land use would be expected to change based on the requirements of the Interim Force and, ultimately, the requirements of the Objective Force. As a result of implementing the type and magnitude of changes envisioned, the intensity and nature of installation land use and, in some cases, adjacent land use, would be expected to change for activities such as systems acquisition, deployment, stationing, and training.

No Action Alternative. No large-scale additional or rapid increase in effects to land use would be expected. Changes in weapons systems, doctrine, and training would inevitably occur. Those changes would be of such infrequency or magnitude, however, as to have no substantial impacts to land use or compatibilities with adjoining property.

Real Property and Infrastructure

Proposed Action Alternative. No direct effects would be expected. However, activities affecting real property and infrastructure would cause indirect effects to several other resources such as land use. These effects would be both short-term and long-term. Additional base realignment and closure actions could reduce the inventory of real property and infrastructure. Disposal of excess properties would represent cost avoidance of their maintenance; if wholly or partially allocated to the Army, the savings could be applied to remaining assets or to other purposes, as appropriate. These effects would be both short-term and long-term.

No Action Alternative. No additional or increased effects would be expected. The Army would continue to expend funds for acquisition of real property assets, for repair and maintenance of facilities, and for management of its real property and infrastructure. The effects of future base realignment and closure could also occur under this alternative.

Airspace

Proposed Action Alternative. Army Transformation would result in short-and long-term direct adverse effects to airspace use. Construction or modification of airfields and training and maneuver areas could result in changes to existing airspace use. Airspace use would be most affected by the brief, intense activities of deployment exercises and by routine training exercises of varying intensities. Effects to airspace use would be dependent also upon the degree of use of modified or new systems and their associated support requirements (e.g., unmanned aerial vehicles).

No Action Alternative. No additional effects would be expected. There would be little change in airspace use with respect to the Army's rotarywing assets. Division and corps commanders presently exercise operational control over unmanned aerial vehicles. The extent of training with these limited assets would not be expected to change materially over the short term.

Air quality

Proposed Action Alternative. Implementation of transformation in the Army would over the long-term result in a moderate overall improvement in ambient air quality at Army installations. Net improvement in air quality over present conditions would be attributable to continuing changes in vehicles, equipment, and processes; reductions in use of mobile sources in field training as the use and effectiveness of simulation training increases; and improved adherence to compliance standards through use of better management techniques. In the short-term, the Army's retention of and predominant reliance on the Legacy Force would have little effect on ambient air quality. Training in the use of existing and interim systems (vehicles, weapons, and other equipment) would not

be expected to involve any material changes in generation of air emissions. Similarly, performance and maintenance of existing systems would not materially change except, perhaps, as a result of improvements in fuel efficiency. Numbers of mobile and stationary sources across the Army's inventory of installations would remain essentially static. That is, there would be little, if any, variance in the numbers of tactical vehicles and privately-owned vehicles (commuters) or in the numbers of "process" emissions from maintenance shops and other sources (e.g., on-post dry cleaning establishments). In the short term, emissions from stationary sources could be reduced as the Army moves toward removal of WW II-era facilities and construction of new, consolidated facilities having more efficient heating and cooling systems.

No Action Alternative. No additional effects would be expected. Levels of air emissions presently produced by Army activities would generally continue, subject to slight incremental increase or decrease due to changes that would occur even in the absence of a program for transformation. The Army would continue to recapitalize and modernize its equipment and vehicles inventories, regulatory requirements would continue to evolve (generally becoming more stringent), and the mobile and stationary sources associated with training and day-to-day facilities operations would continue to generate emissions of varying types and quantities. Air emissions resulting from Army operations would occur within the context of, and as authorized by, relevant air quality permits issued by appropriate authorities.

Noise

Proposed Action Alternative. Army Transformation would result in both direct adverse and beneficial effects. Short-term minor adverse effects could occur due to activities associated with construction, accelerated training, and deployment. Short-term adverse noise effects would likely occur during increased training exercises associated with unit conversions. However, in the long term, overall beneficial effects would likely occur with the use of new systems based on technological advances (i.e., reductions in engine noise).

No Action Alternative. No effects would be expected. Noise levels of Army activities would generally continue, subject to slight incremental increase or decrease due to changes in training doctrine or employment of equipment.

Water Resources

Proposed Action Alternative. The activities associated with transformation would cause both direct and indirect adverse effects to water resources with considerable variability among locations. Effects due to systems acquisition, construction, land transactions, training, and institutional matters would be of both short-term and long-term duration.

No Action Alternative. Long-term direct beneficial effects would be expected. Army environmental stewardship efforts seek the enhanced conservation and protection of natural resources at Army installations. Consistent with this goal, the Army has begun to implement, or is now at the threshold of implementing, important programs and initiatives such as Integrated Training Area Management, Integrated Natural Resources Management Plans, an EMS, and implementation of range sustainability principles. Programs and initiatives such as these, which would commence even in the absence of the proposed action, are expected to produce positive benefits to the targeted resources.

Geology and Soils

Proposed Action Alternative. Activities associated with transformation would cause direct adverse affects to soil resources. Differences from current practices would be related to use of wheeled vehicles instead of tracked vehicles, expected increases in off-road training miles, and potential use of new, currently vegetated areas for construction, training, or deployment. Optimal use of soil resources would require that soil use be considered along with use of other resources so that it could be used sustainably for dedicated purposes and/or not damaged to the point where it could not be returned to other uses (such as natural areas or agricultural lands) when required.

No Action Alternative. No additional or increased effects would be expected. Incidental adverse effects to soils, as well as protective and rehabilitative measures applied as circumstances warrant, would continue to occur.

Biological Resources

Proposed Action Alternative. The activities associated with transformation would cause adverse and beneficial effects to biological resources. These effects would be both short-term and long-term. Training and construction activities would create the majority of adverse effects. Army land stewardship initiatives aimed at range and maneuver area sustainability would be expected to ameliorate adverse effects and generate beneficial effects.

No Action Alternative. Long-term direct beneficial effects would be expected. Army environmental stewardship efforts seek the enhanced conservation and protection of natural resources at Army installations. Consistent with this goal, the Army has begun to implement, or is now at the threshold of implementing, important programs and initiatives such as Integrated Training Area Management, Integrated Natural Resources Management Plans, an EMS, and implementation of range sustainability principles. Programs and initiatives such as these, which would commence even in the absence of the proposed action, are expected to produce positive benefits to the targeted resources.

Cultural Resources

Proposed Action Alternative. Long-term direct adverse and beneficial effects would be expected. Throughout the period of transformation, the Army would continue to exercise diligence with respect to archaeological sites, traditional cultural and historic properties, and paleontological resources presently within its control. Notwithstanding the Army's responsible management pursuant to federal law and regulations, however, actions within the construction and training activity groups pose various risks of harm to cultural resources. Installation commanders' adherence to Integrated Cultural Resources Management Plans would minimize these potential risks. Land transactions involving private land could result in beneficial effects through the provision of federal protections to cultural resources on any private land that might be purchased.

No Action Alternative. Long-term direct adverse and beneficial effects would be expected. The potential for adverse effects on cultural resources exists without regard to implementation of the proposed action. The preceding discussion concerning the proposed action is equally applicable to the no action alternative.

Hazardous Materials and Wastes

Proposed Action Alternative. Direct beneficial and adverse effects would be expected. The beneficial effects would occur within the context of systems acquisition and land activities. Adverse effects would occur with respect to increased facility construction and modification.

No Action Alternative. Long-term direct beneficial effects would be expected. Existing programs for the management of hazardous materials and wastes would continue. Abatement actions to deal with threats arising from past hazardous wastes practices would also continue. Hazardous materials management and pollution prevention programs for weapons systems and facilities would reduce or eliminate future environmental impacts.

Human Health and Safety

Proposed Action Alternative. Long-term direct adverse and beneficial effects would be expected. Beneficial effects would be expected with respect to systems acquisition, training, and institutional matters. Adverse effects would be expected with respect to construction and deployment.

No Action Alternative. No increase in effects would be expected.

Socioeconomic Environment

Proposed Action Alternative. At the national level of assessment addressed in this PEIS, no effects to socioeconomic resources would be expected. Although workforce levels at individual installations or within communities linked strongly to

some defense industries could be affected by transformation, overall troop levels and associated civilian employment would likely remain essentially unchanged. The Nation's military force levels are determined by national security policy decisions and would not be affected by the proposed action. Employment changes could, however, take place at the installation or community level and, in such cases, the resulting economic effects would be assessed in a site-level EA or EIS. Implementation of the proposed action would be consistent with the goals for achievement of environmental justice as articulated in Executive Order 12898. Implementation would also comport with the objectives of Executive Order 13045; the Army's actions would not pose any risks of safety to children, whether resident on an installation or present as a visitor.

No Action Alternative. No change in effects would be expected as change would occur on a more evolutionary scale.

CUMULATIVE EFFECTS

There is a growing recognition that the combined, incremental effects of various human activities on a resource—cumulative effects—can pose a threat to the resource. While each such effect may be insignificant by itself, adverse effects from multiple sources occurring at different times can build up and can result in serious degradation of a resource. For a program such as Army transformation, activities with the potential for producing adverse effects would be occurring at many different locations nationwide. At this scale, cumulative effects to a resource contributed to by an Army program activity would have either to affect the resource on a nationwide (or regional) basis or be likely to affect all or most such resources in the vicinity of a specific installation or installations.

Implementation of a program to transform the Army may result in cumulative impacts of both types, some positively and some negatively. On the positive side, it is likely that in the process of achieving the Objective Force there will be an overall reduction in emissions from military vehicles and aircraft nationwide as a result of the fielding of more fuel-efficient or alternative fueled systems. Similarly, many new systems will be designed for quieter operation, primarily in the interest of reducing early detection from opposing forces. It is also possible that, over time, as advances in realistic combat simulation technology are made, there could be some reduction in the total amount of land needed for maneuver training and in the frequency of its use.

On the other hand, increases in the use of airspace by unmanned aerial vehicles, near-term land requirements for effective field training of the Interim Force and the construction of deployment and staging hardstand, and other transformation related construction, could contribute to adverse cumulative effects locally to some resources at some installations.

MITIGATION

The Army recognizes that its resources are finite and require appropriate stewardship for their sustainability. Whenever appropriate, it designs its actions to avoid, reduce, or compensate for adverse environmental effects.

The PEIS has been prepared at the inception of a very long process of transformation, which, by its nature, would require that extensive planning and step-wise execution occur over approximately 30 years. The potential environmental effects of creating, training, and employing the Objective Force can, at this stage of the process, be described only in the most general of terms.
Identification of specific mitigation measures for the adverse impacts identified is not practicable. In order to attain its underlying goal to treat is resources in a manner that best assures their long-term availability, the Army would continue to act responsibly to avoid, reduce, or compensate for adverse effects arising throughout the transformation process. All ongoing environmental initiatives described in conjunction with the no action alternative for the various resource areas would act to mitigate adverse effects of transformation activities. At the present juncture, the Army can commit to five types of actions to minimize adverse effects that transformation might generate.

- *Mitigation in conjunction with site-specific NEPA analyses.* Prior to implementation of transformation-related projects or proposed actions at specific sites, the Army would analyze each action to evaluate potential environmental effects. Identification of site- or project-specific mitigation would occur through this process.

- *Fostering of a "sustainable environment" ethic.* The Army would continue on its present course to implement sustainability principles on both its ranges and the built environment, and with respect to actions taken that affect natural resources. Development of an Army-wide ethic that fosters considerations of sustainability is presently at an early stage with the initiation of facilities sustainable design and integrated, adaptive management of natural resources on an ecosystem basis.

- *Implementation of an Environmental Management System (EMS).* An EMS would provide an overarching architecture for informed decision making with respect to environmental issues. Implementation of a comprehensive EMS Army-wide would be expected to occur before 2006.

- *Use of best management practices.* Best management practices are various site- and project-specific stratagems that planners, engineers, natural resources managers, and other professional use to avoid or minimize adverse effects while carrying out projects. Consistent use of best management practices reduces risk of creating situations that might lead to consequences that would be adverse to the environment.

- *Programmatic Environmental Safety and Health Evaluation*. The Army would continue to adhere to DoD acquisition regulations requiring weapon systems acquisition managers to conduct programs to review environmental compliance requirements, comply with NEPA, assess safety and health hazards, manage hazardous materials, and prevent pollution.

This page intentionally left blank.

TABLE OF CONTENTS

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

1.0 PURPOSE, NEED, AND SCOPE

1.1 INTRODUCTION

On October 12, 1999, the Secretary of the Army and the Chief of Staff of the Army articulated a vision to posture the Army to meet the demands of the 21st century: "Soldiers on Point for the Nation … Persuasive in Peace, Invincible in War."

The Army Vision is about people, readiness, and transformation. People are the centerpiece of the Army's formations, and leadership is the Army's stock in trade. It is imperative that the Army continues to take care of its quality soldiers, civilians, and veterans, as well as their families. Readiness has always been the top priority. The Army has a nonnegotiable contract with the American people to fight and win the Nation's wars.

The requirement for change within the Army is based on the emerging security challenges of the 21st century. Chief among these challenges is the need to be able to respond more rapidly to different types of operations requiring military action. The strategic significance of land forces continues to lie in their ability not only to fight and win the Nation's wars but also to provide options that shape the global environment to benefit the United States and its allies. The Army must change to become more strategically responsive and dominant at every point on the spectrum of operations. A variety of timely and effective responses is required to meet these ends.

The ultimate force that would achieve the Army Vision is referred to as the Objective Force. Compared to those elements of today's Army (referred to as the Legacy Force), whose readiness would be maintained through equipment upgrade and improvement during the early and middle phases of the transformation process, the Objective Force would have the characteristics of being more responsive, deployable, agile, versatile, lethal, survivable, and sustainable across the entire spectrum of operations. A key measure of transformed forces would be their strategic mobility. The Army would use an Interim Force to develop the capability to place sustainable combat forces—a brigade combat team—anywhere in the world in 4 days (96 hours) after liftoff. The Army would build that capability into a momentum that places a warfighting division on the ground in 5 days (120 hours) and five divisions in 30 days.

The Army proposes to undertake a multiyear, phased, and synchronized program of transformation. To achieve the Objective Force, the Army over a 30-year period would conduct a series of transformation activities during an Initial Phase, an Interim Capability Phase, and an Objective Force Phase. These phases are described in greater detail in Section 2.1.3. Transformation would affect most, if not all, aspects of Army doctrine, training programs, leadership development programs, organizations, installations, materiel, and soldiers.

Pursuant to the National Environmental Policy Act of 1969 (NEPA), this programmatic

environmental impact statement (PEIS) adopts a top-tier program development perspective in evaluating the potential environmental and socioeconomic effects associated with transformation. It has been prepared in accordance with regulations issued by the Council on Environmental Quality (CEQ) (Title 40 of the *Code of Federal Regulations*, Parts 1500–1508) and Army Regulation 200-2 (*Environmental Effects of Army Actions*). This early programmatic approach to environmental effects analysis will provide decision makers, regulatory agencies, and the public with timely information on those potential effects, mitigation measures that would be taken, and environmentally sustainable features that could be incorporated into subsequent planning for transformation initiatives. These will be incorporated into NEPA analysis and documentation that might be required for specific proposed actions and locations as they are identified. Examples of future actions for which more detailed environmental impact analysis might be appropriate following the completion of this PEIS include stationing or relocation of operational forces or elements of the institutional Army, construction of facilities, testing and fielding of new or modified weapon systems, land acquisition, and science and technology initiatives.

1.2 PURPOSE AND NEED

The purpose of the proposed action is to enable the Army to achieve the force characteristics articulated in the Army Vision in the most timely and efficient manner possible and without compromising readiness and responsiveness. Early planning, adaptability to changing conditions, and thorough coordination are essential to dealing with the magnitude and complexity of the efforts inherent in such change. A phased program of transformation permits an orderly, flexible, synchronized process to be undertaken, while maintaining a force responsive to national security requirements.

Transformation is needed to address the changing circumstances of the 21st century. The Army is legally bound to defend the United States and its territories, support national policies and objectives, and defeat nations responsible for aggression that endangers the peace and security of the United States. To carry out these tasks, the Army must adapt to changing world conditions and must improve its capabilities to respond as the following points suggest. The Army must shed its Cold War design and prepare to meet the national security requirements of the 21st century.

- Recent events show that the Army cannot merely be prepared to fight the next war as it fought the last major war. America's potential foes undoubtedly have dissected past events and have initiated actions to counter the predominance the Army displayed in Operation Desert Storm in 1991. Recent terrorist attacks on the United States serve to underscore the need for planning and training to meet a variety of non-typical scenarios as well as more conventional challenges to the nation and national interests.

- Warfighting doctrine continues to evolve for a number of reasons. First, it must keep pace with technology. Second, planners must consider opponents who would engage in strategic and operational warfare designed specifically to offset

the strengths of the United States and the Army. This could include the use of weapons of mass destruction; the use of selectively acquired high-technology sensors, communications, and weapon systems; the exploitation of cyberweapons to disrupt the next generation of military logistics systems, which rely on information technology; and engagement in urban, desert, or jungle environments that degrade the Army's capacity to find and attack militarily significant targets. The use of heavy, massed forces that require months to put in place is not an optimal response to an opponent that employs such means of warfare.

- The demands placed on the Army to respond to changing world conditions have intensified. The Army responded to 16 contingencies during the Cold War (1947-1989), when attention was focused on Western Europe and the standoff with the Warsaw Pact. From 1989 to 1997, the Army responded to 45 such unforeseen events.

- Although the end of the Cold War resulted in a smaller Army, it did not affect the Army's overall commitments. The Army currently has more than 120,000 troops forward stationed with the Southern, European, Pacific, and Central Commands. In fiscal year 2000, the Army averaged more than 26,000 additional soldiers deployed to conduct operations and participate in exercises in 66 countries around the globe. These forces are drawn from an Army that has reduced its structure from 18 to 10 active component divisions in the past decade.

- The spectrum of operations for which today's Army must be prepared has expanded. Operations in the 21st century can be expected to encompass both peace and combat scenarios. The Army could be called on to participate in peace operations, such as domestic disaster relief and humanitarian assistance, and in war operations, such as limited conventional conflict and global conventional war.

- Over the past decade, the world has experienced 50 ethnic wars, 170 border conflicts, and 2 major wars involving extraregional forces. International terrorism is a growing threat that respects no borders. There is every indication that violence on the national, transnational, and subnational levels will continue well into the 21st century. In such a world environment, the Army must be prepared to respond as directed by the National Command Authority.

Implementation of a program of transformation is the means by which the Army proposes to effect the needed changes in both the operational forces and the institutional establishment.

1.3 SCOPE

A PEIS is an environmental analysis prepared at an early stage of a program. It facilitates consideration of the environment through a rational tiered decision-making

process. This PEIS identifies, evaluates, and documents, at the program level, the environmental and socioeconomic effects of transforming the Army. Future project-level or site-specific NEPA analyses, such as evaluating potential environmental effects during planning for transformation at a particular installation, will rely on and incorporate the information in the PEIS while focusing on more narrow and specific environmental issues.

The scope of this PEIS is necessarily broad. Its breadth is commensurate with the lengthy planning horizon and diverse array of actions associated with transformation. It is being initiated early in a 30-year process of change. Future combat systems have not yet been developed. Knowledge of specific activities and related time frames and locations is imprecise. Throughout transformation, the Army will have to adapt to changing national and global conditions and national security requirements.

Why the Army needs to change (two parts):

- *The near-term outlook: Outfitted to fight the Cold War, the Army needs options (equipment and organizations) better adapted for the set of post-Cold War missions that it is being handed. It needs units that can deploy fast with a small logistics requirement and be equipped with nimble armored vehicles for protection and mobility, overpowering armament to handle any situation that turns bad and intelligence assets to keep soldiers out of most bad situations in the first place.*
- *The long-term outlook: During a period in which the United States faces no peer enemy, the Army must take advantage of science and technology breakthroughs to create the next generation of equipment while developing training and doctrine advancements to go with it.*

—ARMY Magazine*, February 2001. Copyright 2001 by the Association of the United States Army. Reproduced by permission*

Because the Army *must* change, this PEIS examines in detail only two alternatives: the proposed action and the "no action" alternative. The latter also serves as the baseline against which effects of the proposed action can be evaluated. These alternatives, briefly described here, are more fully explained in Section 2.0.

- *Proposed Action.* The proposed action, Army's preferred alternative, is that it fully transforms to an Objective Force through a multiyear, phased, synchronized process. Through 2032, the Army would carry out transformation-related activities through an Initial Phase, an Interim Capability Phase, and an Objective Force Phase. Inherent in this alternative is the transformation of portions of today's Army to the Interim Force, recapitalization of current systems that would be retained, and attainment of an Army that has the characteristics of the Objective Force.

- *No Action.* Changes in military doctrine, technology, and logistics must somehow take place. Therefore, under this alternative, the Army would not undertake a formal synchronized program of transformation. Needed changes affecting Army organization, weapons systems, operations, and other matters would be addressed in an incremental, evolutionary manner.

Because of uncertainties inherent in the duration and complexity of transformation, the PEIS focuses on identifying and analyzing the various types of actions and activities associated with transformation that hold the potential for affecting the environment positively or negatively. This PEIS and other transformation-related analyses will assist Army planners and decision makers in understanding and incorporating into transformation planning and decision-making the potential risks and associated environmental impacts. Such analysis will also assist in meeting the procedural compliance requirements of NEPA.

A program-level impact analysis of the proposed action is accomplished by identifying the nature and magnitude of likely environmental effects generically and irrespective of where they might ultimately be encountered as a result of transformation. Section 3.0 (Affected Environment) includes information on the environmental characteristics of installations likely to be involved in near-term transformation activity. Section 4.0 (Environmental and Socioeconomic Consequences) identifies possible generic mitigation measures.

Certain initial transformation-related actions that will spearhead and validate early transformation concepts are under way. Other ongoing and planned analyses of potential environmental and socioeconomic effects associated with transformation include the following:

- *Preparation of a NEPA analysis for fielding two Initial BCTs at Fort Lewis, Washington.* This analysis is considering the environmental effects of converting two brigade-size units to Initial BCTs. The Army took this early action to validate basic organizational and operational concepts relevant to transformation on

which subsequent planning and implementation activities could logically build.

- *Preparation of location-specific NEPA analyses associated with transformation of current forces to form Interim Force elements.* New or additional activities or impacts or those with substantial site-specific components resulting from other activities associated with Interim Force elements as compared with those of current forces will be evaluated in accordance with NEPA to enable better-informed decisions at those locations.

- *Preparation, as appropriate, of PEIS on transformation programs of Army Major Commands.*

- *Supplementation of this PEIS, if appropriate, as characteristics of the Objective Force become more clearly defined.*

The resource areas and environmental conditions addressed in the PEIS are land use, real property; airspace; air quality; noise; water resources; geology and soil resources; biological resources; cultural resources; hazardous materials and wastes; human health and safety; and the sociological environment, including environmental justice. The transformation-related activities most likely to affect these resources are described in Section 2.1.5.

1.4 METHODOLOGY

Army planners and decision makers need timely information on environmental values and environmental effects in order to provide sound stewardship of the environment during the detailed planning for and implementation of Army transformation. In a typical NEPA analysis, the likely effects of a proposed action on a defined set of resources are evaluated and described. The proposed action of this PEIS, however, is broad and will evolve through multiple phases over a lengthy period of time. To provide useful information on potential environmental effects for transformation planners, as well as to meet the requirements of law, this PEIS relies on identification of several types of likely impact-producing activities or “activity groups” (clusters of related actions described in Section 2.2.5) as the elements to be evaluated. The analysis postulates activities generically (and specifically, where possible) against a nonspecific resource base (affected environment) that is, in total, the environmental resources and conditions that might be affected by Army actions. This approach identifies risks and effects so that they can be documented, mitigated where possible, and addressed in detail in subsequent site- and project-specific NEPA analyses.

Because of strategic factors and ongoing planning and budgeting that will precede final designation of the sequence in which operational elements of the Army (other than the units of the Initial Force at Fort Lewis, Washington) will transform, the description of the “affected environment” in this PEIS focuses on the ecoregions in which installations housing the Army’s major combat units are located. Further information that will be used in the transformation planning process to determine how best to accommodate unit

transformation at the Army's principal "force projection" installations is provided in matrices that contain information on relevant environmental resources and related conditions at those locations.

The programmatic environmental analysis was performed by evaluating the potential risks to and effects on resources described in Section 3.0 associated with identifiable transformation-related activities in each of the activity groups. For example, in Section 4.3, the likely effects on land use that would occur as a result of transformation-related training activities are described. More specifically, potential use by units of new, sophisticated systems likely to be made available through scientific advances, such as active armor, laser devices, and sensor platforms, is also evaluated for its possible effects on land use.

An interdisciplinary team of environmental scientists, biologists, planners, economists, engineers, archeologists, historians, and military technicians have identified and analyzed the likely beneficial and adverse effects on existing conditions that would occur as a result of transformation. The baseline against which effects are measured and evaluated is the environment in which the Army operates in 2001. This baseline is described in Section 3.0. Environmental and socioeconomic consequences of transformation are described in Section 4.0. The analyses identify direct, indirect, and cumulative effects, as well as mitigation measures, where appropriate.

1.5 TIERING PROCESS

Tiering is a process wherein a NEPA analysis is first performed on a broad program, such as the proposed program for Army transformation, and subsequently with a lesser scope on narrower site-specific actions, where issues can be more clearly identified and more detailed information is available. In a tiered analysis, earlier information and decisions can be incorporated by reference and excluded from redundant consideration. Decisions tiering from the PEIS, such as what approach the Army will follow in undertaking the needed changes and where, in general, transformation-related actions would occur, fall into the latter category.

Appropriate NEPA analysis will be performed as changes are proposed for various installations or as specific systems development projects are defined clearly enough to permit a meaningful analysis of alternatives and their potential effects. Discussion and information in this PEIS on such things as the purpose of and need for change, general environmental conditions at the Army's primary power projection installations, types of effects likely to occur in association with change, and mitigation measures that have applicability program-wide can assist in focusing those follow-on analyses and in reducing the time and effort that might otherwise be required.

1.6 PUBLIC INVOLVEMENT

Public participation in the NEPA process not only provides for and encourages open communication between the Army and the public, but also promotes better decision-

making. All persons who have a potential interest in the proposed action, including minority, low-income, disadvantaged, and Native American groups, are urged to participate in the Army's environmental impact analysis process conducted under NEPA.

CEQ regulations and Army Regulation 200-2 guide public participation opportunities with respect to the proposed action. These opportunities include issuance of a Notice of Intent to prepare an EIS, a public scoping process, a 45-day public review period for the draft PEIS, and public release of the final PEIS. After a 30-day public review period, the Army issues a Record of Decision on the PEIS; how environmental, cultural, and socioeconomic considerations would be addressed; what mitigation measures are being considered; and what the Army has decided with respect to the proposed action. On each of these occasions, the Army shares information with the public and hears public concerns regarding the proposed action and the Army's evaluation of the proposed action.

On December 15, 2000, the Army published its Notice of Intent to prepare the PEIS in the *Federal Register*.[1] The Army also published a formal nationwide notice in *USA Today* on December 19, 2000. The Army solicited public scoping comments through a link to a specifically designed PEIS homepage on its World Wide Web site (http://www.army.mil).

1.7 KEY TERMS AND ACRONYMS

The Army is a large and highly complex institution that has developed its own lexicon. For the benefit of readers who may be unfamiliar with Army doctrine and organization, explanations of key terms are provided in Appendix A.

1.8 STATUTORY AND REGULATORY FRAMEWORK

Army decisions that affect environmental resources and conditions occur within the framework of numerous laws, regulations, and Executive Orders (EOs). Some of these authorities prescribe standards for compliance; others require specified planning and management actions, the use of which is designed to protect environmental values potentially affected by Army transformation.

Implementation of transformation and achievement of the Army Vision would affect every aspect of the Army and its overall environmental stewardship efforts. Accordingly, the breadth of the subject matter in this PEIS involves consideration by Army planners of the sizable array of laws, regulations, and EOs related to environmental protection. Laws and related regulations bearing on the Army's proposed action include the Clean Air Act; Clean Water Act; Coastal Zone Management Act; Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation, and Liability Act; Pollution Prevention Act; National Historic Preservation Act; Endangered Species Act; Noise Control Act; and Sikes Act.

[1] *Federal Register* , December 15, 2000, 65: 78476.

Executive Orders bearing on the proposed action include EO 11988 (*Floodplain Management*), EO 11990 (*Protection of Wetlands*), EO 12088 (*Federal Compliance with Pollution Control Standards*), EO 12114 (*Environmental Effects Abroad of Major Federal Actions*), EO 12580 (*Superfund Implementation*), EO 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*), EO 13007 (*Sacred Indian Sites*), EO 13045 (*Protection of Children from Environmental Health Risks and Safety Risks*), EO 13101 (*Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition*), EO 13123 (*Greening the Government Through Efficient Energy Management*), EO 13134 (*Developing and Promoting Biobased Products and Bioenergy*), EO 13148 (*Greening the Government Through Leadership in Environmental Management*), EO 13149 (*Greening the Government Through Federal Fleet and Transportation Efficiency*), EO 13175 (*Consultation and Coordination with Indian Tribal Governments*), and EO 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*).

These authorities are addressed at various sections throughout this PEIS when relevant to particular environmental resources and conditions. Full text of the laws, regulations, and EOs is available on the Defense Environmental Network & Information Exchange web site at http://www.denix.osd.mil.

This page intentionally left blank.

2.0 PROPOSED ACTION AND ALTERNATIVES

The Army's proposed action is to conduct a full transformation through a multiyear, phased, synchronized process. As described in Section 1.2, the Army's purpose in taking action is to achieve the force characteristics articulated in the Army Vision. The need for the action is to address the changing national security challenges of the 21st century.

2.1 INTRODUCTION

The Army has considered various alternatives for fulfilling the Army Vision. The range of alternatives considered in an EIS includes reasonable alternatives and alternatives eliminated from detailed analysis (with brief explanation for their elimination). A reasonable alternative to the action proposed is one that would satisfy the purpose of and need for change. That is, alternatives must represent reasonable options for identifying, planning for, and implementing changes to meet the security requirements needed for responding to 21st century threats and protecting national interests. Evaluation of a no action alternative is also required. Four alternatives are identified: synchronized, full transformation; partial transformation; direct transition (to an Objective Force); and no action. Reasons for elimination of two of these (partial transformation and direct transition) are provided below. Section 2.2 provides a detailed description of the proposed action, and Section 2.3 describes the no action alternative.

Alternatives eliminated from detailed analysis are:

- *Partial Transformation*. Partial transformation would represent any degree of programmed change that would stop short of the goal of an Objective Force as articulated in the Army Vision. In that respect, the partial transformation alternative is infeasible because it would fail to meet the need for the proposed action. Partial transformation would not enable achievement of the force characteristics of the Objective Force in any meaningful way, and the Army would be at risk of not being able to respond to U.S. strategic requirements in a timely, fully successful fashion. Failure to develop a force capable of dominance across the spectrum of operations could jeopardize national security interests. Because pursuing partial transformation would not be reasonable, it has been eliminated from further study in this PEIS.

- *Direct Transition*. Under this alternative, the Army would transform its present operating forces directly to the Objective Force. The transformation would occur when research and development initiatives in science and technology would enable fielding of new weapons systems incorporating leap-ahead changes. The Army would not establish an Interim Force pending the equipping and fielding of the Objective Force. Scientific and technological advances supporting direct transition to an Objective Force would not be available for at least a decade. Until then, the Army would have no improvement in its capabilities to respond rapidly to crises or other contingencies. Because of this shortcoming, this alternative

would fail to meet the need for the proposed action. As a practical matter, a rapid, all-inclusive transformation of the Army without the benefit of lessons learned derived from development and refinement of an Interim Force would pose risks to optimally organizing the Objective Force. These factors render the direct transition alternative unreasonable and infeasible. Accordingly, it has been eliminated from further study in this PEIS.

2.2 PROPOSED ACTION

2.2.1 Concept

Transformation through a multiyear, phased, synchronized approach (the Army's preferred alternative) would be comprehensive, extending throughout the operational force and the institutional Army. It would translate the Army Vision from concept to reality in the most efficient and effective manner possible.

The Army would retain its Legacy Forces (the present operational force assets) until their scheduled transformation. The Army would modernize and sustain selected legacy formations to maintain essential capabilities in support of the National Command Authority. While maintaining readiness, the Army would simultaneously design and field new Interim and Objective Forces, both of which would respond to the near-term capabilities gap and, ultimately, provide for a more strategically responsive Army.

Deliberate synchronized transformation would entail three simultaneous efforts: (1) maintenance of a trained and ready force capable of fighting and winning the Nation's wars, (2) transformation of the operational force, and (3) transformation of the institutional Army. These three efforts would proceed based on a strategy involving a series of decisions. Each decision would be based on stated objectives and the achievement of associated conditions that would have to be met before implementing subsequent decisions.

2.2.2 Characteristics of Transformed Forces

Transformation seeks to fulfill the Army Vision, which provides for an Objective Force that has the characteristics of being more responsive, deployable, agile, versatile, lethal, survivable, and sustainable. All transformation efforts would proceed in a controlled and coordinated fashion to implement changes necessary to achieve these characteristics. The seven force characteristics that will drive the transformation process are described in detail in Appendix B.

2.2.3 Transformation Objectives and Phases

Objectives are desired outcomes. They are essential to achieving unity of effort and to focus on realization of the Army Vision. Objectives are defined by associated sets of conditions. The three major objectives of transformation are the Objective Force, the Interim Force, and the Initial Force.

1. *Objective Force.* The Objective Force would achieve the ultimate transformation objective. It is a future force that would have the seven force characteristics described in the Army Vision, would be strategically responsive, and would be able to deploy rapidly and dominate across the full spectrum of operations. Capitalizing on advances in science and technology, the Objective Force would be equipped with leap-ahead technologies that enable overmatching combat power. Elements of the institutional Army would also undergo change. Installations would be power projection platforms to enhance deployment and to support deployed formations. Training regimes would address complex and varying situations, affording soldiers and leaders greater agility.

The objective force represents the art of the possible: what can be done to equip, organize and train units to assimilate the best aspects of the heavy, light and interim forces. Futurists believe that the line distinguishing the heavy force and the light force will progressively blur.
Currently, the objective force is in the science and technology phase, which mainly focuses on equipment at this stage. Laboratories and other research facilities … are doing core research to create, for example, a new family of armored fighting vehicles called the future combat system. Their goal is to produce fighting vehicles that are much lighter than armored vehicles in service today but which offer equal or better protection for soldiers who will use them.

—ARMY Magazine*, February 2001. Copyright 2001 by the Association of the United States Army. Reproduced by permission*

2. *Interim Force.* The Interim Force would fill the strategic near-term capability gap. It would leverage state-of-the-art technology and a modernized Legacy Force as a bridge to the future. The Interim Force, although organized as a rapidly deployable force for providing the warfighting commanders-in-chief with increased options for responding to small-scale contingencies, would be available for employment, with augmentation, in major-theater wars. Interim Force units would be highly mobile at the strategic, operational, and tactical levels. They would be transportable in the Air Force's principal tactical cargo plane—the C-130—or comparable aircraft. They would be equipped with a family of interim armored vehicles (IAVs), lightweight artillery, and other available technology designed to ensure maximum lethality and survivability while increasing tactical, operational, and strategic maneuverability. Interim Force brigade bases would be self-contained, fully mobile, and completely deployable by air. Deploying units would be projected as combat-ready units, organized and equipped for immediate operational employment.

The interim force is a stopgap force in several ways and a leap-ahead force in others. The plan is to use available technology to re-equip brigade-sized units to adapt them to meet many of the Army's missions. This will enable them to deploy more quickly than the heavy force but have more combat punch, ground mobility and soldier protection than the Army's light forces, the airborne, air assault and light infantry units. The interim force has another purpose, too. While interim force units handle missions, they will also be used to develop much of the doctrine and training aspects of the objective force.

—ARMY Magazine*, February 2001. Copyright 2001 by the Association of the United States Army. Reproduced by permission*

3. *Initial Force*. The Initial Force consists of two brigades located at Fort Lewis, Washington. These brigades, furnished with off-the-shelf equipment, are being used to evaluate and refine the Operations and Organization (O&O) concept for a brigade combat team and to validate tactics, techniques, and procedures. Achievement of these measures will establish the critical conditions necessary for the Interim Force. Lessons learned and insights derived from the Initial Force will help achievement of Interim Force capability. Upon fielding of the first IAVs, these units would be designated Interim Brigades.

As proposed, transformation of the Army would occur in three major phases:

1. *Initial Phase*. In this phase, the Army is creating two Initial BCTs at Fort Lewis, to validate an organizational and operational model for Interim BCTs. In the Initial Phase, warfighting units would be fully manned and the major focus would be on developing the strategic, operational, and tactical doctrine for subsequent phases of transformation.

2. *Interim Capability Phase*. The major objective of the Interim Capability Phase would be to complete the fielding of five to eight Interim BCTs. At least one Interim BCT would be drawn from the Army National Guard. The Interim Capability Phase would begin with the fielding of the IAVs. The Interim BCTs at Fort Lewis would become part of the Interim Force at that time. The Interim Capability Phase would end when the last Interim BCT is fully manned, equipped, and trained to possess the capabilities described in the Interim BCT O&O. During this phase, the Army would consist of both Legacy Forces and transformed forces. The transformed forces would be capable of conducting joint, multinational, and interagency missions. Insights gained from these operations would help refine and define the operational requirements and capabilities of the Objective Force. The Army would expect to transition from the Interim Force to the Objective Force in the 2008–2010 time frame. This transition would depend highly on progress in science and technology developments.

3. *Objective Capability Phase*. The major goal of the Objective Capability Phase is the Objective Force itself. This phase of the transformation would begin when the first Objective Force operational unit is fully manned, equipped with a "Future Combat System," and trained to achieve the capabilities described for the Objective Force. It would end when the Army has been fully converted to the Objective Force capability.

2.2.4 Synchronization of Efforts

Integration and synchronization of the Army's transformation efforts would be guided by the Transformation Campaign Plan (TCP). The TCP is a "living" and continuously evolving internal "working" plan for synchronizing transformation activities. The TCP contains the level of detail required to synchronize efforts and to maximize the effectiveness and efficiency of those efforts. The TCP is also designed to allow maximum flexibility for innovation and initiative throughout the Army as the Army moves toward achieving the transformation objective.

For instance, the TCP could be revised upon determination by senior leadership that specific tasks or responsibilities need to be reassigned from one major Army command to another. Alternatively, future events might lead to revised perspectives on the world situation that the Army confronts, resulting in identification of amended or new strategic

requirements to be addressed. The basic feature of the TCP—the establishment of a framework for synchronization of planning for and execution of transformation to reach the goals expressed in the Army Vision—is not expected to change substantially, despite the "new" war on terrorism.

2.2.5 Activities Occurring During Transformation

Section 1.4 discusses how the methodology of this PEIS is founded on evaluation of "activity groups". Carrying out the proposed action to transform the Army would result in changes designed to meet the characteristics of the Objective Force. The changes would occur through various actions, any of which, depending on the circumstances, could possibly result in adverse effects to the quality of the human environment. For the purpose of this program-level analysis, the groups of actions evaluated are referred to as "activity groups." The following are key aspects of each defined activity group:

- *Systems Acquisition.* This activity group involves the development, testing, production, fielding, and disposal of the weapon systems and equipment necessary to achieve the seven force characteristics. The Objective Force would have modern equipment based on new technologies that would enable effective and efficient accomplishment of assigned missions. Until the Objective Force is fielded, however, the Army would sustain, its Legacy Force through modernization and recapitalization in order to maintain readiness for current missions. Systems acquisition activities would result in modification of existing systems already fielded to the Army, such as the M1A1 Abrams tank, M2/M3 Bradley Fighting Vehicle, and AH-64 Apache helicopter, to make them more modern. The Army would also field an Interim Force equipped with a variety of modernized and recapitalized equipment, as well as new systems that do not yet exist. In addition to the Legacy Force's use of existing systems, during the transition period the Interim Force would rely on systems acquisition activities producing new systems, such as the Interim Armored Vehicle and Mobile Gun System. New systems would reflect the Army's focus on technologies related to composite armor; active protection systems; multirole cannons, capable of both direct and indirect fire; compact kinetic energy missiles; hybrid electric propulsion; and advanced electro-optical, infrared sensors. Impacts associated with use of the systems that would be produced through the acquisition process are addressed in the evaluation of the training activity group that follows.

- *Construction.* This activity group involves all types of construction activities, including the erection or creation of buildings, training facilities (e.g., multipurpose ranges), and infrastructure. The construction activity group includes both new construction and repair and maintenance of existing facilities. It also involves demolition or deconstruction of buildings and facilities. All construction projects support mission requirements. Their execution requires consideration of such factors as alternative means of satisfying real property requirements, master planning, and land use and site selection.

- *Land Transaction.* This activity group involves three distinct types of real property activities: acquisition, asset management, and disposal. These activities underlie the Army's maintenance of an adequate inventory of land. Acquisition involves gaining temporary or permanent control of property for Army use; in many instances, it results in lands being put to new or different uses. The majority of land acquisitions occur through purchase, withdrawal of public domain lands for (primarily) military use, permit, or lease. Asset management refers to the Army's granting leases, licenses, easements, or permits to others. Such grants vary in duration. Upon discontinuance of the military's requirement for land, the Army divests itself of right, title, or interest in land, buildings, or structures through the disposal process.

- *Deployment.* This activity group involves operational deployment of forces, as well as training that is specifically tied to deployment of forces. Operational deployments and realistic training for deployment are characterized by intense, highly focused activities occurring in compressed time frames at or near installations that serve as power projection platforms.

- *Stationing.* This activity group involves distribution of forces across Army installations in a manner that best supports achievement of the Army's mission. Stationing decisions are based on many factors, including Army force structure; availability of ranges and maneuver areas for training; and availability of support assets such as housing, schools, and other services for personnel and their families.

- *Training.* This activity group involves achieving and maintaining readiness to perform assigned missions. Army doctrine for individual and collective (unit) training is based on mission-essential training lists. These lists identify all types of training activities that are needed by individuals and units to be ready to perform their missions. Following basic training given to all new personnel, initial training of individuals in their military occupational specialties occurs at Army formal schools. For the active component, individual and unit training occur primarily at the installations at which organizations are stationed. For the reserve component, individual and unit training occur primarily at organizational armories, major training areas, and training sites throughout the various states and at active component installations. The Army also operates three major Combat Training Centers: the National Training Center at Fort Irwin, California; the Combat Maneuver Training Center at Hohenfels, Germany; and the Joint Readiness Training Center at Fort Polk, Louisiana. Combined arms exercises at these sites are robust and involve training of many soldiers. In fiscal year 2000, 82,000 personnel trained at the three Combat Training Centers in a total of 26 rotations involving brigade-sized units. The training activity group also addresses management of the Army's inventory of millions of acres of training ranges and maneuver areas.

- *Institutional Matters.* This activity group involves the entire range of diverse day-to-day activities not otherwise specifically accounted for in the other six activity groups. Institutional matters include the Army's continuous examination and refinement of

concepts, doctrine, and strategic plans for use of forces in joint service, interagency, and multinational operations. The activity group also extends to management actions that address sustainment of forces, personnel actions (recruiting, retention, and assignment), and budgeting. Finally, institutional matters include to the various programs and actions the Army implements in fulfilling its environmental stewardship role.

2.2.6 Transformation Decisions

The decision to be made is how best to change the Army to achieve the Army Vision and fulfill its contract with the American people. This decision will be based on strategic, operational, environmental, and other considerations, including the results of this analysis. In implementing the proposed action over the next three decades, the Army would make many other decisions that would enable or foreclose alternatives that might be applicable to subsequent decisions. As the Army prepares for these decisions on transformation, actions and activities will be evaluated as to their potential for affecting the environment and additional impact analyses will be completed where appropriate. Some of those analyses would be tiered from this PEIS.

The Army has initiated certain actions to validate Initial and Interim Force concepts. The Army began the Initial Phase by identifying two Initial BCTs at Fort Lewis. These Initial BCTs serve as the validation force for development of operational concepts relevant to transformation. In many instances, the two Initial BCTs use “off-the-shelf” equipment and vehicles in lieu of the equipment and vehicles expected to be acquired for the Interim Force. The Army has taken this initial action to validate basic concepts on which subsequent transformation planning and implementation activities can logically build. Activities at Fort Lewis are being conducted in compliance with NEPA and other relevant authorities pertaining to environmental protection. The Army is also conducting an acquisition program for an IAV to be used by the Interim Force. Compared to present heavy forces, which consist primarily of units employing the M1A1 Abrams tank and the M2/M3 Bradley Fighting Vehicle, the IAV is intended to provide improved force deployability and sustainment. Ultimately, the Army would develop and acquire what is referred to as its Future Combat System (FCS). The FCS would be an integrated system of systems that would exploit leap-ahead advances in scientific technologies.

Transformation to the Interim Capability Phase would involve converting a number of existing brigades to Interim BCTs and, eventually, to units that have the characteristics of the Objective Force. Because of equipment fielding, personnel staffing, and training requirements, the conversion process for brigades and possibly higher echelons would occur over a period of several years. Ultimately, all Army units, regardless of their type or location, would be affected by transformation.

The Army is studying the exact number and sequence in which brigades, higher echelons, and other Army elements would transform. The Army soon plans to identify certain brigades to be included in the Interim Force. The installations at which

these brigades would live and train are the locations where the potential environmental effects of transformation would first arise. Identifying environmental and socioeconomic parameters at those installations most likely to be involved in early transformation activities that have a potential for adverse effects will enable the Army to include these considerations in performing detailed planning, as well as in making decisions that best support both environmental stewardship and transformation objectives while meeting national security requirements. The Army has tentatively identified three additional brigades and an armored cavalry regiment for sequenced transformation. These are the 172nd Infantry Brigade (Separate), Forts Wainwright and Richardson, Alaska; the 2nd Armored Cavalry Regiment (Light), Fort Polk, Louisiana; the 2nd brigade, 25th Infantry Division (Light), Schofield Barracks, Hawaii; and the 56th Brigade of the 28th Infantry Division (Mechanized), Pennsylvania National Guard.

2.3 NO ACTION

Inclusion of the no action alternative is prescribed by CEQ regulations that implement NEPA.

Under the no action alternative, the Army would not implement a formal synchronized transformation program. Actions taken to date, such as the formation of Initial BCTs at Fort Lewis to serve as validation platforms for transformation concepts, could be suspended or retained. Incremental changes would occur with respect to Army doctrine, equipment, basing, and other matters, as circumstances might dictate. Such largely piecemeal changes could eventually lead to improvements similar to the objectives of the Army Vision.

Failure to implement a program to transform the Army could result in inability to respond to U.S. strategic requirements in a timely and fully successful fashion. Failure to develop in a timely manner a force capable of successfully meeting all types of challenges could jeopardize national security interests.

2.4 OTHER ALTERNATIVES CONSIDERED

In the face of emerging security challenges and new technologies, maintenance of forces status quo would impair the Army's ability to maintain its commitment to the Nation and to fulfill the Army Vision. The Army's preferred alternative is to implement the proposed action expressed in Section 2.1.

Any reasonable alternative to the Army's proposed action must satisfy the purpose of and need for change stated in Section 1.2. Alternatives would have to represent reasonable options for identifying, planning for, and implementing changes to meet the security requirements needed for responding to 21st century threats and protecting national interests.
In its Notice of Intent in the *Federal Register* on December 15, 2000, the Army indicated

consideration of an alternative wherein transformation would be only partially implemented. On further review during the scoping process, such an alternative was determined to be infeasible because it would fail to meet the need for the proposed action. Any "partial" program for transformation that would result in the Army's keeping its heavy forces (primarily Abrams tanks and Bradley Fighting Vehicles) for an indefinite period would not satisfy the need to improve the responsiveness and deployability of operating forces.

Another alternative might involve the Army's direct transition to the Objective Force, without establishment of an Interim Force. Science and technology initiatives could be evaluated to identify, over time, feasible leap-ahead changes in weapons systems. Those systems could be produced and fielded, and the Army could move directly from how it is currently organized and equipped to being an organization having the force characteristics of the Objective Force. This alternative, however, fails to meet the need to improve, in the near term, the Army's capabilities to respond rapidly to crises or other contingencies.

Framing other hypothetical alternatives (e.g., transformation of only "light" forces or of only "heavy" forces) results in options that fail to adequately meet the seven Objective Force characteristics identified in the Army Vision statement or the purpose and need stated in Section 1.2.

In the absence of other reasonable alternatives that meet both the Army's purpose and need for change, this PEIS examines in detail only the proposed action and the no action alternative.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the Army's environmental and socioeconomic resources in 2001. It contains information on resource conditions, management, and concerns, and serves as a baseline against which potential impacts of implementing the proposed action and alternatives can be evaluated.

Twelve resource areas are included for evaluation: land use, real property (facilities and infrastructure), airspace, air quality, noise, water resources, geology and soil resources, biological resources, cultural resources, hazardous materials and wastes, human health and safety, and the sociological environment. The resource areas are discussed in Sections 3.3 through 3.14.

Appendix C provides an overview of Today's Army. Because the proposed action is expected to affect every facet of the entire Army, it is useful to understand the institutional Army and the operating forces that would be affected in a broad context. This understanding can help in evaluating the potential changes that would occur with creation of the Objective Force, even though the structure, equipment, and doctrine of that force can be estimated only in the broadest of terms.

3.2 Army Stewardship of Environmental Resources

3.2.1 Introduction

The Army is a national leader in environmental and natural resource stewardship. It has attained this stature by vigorously embracing stewardship concepts and by implementing numerous programs that support sound environmental principles.

The foundation for the Army's stewardship of its resources is *The U.S. Army Environmental Strategy into the 21st Century* ("Strategy"), issued in 1992. It provides comprehensive direction for all management actions related to the environment. The Strategy consists of specific goals, objectives, and an action plan that continues to be implemented. It harnesses the strengths of the Army—command leadership, organization, and commitment to purpose—to achieve environmental stewardship by wisely using and managing resources. The Strategy recognizes four principal environmental program areas: compliance, restoration, prevention, and conservation.[1] These are referred to as the pillars of the Army's overall environmental stewardship program.

- *Compliance Pillar.* Compliance requires the Army to follow all environmental laws. Compliance ensures that the operations at Army installations meet federal, state,

[1] Army Regulation 210-14 (*The Army Installation Status Report Program*), published January 1, 2001, identifies 19 media to be managed at Army installations and adds a fifth major area of concern, Foundation (Program Management).

local, and applicable host-nation environmental requirements and Army regulations.

- *Restoration Pillar.* Restoration includes all activities necessary to clean up installations contaminated by past practices. The restoration goal is to protect human health and the environment through rapid cleanup of contaminated sites. The Army has identified more than 10,500 potentially contaminated sites.

- *Prevention Pillar.* The prevention goal is to adopt and implement integrated management approaches, procedures, and operations to reduce all environmental contamination and pollution. The pollution prevention pillar strategy focuses efforts on preventing or reducing pollution before it is released.

- *Conservation Pillar*. The conservation goal is to conserve, protect, and enhance environmental and natural and cultural resources. Army installation commanders use all practical means consistent with Army missions to conserve and protect resources. The protection, care, and wise management of natural and cultural resources are critical to ensuring that the Army can perform its national defense mission.

Command emphasis and participation in environmental matters occur at all levels of the Army. The following achievements mark the Army's performance in fiscal year 2000 and demonstrate the breadth of the efforts:

- A Senior Leadership Conference brought Army leaders together to discuss environmental issues and to provide a foundation for developing effective and efficient approaches to new and recurrent management issues. The participation of 24 general officers and 14 members of the Senior Executive Service resulted in identification of 66 specific actions required to address 22 issues.

- The Army published an Environmental Campaign Plan and an Operational Directive to guide environmental initiatives.

- The Army held it's first worldwide conference in December 2000 as a follow-on to the SELC in March 2000. The Army Worldwide Environmental and Energy Conference brought together Army leaders, installation managers, and civilian agency officials to discuss the challenges associated with Army Transformation and to present the outcomes from the SELC.

Three of the Army's environmental programs deserve particular note. These relate to analysis of environmental impacts associated with Army proposals, management of natural resources through integrated planning, and management of training areas. The following three sections address these programs in detail. The remainder of this section describes other specific programs the Army has in place to protect, conserve, preserve, and restore environmental resources.

3.2.2 National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA) requires the analysis and documentation of potential environmental effects associated with all major federal decisions. NEPA ensures that environmental factors are considered equally with the technological and economic components of a decision and that the public is fully informed and appropriately involved in the environmental analysis process.

The purposes of NEPA are to declare a national policy which will encourage productive and enjoyable harmony between man and his environment and promote efforts which will prevent or eliminate damage to the environment.[2] The law requires that on all proposals for major federal actions significantly affecting the quality of the human environment, federal agencies include a detailed statement on impacts, irreversible effects, alternatives to the action, long-term environmental impacts, and irretrievable commitments of resources. Use of the procedures established for NEPA provides a valuable framework for both integrating environmental compliance requirements and providing necessary information to the decision maker, other agencies, and the public.

The process for implementing NEPA is established in the President's Council on Environmental Quality (CEQ) regulations.[3] The CEQ regulations are implemented within the Army through AR 200-2 (*Environmental Effects of Army Actions*). For Army actions, the "NEPA process" consists of accomplishing the following:

- Integrating other environmental requirements.
- Involving the public.
- Identifying associated effects.
- Operating on the principle of "full disclosure".
- Analyzing relevant technical information.
- Documenting analyses, their results, and decisions resulting from them.
- Summarizing technical information for the public and the decision maker.
- Identifying a preferred course of action.
- Designing and implementing mitigation and monitoring.

Application of the NEPA process to Army proposed actions results in one of three means of satisfying the CEQ regulations. First, an action might be one that previously has been determined not to have a significant effect, either individually or cumulatively, on the human environment. In such a case, the proponent can proceed with the action based on the "categorical exclusion." Second, for an action not qualifying as a categorical exclusion, a proponent may prepare an environmental assessment (EA) for proposed action. If the EA shows that impacts would not be significant, the proponent can issue a Finding of No Significant Impact and proceed with the action. If the EA shows that impacts would be significant, the proponent must undertake the third means of satisfying the CEQ regulations, which is to prepare an environmental impact statement (EIS) before initiating the proposed action.

[2] 42 U.S. Code 4321 (Pub. L. 91-190, Sec 2).
[3] 40 CFR Parts 1500 - 1508.

The Army routinely prepares NEPA documents on a wide array of proposals that encompass a broad spectrum of mission-related and support actions and activities. These include, but are not limited to, the following:

- Real property master planning.
- Real property acquisition, grants of rights, and disposal.
- Military construction.
- Weapon systems acquisition.
- Equipment modernization.
- Force management.
- Training.
- Environmental management planning.
- Installation management.

3.2.7.3 Integrated Natural Resources Management Plans

The purpose of Integrated Natural Resources Management Plans (INRMPs) is to guide natural resources management programs, while ensuring the sustainability of desired military training area conditions and maintaining ecosystem viability. In addition, INRMPs ensure that natural resources conservation measures and Army activities are consistent with federal stewardship requirements.

Under the Natural Resource Management on Military Lands Act of 1960 (Title 16 of the *United States Code* [USC], Section 670 and following), commonly known as the Sikes Act, as amended according to the Sikes Act Improvement Act of 1997,

> The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary. Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the program to provide for the conservation and rehabilitation of natural resources on military installations; the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and subject to safety requirements and military security, public access to military installations to facilitate the use.

Under 16 U.S.C. § 670a(b) of the Sikes Act Improvement Act of 1997, to the extent appropriate and applicable, an INRMP must be consistent with the use of military installations to ensure the preparedness of the Armed Forces. Each INRMP prepared under subsection (a) of this section must provide for the following:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation.

- Fish and wildlife habitat enhancement or modifications.
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants.
- Integration of and consistency among the various activities conducted under the plan.
- Establishment of specific natural resource management goals and objectives and time frames for proposed action.
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources.
- Public access to the military installation that is necessary or appropriate for the use described above, subject to requirements necessary to ensure safety and military security.
- Enforcement of applicable natural resource laws (including regulations).
- No net loss in the capability of military installation lands to support the military mission of the installation.
- Such other activities as the Secretary of the military department determines appropriate.

DoD's general conservation management policy as described in DoD Instruction (DoDI) 4715.3 (May 3, 1996), *Environmental Conservation Program*, stipulates that all DoD conservation programs shall work to guarantee continued access to our land, air, and water resources for realistic military training and testing while ensuring that the natural and cultural resources entrusted to DoD care are sustained in a healthy condition for scientific research, education, and other compatible uses by future generations.

United States Army Environmental Strategy into the 21st Century provides the framework to ensure that environmental considerations are integral to the Army mission and that an environmental stewardship ethic governs all Army activities. The general goals of any INRMP would be to conform to those outlined in the Army Environmental Strategic Action Plan. Those general goals include the following:

- To ensure the long-term sustainability of the lands to support the military mission.
- To conserve and protect the natural resources.
- To protect the cultural resources.
- To provide ample recreational opportunities.
- To accommodate multiple uses of the land.

It is Army policy that INRMPs will address management of listed species (in accordance with the Endangered Species Act) and their habitat.

Conservation involves the responsible management of Army lands to ensure long-term natural resource productivity so the Army can achieve its mission. Conservation balances the need for long-term resource use and resource protection. Preservation focuses on resource protection by limiting use by the Army community and the public. Preservation is essential for ensuring the future integrity of valuable national resources such as wetlands, endangered species and their habitats, and historic and cultural sites.

The Army's commitment to the conservation of its natural resources is further reflected in Army Regulation (AR) 200-3, *Natural Resources—Land, Forest, and Wildlife Management,* and the Headquarters, Department of the Army (HQDA) INRMP Policy Memorandum (21 March 1997), entitled *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)*. AR 200-3 "sets forth the policy, procedures, and responsibilities for the conservation, management, and restoration of land and the natural resources thereon consistent with the military mission and in consonance with national policies" (HQDA, 1995b). The INRMP Policy Memorandum states that the purpose for completing planning-level surveys and the INRMP is "to ensure that natural resource conservation measures and Army activities on mission land are integrated and are consistent with federal stewardship requirements" (HQDA, 1997c).

Installation INRMPs are to be reviewed annually and revised as necessary. Major revisions are to be completed at least every five years. In accordance with the Sikes Act Improvement Act of 1997, INRMPs are prepared in cooperation with federal and state fish and wildlife management agencies, and the public is invited to comment on plans before they are finalized.

3.2.4 Integrated Training Area Management Program

The Integrated Training Area Management (ITAM) Program establishes procedures to achieve optimum, sustainable use of training lands by implementing a uniform land management program that includes inventorying and monitoring land conditions, integrating training requirements with land carrying capacity, educating land users to minimize adverse impacts, and providing for training land rehabilitation and maintenance. There are four distinct programs under ITAM that carry out management activities.

- Land Condition Trend Analysis (LCTA).
- Land Rehabilitation and Maintenance (LRAM).
- Training Requirements Integration (TRI).
- Environmental Awareness.

The purpose of LCTA is to collect and analyze field data concerning natural and cultural resources in installation training areas. Installation land managers and trainers use land

condition data to make decisions regarding training intensity and land rehabilitation priorities. Although LCTA field data is sometimes useful to forestry and wildlife programs, LCTA inventory and monitoring is targeted to provide information that primarily supports training and testing activities. LCTA provides spatial information in map formats that are most useful to LRAM and TRI components of ITAM. Installation LCTA programs share Army-wide program goals and data elements, but have sufficient flexibility to develop regional and site-specific methods. Necessary data elements include locations and descriptions of vegetation, wetlands and water bodies, threatened and endangered species (TES), cultural resources, soils, geology, elevation, climate, roads, and training areas.

The LRAM program mitigates the environmental effects of training and testing through land maintenance and repair activities. LRAM repairs landscapes that no longer provide realistic or safe conditions in which to train. Land rehabilitation work may also play a role in compliance with installation environmental regulations and best management practices (BMPs). Proactive and reactive techniques are used to solve specific problems relating to loss of vegetation, soil erosion, catastrophic events, and nonmilitary impacts such as grazing. Restoration efforts depend on funding and the relative importance to training of a specific area.

The objective of TRI is to guarantee adequate accessibility to training lands by integrating military training activities with ecological land constraints. TRI balances decisions regarding training events with environmental considerations. TRI accomplishes its mission by using Army Training and Testing Area Carrying Capacity (ATTACC) methodology to quantify the carrying capacity of training lands. Environmental and training factors considered include land condition, land rehabilitation costs, and training load (MIMs). A successful TRI program will accurately predict the impacts and risks of land use, and allow land managers to make informed decisions that minimize environmental damage from training.

The Environmental Awareness program develops and distributes informational materials related to the sound environmental stewardship of natural and cultural resources on training lands. The Environmental Awareness program helps land users understand the impacts of their activities on the environment. This program also helps to convey Command emphasis on environmental stewardship and facilitates compliance with environmental regulations on training lands. Environmental Awareness receives technical assistance from installation natural resource staff to develop site-specific informational materials. Environmental awareness materials include soldiers' field cards, posters, radio/television announcements, and articles in military periodicals. These educational materials are used to orient training land users on relevant environmental restrictions, rules, and procedures.

3.2.5 Specific Environmental Programs

The Army has in place numerous discrete programs that are based on specific media or resources to support environmental objectives. The environmental programs are

introduced here and, as appropriate, described in further detail in subsequent portions of Sections 3.0 and 4.0.

- *Acquisition Pollution Prevention Program*. This program coordinates the activities of weapon system acquisition managers and their supporting staffs addressing engineering design, configuration management and logistic support to eliminate the use of hazardous materials from weapon systems. The program staff integrates technology requirements across Army commodity areas to maximize environmental benefits over the life cycle of weapon systems. Areas addressed by the program include elimination of ozone depleting chemicals, hazardous materials and toxic substances.

- *Installation Pollution Prevention Program*. To conserve and reduce the consumption of resources, this program seeks to adopt and implement integrated management approaches, procedures, and operations concerning pollution prevention in all Army mission areas. Army policy is to conserve water and other natural resources and to minimize or eliminate sources of pollutants to the air, land, and surface or ground water due to water usage and solid waste generation and to demonstrate leadership to attain national goals set for controlling water pollutants. The Army seeks to conserve and recover resources and to reuse or recycle materials that otherwise would normally enter the solid or liquid waste stream. The Army cooperates with federal, state, regional, and local authorities in the formation of management plans for water resources, solid wastes, and wastewater management.

- *Environmental Training Program*. This program seeks to develop highly competent environmental staff at all levels and to develop an environmentally aware and knowledgeable Army community and work force. The program also develops quality environmental training and awareness products that support the overall environmental program. Army policy is to institutionalize the ethic of environmental stewardship on installations by providing environmental awareness training to units and the community and developing a high-quality environmental staff at the installation level.

- *Air Quality Management Program.* This program seeks to control emissions to the atmosphere in order to protect human health and the environment and to comply with all applicable federal, state, and local air quality control regulations. Installation commanders identify sources of air emissions, determine the type and amount of pollutants being emitted, and ensure that all activities conform with applicable state and federal implementation plans.

- *Radon Reduction Program.* This program seeks to reduce the risk of lung cancer to soldiers, their families, and civilian personnel by minimizing exposures to radon. Policy requires identification of structures owned and leased by the Army that have indoor radon levels greater than 4 picocuries per liter of air. Commanders must modify all Army-owned structures having radon levels greater than this threshold.

Commanders notify occupants of the results of random monitoring and maintain an archival database compatible with the Army's system for storing all measurement data.

- *Asbestos Management Program.* This program manages all asbestos-containing materials (friable or nonfriable) to minimize environmental release and subsequent occupational and incidental exposure. Army policy is to exclude asbestos from all procurement where an asbestos-free substitute exists and to handle, store, transport, and dispose of asbestos in accordance with federal, state, local, and applicable overseas requirements. Installation commanders develop and execute installationwide asbestos operations and management programs designed to minimize exposure of individuals. Property surveys establish the inventory and database of structures having asbestos-containing materials. Remedial actions (removal or repair) are taken whenever asbestos-containing materials are found to have potential to affect inhabitants or occupants.

- *Lead Hazard Management Program.* This program seeks to manage lead in place unless it presents an imminent health threat as determined by the installation medical officer. Policy imposes requirements to reduce the release of lead, lead dust, or lead-based paint into the environment from deteriorating paint surfaces, as well as to ensure the proper disposal of wastes contaminated with lead-based paint.

- *Drinking Water Management Program.* This program seeks to conserve water resources, protect them from contamination and ensure their availability for legitimate use, and comply with all applicable regulations. Army policy is to preserve rights to and conserve all water resources and to provide drinking water that satisfies the most stringent regulations and standards set by the Environmental Protection Agency (EPA) and applicable state and local authorities.

- *Wastewater Management Program.* This program seeks to protect water resources from contamination and to ensure that all installations comply with appropriate permit requirements. Army policy is to control or eliminate all sources of pollutants to surface or ground waters by using conventional treatment systems or by employing alternative or innovative processes. The Army seeks to attain zero discharge of water pollutants and cooperates with federal, state, regional, and local authorities in forming and carrying out water pollution control plans.

- *Environmental Noise Management Program.* This program seeks to protect present and future installation missions and to protect the health and welfare of military personnel, family members, and civilian employees. The program also protects the public by reducing community annoyance from environmental noise where feasible. Army policy is to reduce harmful or objectionable noise impacts to the greatest practical extent. This is accomplished through compliance with applicable laws respecting the control and abatement of environmental noise and

maintenance of an active program to protect the present and future operational capabilities of installations and facilities.

- *Hazardous Waste Management Program.* This program manages hazardous waste to promote the protection of public health and the environment. Army policy is to substitute nontoxic/nonhazardous materials for toxic/hazardous ones; ensure compliance with local, state, and federal hazardous waste requirements; and ensure the use of waste management practices that comply with all applicable requirements pertaining to generation, treatment, storage, disposal, and transportation of hazardous wastes. The program reduces the need for corrective action through controlled management of solid and hazardous waste.

- *Solid Waste Management Program.* This program manages the generation, collection, storage, processing, treatment, and disposal of solid wastes in compliance with federal, state, and local environmental laws and regulations through use of an integrated management approach to arrive at the most cost-effective and environmentally safe procedures. Army installations minimize the generation and disposal of solid wastes by actively encouraging and participating in source reduction, reuse, recycling, and composting programs. Installations develop and maintain affirmative procurement programs for acquiring recyclable and recycled content products.

- *Underground Storage Tank Program.* This program seeks to ensure compliance with federal, state, and local environmental laws and regulations. Army policy is that underground storage tanks will not be used to store hazardous waste. All new and replacement underground storage tanks use double wall construction with an interstitial space. Under this program, abandoned underground storage tanks are removed.

- *Installation Restoration Program.* This program seeks to clean up previously contaminated lands on active Army installations as quickly as funds permit to protect human health and the environment. Army policy provides for protection of the health and safety of installation personnel and the public; protection of the quality of the environment by identifying and addressing the threats posed by uncontrolled hazardous materials; and compliance with federal, state, regional, and local requirements applicable to the cleanup of hazardous materials. The program also includes a comprehensive public affairs program that solicits public comments on proposed cleanup actions and that considers public comments in decision-making.

- *Cultural Resources Management Program.* This program seeks to ensure that the Army manages the cultural resources under its control in compliance with the public laws. It also supports a spirit of stewardship of America's historic and cultural heritage. Army policy is to identify properties that meet eligibility criteria for inclusion on the National Register of Historic Places, as well as Native American or other cultural resources requiring consideration under the law. Army installations

develop cultural resources management plans as part of their master planning. The Army uses historic buildings, structures, and places in a manner consistent with the mission and ensures that the historic integrity of the property is not damaged. The Army consults groups and individuals associated with cultural resources on installations about their protection, access, and use.

- *Fish and Wildlife and Endangered Species Management Programs.* The goal of this program is to maintain a trained and ready Army while meeting environmental compliance and stewardship responsibilities. The policies designed to accomplish the program goals are for personnel at all levels to ensure that they carry out mission requirements in harmony with the requirements of the Endangered Species Act (ESA), work in harmony with trainers or land users and with the federal agencies charged with enforcement of the ESA, and engender proactive attitudes within the installation in managing the conservation of endangered species while meeting the imperative of maintaining a trained and ready Army. In connection with these, the Army establishes cooperative and mutually beneficial working relationships with all installation elements, other DoD and federal agencies, states, and public interest organizations on endangered species matters. It also identifies and locates endangered, threatened, and candidate species on installations and prepares installation Endangered Species Management Plans (ESMPs) for all endangered and threatened species. As circumstances warrant, the Army consults with the US Fish and Wildlife Service or National Marine Fisheries Service regarding any activity that might affect an endangered or threatened species.

- *Overseas Environmental Compliance Program.* This program develops and implements standards and regulations for protection of human health and the environment at overseas Army installations. DoD Directive 6050.16 and the *Overseas Environmental Baseline Guidance Document* (OEBGD) lay out procedures and criteria for environmental compliance at DoD installations Outside the Continental United States (OCONUS). Executive agents appointed by the DoD identify host nation and Status of Forces Agreements (SOFA) environmental standards and final governing standards. Unless inconsistent with applicable host nation law, base rights, status of forces agreements, or other international agreements, the baseline guidance applies when host nation environmental standards do not exist, are not applicable, or provide less protection to human health and the natural environment than the baseline guidance provides.

- *Notice of Violation (NOV) Control and Management Program.* This program seeks to demonstrate leadership in environmental protection and improvement and to comply with all applicable federal, state, regional, and local environmental quality goals. Installation managers monitor compliance with applicable federal, state, regional, and local environmental quality requirements. Unit, activity, or installation commanders that receive any notices of noncompliance coordinate the NOV with their legal office and report the event to their MACOMs. Within 24 hours, installations input the NOV information into the Army's Environmental Quality

Report database. The Army makes every effort to ensure that all instances of noncompliance with environmental laws and permits are identified and corrected immediately. This process begins with written requests and reports through the chain of command, with follow-up actions to identify funding requirements and deadlines for implementation. Where correction is dependent on major construction, budget submission, or other long-range programming and execution requirements, appropriate action is taken.

- *Environmental Compliance Assessment System (ECAS).* This program seeks to assist commanders in attaining and sustaining compliance with environmental laws and regulations. Installations authorize an external assessment at least once every 4 years. Installations then develop corrective actions to address deficiencies identified in the external assessment. Each installation conducts an internal self-assessment at the midpoint of the assessment cycle. Assessments use a standard Army ECAS protocol. Installations or facility managers take an active role during the on-site assessment, including in-briefs and exit briefs. They also help develop corrective actions, choose final corrective actions, and implement corrective actions.

- *1383 Reporting System.* The primary purpose of the Report Code Symbol (RCS) 1383 Report and supporting 1383 database is to identify all Army environmental program requirements. These requirements are tracked from the time they are first identified until they are executed. The data reported in the RCS 1383 Report are used to forecast costs of new program requirements. The data are also used in policies under development or proposed for promulgation by the Congress and EPA, as well as to prepare budget guidance, build the Program Objective Memorandum, develop budget estimates, and validate budget requests. The 1383 Reporting System helps in assessing the execution of the Army environmental program. It is also used to prioritize and distribute funds in times of shortfall. The report is submitted semiannually through the MACOM and the Army Environmental Center to Headquarters for final review and approval. The report is then sent to the EPA and the Office of Management and Budget (OMB), which uses the information in preparing the President's budget for submission to Congress. The 1383 Reporting System has become the centerpiece for programming and planning resources needed to execute the Army's environmental program.

3.3 LAND USE

3.3.1 Definition and Description

Land use refers to the planned development of property to achieve its highest and best use and to ensure compatibility among adjacent uses. In the civilian sector, land use plans guide the type and extent of allowable land use in an effort to control and limit growth; maintain and improve social, cultural, and physical amenities; promote a stable economy; preserve agricultural lands; maintain scenic areas; supply adequate housing; ensure the availability of necessary public services and utilities; and protect specially

designated or environmentally sensitive areas. These concepts apply, in part, to Army land use planning. Except for economic growth considerations, land use planning at Army installations proceeds toward the same ends. In the Army, land use planning is the mapping and planned allocation of the use of all installation lands based on established land use categories and criteria.

Land use planning is performed through a series of well-defined steps. The land use planning process is iterative because it needs feedback and ideas from the installation unit, tenant organizations, and residents. Plans are prepared and made to work as a matter of public business by active solicitation of comments, holding public meetings, and keeping installation residents informed of the plan. Land use planning never stops. It is used on a continuing basis as a component of real property master planning.

3.3.2 Army Land Use Management

Army land use planning involves identification, evaluation, and implementation phases. In the identification phase, planners establish land use planning objectives and goals and develop a strategy for accomplishing the land use plan. The unique characteristics of each installation require separate formulation of land use objectives and goals. In the evaluation phase, planners conduct a functional relationships analysis and actually prepare the land use plan. In the implementation phase, the land use plan is put to work to attain the identified planning objectives and goals.

Several concepts underlie Army land use planning. The mix of land use solutions at each installation is unique. The Army has no ideal plan because of the wide array of installation missions and existing assets. No two land use plans are alike because of differences in installation missions and in natural and built (existing) environments. Land use planning integrates the physical elements of an installation and the human (sociocultural) activities that take place within and around the installation. Sociocultural influences shape the land use plan as much as does the physical environment. The process of implementing land use plans includes efforts to keep them relevant through annual review and periodic updates. Joint proactive planning with adjacent communities fosters successful project development and facilities management. Coordination with city and county planning agencies aids in achieving compatibility with nearby off-post land uses.

Army installation land use planning uses 12 general land use classifications. These roughly parallel the types of designations employed by counties and municipalities in the civilian sector. The Army's 12 classifications are airfields, maintenance, industrial, supply/storage, administration, training/ranges, unaccompanied personnel housing, family housing, community facilities, medical, outdoor recreation, and open space. Like designations used in the civilian sector, the Army's land use classifications identify the principal kinds of facilities and activities to be found in particular areas of an installation. Table 3-1 lists the Army's 12 land use categories. Also shown are facility category groups typically appropriate to each land use category.

3.4 REAL PROPERTY

3.4.1 Definition and Description

This section address three closely related aspects of the Army's real property: lands, facilities, and infrastructure.

Table 3-1
Army Land Use Classifications

Airfield Land Use: Landing and takeoff area, aircraft maintenance, airfield operational and training facilities, and navigational and traffic aids
Maintenance Land Use: Depot maintenance, installation maintenance, Table of Organization and Equipment (TOE) unit maintenance
Industrial Land Use: Production; research, development, and test facilities; potable water supply, treatment, and storage; electric power source, transmission, distribution, substations, and switching stations; heat sources, transmission lines, and distribution lines; sewage and industrial waste treatment and disposal; sewage and industrial waste collection; and parking areas
Supply/Storage Land Use: Installation ammunition storage, depot ammunition storage, cold storage, general-purpose warehouse, controlled-humidity warehouse, flammable materials storehouse, fuel storage, engineer material storage, medical warehouse, unit storage, and salvage and surplus property storage
Administration Land Use: Installation command and control, directorates, tenants, organizational, and special
Training/Ranges Land Use: Training facilities, buildings; training grounds and facilities other than buildings; firing ranges, training; and firing ranges, research, development, testing, and evaluation
Unaccompanied Personnel Housing Land Use: Officer unaccompanied personnel housing, enlisted unaccompanied personnel housing, and visiting officers and soldiers quarters
Family Housing Land Use: Family housing
Community Land Use: Commercial and services
Medical Land Use: Hospital, dental clinic, clinic without beds, electric power source, heat source, parking areas
Outdoor Recreation Land Use: Recreation building, outdoor swimming pool, tennis courts, multiple court areas, baseball field, softball field, football field, and soccer field
Open Space: Unoccupied land, buffer and easement, and greenbelt

Real property consists of land and interests in land, leaseholds, standing timber, buildings, improvements, and appurtenances thereto.[4] Facilities are the buildings, structures, and other improvements placed on the land to support the Army's mission. Infrastructure is the combination of supporting systems that enable use of land and facilities.

The Army holds real estate in every state. The variety of locations provides the Army with installations having terrain with the characteristics of the key environments of deserts, the arctic, jungles, and mountains. The Army's installations also contain lands that are classifiable as swamp/wetland, forest, open woodland/savanna, grassland prairie, and semiarid shrub/steppe. Because the majority of the Army's lands are dedicated to training and range uses, the array of terrain settings enables Army units to train in a wide variety of environments. Table 3-2 lists the terrain settings at a representative selection of Army installations. In many instances, installations have multiple terrain settings within their confines.

The Army has a vast array of facilities across its installations. Each facility exists to aid the Army in a particular function or to carry out a specific aspect of the Army's mission. Facilities are classified into facility category groups (FCGs). Use of five-digit FCG codes permits the Army to manage its inventory of facilities and to achieve uniformity in facilities among installations. Table 3-3 provides a representative sampling of FCGs used to identify the Army's types of facilities.

The Army's Military Construction program (MCA) is for new construction projects costing more than $500,000. MCA projects include barracks, motor pools, ranges, family housing, administrative buildings, and gymnasiums, among others. The MCA program funding for FY00 is $1.042 billion; for FY01, $909 million; and for FY02 (requested), $1.329 billion.

The Army's MCA program includes the DoD Barracks Buyout Program, in which each barracks will be brought up to the 1 + 1 standard by the end of FY08. The 1 + 1 standard provides for one soldier to a room and two soldiers to a shared bathroom. The Army is on track to meet the FY08 deadline.

[4] Real estate includes land, right, title, and interest therein and improvements thereon. Land includes minerals in their natural state and standing timber; when severed from the land, these become personal property. The General Services Administration (GSA) has excepted growing crops from the definition of real estate when the disposal agency designates such crops for disposal by severance and removal from the land. Rights and interest include leaseholds, easements, rights-of-way, water rights, air rights, and rights to lateral and subjacent support. Installed building equipment is considered real estate until severed. Equipment in place is considered personal property.

Table 3-2
Terrain Settings at Select Army Installations

Fort A.P. Hill, VA: Forest swamp/wetland
Fort Benning, GA: Swamp/wetland, forest, open woodland/savanna
Camp Blanding, FL: Forest, open woodland/savanna
Fort Bliss, TX: Desert, mountain, semiarid steppe
Fort Bragg, NC: Forest, open woodland/savanna
Fort Campbell, KY: Forest, open woodland/savanna
Fort Carson, CO: Open woodland/savanna, grassland/prairie, semiarid steppe
Fort Chaffee, AR: Forest, swamp/wetland
Fort Dix, NJ: Forest, swamp/wetland
Fort Drum, NY: Swamp/wetland, forest, open woodland/savanna, grassland/prairie
Fort Hood, TX: Open woodland/savanna, grassland/prairie, semiarid/steppe
Fort Indiantown Gap, PA: Forest
Fort Irwin, CA: Mountain, desert
Fort Knox, KY: Forest
Fort Lewis and Yakima Training Center, WA: Swamp/wetland, forest, desert, open woodland/savanna, mountain, grassland/prairie
Fort McClellan, AL: Forest
Orchard Training Area, ID: Semiarid steppe
Fort Pickett, VA: Forest
Fort Polk, LA: Forest
Fort Riley, KS: Forest, grassland/prairie
Camp Shelby, MS: Forest, open woodland/savanna
Fort Sill, OK: Open woodland/savanna, grassland/prairie
Fort Stewart, GA: Swamp/wetland, forest, open woodland/savanna
Schofield Barracks and Puhakuloa Training Center, HA: Mountain, jungle, open woodland/savanna, semiarid steppe
Fort Wainwright, AK: Mountain, swamp/wetland, arctic, forest, open woodland/savanna

The Army's Family Housing construction program for FY00 was funded at $76.4 million and included projects at Forts Campbell, Lee, and Lewis; three installations in Germany; and one installation in Korea. The FY01 program is $229.4 million and includes projects at Forts Wainwright, Huachuca, McNair, Dietrick, Bragg, Campbell, Jackson, Bliss, Belvoir, Irwin, Leonard Wood, Lee, and Buchanan; Schofield Barracks; the U.S. Military Academy; Camp Humphrey; and four installations in Europe. The FY02 requested program budget is $147.5 million.

Adequate housing is a prime contributor to the health and well-being of soldiers and their families. Seventy-five percent of the approximately 90,000 Army housing units located in the United States do not meet current Army standards. In response to this concern, the Army's Residential Communities Initiative (RCI) uses both public and private

Table 3-3
Representative FCG Codes and Types of Facilities

11110: Fixed wing runway
17121: Indoor firing range
17160: Training aids center
17907: Sniper training field firing range
21110: Aviation unit maintenance hangar
21410: Vehicle maintenance shop, organizational
30000: Research, development, and test facilities
44100: Controlled humidity warehouse
44110: General purpose warehouse
51010: Hospital
61050: Administration building general purpose
72100: Unaccompanied personnel housing - enlisted personnel
73010: Fire station
73073: Post office main
74021: Commissary
75030: Outdoor swimming pool
81100: Electric power source
83200: Sewage and Industrial Waste Collection
85210: Parking area - organizational vehicles
85215: Parking area - nonorganizational vehicles

funding to resolve construction, rehabilitation, and housing maintenance concerns. Beginning in FY02, the Army will no longer program for Family Housing construction at sites to be privatized.

A NEPA analysis will be prepared when necessary before implementing RCI projects. Current RCI pilot sites are Fort Lewis, Washington; Fort Hood, Texas; Fort Carson, Colorado; and Fort Meade, Maryland. Other installations are in the process of being scheduled. Implementation of transformation at any installation should consider increased demand for housing and community support services, as well as the NEPA requirements and time lines associated with transformation and RCI activities.

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly synthetic, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as “urban” or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to economic growth of an area. Although there is no national consensus as to what constitutes infrastructure, the following reflect the principal elements most often associated with the term.

- *Water Systems*. Water systems provide water for potable use, industrial applications (including fire suppression), and agricultural irrigation. Concerns related to water systems typically pertain to availability and quality of water supplies, treatment processes, distribution, and consumption rates.

- *Wastewater Systems*. Wastewater treatment systems may treat sanitary sewer, industrial, or both kinds of wastes. Most systems are publicly owned treatment works (POTW). For regulatory purposes, there is a subcategory of federally owned treatment works (FOTW). Wastewater treatment systems consist of a collection system of piping from waste sources that conveys wastes to a central treatment site. As a very general rule, treatment works are identified as primary (mechanical treatment only), secondary (mechanical and biological treatment), or tertiary (mechanical and biological or chemical treatment). Wastewater treatment plants operate under National Pollutant Discharge Elimination System (NPDES) permits issued by the EPA or the states pursuant to the Clean Water Act. Concerns regarding wastewater systems typically pertain to the age of the system (either its collection system and infiltration/inflow problems or the treatment plant itself), the capacity of a treatment plant (usually expressed in millions of gallons per day), and a treatment plant's record of violations or NPDES permit effluent exceedances.

- *Storm Water Systems*. Storm water systems convey precipitation away from developed sites to appropriate receiving surface waters. For a variety of reasons, storm water systems may employ a variety of devices to slow the movement of water. For instance, a large, sudden flow could scour a streambed and harm biological resources in that habitat. Storm water systems provide the benefit of reducing amounts of sediments and other contaminants that would otherwise flow directly into surface waters. Failure to appropriately size storm water systems to hold or delay conveyance of the largest predicted precipitation event often leads to downstream flooding and the environmental and economic damages associated with flooding. As a general rule, a higher density of development, such as that found in the cantonment areas of Army installations, requires a greater degree of storm water management because of the higher proportion of impervious surfaces that occurs in such developed areas.

- *Solid Waste Management*. Solid waste management is primarily concerned with the availability of landfills to support a population's residential, commercial, and industrial needs. Alternative means of waste disposal may involve waste-to-energy programs or incineration. In some localities, landfills are designed specifically for and limited to disposal of construction and demolition debris. Recycling programs for various waste categories (e.g., glass, metal, and paper) reduce reliance on landfills for disposal.

- *Energy*. Types of energy include electrical power, natural gas, fuel oil, and steam. Army installations use all of these forms of energy. Concerns regarding energy

can extend to selection of type, conservation measures, availability, costs, or consumption rates.

- *Traffic and Circulation*. Smooth flow of traffic and the adequacy of road networks to move people efficiently contribute materially to the quality of the human environment. Activities can cause or adversely affect traffic congestion or can occur in locations with an inadequate or only marginally adequate supporting road network. Effects of activities are often expressed in terms of projected change in automobile traffic conditions. One of the more prevalent approaches for representing such changes is described in the Transportation Research Board's *Highway Capacity Manual* (1985). This approach classifies traffic conditions using a measure known as Level of Service (LOS). In general, LOS is represented as a scale from "A" to "F." Traffic conditions associated with the letter grades on this scale are as follows: LOS A represents free flow in traffic operations, LOS B represents reasonably free flow, LOS C represents stable, LOS D represents borderline unstable, LOS E represents extremely unstable, and LOS F represents breakdown in traffic operations. Assignment of LOS ratings to segments of roadways or intersections is based on studies assessing traffic count and observation. A second prevalent approach for describing traffic is the average daily traffic (ADT). ADT is usually expressed as a numeric value that describes the average number of vehicles passing a fixed point over a 24-hour period. This measure is particularly useful when there are changes due to activities using a particular roadway or intersection. Data for ADT and LOS are not always available to describe conditions at or near the location where activities occur.

- *Transportation Systems*. Transportation systems are organized means of moving people and commodities. Principal transportation systems include commercial air carriers, maritime shipping, railroads, bus services, and trucking. Movement of people by privately owned vehicles on a local or regional scale is addressed under traffic and circulation. In many instances, the location and availability of transportation system hubs, terminals, routes, and operational adjuncts (e.g., controlled airspace near an airfield) can affect or be affected by activities.

- *Communications Systems*. These consist primarily of radio and telecommunications systems.

3.4.2 Army Real Property Management

To manage its land, facilities, and infrastructure, each Army installation prepares a real property management plan (RPMP) based on assigned mission and guidance contained in a variety of plans and other documents. These references establish trends, strategies, goals, and objectives on which Army planners can base long-range and near-term plans for economical, environmentally responsible, and effective support of Army goals, objectives, missions, and populations. The Army adheres to five basic concepts in its planning goals and objectives:

- *Maximize Facilities Utilization*. The Army seeks to arrive at the optimal allocation of existing facilities, utilities, and transportation networks and information systems.

- *Maintain*. The Army seeks to maintain what it owns and to reduce its backlog of maintenance and repair.

- *Meet Regulatory and Environmental Concerns*. The RPMP process aids Army installation commanders in demonstrating leadership and complying with the letter and intent of federal, DoD, and Department of the Army policy guidance documents that govern or influence the practice of planning, including pollution abatement and energy management policies.

- *Renew*. Planning enables the orderly and cost-effective renewal of facilities, including their supporting infrastructure. Renewal may occur through rehabilitation, replacement, or elimination of deficiencies.

- *Provide New Facilities*. This alternative is the last resort for providing facilities. No new construction may be proposed in an RPMP that can be supported by existing underutilized adequate facilities, provided that the use of such facilities does not degrade operational efficiency.

Army Regulation 210-10 (*Real Property Master Planning*) guides the Army's real property planning process. The directive provides for each installation's preparation of an RPMP, which consists of four components:

- *Long Range Component (LRC)*. The LRC establishes the basic framework and specific options for developing and managing the installation; documents installation capabilities, constraints, and opportunities; and notes specific optimum land use and expansion capabilities based on a thorough environmental baseline analysis. The elements of the LRC are the long-range analysis; environmental quality, natural resources, and cultural resources baseline analysis; land use analysis; utilities assessment; transportation assessment; and supporting graphics, including various plans, an environmental overlay, and the installation design guide.

- *Capital Investment Strategy (CIS)*. The CIS is the installation commander's plan for using and investing in real property to support installation missions and the objectives of the Army Long-Range Facilities Plan, a status summary of real property support for installation missions, and a link between real property deficiencies described in the LRC and the projects listed in the Short-Range Component (SRC). The elements of the CIS are an executive summary, consideration of alternatives, an action plan, and supporting graphics. The CIS is supported by the tabulation of existing and required facilities (TSB); additional graphics, including the future development site plan; the environmental analysis; and the facilities reduction plan.

- *Short-Range Component (SRC)*. The SRC integrates real property master planning into the Army's operational planning process over the 6-year budget period, implementing the CIS by specifying projects for real property management and development. The SRC reflects the installation commander's plans for facilities construction, revitalization, major repair, major environmental undertakings, and disposal actions. The SRC incorporates the facility investment plans of nonappropriated funded and other separately funded activities. The elements of the SRC include the overview; the real property investment plan; and supporting graphics, including site-specific project location plans and site-specific extracts of the environmental overlay.

- *Mobilization Component (MC)*. The MC supports the mobilization planning strategy of the installation. It develops the expansion capability analyses of the LRC into specific plans to allocate facilities and acquire additional facilities needed to support mobilization missions, functions, and tasks. For industrial installations, the MC follows MACOM guidance published in a MACOM supplement to AR 210-20. The MC consists of a narrative report, land use plan, mobilization tabulation of existing and required facilities, mobilization site plans, and environmental analysis.

The Army's management of its lands adheres to numerous statutory requirements, regulations, and federal policies. In the land management arena, definitions applicable to the various kinds of actions are critical. Table 3-4 provides brief definitions of terms that commonly arise in the Army's management of land.

The Army holds its considerable extent of land pursuant to several statutory authorities. These laws strictly control the circumstances under which the Department of the Army may acquire or dispose of interests in land and other real property. For instance, no land is purchased in the name of the United States except under a law authorizing such purchase.[5] Moreover, no military department may acquire real property not owned by the United States unless the acquisition is expressly authorized by law.[6]

Numerous congressional acts authorize the Secretary of the Army to acquire real property. By far, the act most often relied on is the annual military construction authorization act. That legislation and other authorities commonly relied on are provided in Table 3-5.

[5] 41 U.S.C. 14.
[6] 10 U.S.C. 2676.

Table 3-4
Definitions of Terms Related to Real Property Management

Disposal: Any authorized method of permanently divesting Department of the Army of control of and responsibility for real estate.
Excess Real Estate: Any real property under the control of any federal agency that is not needed for the discharge of agency responsibilities.
Fee Owned: Real property for which the United States has all right, title, and interest rather than a partial interest.
Improvements: An addition to land amounting to more than repair or replacement and costing labor or capital (e.g., buildings, pavement, pipelines, and other structures more or less permanently attached to the land).
Ingrants: Property acquired for Army use by lease, license, or permit.
Nonexcess Property: Property required for an Army mission but proposed for sale to obtain proceeds in an amount sufficient to fund acquisition of replacement land or facilities.
Nonusable Condition: Used to describe a facility as unserviceable because it has deteriorated to the extent that it needs extensive restoration, is a danger to the health and safety of personnel, or might damage equipment.
Personal Property: Any property not considered real property.
Public Domain: Land or interest in land owned by the United States and administered by the Secretary of the Interior, through the Bureau of Land Management, without regard to how the United States acquired ownership, except lands located in the Outer Continental Shelf and lands held for the benefit of Native Americans.
Real Property: Real estate owned by the United States and under the control of the Army. It includes the land, right, title, and interest therein and improvements thereon. The land includes minerals in their natural state and standing timber; when severed from the land, these become personal property. GSA has excepted growing crops from the definition of real estate when the disposal agency designates such crops for disposal by severance and removal from the land. Rights and interest include leaseholds, easements, rights-of-way, water rights, air rights, and rights to lateral and subjacent support. Installed building equipment is considered real estate until severed. Equipment in place is considered personal property.
Reassignment: Change of jurisdiction over real estate from one command or agency to another within the Department of the Army.
Surplus Real Estate: Any excess real property not required for the needs and discharge of the responsibilities of all federal agencies, as determined by the GSA Administrator.
Transfer: Change of jurisdiction over real property from one federal agency or department to another, including military departments and defense agencies.
Withdrawn Public Lands: Public domain held back for the use or benefit of an agency by reservation, withdrawal, or other restriction for a special governmental purpose.

Table 3-5
Selected Real Property Acquisition Authorities

Acquisition Limitation: 10 USC 2676(a) provides "No military department may acquire real property not owned by the United States unless the acquisition is expressly authorized by law."
Annual Military Construction Authorization Acts: These acts contain authorization for the acquisition of lands and rights and interests thereto or therein at specified installations and facilities or for specified military purposes. The acquisitions are accomplished by donation, purchase, exchange of government-owned lands, or other means.
Armed Forces Reserve Facilities: The National Defense Facilities Act of 1950, as amended (10 USC 2233), authorizes the acquisition of real estate by purchase, lease, or transfer for Armed Forces Reserve Facilities.
Contiguous parcels not exceeding $25,000 in cost needed in the interest of national defense: 10 USC 2672 authorizes the Secretary of the Army to acquire any interest in land that the Secretary or designee determines is needed in the interest of national defense and which does not cost more than $25,000, exclusive of administrative costs and the amounts of any deficiency judgments. Acquisition may be by gift (donation), purchase, exchange of government-owned land, or otherwise.
Transfer from the Departments of the Navy and the Air Force, the Marine Corps, and the Coast Guard: 10 USC 2571 authorizes the interchange of supplies and real estate owned by the government between the Army, Navy, Air Force, Marine Corps, and Coast Guard without compensation, provided the request is made by the Secretary of the Army and is approved by the Secretary of the transferring department.
Use of public domain lands under public land orders or permits from the Department of the Interior: Until passage of the Act of February 28,1958, often known as the Engle Act (43 USC 156), this type of acquisition was accomplished by withdrawal and reservation of public domain lands by Executive Order of the President or by Public Land Order of the Secretary of the Interior or designee. Under the Engle Act, it is necessary to obtain legislation to withdraw, reserve, or restrict more than 5,000 acres.
Exchange of military lands for national forest lands (Secretary of Agriculture): Public Law 804, 84th Congress, authorizes the Secretary of a military department to acquire national forestlands by exchange (interchange) of lands under the control of a military department that lie within or adjacent to the exterior boundaries of a national forest with the Secretary of Agriculture without reimbursement or transfer of funds.
Acquisition of leasehold interests: There is no general statute that specifically authorizes the Secretary of the Army to acquire real property by lease, except 10 USC 2675, which authorizes certain leases in foreign countries. For authority to lease elsewhere, the Army relies on the language in the general provisions of the annual appropriation acts, which provides for leasing of buildings and facilities.

The Army acquires land through a variety of methods. The most common are purchase, condemnation, donation, and exchange when specified by an authorization act. Easements are also obtained using these four methods. Licenses in nongovernment real property are generally acquired by donation, although a nonrevocable license may be acquired by purchase. Leaseholds in nongovernment-owned real property, giving the government exclusive use or co-use with the owners for

specific purposes, are acquired by negotiation or condemnation. Permanent custody and control over government-owned real property is acquired by transfer, reassignment, withdrawal, reservation, or exchange. Permits to use government-owned real property are instruments issued by another government department or agency. Although in the nature of a license (may be revocable or nonrevocable), they are designated as “permits" because they relate to government-owned real property. This distinguishes them from "licenses" relating to nongovernment-owned real property. The Army may also obtain real property through recapture. This method allows use of former government-owned real property that was disposed of under a “National Security Clause,” a “National Emergency Clause,” or a similar provision. Procurement of options on real property that may be needed for a military project (before or after its acquisition is authorized by law) is by negotiation. When acquiring lands, the Army extinguishes third-party interests, such as outstanding oil, gas, mineral, grazing, timber, and water rights. Easements for rights-of-way for highways, railroads, power lines, communication lines, waterlines, and sewer lines are obtained through purchase, condemnation, donation, or exchange.

The Army adheres to several principal policies in acquisition of real property. Foremost, no request to acquire real estate by transfer, purchase, lease, or condemnation is considered or approved unless it is established that the activity to be accommodated is essential to an assigned mission, that real property under the control of the Army is inadequate to satisfy the requirement, and no real property under the control of the Navy or Air Force or other federal agency is suitable and available for use by the Army on a permit or joint use basis.

If an activity is essential to an assigned mission and the real property need cannot be filled by the use of Army or other federal property on a permit or joint use basis, the following alternatives are considered in the order listed: donation or long-term nominal rental lease, acquisition of excess lands from the other military departments by transfer, recapture of use, withdrawal from the public domain, exercise of existing authorities for the exchange of government-owned real property for nongovernment-owned real property that is adaptable to the military need, acquisition of excess lands from federal agencies by transfer, and acquisition by purchase, lease, or condemnation. Specific requirements are determined in each case, and only the minimum amount of real property necessary to support the mission is to be acquired. Desirability of location in an urban area, reduced travel time for employees or business representatives, nominal savings in transportation costs, environmental considerations (noise or traffic), or desirability of single-unit offices instead of split locations in close proximity are not considered sufficient justification for acquiring leased space or facilities when government-owned property is available. Except in very narrowly defined circumstances, if permanent construction is to be placed on land, the government must have fee title or acquire title to the land (including all mineral rights and improvements) or a permanent easement interest must be secured, with the following exceptions. Where temporary construction or no construction is to be placed by the government, acquisition of a lesser interest (leasehold, easement, license) generally is considered to be in the best interest of the Army. Land for use as a training site by the reserve

component normally is not acquired when the value of the land exceeds that of rural farmland in the area.

In acquiring real estate, the Army sometimes obtains less than full ownership. The degree of property rights that the Army obtains varies depending on the circumstances of each requirement, though in most instances the Army acquires title in fee. Table 3-6 identifies the range of property interests that the Army may obtain in its acquisition actions.

Under Article IV, Section 3, Paragraph 2 of the U.S. Constitution, the authority to dispose of U.S. real property is vested in Congress. The principal law authorizing the disposal of federal real estate is the Federal Property and Administrative Services Act of 1949, as amended (40 USC 471 et seq.). This act provides that each federal agency must report real estate that is excess to its requirements to the GSA. The GSA then determines if the available property can meet an unfulfilled requirement of any other federal agency. If not, GSA supervises and directs the disposal of the surplus property. All disposals of real estate are made under the authority of the Federal Property Act and implementing regulations issued by GSA called the Federal Property Management Regulations (FPMR), at 41 CFR Part 101, unless otherwise authorized by acts of

Congress. Where other legislation authorizes disposal, the procedures of the GSA implementing regulations may nevertheless be helpful as nonbinding guidelines in processing the disposal. In addition to the Federal Property Act, the more important of the principal acts of Congress authorizing the Secretary of the Army to dispose of real estate are shown in Table 3-7.

Table 3-6
Types of Interests in Real Estate

Fee: Real estate for which an owner has all right, title, and interest. A fee estate is without condition, limitation, or restriction. Title to most U.S. real property is held in fee.
Leasehold: An estate in realty held under a lease for a fixed period of time. A lease is a contract for exclusive possession of property for a determinate period. The lessor grants a leasehold in consideration of a return of rent.
License: An authority to do a specified act on the property of another without acquiring any estate or interest in that land.
Permit: A temporary authority given to a government agency to use real property under the jurisdiction of another government agency.
Easement: A right to use the land of another for a special purpose.
Option: A right to purchase real estate at a specified price during a stipulated period of time.

Table 3-7
Real Property Disposal Authorities

Interchange between military departments (10 USC 2571): Authorizes interchange of real estate without compensation between the Army, Air Force, Navy, and Coast Guard. (At the direction of the Deputy Secretary of Defense, this authority is not used except for property actively used by another military department. The military departments must normally acquire such property through GSA and pay fair-market value, unless the department has been using the property under a permit.)
Exchange 10 USC 2672: Authorizes exchange of government-owned land valued at less than $100,000 for other lands for national defense purposes.
Exchange 10 USC 2672a: Authorizes exchange of government-owned land for other land for national defense purposes to maintain the operational integrity of a military installation and under conditions of urgency that do not permit the delay needed to include the exchange in an annual Military Construction Authorization act.
Federal highway transfers (23 USC 317): Authorizes transfer without charge and under certain conditions of land or material resources for the construction or maintenance of federal highways from adjacent lands to the Department of Transportation.
Interchange National Forest (16 USC 505a): Authorizes interchange without reimbursement or transfer of funds of Department of the Army-controlled real estate and adjacent national forest lands under certain conditions.
Transfers to District of Columbia (40 USC 122): Authorizes transfer of jurisdiction over property interests to the District of Columbia for purposes of administration and maintenance under certain conditions.

Army Regulation 210-14 (*The Army Installation Status Report Program*) establishes the Installation Status Report (ISR) Program throughout the Army. Under the overall direction of the Assistant Secretary of the Army (Installations and Environment), the Assistant Chief of Staff (Installations and Environment) serves as the functional proponent for the program. The ISR Program assists the Army leadership in making appropriate and responsible decisions required to sustain and improve the management of installations' facilities, environmental programs, and services. Data collected through submission of ISR reports provide executive-level information on installations' real property assets, major environmental programs, and installation support services.

ISR Program reports address three areas: infrastructure, environment, and services. Each of these areas is assigned evaluative codes that reflect an installation's overall condition and readiness. In the ISR infrastructure portion of the report, the facilities and utilities systems of five primary areas are both qualitatively and quantitatively evaluated: mission facilities, mobility facilities, housing, community facilities, and installation support. Evaluations are reflected in Condition Ratings (C-Ratings) that range from C-1 to C-5. A C-1 rating reflects a report element that requires little immediate attention, while a C-5 rating shows that an installation's status is being degraded or that it is in a nonreportable status (i.e., pending base realignment and closure action).

Current Army programs seek to obtain high utilization rates for existing facilities. These programs maximize return on capital by minimizing vacant space and removing old unusable space. Two of the Army's programs for facilities are the New Leasing Initiative and the Facilities Reduction Program.

- The Army's New Leasing Initiative is designed to find private enterprises to lease underutilized facilities and property for commercial use or joint use with the installation. The first installations taking up the initiative are Fort Sam Houston, Fort Bliss, Fort Leonard Wood, Picatinny Arsenal, and Yuma Proving Ground. Historically, rental payments from leases of Army nonexcess real property have been deposited into the U.S. Treasury as miscellaneous receipts. Under authority contained in Section 2806 of the National Defense Authorization Act of 1991, Army Headquarters may share lease proceeds with the installation controlling the leased property. Lease proceeds are "no year" funds that may be used only for facilities maintenance and repair or for environmental restoration. Army policy provides for return of all proceeds to the generating installations where use of lease proceeds needed capital for real property purposes and reduces competing demands inherent in the Army budget.

- The Army's Facilities Reduction Program seeks to eliminate excess space. The program realized reduction of about 58 million square feet of space between 1992 and 1999. The Army is also investing $104 million between 1998 and 2003 to consolidate 112 Army activities into its own space. Beginning in 2003, these consolidations will reduce annual rental costs by an estimated $70 million.

Infrastructure management. Another management initiative for infrastructure is the privatization of utilities. The purpose of privatization is to provide reliable systems, not to save money. The level of funding over the past years has not been sufficient to keep the utility infrastructure from deteriorating. The Army is using the capital of outside companies to upgrade the systems; by privatizing the systems, the Army is leveraging the experience of the private sector to upgrade them quicker. The Defense Reform Initiative Directive 49 (DRID 49) requires privatization of non-mission-essential utilities systems by 2003.

The Army has approximately 1,100 utility systems and has identified 320 as eligible for privatization. The remainder will continue to be managed by the Army due to Status of Forces Agreements with host nations outside the United States. By the end of FY00, the Army had made a go/no-go decision on 320 utility systems, exempting 1 for security reasons, exempting 25 for economic reasons, and deferring 38 for future consideration. As of March 2001, 15 utility systems were already privatized. Requests for Proposal for 91 utility systems will be issued in FY01. The Army currently estimates utility privatization is 13 percent complete and will meet the 2003 deadline imposed by DRID 49.

3.5 AIRSPACE

3.5.1 Definition and Description

The Federal Aviation Administration (FAA) manages all airspace within the United States and its territories. The FAA recognizes the military's need to conduct certain flight operations and training within airspace that is separated from that used by commercial and general aviation.

Airspace is defined in vertical and horizontal dimensions and by time. Airspace is a finite resource that must be managed to achieve equitable allocation among commercial, general aviation, and military needs. The FAA has established various airspace designations to protect aircraft while operating near and between airports and while operating in airspace identified for defense-related purposes. Flight rules and air traffic control procedures govern safe operations in each type of designated airspace. Most military operations are conducted within designated airspace and follow specific procedures to maximize flight safety for both military and civil aircraft.

Controlled airspace is a generic term for the different types of airspace (Classes A, B, C, D, E, and G airspace) and defined dimensions within which air traffic control service is provided to instrument-flight-rules (IFR) flights and visual-flight-rules (VFR) flights in accordance with the airspace classification. The classifications of airspace are as follows:

- *Class A Airspace*. This airspace occurs from 18,000 feet above mean sea level (MSL) to 60,000 feet above MSL. All operations within this airspace are in accordance with regulations pertaining to IFR flights. This airspace is dominated by commercial aircraft using jet routes between 18,000 and 45,000 feet above MSL.

- *Class B Airspace*. This airspace occurs from the surface to 14,500 feet above MSL around the Nation's busiest airports. Before operating in Class B airspace, pilots must contact controlling authorities and receive clearance to enter the airspace. Aircraft operating within Class B airspace must be equipped with specialized electronics that allow air traffic controllers to accurately track aircraft speed, altitude, and position.

- *Class C Airspace*. This airspace occurs from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and meet specified levels of IFR operations or passenger enplanements. Aircraft operating within Class C airspace must be equipped with a two-way radio and an operable radar beacon transponder with automatic altitude reporting equipment. Aircraft may not operate below 2,500 feet above the surface within 4 nautical miles of the primary airport of a Class C airspace area at an indicated airspeed of more than 200 knots (230 miles per hour).

- *Class D Airspace*. This airspace occurs from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have a control tower. Class D airspace encompasses a 5-statute-mile radius from the airport. Unless authorized otherwise by air traffic control (ATC), aircraft must be equipped with a two-way radio. Aircraft may not operate below 2,500 feet above the surface within 4 nautical miles of the primary airport of a Class D airspace area at an indicated airspeed of more than 200 knots (230 miles per hour).

- *Class E Airspace*. This airspace is any controlled airspace not designated as Class A, B, C, or D airspace. It includes designated federal airways, portions of the jet route system, and area low routes. Federal airways have a width of 4 statute miles on either side of the airway centerline and occur between the altitudes of 700 feet above ground level (AGL) and 18,000 feet above MSL, but they may have a floor located at ground level at nontowered airfields. No specific equipment is required to operate within Class E airspace.

- *Class G Airspace*. Class G airspace (uncontrolled) is that portion of the airspace that has not been designated as Class A, B, C, D, or E airspace. ATC does not have authority over operations within uncontrolled airspace. Primary users of Class G airspace are VFR general aviation aircraft.

Special use airspace permits activities that either must be confined because of their nature or require limitations on aircraft that are not a part of those activities. Prohibited Areas and Restricted Areas are regulatory special use airspace. They are established in Federal Aviation Regulation (FAR) Part 73 through the rule-making process of the Administrative Procedures Act (5 USC 551-702). Warning Areas, Military Operations Areas (MOAs), Alert Areas, and Controlled Firing Areas are nonregulatory special use airspace. The FAA may designate these types of special use airspace without resort to the procedures demanded of the Administrative Procedures Act.

3.5.2 Army Management of Airspace

Military operations are conducted within designated airspace identified for defense-related purposes. Military operations follow specific procedures to maximize flight safety for nonparticipating civil and military aircraft. Those airspace areas designated for special military use consist of MOAs, which represent airspace used to separate visual military flight activities from instrument flight traffic, and Military Training Routes (MTRs), which represent airspace routes generally below 10,000 feet above msl that are used for high-speed navigation and tactical flight training.

Relevant to land use planning at airports and airfields is the designation of the Installation Compatibility Use Zone (ICUZ), Clear Zone, and the Accident Potential Zone (APZ). The AICUZ consists of land areas on which certain land uses may obstruct the airspace or otherwise be hazardous to aircraft operations, and land areas that are exposed to the health, safety, or welfare of aircraft operations. The purposes of AICUZ are to minimize the potential of major catastrophe from aircraft accidents; to prevent

incompatible development in noise exposure and accident areas; to assist local authorities to protect and promote the public health, safety, and welfare of area inhabitants; and to protect, through compatible land use planning and control, the compromise of installation operation capability. A Clear Zone represents the area at the end or just beyond the runway surface where most land uses are incompatible with military aircraft landing operations. Extending beyond the Clear Zone along the aircraft flight path, the APZ allows a variety of land uses; however, intensive uses (e.g., schools, churches, and restaurants) should be restricted because of the greater accident risks in these areas. Outside the Clear Zone and APZ, the risk of accidents is generally not significant enough to warrant special consideration in land use planning. Designation of AICUZ, Clear Zones, and APZ areas is the responsibility of the Army as the airfield operator.

Specific aviation and airspace management procedures and policies to be used by the Army are provided in AR 95-2, *Air Traffic Control, Airspace, Airfields, Flight Activities, and Navigational Aids*. Other applicable regulations regarding Army airspace management include the following:

- *FAA Order 7490, "Policies and Procedures for Air Traffic Environmental Actions."* Includes procedures and guidance for process special use airspace (SUA) environmental issues between FAA and DoD.

- *FAA Order 7610.4H, "Special Military Operations."* Specifies procedures for air traffic control planning, coordination, and services during defense activities and special military operations conducted in airspace controlled by or under the jurisdiction of the FAA.

- *Memorandum of Understanding Between the Federal Aviation Administration and the Department of Defense Concerning Special Use Airspace Environmental Actions (26 January 1998)*. The purpose of this Memorandum of Understanding (MOU) is to provide guidelines for compliance with NEPA and CEQ regulations without unnecessary duplication of effort by the FAA and DoD. It promotes early coordination between the FAA and DoD during the environmental review process associated with the establishment, designation, and modification of SUA; permits the application of lead and cooperating agency procedures; and provides for the issuance of environmental documents for the development, designation, and use of SUA.

Table 3-8 lists the Army airspace for representative installations.

Table 3-8
Airspace Information at Representative Installations

Representative Installation	State	FAA Designation	Size (mi^2)	Altitude (ft)	Hours	Controlling Agency
Fort Benning	GA	Special use	277	To 25,000	1100-0700 Daily, Intermittent Use	FAA Atlanta, GA
Camp Blanding	FL	-	-	-	-	-
Fort Bliss	TX	Special use	1,260	Unlimited	Continuous	FAA Albuquerque, NM
Fort Bragg	NC	Special use	1,075	To 29,000	Continuous, with restrictions	FAA Washington, DC
Fort Campbell	KY	Special use	128	To 27,000	Continuous, with restrictions	FAA Memphis, TN
Fort Carson	CO	Permanent restricted use, Special use	152	Unlimited	Continuous	FAA Denver, CO
Fort Drum	NY	Special use	147	To 23,000	Continuous, with restrictions	FAA Boston, MA
Fort Hood	TX	Special use	269	To 45,000	Continuous, with restrictions	FAA Houston, TX
Fort Irwin	CA	Special use	955	Unlimited	Continuous	FAA Edwards, CA
Fort Knox	KY	Special use	151	To 20,000	Continuous	FAA Louisville, KY
Fort Lewis	WA	Special use	55	To 14,000	1500-0700 M-F, 2 hrs notice	FAA Seattle, WA
Yakima Training Center	WA	Special use, with restricted areas	451	To 55,000	Advance notice	FAA Seattle, WA
Orchard Training Area	ID	Restricted, Class A and Class B (Class C in southeast portion)	-	-	-	-
Fort Polk	LA	Special use, with restricted areas	255	To 35,000	Continuous	FAA Houston, TX
Fort Riley	KS	Restricted, Special use	158	To 29,000	Continuous	FAA Kansas City, MO
Camp Shelby	MS	Special use	109	To 29,000	24 hrs notice	FAA Houston, TX

Table 3-8
Airspace Information at Representative Installations

Representative Installation	State	FAA Designation	Size (mi^2)	Altitude (ft)	Hours	Controlling Agency
Fort Sill	OK	Special use	195	To 40,000	Continuous, with restrictions	FAA Fort Worth, TX
Fort Stewart	GA	Special use	386	To 29,000	1100-0500 daily	FAA Jacksonville, FL
Schofield Barracks Military Reservation	HI	Restricted (over the west side of the impact area), Special use	51	To 30,000	Advance notice	FAA Honolulu, HI
Fort Wainwright	AK	-	-	-	-	-
Fort Richardson	AK	Special use	31	To 11,000	Continuous	FAA Anchorage, AK
		Special use	187	To 20,000	1600-0400 M-F	FAA Eielson, AK
Fort McClellan	AL	Special use	40	To 24,000	Intermittent use, 1200-0400 daily	FAA Atlanta, GA
Fort Dix	NJ	Special use	32	To 8,000	Continuous, with restrictions	FAA New York, NY
Fort Pickett	VA	Special use	47	To 18,000	24 hrs notice	FAA Washington, DC
Fort Chaffee	AR	Special use	105	To 30,000	Sunrise-sunset	FAA Memphis, TN
Fort A.P. Hill	VA	Special use	42	To 5,000	Continuous	FAA Richmond, VA
Fort Indiantown Gap	PA	Special use	42	To 13,000	1300-0400 daily , with restrictions	FAA New York, NY

Note: The following installations have Military Operations Areas (MOAs): Fort Benning, Fort Bragg, Fort Campbell, Fort Hood, Fort Lewis, Fort Polk, Fort Stewart, and Fort Pickett.

3.6 AIR QUALITY

3.6.1 Definition and Description

The Clean Air Act (CAA) has evolved since 1967, from a set of principles to guide states in controlling sources of air pollution to a series of detailed control requirements that the federal government implements and the states administer. The CAA has historically regulated air pollution sources through three primary programs: (1) ambient air quality regulation of new and existing sources through emission limits contained in state

implementation plans (SIPs); (2) more stringent control technology and permitting requirements for new sources; and (3) specific pollution problems, including hazardous air pollution and visibility impairment. The 1990 amendments to the CAA not only modified these three programs but also addressed new air pollutants and added a fourth category—a comprehensive operating permit program. The comprehensive operating permit program helps to establish in one place all CAA requirements that apply to a given stationary source of air emissions.

The CAA, the primary federal statute regulating air emissions, applies fully to the Army and all its activities. The objectives of CAA are to protect and enhance the quality of air resources; initiate and accelerate a national research and development program to prevent and control air pollution; assist state, tribal, and local governments in the development and implementation of air pollution prevention and control programs; and encourage and assist the development and operation of regional air pollution prevention and control programs. The CAA categorizes regions of the United States as nonattainment areas if air quality within those areas does not meet the required ambient air quality levels set by the National Ambient Air Quality Standards (NAAQS). The NAAQS consist of primary and secondary standards for six “criteria air pollutants”: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. Primary standards are established to protect public health. Secondary standards are established to protect public welfare (e.g., plant life, cultural monuments, and wildlife).

States have the authority to establish emission source requirements to achieve attainment of the NAAQS. These requirements may be uniform for all sources or may be specifically tailored for individual sources. To be approved as federally enforceable measures in a SIP, the requirements must be consistent with the CAA. Source emission requirements in SIPs may be established for stationary and mobile sources. Implementation of CAA requirements, for purposes of achieving NAAQS, is achieved primarily through SIPs and various federal programs. The CAA requires states to develop SIPs that establish requirements for the attainment of NAAQS within their geographic areas. SIPs must identify major sources of air pollution, determine the reductions from each source necessary to attain NAAQS, establish source-specific and pollutant-specific requirements as necessary for the area, and demonstrate attainment of NAAQS by the applicable deadlines established in the CAA using any combination of tools. If a state fails to submit a plan that is sufficient to attain the NAAQS, the EPA is to impose a federal implementation plan for that region.

The CAA also establishes standards and requirements to control other air pollution problems. Standards for hazardous air pollutants (HAPs), an acid rain reduction program, and a program to phase out the manufacture and use of ozone-depleting chemicals are the other major programs regulating emissions of air pollutants. The prevention of accidental release and minimization of consequences of any such release of extremely hazardous substances including, but not limited to, the substances published under the Emergency Planning and Community Right-to-Know Act of 1986 are also required under the CAA.

Five aspects of the CAA are particularly relevant to the Army's environmental stewardship efforts with respect to air quality. These pertain to stationary sources, mobile sources, the permit program, reduction of HAPs, and the ozone depletion program.

- *Stationary Sources.* The CAA establishes a variety of requirements or standards that states apply to stationary emission sources. The following requirements or standards have been established:

  New Source Performance Standards (NSPS): NSPS are nationally uniform emission limitations for new or modified stationary emission sources. The standards are based on the category of the industrial source and the availability of pollution control technology.

  Lowest Achievable Emission Rate (LAER): LAER is a case-by-case, technology-based standard required for certain new or modified existing major stationary sources. These rates must be met in addition to NSPS and are implemented by permit.

  Reasonably Available Control Technology (RACT): RACT is a technology-based standard for existing sources usually developed on a source category basis. In attainment areas where the air is cleaner than the NAAQS or in unclassifiable areas, new or modified major sources must install Best Available Control Technology (BACT). BACT is a technology-based standard that is stricter than NSPS and is part of a program called the Prevention of Significant Deterioration of Air Quality. The NSPS Program, as prescribed in the CAA, is a set of nationally uniform emission standards developed by category of industrial source and is based on the pollution control technology available to that category of source. The program encompasses "new sources" only, which include any stationary source constructed or modified after proposal of the regulations applicable to that source. Each source must comply with NSPS set forth in the regulations for its category. NSPS are set at levels that reflect the degree of control achievable through the application of the best system of continuous emissions reduction that has been adequately demonstrated.

- *Mobile Sources.* Mobile sources include cars, trucks, planes, vessels, and off-road engines and vehicles. The EPA generally has authority to set emission standards for these sources and related controls on their fuels. Federal mobile source requirements established by the 1990 CAA Amendments include automobile emission standards, fuel quality standards, and fleet requirements more strict than those required previously. In particular, some areas must have improved inspection and maintenance programs to ensure that vehicles continue to meet emission standards. Since 1998, the CAA has also required government agencies that own buses or trucks to buy new clean models (e.g., trucks with new engines that reduce particulate emission by 90 percent). Certain state requirements for

motor vehicles, off-road vehicles, and fuels are preempted with a provision for a waiver of preemption.

- *Permit Program.* Title V of the 1990 CAA Amendments established an operating permit program similar to the Clean Water Act for all major stationary sources of air pollution. The CAA permit program is generally administered by the state air pollution control agencies authorized by the EPA. Each permit may include a compliance schedule, enforceable emission limits and standards, and requirements for submitting monitoring data. Penalties can be assessed against any source that violates any requirements of its permit. The Title V permit program for major sources is fee-based, and federal agencies like the Army are explicitly subject to any requirement to pay a fee or charge imposed by a state or local agency to defray the costs of its air regulatory program.

- *Reduction of Hazardous Air Pollutants (HAPs).* The EPA is required to list all categories of major sources that release any of the 188 chemicals designated by Congress as HAPs in the 1990 CAA. The EPA also reviews and updates the list of chemicals and promulgates emission standards for listed source categories. New and existing major sources of HAPs must comply with applicable National Emission Standards for Hazardous Air Pollutants (NESHAP), which are adopted standards for specified categories of emission sources. Compliance with NESHAP requires a level of emission reduction that can be achieved by a particular source category by implementing Maximum Available Control Technology (MACT). If further emission reduction is necessary to protect public health, the EPA may establish health-based standards in addition to MACT. Under the CAA, the NESHAP for asbestos establishes work practices to minimize the release of asbestos fibers during activities involving the processing, handling, and disposal of asbestos and asbestos-containing material when a building is being demolished or renovated. The requirements and standards are described in 40 CFR Part 61, Subpart M. The CAA programs regulating HAP emissions also establish standards for many small stationary sources that do not qualify as “major” sources (e.g., dry cleaners) and include a program to prevent the catastrophic and accidental release of HAPs.

- *Ozone Depletion Program.* The 1990 CAA Amendments established a new program to protect the stratospheric ozone layer. The program sets a schedule to phase out the production of most ozone-depleting chemicals such as chlorofluorocarbons (CFCs), halons, and hydrochlorofluorocarbons. Other measures include requiring the use of substitute chemicals that are ozone-friendly, recycling CFCs (e.g., in automobile air conditioners), and labeling products that contain ozone-depleting chemicals.

The Army has broad compliance responsibilities under the CAA. It must comply with all federal, state, interstate, and local requirements; administrative authorities; and processes and sanctions in the same manner and to the same extent as any nongovernmental entity. This compliance requirement includes any reporting,

recordkeeping, permitting requirements, and payment of service charges and fees set forth in regulations or statutes. It also includes cooperating with the EPA or state inspections. Table 3-9 identifies the Army's principal responsibilities under the CAA.

The Army may be exempt from certain CAA obligations under limited circumstances. For example, the President may exempt a federal facility from compliance with a requirement of the CAA if it is determined to be in the "paramount interest" of the United States (though certain exceptions and requirements apply). Exemptions may not be granted because of a lack of appropriations unless the President specifically requested such appropriations as part of the budgetary process and Congress failed to make the requested appropriations available. If applicable, the President may exempt a particular emission source or federal facility for up to 1 year. The President also can issue regulations exempting the compliance of weaponry, equipment, aircraft, vehicles, or other classes or categories of property owned by the Armed Forces and the National Guard that are uniquely military in nature.[7] Federal facilities must comply with the applicable provisions of a valid automobile inspection and maintenance program, although military tactical vehicles are exempt.[8] Employees that operate motor vehicles on federal facilities must show proof of compliance with the requirements of a vehicle inspection and maintenance program.

Under Section 176(c) of the CAA, the Army is prohibited from engaging in, supporting, providing assistance for, or approving activities (e.g., issuing a license or permit) that are inconsistent with SIP requirements. This is known as the General Conformity Rule. According to Section 176(c), activities must conform to an implementation plan's purpose of "eliminating or reducing the severity and number of violations" of NAAQS and achieving "expeditious attainment" of such standards. Such activities must not

Table 3-9
Army Responsibilities Under the Clean Air Act

Obtaining necessary permits
Maintaining emissions within permitted levels
Complying with State Implementation Plan requirements
Ensuring that all CFC technicians attend EPA-certified training courses
Ensuring that all CFC recovery/recycling equipment is certified to EPA standards and venting prohibitions are maintained
Managing facilities with asbestos-containing material (ACM) and conducting ACM removals in conformance with the air toxics program requirements
Complying with applicable federal controls on mobile sources and their fuel
Developing risk management plans where required
Maintaining all required records and documentation
Managing facility construction and modification

[7] Clean Air Act §118(d), 40 U.S.C. 7518(d).
[8] Clean Air Act §118(c), 40 U.S.C. 7518(c).

cause or contribute to a new violation; increase the frequency or severity of an existing violation; or delay timely attainment of any standard, required interim emission reduction, or other milestone. Pursuant to that rule, conformity determinations are required to ensure that state air quality standards would not be exceeded and that the action would comply fully with the SIP. The proponent compares the emission levels of the proposed action to current baseline emissions. Where increases in emission levels exceed thresholds established in the General Conformity Rule, a conformity determination must be prepared. In support of the conformity determination, additional air quality modeling may be required to show more precisely the action's impacts on air quality in the region.

The EPA exercises enforcement authorities under several provisions of the CAA. With respect to Army violations of CAA requirements, the EPA may issue a unilateral order or negotiate a compliance agreement with the installation and/or assess penalties. Table 3-10 identifies the sanctions that may be imposed against the Army for violations of the CAA. In addition to issuing orders, negotiating compliance agreements, and assessing civil penalties, sanctions may be sought against individual employees of the Army for criminal violations. Table 3-11 shows the sanctions that may be imposed against

Table 3-10
Agency Sanctions

CAA § 113(d)(1): Any person who violates any requirement or prohibition of an applicable implementation plan, attempts to construct or modify a major stationary source not in compliance with new source requirements as specified in the CAA, or violates any other specified requirement is punishable by a civil administrative penalty of up to $27,500 per day of violation. The maximum penalty that can be assessed is $220,000, except where the EPA Administrator and the Attorney General jointly determine that a matter involving a larger penalty amount is appropriate for administrative penalty assessment.
CAA § 113(d)(3): The EPA is authorized to implement, after consulting with the Attorney General and states, a field citation program under which civil penalties of up to $5,500 per day of violation may be assessed for minor infractions.
CAA § 205(c): Authorizes the EPA to assess any civil penalty prescribed in § 205(a) and other subsections specified in § 205(c), in lieu of commencing a civil penalty action. The penalty should not exceed $220,000, unless the EPA Administrator and the Attorney General jointly determine that a matter involving a larger penalty amount is appropriate for administrative penalty assessment.
CAA §211(d)(1): Any person who fails to furnish information or conduct required tests or who violates any subsection requirement specified in § 211(d)(1) is punishable by a civil penalty of up to $27,500 per day of violation and the amount of economic benefit or savings resulting from the violation. This section authorizes the EPA to assess such a penalty in accordance with CAA §205(c).
CAA § 213(d): The emission standards developed under §213 (Nonroad Engines and Vehicles) must be enforced in the same manner as standards prescribed under § 202 (Emission Standards for New Motor Vehicles or New Motor Vehicle Engines). The EPA may assess civil administrative penalties in accordance with CAA §205(c).

Table 3-11
Individual Sanctions

CAA § 113(c)(1): Any person who knowingly violates certain CAA requirements is punishable by a fine pursuant to the Alternative Fines Act (18 USC § 3571), or by imprisonment not to exceed 5 years, or both. A second conviction for a knowing violation may result in a maximum punishment double that for a first-time knowing violation (i.e., double the fine and/or imprisonment, not to exceed 10 years).
CAA § 113(c)(2): Authorizes a punishment by fine pursuant to Title 18 and/or imprisonment for not more than 2 years for falsifying information, falsifying methods or devices, or failing to notify or report as required. CAA § 113(c)(2) also authorizes doubling fines and imprisonment for violations committed after a first conviction.
CAA § 113(c)(3): Establishes fines under the Alternative Fines Act and/or imprisonment not to exceed 1 year for failure to pay any fee owed to the United States. CAA § 113(c)(3) also authorizes doubling fines and imprisonment for violations committed after a first conviction.
CAA § 113(c)(4): Establishes fines under the Alternative Fines Act and/or imprisonment not to exceed 1 year for a person who negligently releases into the ambient air any hazardous air pollutant or hazardous substance and who at the time negligently places another person in imminent danger of death or serious bodily injury. CAA §113(c)(4) also authorizes doubling fines and imprisonment for violations committed after a first conviction.
CAA § 113(c)(5): Authorizes a punishment by fine under the Alternative Fines Act and/or imprisonment of not more than 15 years for knowing releases of hazardous air pollutants when it is known that such release places another person in imminent danger of death or serious bodily injury. CAA § 113(c)(5) also authorizes a fine of not more than $1 million for each violation for organizations convicted of a knowing release. Additionally, CAA § 113(c)(5) authorizes doubling fines and imprisonment for violations committed after a first conviction. In accordance with CAA § 306, a person who has been convicted of a criminal offense or has a serious pattern of civil violations may be barred from receiving federal government contracts, loans, and grants.

individuals for violations of the CAA. Under CAA Section 303, the EPA may also immediately bring suit or take other action as may be necessary to restrain any action that is causing or contributing to the emission of air pollutants presenting an imminent and substantial endangerment to public health or welfare or to the environment.

3.6.2 Army Air Quality Management

Installations must consider the effects that planned projects and activities will have on air quality both on and off post. There are two independent legal requirements that address air quality management: (1) NEPA and (2) the general conformity provision of Clean Air Act (CAA) Section 176(c), including EPA's implementation, the General Conformity Rule. Depending on the action and the air quality conformity attainment status of the installation (or other affected property), an installation might have to complete a separate conformity analysis in addition to the NEPA analysis. Applicability of the two requirements must be considered separately. Exemption from one requirement does not automatically exempt the action from the other requirement, nor

does fulfillment of one requirement constitute fulfillment of the other. Although installations should integrate compliance efforts to save time and resources, the two requirements are very different, necessitating separate analyses and documentation.

The CAA Amendments of 1990 (CAAA-90) provide a comprehensive national program with the goal of reducing the levels of pollutants in the ambient air. The DoD strategy for air quality compliance includes prevention, control, and abatement of air pollution from stationary and mobile sources. The CAAA-90 provide the framework for the majority of air quality regulations and guidelines with which Army installations must comply. The CAAA-90 are implemented by detailed federal, state, and local regulations.

Areas of the country where air pollution levels persistently exceed the national ambient air quality standards may be designated “nonattainment.” The areas that include “Representative Installations” are shown in Table 3-12.

AR 200-1. The Air Pollution Abatement Program in AR 200-1 includes activities to control emissions and cooperation with appropriate regulatory agencies. The objectives to:

- identify and monitor air pollution sources, determine types and amounts of pollutant emissions, control pollutant levels to those specified in applicable regulations or to protect health;

- procure commercial equipment and vehicles with engines that meet applicable standards and regulations and that do not present a health hazard (exceptions are those vehicles or engines specifically excluded or exempted by EPA regulations or agreements);

- ensure that each piece of military equipment is designed, operated, and maintained so that it meets applicable regulations;

- monitor ambient air quality in the vicinity of Army activities per applicable regulations;

- cooperate with EPA and state authorities to achieve the requirements of the CAA 1977 and applicable regulations issued according to this act, applicable state and local air pollution regulations, air pollution control provisions in other federal and state environmental laws and regulations, including RCRA of 1976, as amended, the Toxic Substances Control Act (TSCA) of 1976, CERCLA of 1980, Superfund Amendments and Reauthorization Act of 1986 (SARA of 1986), and applicable State and local environmental regulations; and

- comply with all federal, state, and local regulations concerning air quality.

Table 3-12
Currently Designated Nonattainment Areas for All Criteria Pollutants
(Listed by State, County then Pollutant as of January 29, 2001)

Installation	State	County/Counties	Nonattainment Area
Fort Benning	GA	Muscogee and Chatahoochee in GA; Russell in AL	Attainment
Camp Blanding	FL	Clay	Attainment
Fort Bliss	TX	El Paso and Hudspeth in TX; Otero and Dina Ana in NM	El Paso Co. – carbon monoxide, ozone, PM-10; Dona Ana Co. – ozone, PM-10
Fort Bragg	NC	Cumberland	Attainment
Fort Campbell	KY	Christian and Trigg in KY; Montgomery and Stewart in TN	Attainment
Fort Carson/Pinon Canyon Maneuver Site (PCMS)	CO	El Paso, Pueblo, Fremont/Las Animas	Attainment
Fort Drum	NY	Jefferson	ozone
Fort Hood	TX	Coryell, Bell	Attainment
Fort Irwin	CA	San Bernardino	carbon monoxide, ozone, PM-10
Fort Knox	KY	Meade, Bullitt, Hardin	Bullitt Co. – ozone
Fort Lewis/Yakima	WA	Pierce, Thurston	Pierce Co. – PM-10
Orchard Training Area	ID	Elmore, Ada	Ada Co. – carbon monoxide
Fort Polk	LA	Vernon, Rapides, and Beauregard Parishes	Attainment
Fort Riley	KS	Riley, Geary, Clay	Attainment
Camp Shelby	MS	Forrest	Attainment
Fort Sill	OK	Comanche	Attainment
Fort Stewart	GA	Liberty	Attainment
Schofield Barracks/ Puhakuloa	HI	Honolulu	Attainment
Fort Wainwright/ Richardson	AK	North Star Borough (Fairbanks)	Fairbanks – carbon monoxide
FIG/Dix	NJ	Burlington	ozone
Fort McClellan	AL	Calhoun	Attainment
Fort Pickett	VA	Nottoway	Attainment
Fort Chaffee	AR	Sebastian, Logan, Franklin, Crawford	Attainment
Fort A.P. Hill	VA	Caroline	Attainment

Sources:
PEA – Army Force Structure Realignment. March 1995
http://www.epa.gov/oar/oaqps/greenbk/ancl.html
http://www.military.com/InstallationGuides/ChooseInstallation/1,11400,,00.html
http://www.army.mil/public/installations.htm

3.7 NOISE

3.7.1 Definition and Description

Noise is generally defined as unwanted sound. It can be any sound that is undesirable because it interferes with communications or other human activities, is intense enough to damage hearing, or is otherwise annoying. Human response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day.

In general, the military noise environment consists of three types of noise: transportation noise from aircraft and vehicle activities, high-amplitude noise from armor and artillery firing and demolition operations, and noise from firing at small arms ranges.

The most widely used metric for noise is the day-night average sound level (DNL or L_{dn}). The L_{dn} represents energy-averaged sound levels measured by summation and averaging of sound exposure level (SEL) values during a 24-hour period. A penalty of 10 decibels (dB) is assigned to noise events (including aircraft operations) occurring between 10:00 p.m. and 7:00 a.m. The 10-dB penalty compensates for generally lower background noise levels and increased annoyance associated with events occurring at night. L_{dn} is a useful descriptor for noise in two respects. First, it is an average; it fits intuitive concepts when dealing with continuous noise, such as that from a busy highway. Second, because it is a summation of sound energy over a 24-hour period, it is a cumulative metric. For intermittent sound, it represents the total sound being received rather than the sound level at any given time. In this respect, it effectively identifies a “noise dose” for a day.

Noise from transportation sources, such as vehicles and aircraft, and from continuous sources, such as generators, is assessed using the A-weighted DNL (ADNL). The ADNL significantly reduces the measured pressure level for low-frequency sounds while slightly increasing the measured pressure level for some high-frequency sounds. Noise from small arms ranges is assessed using the ADNL. Impulse noise resulting from armor, artillery, and demolition activities is assessed in terms of the C-weighted DNL (CDNL). The CDNL is often used to characterize high-energy blast noise and other low frequency sounds capable of inducing vibrations in buildings or other structures. The C-weighted scale does not significantly reduce the measured pressure level for low frequency components of a sound.

3.7.2 Army Noise Management

The Army’s Environmental Noise Management Program (ENMP) is described in Chapter 7 of AR 200-1. The Army’s ENMP implements federal law concerning environmental noise generated by Army activities, including aircraft operations, range firing, and weapons testing. The goals of the ENMP are to protect the health and welfare of people on and off installations affected by Army-produced noise and to reduce community annoyance from environmental noise. The program seeks to

achieve compliance with applicable noise regulations in a manner consistent with an installation's mission.

The ENMP requires installations to implement environmental noise policies to identify and control noise effects. Among these policies is the requirement to make noise predictions for long-range planning purposes. As a part of the ENMP, noise contour maps are prepared. The maps delineate up to three different noise zones, which are based on the expected percentage of the population that would be highly annoyed by environmental noise. These noise zones are determined through mathematical modeling and computer simulations. The associated noise levels for each zone are shown in Table 3-13.

3.8 WATER RESOURCES

3.8.1 Definition and Description

Water resources include surface water, groundwater, wetlands, and floodplains. Surface water resources consist of lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale. Storm water flows, which may be exacerbated by high proportions of impervious surfaces (e.g., buildings, roads, and parking lots), are important to the management of surface water. Storm water is also important to surface water quality because of its potential to introduce sediments and other contaminants into lakes, rivers, and streams. Groundwater consists of the subsurface hydrologic resources. It is an essential resource often used for potable water consumption,

Table 3-13
Noise Levels

Noise Zone	Population Highly Annoyed	Transportation Noise (ADNL)	Small Arms Noise (ADNL)	Impulsive Noise (CDNL)
Zone I	<15%	<65dBA	<65dBA	<62dBA
Zone II	15% – 39%	65 – 75dBA	65 – 75dBA	62 – 70dBA
Zone III	>39%	>75dBA	>75dBA	>70dBA

agricultural irrigation, and industrial applications. Groundwater typically may be described in terms of its depth from the surface, aquifer or well capacity, water quality, surrounding geologic composition, and recharge rate. Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support (and that under normal conditions do support) a prevalence of vegetation typically adapted for life in saturated soil conditions. Floodplains are areas of low-level ground present along a river or stream channel. Such lands may be subject to periodic or infrequent inundation due to rain or melting snow. Risk of flooding depends on topography, the frequency of precipitation events, and the size (areal extent) of the watershed above the floodplain. Federal, state, and local regulations generally limit

development in floodplains to passive uses, such as recreational and preservation activities, in order to reduce the risks to human health and safety.

3.8.1.1 Wastewater

Army activities subject to Clean Water Act (CWA) regulation include activities involving the collection and discharge of effluents (e.g., discharging pollutants from a point source into waters of the United States) or construction activities near waterways or wetlands. Principal sections of the CWA that are of particular relevance to Army activities include the following:

- *CWA § 303 (Water Quality Standards and Implementation Plans).* Section 303(d) requires states to identify waters that do not meet or are not expected to meet water quality standards even after technology-based or other required controls are in place. States establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters.

- *CWA § 307 (National and Local Pretreatment Standards).* Facilities that discharge to POTWs are excluded from NPDES permitting requirements but are subject to national general pretreatment standards (at 40 CFR Part 403), applicable categorical pretreatment standards (specified in 40 CFR Parts 405-471), and any state or local pretreatment standards. Facilities must sample the effluent and submit reports on the results of such sampling at a frequency specified in their permit. Monitoring reports must be submitted to te EPA, states, or POTWs with approved pretreatment programs. The 1992 Federal Facility Compliance Act added provisions for federally owned treatment works. These facilities have an NPDES permit and treat influent that is composed of mostly domestic sewage. The 1992 act extends to federally owned treatment works the so-called Domestic Sewage Exclusion from the definition of “solid waste,” provided the facility meets all specified conditions.

- *CWA § 308 (Inspections, Monitoring, and Entry).* The EPA, state agencies, or their authorized representatives (e.g., contractors) have broad authority to conduct compliance inspections at any premises on which an effluent source is located or in which any records required to be maintained under the CWA are located. Inspectors may have access to any records, inspect any monitoring equipment, and sample any effluent to check compliance with NPDES permit requirements, water quality standards, pretreatment standards, effluent limitations, or toxic standards.

- *CWA § 313 (Federal Facilities Pollution Control).* Each federal agency that has jurisdiction over any facility or is engaged in activity resulting in the discharge or runoff of pollutants is subject to and must comply with all federal, state, interstate, and local requirements and administrative authorities for the control and abatement of water pollution. These requirements include adhering to any reporting,

recordkeeping, or permitting requirements. If the President determines it to be in the paramount interest of the United States, he may exempt any effluent source of any department, agency, or instrumentality in the Executive Branch from compliance with any requirements of the CWA for a 1-year period, except for requirements under the National Standards of Performance (CWA § 306) and the Toxic and Pretreatment Effluent Standards (CWA § 307). Exemptions are renewable annually. Further, CWA § 313 waives the traditional immunity of the federal government and requires federal facilities to comply with federal, state, interstate, and local water pollution controls. Requirements include compliance with EPA or state inspections and all applicable federal, state, interstate, and local substantive and procedural requirements (including recordkeeping, reporting, payment of reasonable service charges, and permits). CWA § 313 exempts federal employees from civil penalties.

- *CWA § 402 (National Pollutant Discharge Elimination System).* Point source discharges of wastewater must comply with requirements established by an NPDES permit issued by the EPA or a state agency that has an approved NPDES program. NPDES permits contain water quality-based and/or technology-based standards for effluent discharges (specified in 40 CFR Parts 405-471 or by the best professional judgment of the permit writer), monitoring requirements, analytical testing methods, and reporting requirements. Dischargers must submit Discharge Monitoring Reports that record flow measurement, sample collection data, and laboratory test results on a quarterly or monthly basis. Noncompliance reports must be submitted quarterly or monthly stating the cause of the noncompliance, period of noncompliance, and plans to eliminate recurrence of the incident. Point source storm water discharges that are associated with certain industrial activities or are designated by the EPA for contributing to a violation of water quality standards also require a permit.

- *CWA § 404 (Permits for Dredged or Fill Material).* Facilities that discharge dredged or fill materials into navigable waters must apply for a permit issued by the Army Corps of Engineers. The EPA may restrict or deny the dredging or filling of any site where the activity could have an adverse effect on the environment. States may apply for the authority to implement the CWA § 404 program. However, the Army Corps of Engineers retains authority over navigable waters within the state. Under limited circumstances, the discharge of dredged or fill materials, as part of a federal project specifically authorized by Congress, is not prohibited by or subject to regulation under CWA § 404.

- *CWA § 405 (Permits of Sludge Management).* All works that treat domestic sewage are required to meet federal requirements for the use and disposal of sewage sludge through land application, surface disposal, or incineration. These requirements are incorporated into permits issued under CWA § 402, under the appropriate provisions of other legislation (e.g., Solid Waste Disposal Act; Safe Drinking Water Act; Marine Protection, Research, and Sanctuaries Act; Clean Air Act), under EPA-approved state sludge management programs, or, in the case of a

treatment works that is not subject to the above requirements, in a sludge-only permit.

The EPA's Oil Pollution Prevention regulation establishes requirements for facilities to prevent oil spills from reaching navigable waters of the United States or adjoining shorelines. The rule applies to owners or operators of certain facilities that drill, produce, gather, store, process, refine, transfer, distribute, or consume oil. The regulation requires that all regulated facilities (including federal facilities as specified in 40 CFR 112.1(c)) have a fully prepared and implemented Spill Prevention, Control, and Countermeasures (SPCC) Plan. An SPCC Plan is a detailed, facility-specific, written description of how a facility's operations comply with the prevention guidelines in the Oil Pollution Prevention regulation. The guidelines include measures such as secondary containment, facility drainage, dikes or barriers, sump and collection systems, retention ponds, curbing, tank corrosion protection systems, and liquid devices. A registered professional engineer must certify each SPCC Plan. Unlike oil spill contingency plans that typically address spill cleanup measures after a spill has occurred, SPCC Plans ensure that facilities put in place containment and other countermeasures that would prevent oil spills that could reach navigable waters. Under the regulation, facilities must detail and implement spill prevention and control measures in their SPCC Plans. A spill contingency plan is required as part of the SPCC Plan if a facility is unable to provide secondary containment.

Several compliance responsibilities under the CWA result from the types of facilities used by and the range of activities at Army installations. These are summarized in Table 3-14.

3.8.1.2 Drinking Water

The Safe Drinking Water Act (SDWA) mandates that the EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes the EPA to develop national drinking water standards and to undertake joint efforts with federal, state, and tribal authorities to ensure compliance with the standards. The SDWA also directs the EPA to protect underground sources of drinking water through the control of underground injection of liquid wastes.

To meet these objectives, the EPA has developed primary and secondary drinking water standards under its SDWA authority. The EPA and authorized states and tribes exercising delegated authorities enforce the primary drinking water standards. The standards identify contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant-level goals (MCLGs), which are nonenforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits. MCLs are set as close to MCLGs as possible, considering cost and feasibility of attainment.

Table 3-14
Principal Army Responsibilities Under the Clean Water Act

Obtaining a National Pollutant Discharge Elimination System permit and managing direct discharges in compliance with permit conditions
Managing discharges to a publicly owned treatment works in accordance with established federal, state, and local pretreatment standards
Managing domestic treatment works in accordance with sludge requirements
Applying for CWA § 404 dredge and fill permits for construction and development projects
Monitoring, recording, and reporting pollutant effluent concentrations
Developing, implementing, and maintaining storm water pollution prevention plans and obtaining necessary permits
Developing Spill Prevention, Control, and Countermeasure Plans

Two programs authorized by the SDWA are the Sole Source Aquifer Program and the Wellhead Protection Program. The federally implemented Sole Source Aquifer Program prohibits federal expenditures on projects that might contaminate the sole or principal source of drinking water for a given area. The Wellhead Protection Program protects the surface and subsurface area surrounding a water well or well field that supplies a public water system and through which contaminants are reasonably likely to move toward and reach the water well or well field.

Amendments to the SDWA in 1996 established new state groundwater protection programs. Under these programs, the EPA may make grants to states to develop programs to ensure coordinated and comprehensive protection of groundwater resources within a state. The *Clean Water Action Plan*, introduced in February 1998, is designed to accelerate the progress made in improving the quality of waters since the passage of the Federal Water Pollution Control Act of 1972. In the interest of protecting water quality, the *Clean Water Action Plan* announced the intention of federal agencies to adopt policies that will reduce water pollution from federal activities and that foster a unified watershed-based approach to land and resource management. Objectives of the plan include developing a common science-based approach to watershed assessment for federal lands, using a watershed management approach when protecting and restoring watersheds, improving compliance with water quality requirements under the CWA, and enhancing collaboration and cooperation among federal agencies.

3.8.1.3 Water Rights

A water right is the right to divert water from a state-owned source and put it to beneficial use. Typical beneficial uses include crop irrigation, livestock production, domestic use, mining, and wildlife habitat. Water right laws vary from state to state. Some states regulate groundwater withdrawals differently than surface water withdrawals, whereas others govern the two similarly. Many western states recognize right of prior appropriation and follow the doctrine of “first in time, first in right,” in which

water is appropriated among users according to the date the water right was first established. Under this doctrine, the last user to be assigned water rights from a particular source will be the first to have to halt water use during times of water shortage so that there will be sufficient water for the other users. Water rights may also be lost if they are not used by the holder. Some states recognize a riparian right to use water. Riparian rights allow for unlimited use of water that flows on the border of or through a landowner's property. Riparian rights generally cannot be lost if not used.

Western states that receive little rainfall often have complicated and highly prescribed means of appropriating water among users. In the eastern United States, where rainfall is more abundant and more evenly distributed throughout the year, water rights rules for small agricultural and domestic users are more relaxed. However, throughout the United States, state permits are required for large withdrawals, such as municipal water supply. Some rapidly growing metropolitan areas in the eastern United States are now facing water rights disputes not unlike those in the West as demand for water increases in these densely populated areas.

3.8.1.4 Watersheds

Tables 3-15, 3-16, 3-17, and 3-18 present general information about watersheds, underground aquifers, miles of streams, and acres of lakes that occur on various representative installations. Each installation would consider the specific aquifers and bodies of water that occur on that installation, particularly any sensitive aquatic habitats, for possible adverse effects due to Army transformation.

3.8.2 Army Management of Water Resources

Historically, the Nation's clean water programs have been based primarily on technology-based controls. More recently, regulators have shown a trend toward water quality-based controls implemented on a watershed basis. This shift from technology-based controls will mean that nontraditional sources of water quality impairment such as nonpoint source pollution (polluted runoff, which is acknowledged as a major source of contaminants in water) will be targeted. The Army has embraced this concept and is managing its lands on an ecosystem basis.

Table 3-15
Watershed Information

Installation	Watershed Name	USGS Cataloging Unit (8-digit)
Fort Lewis/Yakima	Deschutes	17110016
	Lower Yakima	17030003
	Nisqually	17110015
	Puget Sound	17110019
	Upper Columbia-Entiat	17120010
	Upper Columbia-Priest Rapids	17020016
	Upper Yakima	17030001
Fort Hood	Cowhouse	12070202
	Lampasas	12070203
	Leon	12070201
Fort Carson/PCMS	Fountain	11020003
	Purgatorie	11020010
	Upper Arkansas	11020002
	Upper Arkansas-Lake Meredith	11020005
Fort Riley	Lower Republican	10250017
	Upper Kansas	10270101
Fort Drum	Black	04150101
	Indian	04150303
	Oswegatchie	04150302
Fort Stewart	Altamha	03070106
	Canoochee	03060203
	Lower Ogechee	03060202
	Ogechee Coastal	03060204
Fort Benning	Kinchafoonee-Muckalee	03130007
	Middle Chattahoochee-Walter F. George Reservoir	03130003
Fort Bragg	Upper Cape Fear	03030004
Fort Campbell	Lower Cumberland	05130205
	Red	05130206
Fort Polk	Lower Red-Lake Latt	11140207
	Lower Sabine	12010005
	Upper Calcasieu	08080203
	Whiskey Chitto	08080204
Fort Irwin	Coyote-Cuddeback Lakes	18090207
	Death Valley-Lower Amargosa	18090203
	Mojave	18090208
	Panamint Valley	18090204
Fort Wainwright	Chena River	19040506
	Salcha River	19040505

Table 3-15
Watershed Information

Installation	Watershed Name	USGS Cataloging Unit (8-digit)
	Tanana River	19040507
Schofield Barracks	Hawaii	20010000
	Oahu	20060000
Fort Bliss	El Paso-Las Cruces	13030102
	Rio Grande-Fort Quitman	13040100
	Salt Basin	13050004
	Tularosa Valley	13050003
Fort Knox	Blue-Sinking	05140104
	Rolling Fork	05140103
	Salt	05140102
Fort Sill	Cache	11130202
	Northern Beaver	11130208
	West Cache	11130203
Camp Blanding	Lower St. Johns	03080103
	Santa Fe	03110206
Orchard Training Area	C.J. Strike Reservoir	17050101
	Lower Boise	17050114
	Middle Snake-Succor	17050103
Camp Shelby	Black	03170007
	Lower Leaf	03170005
	Pascagoula	03170006
Fort Dix	Crosswicks-Neshaminy	02040201
	Lower Delaware	02040202
	Mullica-Toms	02040301
Fort McClellan	Middle Coosa	03150106
Fort Pickett	Nottoway	03010201
Fort Chaffee	Dardanelle Reservoir	11110202
	Frog-Mulberry	11110201
	Petit Jean	11110204
	Robert S. Kerr Reservoir	11110104
Fort AP Hill	Lower Rappahannock	02080104
	Mattaponi	02080105

Source: USGS, 2001.

Table 3-16
Representative Installations in Category 1 Watersheds

Installation	State	Water Body Name and HUC number	Cause of Impairment
Fort Benning	GA	none	none
Camp Blanding	FL	none	none
Fort Bliss	TX	none	none
Fort Bragg	NC	none	none
Fort Campbell (KY Watershed)	KY	Dunbar Cave Lake 5130206	Nutrients,Siltation
Fort Campbell (TN Watershed)	TN	Big Mcadoo Creek, Including Unnamed Tributary 5130205	Nutrients, Siltation
Fort Carson	CO	Arequa Gulch, source to Cripple Creek 11020002	Aluminum, Zinc, Toxic Inorganics
Fort Carson/ Pinon Canyon	CO	none	none
Fort Drum	NY	none	none
Fort Hood	TX	none	none
Fort Irwin	CA	none	none
Fort Knox	KY	Taylorsville Lake 5140102	Nutrients
Fort Lewis	WA	none	none
Fort Lewis/Yakima	WA	None	none
Orchard Training Area	ID	none	none
Fort Polk	LA	none	none
Fort Riley	KS	Little Kitten Creek 10270101	Fecal Coliform Bacteria, Low Dissolved Oxygen, Pathogens
Camp Shelby	MS	none	none
Fort Sill	OK	none	none
Fort Stewart	GA	Taylors Creek 3060203	Dissolved Oxygen
Schofield Barracks	HI	none	none
Schofield Barracks/ Pohakuloa	HI	none	none
Fort Wainwright	AK	none	none
Fort Richardson	AK	None	none

Source: Martin, Paul A., USAEC. 2001. Personal Communication.

Table 3-17
Major Aquifers for Representative Installations

Installation	Aquifer Name	Rock Type
Fort Lewis/Yakima	Columbia Plateau aquifer system Pacific Northwest basin-fill aquifers Puget-Willamette Lowland aquifer system	Basalt and other volcanic rock Unconsolidated sand and gravel Unconsolidated sand and gravel
Fort Hood	Edwards-Trinity aquifer system	Sandstone and carbonate rock
Fort Carson/PCMS	None	
Fort Riley	None	
Fort Drum	New York and New England carbonate-rock aquifers New York Sandstone aquifers	Carbonate rock Sandstone
Fort Stewart	Surficial aquifer system	Unconsolidated sand and gravel
Fort Benning	Southeastern Coastal Plain aquifer system	Semiconsolidated sand
Fort Bragg	Northern Atlantic Coastal Plain aquifer system	Semiconsolidated sand
Fort Campbell	Mississippian aquifers	Sandstone and carbonate rock
Fort Polk	Coastal lowlands aquifer system	Semiconsolidated sand
Fort Irwin	Basin and Range aquifers	Unconsolidated sand and gravel
Fort Wainwright	Data N/A	
Schofield Barracks	Data N/A	
Fort Bliss	Rio Grande aquifer system	Unconsolidated sand and gravel
Fort Knox	Mississippian aquifers	Sandstone and carbonate rock
Fort Sill	None	
Camp Blanding	Surficial aquifer system	Unconsolidated sand and gravel
Orchard Training Area	Pacific Northwest basin-fill aquifers Pliocene and younger basaltic-rock aquifers Snake River Plain aquifer system	Unconsolidated sand and gravel Basalt and other volcanic rock Basalt and other volcanic rock
Camp Shelby	Coastal lowlands aquifer system	Semiconsolidated sand
Fort Dix	Northern Atlantic Coastal Plain aquifer	Semiconsolidated sand

Table 3-17
Major Aquifers for Representative Installations

Installation	Aquifer Name	Rock Type
	system	
Fort McClellan	Valley and Ridge aquifers	Sandstone and carbonate rock
Fort Pickett	None	
Fort Chaffee	None	
Fort AP Hill	Northern Atlantic Coastal Plain aquifer system	Semiconsolidated sand

Source: USGS, 2001.

Table 3-18
Stream Miles and Lake Acreage for Representative Installations

Installation	Miles of Streams	Acres of Lakes
Fort Lewis/Yakima	528.95	-
Fort Hood	214.78	450.4
Fort Carson/PCMS	570.40	144.4
Fort Riley	303.50	20.2
Fort Drum	222.32	1,375.2
Fort Stewart	482.61	276.2
Fort Benning	506.66	423.9
Fort Bragg	275.80	572.7
Fort Campbell	205.48	129.8
Fort Polk	302.77	152.2
Fort Irwin	835.67	-
Fort Wainwright	364.16[1]	-
Schofield Barracks	223.68	1.5
Fort Bliss	1,160.41	167.3
Fort Knox	199.76	276.2
Fort Sill	182.60	393.9
Camp Blanding	65.04	2763.3
Orchard Training Area	312.67	-
Camp Shelby	397.93	78.9
Fort Dix	52.27	181.9
Fort McClellan	49.07	24.1
Fort Pickett	91.33	202.4
Fort Chaffee	209.13	352.2
Fort AP Hill	156.31	370.9

[1]Number generated from ESRI GIS data; all others generated from USGS data.
Source: ESRI, 1998, USGS, 2001.

To address increasing concerns over the availability and reliability of water supplies, a number of planning and management initiatives have emerged in recent years, many of which are being implemented on Army installations. Water efficiency measures seek the efficient use of water through behavioral, operational, or equipment changes. Water recycling, reclamation, or reuse measures include use of treated wastewater for beneficial purposes, such as landscape irrigation, industrial processes, toilet flushing, and replenishing a groundwater basin (referred to as groundwater recharge). Water is sometimes recycled and reused on-site; for example, when a facility recycles water used for cooling processes. A common type of recycled water used for nonconsumptive purposes is water that has been reclaimed from municipal wastewater, or sewage. Drought planning and management involves major water users' developing drought contingency plans that emphasize preparedness, coordination, risk management, and mitigation measures.

Executive Order 12902, *Energy Efficiency and Water Conservation at Federal Facilities*, calls for the implementation of water conservation measures by federal agencies. Examples of measures that are increasingly being adopted by the Army pertain to universal metering, water accounting and loss control, costing and pricing, information and education programs, water-use audits, retrofits, water pressure management, landscape efficiency, reuse and recycling, water-use regulation, and integrated resource management. The Army adheres to this Executive Order and incorporates its principles into various installation plans and regulations.

Executive Order 11990, *Protection of Wetlands*, orders federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. Executive Order 11988, *Floodplain Management*, requires that federal agencies take action to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values of floodplains. The Army adheres to these Executive Orders with its construction projects and as circumstances arise. In addition, wetlands and floodplain management are integral components of Integrated Natural Resource Management Plans and the Integrated Training Area Management (ITAM) program.

The Army's natural resources management programs ensure that wetlands, floodplains, and their associated riparian areas are protected and enhanced. Integrated Natural Resources Management Plans provide range operators and natural resource managers with strategies and practices to improve land use on Army installations and to ensure the proper protection, enhancement, and management of surface water and groundwater resources. Two conservation initiatives—the ITAM program and the Strategic Environmental Research and Development Program (SERDP) Ecosystem Management Project (SEMP)—also contribute to continuous improvements in the management of wetlands and floodplains on Army installations. Two ITAM programs support essential environmental management of installation aquatic resources—Land Condition Trend Analysis (LCTA) and Land Rehabilitation and Maintenance (LRAM). Through constant monitoring and evaluation of the LCTA program, installation

managers and trainers are able to assess the quality of wetlands and bodies of water and make decisions regarding training intensity and location. LRAM implements state-of-the-art best management practices to solve specific environmental management problems such as loss of vegetation, soil erosion, and streambank destabilization and to protect installation water resources. The ITAM program seeks optimum sustainable use of training lands by inventorying and monitoring land conditions, integrating training requirements with carrying capacity, educating land users so that they can minimize their adverse impacts, and providing for land rehabilitation and maintenance. The SEMP is an ecosystem research project initiative that focuses on ecosystem science relevant to DoD ecosystem management programs.

The Army's commitment to sound environmental management through AR 200-1 further protects bodies of water and conserves water resources. According to AR 200-1, the Army conserves water resources, including wetlands, estuaries, watersheds, and groundwater. It also states that the Army controls or eliminates sources of pollutants and contaminants to protect water resources. In addition, it states that the Army identifies and implements water pollution prevention initiatives. Finally, AR 200-1 states that the Army incorporates nonpoint source abatement measures into construction, facility operations, and land management activities. These components of AR 200-1 ensure that water resources are protected and enhanced.

The Army-wide program of completing planning level surveys (PLSs) for flora, fauna, vegetative communities, and threatened and endangered species at each installation is another means of ensuring sound management of water-dependent natural resources. Identification and location of unique aquatic species, aquatic habitats, wetland areas, and wetland species allows environmental managers to make decisions on training intensity and location. Knowledge of the species and aquatic habitats ensures the protection and enhancement of these resources.

The Army implements watershed-based management of its land resources that protects the waterbodies within each installation watershed. Watershed management incorporates analysis of land uses occurring in the watershed and evaluation of the current condition of natural resources to ensure that ongoing and planned activities are compatible with the natural environment. Watershed-based analysis identifies situations that are not sustainable for the local area and its natural resources. The integrated natural resource management program is one means of documenting these analyses and incorporating the results into management prescriptions for the installation.

3.9 GEOLOGY AND SOILS

3.9.1 Definition and Description

Geological resources consist of the earth's surface and subsurface materials. Within a given physiographic province, these resources typically are described in terms of topography; soils; geology; minerals; and, where applicable, paleontology.

- *Topography*. Topography pertains to the general shape and arrangement of a land surface, including its height and the position of its natural and artificial features.

- *Soils*. Soils are the unconsolidated materials overlying bedrock or other parent material. Soils typically are described in terms of their complex type, slope, and physical characteristics. Differences among soil types in terms of their structure, elasticity, strength, shrink-swell potential, and erosion potential affect their abilities to support certain applications or uses. In appropriate cases, soil properties must be examined for their compatibility with particular construction activities or types of land use.

- *Geology*. Geology, which concerns itself with the study of the earth's composition, provides information on the structure and configuration of surface and subsurface features. Such information derives from field analysis based on observations of the surface and borings to identify subsurface composition. Hydrogeology extends the study of the subsurface to water-bearing structures. Hydrogeological information helps in the assessment of groundwater quality and quantity and its movement.

- *Minerals*. In a limited number of cases, the presence, distribution, quantity, and quality of mineral resources might affect or be affected by a proposed action. Understanding of the proposed action and minerals is useful in keeping decision makers fully informed of potential socioeconomic and natural resources consequences.

- *Paleontology*. The presence of fossils and human artifacts presents an opportunity for scientists to gain a better understanding of history. In a very limited number of cases, a proposed action might have the potential to damage or destroy paleontological resources. Such resources must be located, quantified, and assessed for their value (including their possible value as cultural resources) before implementation of the proposed action.

3.9.2 Army Management of Geology and Soils

Described below are general geologic settings, landforms, topography, and soils that occur in various ecoregions of the United States (see Table 3-19 for designation of ecoregion for representative installations). Individual installations would consider surficial resource needs and effects while considering sensitive or limiting geologic features that occur in specific regions (karst regions, susceptibility to earthquakes, or soil erosion).

Table 3-19
Representative Installation and Corresponding Ecoregion Province

Installation	State	Ecoregion Province
Fort A.P. Hill	VA	Outer Coastal Plain Mixed Forest
Fort Benning	GA	Southeastern Mixed Forest
Camp Blanding	FL	Outer Coastal Plain Mixed Forest
Fort Bliss	TX	Chihuahuan Desert Province
Fort Bragg	NC	Outer Coastal Plain Mixed Forest
Fort Campbell	KY	Eastern Broadleaf Forest (Continental)
Fort Carson	CO	Great Plains-Palouse Dry Steppe
Fort Carson/Pinon Canyon	CO	Great Plains-Palouse Dry Steppe
Fort Chaffee	AR	Eastern Broadleaf Forest (Continental)
FIG/Dix	NJ	Eastern Broadleaf Forest (Continental)
Fort Drum	NY	Eastern Broadleaf Forest (Continental)
Fort Hood	TX	Southwest Plateau and Plains Dry Steppe and Shrub
Fort Irwin	CA	American Semi-Desert and Desert
Fort Knox	KY	Eastern Broadleaf Forest (Continental)
Fort Lewis	WA	Pacific Lowland Mixed Forest
Fort Lewis/Yakima	WA	Intermountain Semi-Desert
Fort McClellan	AL	Southeastern Mixed Forest
Orchard Training Area	ID	Intermountain Semi-Desert
Fort Pickett	VA	Southeastern Mixed Forest
Fort Polk	LA	Outer Coastal Plain Mixed Forest
Fort Riley	KS	Prairie Parkland (Temperate)/Great Plains Steppe
Camp Shelby	MS	Outer Coastal Plain Mixed Forest
Fort Sill	OK	Great Plains Steppe and Shrub
Fort Stewart	GA	Outer Coastal Plain Mixed Forest
Schofield Barracks	HI	Hawaiian Islands
Scholfield Barracks/Pohakuloa	HI	Hawaiian Islands
Fort Wainwright	AK	Yukon Intermontane Plateaus Tayga
Fort Wainwright/Fort Richardson	AK	Coastal Trough Humid Tayga

American Semidesert and Desert (Fort Irwin)
The topography of this region is characterized by extensive gently undulating plains with low mountains and buttes rising abruptly. The elevations of the valleys range from 280 ft (85 m) below sea level to 4,000 ft (1,200 m) above sea level, where the mountains may reach as high as 11,000 ft (3,400 m). Rocky mountains rise abruptly from outwash aprons and alluvial faces.

Gravel or bare rock covers the ground near the bases of some mountains. Because of heavy, violent desert rainstorms, very little soil is allowed to accumulate on the steep mountain slopes, and bare rock is often exposed at the surface. Soil types found on the older alluvial fans, terraces, and better drained basins are entisols[1] ; throughout the rest of the region aridisols[2] predominate. Both of these soils are subject to erodibility by water and wind and are best maintained with natural vegetaion.

Chihuahuan Desert Province (Fort Bliss)
Several topographic zones are identified in this region, each with characteristic relief and soil assemblages. A broad relatively flat desert basin lies between the Organ and Franklin Mountains. The surface of this intermontane basin is characterized by 1- to 12-foot high semistabilized coppice sand dunes moderately covered with mesquite. There are several mountainous regions, including the Organ Mountains, Hueco Mountains, and Sacramento Mountains. These mountains consist of relatively low subrounded hills that blend gently into the Otera mesa.

Mostly desert, this province has very few permanent streams or rivers. The Rio Grande and Pecos Rivers and a few of their larger tribuaries, originate in more humid provinces and are the only perennial streams. The area consists of undulating plains with elevations near 4,000 ft (1,200 m), with somewhat isolated mountains rising 2,000 to 5,000 ft (600 to 1,500 m). Washes which are dry most of the year fill with water after rain. Basins with no outlets drain into shallow playa lakes that dry up during rainless periods. Extensive dunes of silica sand are found in parts of this province, and dunes of gypsum are notably found in southern New Mexico. Isolated buttes and small beds of blackish lava are found.

There is considerable variability in soil parent material, development, texture, age, and suitability of the soils in this region, and soil types include Aridisols and Entisols. Soils resulting from weathering of limestone, sandstone, and igneous bedrock are found, as well as eolian materials from other areas. The soils are mostly calcareous and alkaline, have moderate permeability, and are moderately well drained, with the exception of soils having impervious caliche layers or bedrock near the surface. Certain soils have high potential for sheet and gully erosion.

Coastal Trough Humid Tayga (Fort Richardson)
Smooth and irregular plains surrounded by high mountains are found in this province. Cook Inlet is characterized by level to rolling topography, with areas of ground moraine and stagnant ice, drumlin fields, eskers, and outwash plains. The low-lying areas are typically less than 500 ft (150 m) above sea level, with a local relief of 50-250 ft (15-80 m). The Copper River Lowland is a broad basin of rolling and hilly moraines and nearly level alluvial plains on the site of a Pleistocene glacial lake. With an altitude of 1000-2000 ft (300-600 m), it is cut by the Copper River and its tributaries, which form steep-walled canyons 100-300 ft (30-150 m) deep.

Continental Eastern Broadleaf Forest (Forts Campbell, Drum, Knox, Dix, and Chaffee)
This area consists of mostly rolling hills with some flat areas and glaciated areas in the north. Low rolling hills, dissected plateaus, and basins are found throughout this region. Parts of Kentucky are characterized by karst topography with underground cave systems, sink holes, and truncated drainage basins. Sheet erosion and locally severe gully erosion has been reported in areas where soil is disturbed. Elevations range from 80 to 1,650 ft (24 to 500 m). Soils in the north tend to be alfisols[3]; toward the south, they grade into ultisols; toward the interior, calcification sets in and forest soils give way to the darker soils of the grasslands (mollisols[4]). All of these soil types are moderately susceptible to soil erosion, depending on the local topography and climate conditions.

Great Plains Steppe and Shrub (Fort Sill)
Typical of this region are irregular plains with a relief of less than 300 ft (90 m). Elevations increase gradually from the east to the west and range from 1,600 ft (490 m) to 3,000 ft (900 m). Slopes on these dissected plains range from nearly level to gently sloping, but slopes in the valleys are short and steep. The Wichita Mountains, located in southwestern Oklahoma, rise as much as 1,000 ft (300m) above the surrounding plains. The soils are mostly mollisols with some alfisols.

Great Plains-Palouse Dry Steppe (Fort Carson, Pinon Canyon)
Characterized by rolling plains and tablelands, this region shows moderate relief with a gradual slope eastward from an altitude of 5,500 ft (1,520 m) near the foot of the Rocky Mountains to 2,500 ft (760 m) in the more central states. The area is mostly flat, with occasional valleys, canyons, and buttes.

The distinctive landscape of the adjacent Pikes Peak Region is the result of the great mountain-building episode that occurred during the Laramide Period more than 60 million years ago. As a consequence, this region may be seismically active (Seismic Zone 2). Twenty million years later, during the Pleistocene Epoch, accelerated erosion of sediments effected by meltwater from alpine glaciers resulted in topographical variations along the Front Range.

The most commonly occurring soil types are aridisols and entisols. Soil erodability is moderate to severe for many of the soils in the region. Landslides caused by water transmission through shale bedrock are evident. The unstable clay formation movement generated by variations in moisture content and temperature requires special engineering design for road and building construction.

Hawaiian Islands (Schofield Barracks, Pohakuloa Training Area)
The Hawaiian Islands are volcanic islands in various stages of erosion. The Schofield Plateau is a saddle-shaped upland area with a basalt substrate. The topography ranges from nearly flat to hilly and mountainous with elevations ranging from sea level to more than 4000 ft (1200 m). Coastlines are mostly rocky and rough. The ground is highly porous, being composed of lava, so surface streams are not abundant.

Soils on the islands are a complex group of leached ultisols[5] and oxisols[6], inceptisols[7], and rocky highlands and coastlines with no soil. The oxisols are considered to be the most important agricultural soils of the state and generally consist of red well-compacted volcanic ash and dark red and brown silty clays. The soils are high in volcanic matter, magnesium, calcium, and iron. Permeability is moderate with slow surface water runoff. The soil erosion hazard is very slight in level areas.

Intermountain Semidesert (Orchard Training Area, Yakima Training Center)
This region covers the plains and tablelands of the Columbia-Snake River Plateaus and Wyoming Basin. The plateaus, at about 3,000 ft (900 m) elevation, are surrounded by lavas that have been folded or faulted into ridges. Toward the south, the plateaus grade into the basins and ranges of the Intermountain Desert Province. Sloping alluvial fans at the edges of the basins merge into flat plains in the center. Badlands can be found in the dissected areas along the outer edges of the region.

Extensive alluvial deposits are found in the floodplains or streams and in the fans at the foot of mountains. There are numerous dry lake beds and extensive eolian deposits, are found, including both dune sand and loess. Loess deposits in the Columbia River Basin are up to 150 ft (46 m) thick, and soils developed from them are complex. Aridisols dominate all basin and lowland areas, and mollisols are found at higher elevations.

Outer Coastal Plain Mixed Forest (Forts Bragg, Polk, Stewart, and A.P. Hill; Camps Blanding and Shelby)
This province is composed of flat and irregular Atlantic and Gulf Coastal Plains down to the sea. Most of the area is gently sloping, with some local relief of less than 300 ft (90 m). There are numerous streams and lakes, most of them including sluggish marshes and swamps.

Soil types in this province include ultisols, spodosols[8], and entisols. Most of the soils tend to be wet, acidic, and low in major plant nutrients. The soils are derived mainly from coastal plain sediments ranging from heavy clay to gravel, with sandy materials predominant. Silty soils are found on level expanses, and sands are prevalent in hilly areas. Many of the soils of this area are classified by the Natural Resources Conservation Service (NRCS) as highly erodible. Soils unprotected by vegetation are susceptible to water erosion from moderate and intense storms. Gullying is the most prevalent and prominent type of erosion, but sheet and rill erosion can be found in the early stages of an erosional event.

Pacific Lowland Mixed Forest (Fort Lewis)
This region lies in a north-south depression between the Coast Ranges and the Cascade Mountains. Elevations range from sea level to 1,500 ft (460 m). In the Willamette Valley, nearly level to gently sloping floodplains are bordered by dissected high terraces and hills. In the Puget Sound Valley, moderately dissected tableland is covered by glacial till, glacial outwash, and lacustrine deposits. Some isolated hills and low mountains are found. Most soils are strongly leached acid inceptisols and ultisols.

A common soil characteristic is somewhat excessively drained, gravelly sandy loam up to 2 feet thick. A less commonly found soil is composed of slowly decomposing vegetative matter, forming a heavy surface deposit, where calcium, sodium, and potassium are leached out by organic acids.

Prairie Parkland, Temperate (Fort Riley)
Both prairie and deciduous forest are found in this region. The topography of this region is mostly gently rolling plains, but steep bluffs border some valleys. Some areas are nearly flat; others have rounded hills. Elevations range from 300 to 2,000 ft (90 to 600 m). Bedrock in this region is primarily limestone and shale, and the region is located within Seismic Zone 2. Soils of the prairies are mollisols, which have black, friable, organic surface horizons 6-12 inches thick, overlying nearly impervious clays. Grass roots deeply penetrate these soils. These soils can be the most productive of the great soil groups.

Southeastern Mixed Forest (Forts Benning, McClellan, and Pickett)
This region includes the Piedmont and the Gulf Coastal Plains, with most of the area having gentle slopes. On the Gulf Coastal Plain, local relief of 100 to 600 ft (30 to 180 m) is seen; on the Piedmont, local relief varies from 300 to 1,000 ft (90 to 300 m). Numerous streams are found in the region, most of them sluggish. There are also numerous lakes, swamps, and marshes.

Soils in the region include strongly leached ultisols and vertisols[9]. The vertisols are clayey soils that form wide deep cracks when dry. Ultisols are rich in oxides of both iron and aluminum and poor in many of the nutrients essential for successful agricultural production. Inceptisols are found on floodplains of major streams and are good agricultural soils.

Southwest Plateau and Plains Dry Steppe and Shrub (Fort Hood)
Found in this region are flat to rolling plains and plateaus with steep bluffs along the creeks. The Stake Plains of Texas are found in this region. Elevations range from sea level to 3,600 ft (1,100 m) on the Edwards Plateau, to higher near the Rocky Mountain Piedmont. A mesa-and-butte landscape is characteristic of certain parts. Bedrock in this region includes interbedded limestone, sand, clay, and shale.

Soils in this region are varied and include entisols in the savanna area, mollisols in the buffalo-grass area, and some alfisols. Soil may be shallow to moderately deep clayey soil found in humid subtropical regions underlain by limestone bedrock. The soils are generally plastic and calcareous. The have a relatively low permeability and high shrink-swell potential and are corrosive to ferrous metals. The plateau areas have a greater soil thickness with a thinning at the ridge lines and steep slopes.

Yukon Intermontaine Plateaus Tayga (Fort Wainwright)
This area includes low mountains and hills interspersed with valleys. Elevations range from 980 to 1,970 ft (300 to 600 m) on ridges in the north to 4,920 ft (1,500 m) in the south. Glacial features are prevalent in much of the region. Deep narrow valleys are

common. The most commonly seen soils are wet inceptisols in flats and low areas. Lower parts of floodplains are poorly drained and covered with peat, while river terraces are better drained.

Background Information on Soils

[1] **Entisols** – Soils with little or no evidence of soil formation. Either young soils or their parent material has not yet reacted to soil forming factors. They may be formed on fresh lava flows or recent alluvium for which there has been too little time for soil formations to take place. They are found in extremely dry areas where too little water and vegetation prevents soil formation, or on steep slopes where the rates of erosion may be greater than the rate of soil formations, thereby preventing horizon development. Management needs vary depending on climate and topography, but in most cases they are subject to erodability and should be maintained with natural vegetation.

[2] **Aridisols** – Dry soils. Aridisols are characterized by a subsurface accumulation of salts, either calcium carbonate, gypsum, other soluble salts, or sodium. Overgrazed aridisols are often left bare and are subject to wind erosion. Found in the western United States.

[3] **Alfisols** – Developed under forests in cool to warm humid areas and are characterized by a subsurface horizon in which a silicate clay has accumulated. They are often found on sloping to steep land and are susceptible to soil erosion.

[4] **Mollisols** – Dark soils of grasslands. High organic matter. Productive agricultural soils. Management issues deal with use of fertilizers and maintaining a crop cover to prevent erosion.

[5] **Ultisols** – Developed primarily in forested, humid tropical, and subtropical areas, found in the southeastern United States. In some ultisols the topsoil has been eroded leaving the red-colored B horizon at the surface. Soil conservation practices are needed to prevent further soil deterioration. In areas with significant slope, the land must be revegetated.

[6] **Oxisols** – Highly weathered soils, found mostly in tropical areas. An easily recognized subsurface layer of iron and aluminum may be evident.

[7] **Inceptisols** – Early stages of soil profile development, after entisols. Management varies depending on climate and topography.

[8] **Spodosols** – Acid, sandy, forest soils. Characteristic of cold, moist to wet climates. Because they drain well, they are not as susceptible to erosion as more finely textured soils. The presence of a forest cover can help to moderate peak stream flows.

[9] **Vertisols** – High content of sticky or swelling and shrinking type clays to a depth of 1 meter or more. In dry seasons, these soils develop deep wide cracks that are

diagnostic for this soil order. Also typical is an uneven surface with microbasins and knolls. Found most frequently in subhumid to semiarid environments. High erodibility.

3.10 BIOLOGICAL RESOURCES

3.10.1 Definition and Description

Biological resources consist of naturally occurring and cultivated vegetative species and domestic and wild animal species and their habitats.

Sensitive biological resources include plant and animal species listed as threatened or endangered by the FWS under the Endangered Species Act or by a state agency pursuant to state law or regulation. An endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as any species likely to become an endangered species in the foreseeable future. Sensitive species also include those species identified by the FWS as candidates for possible listing as threatened or endangered pursuant to the Endangered Species Act. Candidate species are those for which the FWS has obtained substantial information on biological vulnerability preparatory to action to list the species as either threatened or endangered.

Biological resources also include wetlands. Wetlands are important because of the many functions they perform. Wetlands provide essential breeding, spawning, nesting, and wintering habitats for a major portion of the Nation's fish and wildlife species. Wetlands are also important for water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, provision of unique flora and fauna niches, storm water attenuation and storage, sediment detention, and erosion protection. Wetlands are protected as a subset of the "waters of the United States" identified in Section 404 of the CWA. The Army Corps of Engineers defines wetlands as those areas that are inundated or saturated with groundwater or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

3.10.2 Army Management of Biological Resources

3.10.2.1 Vegetation and Wildlife

Discussed below are general wildlife species and vegetation types that occur in the various ecoregions. Individual installations would consider the specific species that occur on their installation, particularly any threatened and endangered species, to identify possible adverse effects due to Army transformation.

American Semidesert and Desert (Fort Irwin). Vegetation is typically sparce, consisting of cacti and thorny shrubs. Thornless shrubs are also found; herbaceous plants may appear after infrequent rain. Creosote bush (*Larrea tridentata*), cholla

cactus (*Opuntia* spp.), and saltbush (Atriplex spp.) may be locally abundant. Ocotillo (*Fouquieria splendens*) and Joshua tree (*Yucca brevifolia*) inhabit higher-elevation sites. Desert mountain tops are virtually devoid of vegetation. Ephemeral shallow playa lakes are found in basins. These salty lakes support several different zones of vegetation that encircle the lake, arranged by degree of salt tolerance (Bailey, 1995).

Desert mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), and peccary (*Pecari angulatus*) survive in some desert habitats. Carnivores include the desert kit fox (*Vulpes macrotis*) and coyote (*Canis latrans*). Predators depend on populations of nocturnal burrowing animals such as kangaroo rats (*Dipodomys* spp.), pocket mice (*Perognathus* spp.), and antelope ground squirrel (*Ammospermophilus leucurus*). Some bird species thrive in desert conditions, for example, cactus wren (*Campylorhynchus brunneicapillus*), roadrunner (*Geococcyx californianus*), loggerhead shrike (*Lanius ludovicianus*), and Gambel's quail (*Callipepla gambelii*). Many different species of snakes and lizards make the desert their home. Some species of pupfish (*Cyprinodon* spp.) are adapted to the highly saline lakes in the region.

Chihuahuan Desert Province (Fort Bliss). Shrubs, cacti, and short grasses predominate in the region. Honey mesquite (*Prosopsis glandulosa*) and creosote bush may form extensive open stands. The prickly pear cactus (*Opuntia* spp.) occurs with several different species of yucca (*Yucca* spp). Grama grass (*Bouteloua* spp.) is the dominant grass species. Cottonwood trees (*Populus* sp.) are found along perennial streams. Junipers (*Juniperus* spp.) and oaks (*Quercus* spp.) create mixed stands at the highest elevations (Bailey, 1995).

Large herbivores, such as mule deer, pronghorn antelope, and peccary, are distributed throughout the region. Small mammals present include blacktail jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), kangaroo rats, and wood rats (*Neotoma* spp). Coyote and bobcat (*Lynx rufus*) are the two main mammalian predators. A diverse bird fauna inhabits the region. One of the most common species is the black-throated sparrow (*Amphispiza bilineata*). Roadrunner, quail (*Callipepla* spp.), hawks, owls, and golden eagle (*Aquila chrysaetos*) are also widespread. Reptiles are abundant in the Chihuahuan desert. Texas horned lizard (*Phrynosoma cornutum*), common chuckwalla (*Sauromalus ater*), and several species of rattlesnakes (*Crotalus* spp.) might be encountered.

Continental Eastern Broadleaf Forest (Forts Campbell, Drum, and Knox). This ecoregion is dominated by broadleaf deciduous forest. Northern reaches of this ecoregion feature forests with maple (*Acer* spp.), American beech (*Fagus grandifolia*), and basswood (*Tilia americana*) as dominant species. Tulip poplar (*Liriodendron tulipifera*), elm (*Elmus* spp.), and sweetgum (*Liquidambar styraciflua*) are often found in wetter sites (Bailey, 1995). In the southern and western portions of this ecoregion, maple and beech forests grade into more drought-resistant oak-hickory (*Quercus* spp.–*Carya* spp.) forests. Oak-hickory stands also occur in drier sites with poor soils throughout the region. The understory is usually well developed and includes species such as dogwood (*Cornus* spp.), sassafras (*Sassafras albidum*) and hornbeam

(*Carpinus caroliniana*). Deciduous and evergreen shrubs are also present. Wildflowers are abundant on forest edges and open oak savannas.

Whitetail deer (*Odocoileus virginianus*) is the most abundant large game species. Gray squirrels (*Sciurus carolinensis*) and fox squirrels (*Sciurus niger*), eastern chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), and raccoon (*Procyon lotor*) are common in this area. Resident birds, such as the blue jay (*Cyanocitta cristata*) and wild turkey (*Meleagris gallopavo*), are found year-round. During the summer, migratory birds, such as the scarlet (*Piranga olivacea*) and summer tanagers (*Piranga rubra*), rose-breasted grosbeak (*Pheucticus ludovicianus*), red-eyed vireo (*Vireo olivaceus*), and ovenbird (*Seirus aurocapillus*), are common. The common map turtle (*Graptemys geographica*), box turtle (*Terrapene carolina*), black rat snake (*Elaphe obsoleta*), and eastern garter snake (*Thamnophis sirtalis*) are frequently observed in the region. Amphibians include the spring peeper (*Psuedacris crucifer*), wood frog (*Rana sylvatica*), green frog (*Rana clamitans*), and spotted salamander (*Ambystoma maculatum*). Cave salamanders (*Eurycea lucifuga*) reside near the openings of limestone caves in the southern part of the region. Largemouth bass (*Micropterus salmoides*) and smallmouth bass (*Micropterus dolomieu*), northern pike (*Esox lucius*), channel catfish (*Ictalurus punctatus*), and black crappie (*Pomoxis nigromaculatus*) are popular game fish in the regions' many lakes and rivers.

Great Plains Steppe and Shrub (Fort Sill). The Great Plains Steppe and Shrub ecoregion is a transitional zone between grasslands to the west and oak-hickory forests to the east. Typical native vegetation consists of short- and tall-grass plains dissected by riparian forest corridors along perennial creeks. Dominant grass species include blue grama (*Bouteloua gracilis*), buffalo grass (*Buchloe dactyloides*), and little bluestem (*Schizachyrium scoparium*). Mesquite shrubs have invaded many pastures and roadsides. Riparian forests feature elm, persimmon (*Diospyros virginiana*), pecan (*Carya illinoinensis*), and eastern cottonwood (*Populus deltoides*). Post oak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*) form dense stands in the Wichita Mountains.

Buffalo (*Bison bison*) that once roamed the region have been reduced to small herds on wildlife refuges and private ranches. Whitetail deer are common, as are raccoon, striped skunk (*Mephitis mephitis*), coyote, and nine-banded armadillo (*Dasypus novemcinctus*). Mourning doves (*Zenaida macroura*) and bobwhite quail (*Colinus virginianus*) are year-round residents. Red-tailed hawks (*Buteo jamaicensis*) and other birds of prey are frequently observed feeding in pastures and agricultural fields. Reptiles include the western diamondback rattlesnake (*Crotalus atrox*), gopher snake (*Pituophis catenifer*), ornate box turtle (*Terrapene ornata*), and prairie lizard (*Sceloporus undulatus*). The bullfrog (*Rana catesbiana*) and the plains spadefoot toad (*Scaphiopus bombifrons*) are two amphibians known from the region. Fish species include largemouth bass, channel catfish, and Red River pupfish (*Cyprinodon rubrofluviatilis*).

Great Plains–Palouse Dry Steppe (Fort Carson, Pinon Canyon). The Great Plains grasslands have scattered trees and shrubs, such as sagebrush (*Artemesia* spp.) and rabbitbrush (*Chrysothamnus* spp.), and form gradient levels of cover, from semidesert

to woodland. Stands of cottonwood and willow (*Salix* spp.) are found adjacent to rivers. Vegetation is sparse in areas with rocky eroded soils, sometimes called badlands or breaks. There are numerous species of grasses and herbs. Common species include buffalo grass, locoweed (*Oxytropis* spp.), grama grass, wheatgrass (*Agropyron* spp.), and needlegrass (*Stipa* spp.). Typical wildflowers include the blazing star (*Mentzelia* spp.) and white prickly poppy (*Argemone polyanthemos*); tumbleweed (*Salsola iberica*) is abundant in certain areas (Bailey, 1995).

The pronghorn antelope is the most abundant large mammal, with the mule deer and white-tailed deer common in brushy areas along streams (Bailey, 1995). The whitetail jackrabbit (*Lepus townsendii*) is in the northern portion of the ecoregion, and the blacktail jackrabbit in the southern portion. The desert cottontail is widespread. Other small mammals, such as prairie dogs (*Cynomys* spp.) and other small rodents, are prey for coyotes, badgers (*Taxidea taxus*) and birds of prey. There are many gallinaceous bird species, including the sage grouse (*Centrocercus urophasianus*), the greater prairie chicken (*Tympanuchus cupido*), and the sharp-tailed grouse (*Tympanuchus phasianellus*). Other bird species include the horned lark (*Eremophilla alpestris*), lark bunting (*Calamospiza melanocorys*), western meadowlark (*Sturnella neglecta*), mountain plover (*Charadrius montanus*), and black-billed magpie (*Pica pica*). Gopher snake, prairie rattlesnake (*Crotalus viridis*), and painted turtle (*Chrysemys picta*) can be encountered in the region. Flathead chub (*Platygobio gracilis*), black bullhead (*Ameiurus melas*), and cutthroat trout (*Oncorhynchus clarkii*) are found in rivers and streams.

Hawaiian Islands (Schofield Barracks, Pohakuloa Training Area). The Hawaiian Islands' volcanic origin and isolation from mainland areas is responsible for many unique and endemic plant species. The diversity of habitats found on Army lands in Hawaii is reflected in the diversity of native species and numbers of federally listed species found on these lands. Currently 40 percent of the federally listed endangered species are found in Hawaii. Many native plants are listed as threatened or endangered because of their restricted range. At all Army installations in Hawaii there are numerous endangered plant species. Approximately 90 threatened and endangered species are found on Army training lands (Char, 2001).

On Oahu, vegetation varies with both altitude and position with respect to prevailing northeasterly trade winds. At low elevation on the lee sides of mountains, shrubland is the dominant cover type. Wetter windward sites and higher-elevation sites support tropical forests. Notable tree species include ohia (*Syzygium malaccense*) and koa (*Acacia koa*) trees. Ferns, mosses, and lichens are also abundant. exist at high altitudes above the treeline. The only bog on Army lands in Hawaii is located in the Kawailoa Training Area, on the island of Oahu. The Pohakuloa Training Area on the Island of Hawaii is located on the plateau between two large volcanoes at 6,000 ft above sea level (Char, 2001). The vegetation at the Pohakuloa Training Area can be characterized as subalpine dryland scrub vegetation.

Isolation is also responsible for a limited but unique native flora and fauna. Many of the native land birds are listed as threatened or endangered. There is an endangered Hawaiian flycatcher located at Makua and Schofield Barracks Military Reservation . The endangered Hawaiian hoary bat is known from a few installations on the islands of Hawaii and Oahu. Introduced mammals thrive in the Hawaiian Islands. Feral pigs, goats, and sheep can be found in natural areas. Introduced species threaten native ecosystems by competing with native species for resources. Introduced mammals thrive in the Hawaiian Islands and threaten native species through grazing and trampling. Many bird species have also been introduced. Reptiles are not abundant, and there are no native Hawaiian reptiles. Native and introduced snails are known from the islands. Several native tree snails (*Achatinella* spp.) occur on the island of Oahu. The endangered Oahu tree snail occurs at several Army installations on the island of Oahu.

Intermountain Semidesert (Orchard Training Area, Yakima Training Center). Sagebrush steppe, composed of sagebrush or shadscale *(Atriplex confertifolia*) mixed with shortgrasses, is the dominant vegetation. Moist alkaline flats support greasewood (*Sarcobatus vermiculatus*). Along streams in and near the mountains, valleys contain willows and sedges (Bailey, 1995).

Pronghorn antelope are known from the Intermountain region. In winter, elk (*Cervus canadensis*) and mule deer move down from mountains into semidesert habitats to escape severe cold. Predators include coyote, mountain lion (*Felis concolor*), and bobcat. Local small mammal fauna features whitetail prairie dog (*Cynomys gunnisoni*), deer mouse (*Peromyscus maniculatus*), jackrabbit, and porcupine (*Erethizon dorsatum*). Numerous waterfowl inhabit the ecoregion to breed and rest there during migration. Mallards (*Anas platyrhynchos*), pintail (*Anas acuta*), green-winged teal (*Anas crecca*), gadwalls (*Anas strepera*), and Canada geese (*Branta canadensis*) are some representative waterfowl species. Sage grouse is an abundant game bird. There are many species of hawks and owls, as well. Sagebrush lizard (*Sceloporus graciosus*) and horned lizards (*Phrynosoma* spp.) are present, in addition to the prairie rattlesnake. Rainbow trout (*Oncorhynchus mykiss*) and other salmonid fishes are well known from the region.

Outer Coastal Plain Mixed Forest (Forts Bragg, Polk, and Stewart; Camps Blanding and Shelby). Temperate evergreen forest is abundant in the outer coastal plain. Common species are deciduous and evergreen oaks, laurels, and magnolias. Well-developed lower strata may consist of tree ferns, small palms, ericaceous shrubs, and herbs. Epiphytes (nonparasitic plants that grow on other plants) are common; Spanish moss (*Tillandsia usneoides*) is one well-known epiphyte. Atlantic coast forested wetlands are dominated by gum (*Nyssa* spp.), red bay (*Persea borbonia*), and cypress (*Taxodium* spp.), while upland areas often support upland pine savannas of longleaf (*Pinus palustris*), loblolly (*Pinus taeda*), slash (*Pinus elliotii*), or pond pine (*Pinus serotina*) with diverse grass, sedge, and forb understories. Poorly drained pocosins (shrub-dominated wetlands) occur in shallow depressions in the Atlantic coastal region.

Open pine savannas are maintained by wildfire; in the absence of fire, oak and other hardwood tree species will become dominant.

The outer coastal plain is a region rich in wildlife species. Whitetail deer and feral pigs (*Sus scrofa*) are important herbivores. Some remote areas support black bears, and some locations in Florida shelter the almost extirpated (extinct) Florida panther (*Felis concolor coryi*). Typical small mammals are raccoons, opossums (*Didelphis virginiana*), flying squirrels (*Glaucomys volans*), eastern cottontail (*Sylvilagus floridanus*), bats (*Myotis* spp.), and many species of ground-dwelling rodents. Bobwhite quail and wild turkey are common ground-nesting game birds. Neotropical migrant birds are numerous, as are wintering migratory waterfowl. The American alligator (*Alligator mississippiensis*) is the largest reptile of the region (Bailey, 1995). Water moccasin (*Agkistrodon piscivorus*) and snapping turtle (*Chelydra serpentina*) are other well-known reptiles. Amphibians are well represented in the region by many rare and common frog, toad, and salamander species. A broad spectrum of fish species are also known from the coastal plain. Of these species, many are common in other parts of North America, while others are restricted to the warm waters of southern rivers and lakes.

Pacific Lowland Mixed Forest (Fort Lewis). Coniferous forest is the dominant indigenous vegetation type. Common trees include the western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and Douglas fir (*Pseudotsuga menziesii*). Coniferous forest is less dense in interior valleys than along the coast. Interior valley forests often contain deciduous trees, such as big-leaf maple (*Acer macrophyllum*), Oregon ash (*Fraxinus latifolia*), and black cottonwood (*Populus trichocarpa*). Prairie-type vegetative communities support open stands of Oregon white oak (*Quercus garryana*) or scattered groves of Douglas fir and other trees such as Pacific madrone (*Arbutus menziesii*). Fescue and other grass species are also abundant in prairie-type communities. Poorly drained sites feature forested wetlands, freshwater marshes, and shrub bogs.

Mule deer are the most common large herbivore in the ecoregion. Mountain lion and bobcat are also found in the region. Small mammals include the bushytail wood rat (*Neotoma cinerea*), brush rabbit (*Sylvilagus bachmani*), and gray fox (*Urocyon cinereoargenteus*). Ruffed grouse (*Bonasa umbellus*), mountain quail (*Oreortyx pictus*), and acorn woodpeckers (*Melanerpes formicivorus*) are attracted to oak forests. Waterfowl, as well as eagles and hawks, are regionally abundant. Reptiles are not abundant in the region. Salamanders, frogs, and toads thrive in moist lowland habitats. Salmon (*Oncorhynchus* spp.) and whitefish (*Prosopium* spp.) are known from streams and rivers.

Prairie Parkland, Temperate (Fort Riley). Vegetation in this region consists of prairie intermixed with groves and strips of deciduous trees. Local soil conditions and slope exposure help determine whether forests or grasslands will be dominant. Trees are most likely to occur near streams or on north-facing slopes. Limestone hills having only thin soils support few trees; in the eastern portion, however, trees can be found on most of the highest hills. Tall grasses dominate prairie communities, and the most common

species are big bluestem (*Andropogon gerardii*), little bluestem, switchgrass (*Panicum virgatum*), and Indian grass (*Sorgastrum nutans*). Wildflowers and legumes are also abundant in grasslands. Before European settlement, fire and grazing maintained grasslands in areas that are also suitable for trees and shrubs. Where fire and grazing are controlled, deciduous trees can colonize grasslands. Upland forest areas are dominated by oak and hickory species. Floodplains and riparian areas support forested corridors of eastern cottonwood, black willow (*Salix nigra*), and American elm (*Elmus americana*). Much of this region has been converted to agriculture because of the favorable climate and soils.

Many species of both prairie and forest animals are found in this ecoregion. White-tailed deer and elk use both forest and grassland habitats in the region. Small mammals include eastern mole (*Scalopus aquaticus*), deer mouse, prairie vole (*Microtus ochrogaster*), and raccoon. Thirteen-lined ground squirrel (*Citellus tridecemlineatus*) and blacktail prairie dog (*Cynomys ludovicianus*) are common on the prairies. Coyotes and badgers are common predators. Belted kingfisher (*Megaceryle alcyon*), bank swallow (*Riparia riparia*), spotted sandpiper (*Actitis macularia*), and green-backed heron (*Butorides virescens*) occur in the riverine forests. In open upland areas, the brown-headed cowbird (*Molothrus ater*), eastern meadowlark (*Sturnella magna*), mourning dove, and red-tailed hawk are common. Reptiles include the red-sided garter snake (*Thamnophis sirtalis*), gopher snake, ornate box turtle, and prairie lizard. Large rivers support many of the fish species typical of the Missouri River drainage. Fish habitat is limited in the western portion of the ecoregion because many smaller streams are intermittent.

Southeastern Mixed Forest (Fort Benning). Temperate forests in this region are stocked with broadleaf deciduous and needleleaf evergreen trees. Southeastern mixed forest, also known as the Piedmont region, has undergone extensive land conversion to agriculture and pine plantation. Loblolly pine, shortleaf pine (*Pinus echinata*), Virginia pine (*Pinus virginiana*), and other southern yellow pines are important timber trees in young forests. Oaks, hickories, black gum (*Nyssa sylvatica*), and sweetgums are commonly associated with pines and eventually gain dominance as pines mature and die. Red maple (*Acer rubrum*) is very common in wet areas. Dominant grasses include panic grasses (*Panicum* spp.) and other native and introduced species. Common understory species are dogwoods, viburnums (*Viburnum* spp.), blueberries (*Vaccinium* spp.), and hollies (*Ilex* spp.), often occurring with woody vines, including poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), or wild grape (*Vitis* spp.).

White-tailed deer, cottontail rabbits, and fox squirrel are common in uplands where deciduous trees are present. Gray squirrels are found in lowland drainages. Raccoon, opossum, and red fox can be found throughout the region (Bailey, 1995). The eastern wild turkey, bobwhite, and mourning dove are common year-round residents. In mature forests, resident and neotropical migrant songbirds such as the pine warbler (*Dendroica pinus*), cardinal (*Cardinalis cardinalis*), summer tanager, Carolina wren (*Thryothorus ludovicianus*), ruby-throated hummingbird (*Archilochus colubris*), blue jays, and tufted

titmice (*Baeolophus bicolor*) are present. Snakes, turtles, and lizards are common in this warm temperate climate. Amphibians are also well represented. Catfish (*Ictalurus* spp., *Ameiurus* spp.), madtoms (*Noturus* spp.), shiners (*Lythrurus* spp.), sunfish (*Lepomis* spp.), and black bass (*Micropterus* spp.) are present in the many rivers and reservoirs in the region. A diverse compliment of freshwater mussels is known from Gulf Coast drainages.

Southwest Plateau and Plains Dry Steppe and Shrub (Fort Hood). Arid grasslands are the dominant vegetation type. Grasslands are often mixed with shrubs or low trees. Xerophytic grasses, such as blue grama and buffalo grass, are often the most prevalent. On steep rocky slopes, evergreen live oaks (*Quercus* spp.) and ash juniper (*Juniperus ashei*) are frequently mixed with mesquite shrubs and grasses. Bald cypress (*Taxodium distichum*), eastern cottonwood, and willows are found near perennial streams. Prickly pear cactus, yucca, and other xerophytic plants often invade overgrazed or poor sites.

The Mexican ground squirrel (*Citellus mexicanus*) and coyote occur here, as well as the white-tailed deer and nine-banded armadillo. Limestone caves in central Texas are home to large populations of Mexican freetail bats *(Tadarida brasiliensis*). Common ground-nesting birds include wild turkey and bobwhite. Hawks and falcons are frequently observed in open fields. Regionally abundant songbirds include the scissor-tailed flycatcher (*Tyrannus forficatus*), great-tailed grackle (*Quiscalus mexicanus*), and mockingbird (*Mimus polyglottos*). Snakes and lizards are common. Guadalupe bass (*Micropterus treculi*) is a notable sportfish endemic to the region.

On January 10, 2001, President Clinton signed Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. The Executive Order recognizes that migratory birds have ecological and economic value to the United States and other countries. Migratory birds are valued for hunting, scientific research, and aesthetic enjoyment. International conventions signed in Canada, Russia, Japan, and Mexico have been ratified by the U.S. government to promote the protection of migratory birds and their habitat. Although migratory bird conservation measures dictated by these international conventions have already been implemented at the federal level, the Executive Order directs federal agencies to take still further action to protect migratory birds.

Each federal agency taking actions that have or could have measurable negative effect on migratory bird populations is directed to develop and implement a Memorandum of Understanding (MOU) with the FWS to promote conservation of migratory bird populations. Federal agencies have 2 years to develop and implement the MOU. Elements of the MOU are expected to be carried out, in part, by integration into agency formal planning processes such as NEPA analysis, integrated resource management plans, and land use compatibility guidelines. Each agency, subject to availability of funds, to the extent permitted by law, and in harmony with agency missions, is directed to:

- Avoid or minimize adverse impacts on migratory bird resources and restore and enhance migratory bird habitat as practicable.

- Prevent or abate pollution of the environment so as to benefit migratory birds.

- Design migratory bird conservation principles into agency planning processes (such as NEPA) as practicable and coordinate with other agencies and nonfederal partners.

- Ensure that agency plans and actions promote recommendations of comprehensive migratory bird conservation efforts, such as Partners-in-Flight and the North American Waterfowl Management Plan.

- Minimize take of migratory birds, and provide advance notice to the FWS if agency actions would result in take of migratory birds.

- Provide training to employees on avoiding or minimizing take of migratory birds and promote migratory bird conservation in international activities.

The Executive Order provides for the creation of an interagency council for the conservation of migratory birds in order to guide the implementation of the Executive Order. The order and the MOUs to be developed do not require changes to the agency's current contracts, permits, or other third-party agreements. Because the order was recently signed and agency MOUs are not required to be completed until January 2003, at this time not enough is known to describe the implications of the Executive Order for Army Transformation.

Invasive Species. In February 1999, President Clinton signed the Executive Order on Invasive Species. An invasive species is described as a species not native to an ecosystem whose introduction is likely to cause environmental or economic harm or harm to human health. Pest plants and insects harmful to agriculture have been the focus of invasive species management in the past. More recently, natural areas managers have observed adverse impacts of invasive species to native wildlife and vegetation. The Executive Order provides for communication and collaboration among most of the major federal departments, including DoD, to create and implement effective invasive species management policy. Federal agencies whose actions may affect the status of invasive species are responsible, subject to availability of funds and to the extent practicable and permitted by law, to use relevant programs to:

- Prevent the introduction of invasive species.

- Detect and respond rapidly to control populations of invasive species in a cost-effective and environmentally sound manner.

- Monitor invasive species populations accurately and reliably.

- Provide for restoration of native species and habitat conditions in areas that have been invaded.

- Conduct research on invasive species, develop technologies to prevent introduction, and provide for environmentally sound control.

- Promote public education on invasive species and management techniques.

- Not authorize, fund, or carry out actions that would be likely to cause introduction or spread of invasive species.

The Executive Order provides for the creation of an Invasive Species Council that has prepared an Invasive Species Management Plan. The plan details management objectives and goals for federal agency efforts concerning invasive species. DoD responsibilities outlined in the plan include Army Corps of Engineers efforts to halt the movement of aquatic species between watersheds, and to identify sources of propagative material to be used for native vegetation restoration projects.

3.10.2.2 Threatened and Endangered Species

The Endangered Species Act (ESA) was passed in 1973 to address concerns about the decline in populations of many unique wildlife species. Supporters of the ESA argued that America's natural heritage was of aesthetic, ecological, educational, recreational, and scientific value to the Nation and therefore worthy of protection. The purpose of the ESA is to rebuild populations of protected species and conserve "the ecosystems upon which endangered and threatened species depend" (FWS, 2001). The law offers two classes of protection for rare species in decline: endangered or threatened. Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened status indicates a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened (FWS, 2001).

The FWS and the National Marine Fisheries Service (NMFS) are jointly responsible for administering the ESA. The FWS has cognizance over terrestrial and freshwater organisms, while the NMFS is primarily responsible for marine species. As of January 31, 2001, 1,244 species were listed as either threatened or endangered. All federal agencies are required to protect threatened and endangered species (TES) while carrying out projects and to preserve TES habitats on federal land. The FWS and NMFS also coordinate TES conservation efforts with state agencies and private landowners. Ideally, with sufficient protection under the ESA, the TES populations will recover to the point at which they no longer need protection under the act. To facilitate this process, a team of experts develops a recovery plan that describes the steps needed to restore the species to health.

Under the ESA, it is illegal to "take" TES. As defined in the ESA, "the term take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to

engage in any such conduct." The Secretary of the Interior, through regulations, defined the term "harm" in this passage as "an act which actually kills or injures wildlife." Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (FWS, 2001). Because most TES are not significantly hunted or collected, habitat degradation is the primary reason for population declines in listed species.

The ESA contains provisions for designation of "critical habitat" for listed species when deemed essential for the conservation and recovery of a species. Critical habitat includes geographic areas "on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection (FWS, 2001)." Areas not occupied by the species at the time of listing but are considered essential to the conservation of the species can be designated as critical habitat. Critical habitat designations are limited to federal agency actions or federally funded or permitted activities.

Appendix D lists TES found on 23 representative installations. Out of 1,244 species listed under the ESA, 112 occur on the representative installations. TES on the 23 representative installations total 57 plants, 7 mammals, 25 birds, 5 reptiles, 1 amphibian, 4 fish, and 13 invertebrates. Two representative installations, Orchard Training Area and Fort Drum, have no reported TES populations. Of the 112 species found on the 23 representative installations, just over half (61 species) occur on two installations in Hawaii, by far the highest concentration of TES considered in the project scope. Critical habitat has been designated for two birds on two installations: Critical habitat has been designated at Fort Lewis for the northern spotted owl (Strix occidentalis caurina) and at Pohakuloa Training Area for the paula honeycreeper (Loxioides bailleui).

3.10.2.3 Wetlands

Wetlands are the transitional area between dry land and aquatic habitat. As defined by the Army Corps of Engineers (1987), wetlands are "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that, under normal circumstances, support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." Three diagnostic characteristics are generally employed to recognize wetlands: hydrology, soils, and vegetation.

- *Hydrology.* Wetlands are inundated with less than 6.6 feet of water on average; otherwise, they are considered deepwater habitat. However, unless wetlands are saturated to the soil surface at least some time during the growing season, evidence of ongoing wetland conditions, they are considered upland or nonwetland habitat.

- *Soils.* Long-term inundation leads to oxygen depletion in soils. The lack of oxygen in wetland soils during part or all of the year causes wetland soils to develop differently than upland soils, and exhibit characteristics that develop under permanent or periodic soil saturation.

- *Vegetation.* Wetlands feature plant species that are adapted to thrive in wet soils with little or no oxygen. Wetland plants have specialized structural or reproductive features that allow them to compete with other plants and persist in inundated soils. Therefore, wetlands are dominated by species that are tolerant of prolonged inundation or soil saturation.

There are many different kinds of wetlands. Wetlands are often categorized by their dominant vegetation type, three general types including emergent herbaceous plants, shrub-scrub, and forest. Geography is also very important in classifying wetlands. Wetlands associated with rivers are considered different from wetlands associated with lakes or coastal estuaries. Wetland definitions can vary by agency, regulations, and policy. The National Wetlands Inventory (NWI) of the Fish and Wildlife Service has identified and mapped most of the known wetlands in the conterminous United States, including those on military installations. NWI maps are not comprehensive and do not delineate wetlands below 10 acres in size and should only be used for general source gathering for land planning activities. Wetland delineations are the best source for accurately identifying jurisdictional wetland boundaries in accordance with current laws, regulations, and policy. Wetland delineations help determine the affected environment as a basis for impact assessments, alternatives analysis, and compensatory mitigation.

Issues and Concerns. Wetlands are protected in the United States by the Clean Water Act (CWA). Wetland protection involves a "no net loss" policy through compliance with the CWA under Section 404. The CWA protects all navigable waters of the U.S. The general definition of navigable waters are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. In addition, it applies to the jurisdictional limits of waters of the U.S. for all other waters such as lakes, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use degradation or destruction of which could affect interstate or foreign commerce. The U.S. Army Corps of Engineers state regulatory Districts have regulatory authority over navigable waters of United States. They are the lead agency and have jurisdiction over wetland regulation and compliance. If military or civilian activities impact wetlands, the U.S. Army Corps of Engineers may issue permits for the discharge of dredged or fill material into wetlands. Under Section 301 of the CWA (Prohibitions) the discharge of dredged or filled materials into waters of the U.S. is subject to permitting under Title IV (permitting and licenses), specifically addressed in Section 404 (discharge of dredged and fill material).

To meet stewardship and compliance objectives, Army land managers avoid impacts on wetlands whenever possible. Wetlands are present on most representative installations. Installations in coastal areas with abundant rainfall are likely to have proportionately more wetland acreage than installations located in mountain or desert settings. However, the overall scarcity of water resources in dry climates increases the importance of existing wetlands to desert wildlife. Wetlands are generally more abundant in association with land occupying major watersheds of streams, rivers and lakes. In addition, installations may have isolated wetlands associated with soils, hydrology, topography, geography, and unique habitat communities. Examples of isolated wetlands are the prairie pothole region of the Dakotas, the Carolina Bay complexes in the Carolinas, and vernal pools in the West and Midwest. Isolated wetlands hydrology are driven by surface runoff or groundwater recharge.

Army natural resources managers are faced with the challenge of protecting wetlands while at the same time providing realistic conditions for military training. Wetlands are susceptible to many different kinds of impacts because they are the active interface between the terrestrial and aquatic components of a drainage basin (Schneider and Sprecher, 2000). Water, sediment, nutrients, toxic substances, and organic matter from upstream or upslope move into wetlands. In the wetland, these inputs may be changed in energy or biochemical status before they are eventually removed farther downstream. Animals also move in and out of wetlands, using them as sources of food, water, and habitat and transferring energy and chemical components between the terrestrial and aquatic ecosystems. Because of these interrelationships, activities upstream or upslope have profound effects on wetlands and on aquatic sites downstream. Consequently, management activities in wetlands can have substantial impacts on communities downstream or within the radius of movement of organisms that use the wetlands.

To predict effects on wetlands, it is necessary to understand the functions that occur in these aquatic sites. Numerous authors have compiled lists of wetland functions, but no list is recognized as official or exhaustive. The National Wetlands Policy Forum (Conservation Foundation, 1988) identified eight natural functions that wetlands may perform in the landscape: (1) nutrient removal and transformation, (2) sediment and toxicant retention, (3) shoreline and bank stabilization, (4) floodflow alteration, (5) groundwater recharge, (6) production export, (7) aquatic diversity and abundance, and (8) wildlife diversity and abundance.

- *Nutrient Removal and Transformation.* Nutrient removal and transformation are the major processes by which wetlands improve water quality. Nitrate and phosphorus from agricultural runoff are removed from the water column. Nitrate converts to gaseous nitrogen, and phosphorus is immobilized; both may be taken up by wetland plants. Nutrient-rich sediments can also become trapped in wetlands.

- *Sediment and Toxicant Retention.* Wetlands can remove from the water column sediments and any attached toxic chemicals, such as pesticides, heavy metals, or excess nutrients/fertilizers. These pollutants may decompose or become buried. Wetlands that provide this function are located downstream of the sediment source and retard water velocity sufficiently for suspended sediments to settle out.

- *Shoreline and Bank Stabilization.* Wave or current erosion can be reduced by wetland plant roots binding together soil that would otherwise be eroded by water movement from an adjacent river, lake, or ocean. This stabilization protects adjacent upland sites from erosion and protects downstream sites from sedimentation.

- *Floodflow Alteration.* Wetlands on floodplains can delay discharge of peak runoff into streams and impede passage of overbank flow downstream during storm events. Both riverine wetlands and depressional wetlands in the headwaters of streams perform this function.

- *Ground water Recharge.* Ground water recharge occurs when water resides on the surface of the land long enough to percolate into the underlying aquifer. Most wetlands that perform this function are depressional wetlands in uplands. Riverine wetlands are usually sites of groundwater discharge rather than recharge, except in arid or semiarid regions where streams may contribute more water to the ground than they gain from it.

- *Production Export.* Production export results when organic carbon of a wetland is transported out of the wetland and into the food chain downstream. This function is provided when the wetland supports highly productive vegetative and microbial growth. Such communities are usually mature and complex. Aerated, flowing water through a wetland transports the decaying organic matter out of the wetland, where it can be used by dependent communities downstream.

- *Aquatic diversity and abundance.* Aquatic diversity is provided when wetlands support thriving populations of aquatic animals, including fish, amphibians, mammals, and invertebrates. Consequently, wetlands that perform this function are often open to larger bodies of water and have sufficient currents to maintain aeration and temperatures adequate to support the aquatic life.

- *Wildlife diversity and abundance.* Wildlife diversity is provided when wetlands support thriving populations of nonaquatic life; waterfowl have received the most attention in the popular literature, but other animals also benefit from wetlands for habitat or food.

Wetland functions are of value to the sustainable management of military lands because of the services they provide in addition to training realism. Three services

applicable to sustainable management are flood attenuation, groundwater recharge, and improvement of water quality by filtering sediment, nutrients and toxics.

3.11 CULTURAL RESOURCES

3.11.1 Definition and Description

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, and any other physical evidence of human activities considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: prehistoric and historic archaeological resources, historic buildings and structures, and traditional cultural properties. Paleontological resources are also considered under NEPA.

- *Prehistoric and Historic Archaeological Resources*. These resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., arrowheads or pottery). Prehistoric resources range from scatters of a few artifacts to village sites and rock art that predate written records in a region. Historic archaeological resources include remains of structures, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features.

- *Historic Properties*. Historic properties can include buildings, sites, structures, objects, and districts. Properties considered significant are usually 50 years old or older. There are exceptions, however, such as, properties that meet significance criteria and date to the Cold War era.

- *Historic Buildings and Structures*. These include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. In general, architectural resources must be more than 50 years old to be considered for protection under laws protecting cultural resources. Structures such as military buildings from the Cold War era may be considered significant if they meet certain criteria.

- *Traditional Cultural Properties*. These resources can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other ethnic groups consider essential for the preservation of their traditional culture.

- *Paleontological Resources.* Paleontological resources are scientifically significant fossilized remains, specimens, deposits, and other such data from prehistoric nonhuman life, including remains of plants and animals.

The Secretary of the Interior developed a set of criteria that is used to identify whether a cultural resource is significant and should be listed on the National Register of Historic Places (NRHP). The criteria for evaluation are these:

> "The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and: a. that are associated with events that have made a significant contribution to the broad patterns of our history; or b. that are associated with the lives or persons significant in our past; or c. that embody the distinctive characteristics or a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or d. that have yielded, or may be likely to yield, information important in prehistory or history." (36 CFR Part 60)

Several federal laws have been enacted to protect and manage the Nation's cultural resources. They are discussed in Section 3.11.2.

3.11.2 Army Cultural Resource Management

Army Regulation (AR) 200-4, *Cultural Resources Management*, and an associated pamphlet, Department of the Army Pamphlet (DA PAM) 200-4, specify Army policy for cultural resources management. The following discussion provides an overview of federal statutes and regulations that are applicable to the management of cultural resources at the Army facilities and any and all real property of other federal, state, and local agencies and private parties used by the Army under license, permit, lease, or other land and/or facility use agreement. The statutes and regulations discussed are as follows:

- National Historic Preservation Act (NHPA) of 1966
- Antiquities Act of 1906, Archeological Resources Protection Act of 1979 (ARPA), and Archeological and Historic Preservation Act of 1974 (AHPA)
- Native American Graves Protection and Repatriation Act (NAGPRA) of 1990
- American Indian Religious Freedom Act (AIRFA) of 1978 and Executive Order 13007, Sacred Sites, dated 1996
- Curation of Federally-Owned and Administered Archaeological Collections (36 CFR Part 79)

Cultural resources are defined as historic properties in the NHPA, as cultural items in the NAGPRA, as archaeological resources in the ARPA, as sacred sites (to which access is provided under the AIRFA) in Executive Order 13007, and as collections and associated records in 36 CFR Part 79, Curation of Federally Owned and Administered Collections. Requirements set forth in NEPA, NHPA, ARPA, NAGPRA, AIRFA, 36 CFR

Part 79, Executive Order 13007, and their implementing regulations define the Army's compliance responsibilities for management of cultural resources. Regulations applicable to the Army's management of cultural resources include those promulgated by the Advisory Council on Historic Preservation (ACHP) and the National Park Service (NPS).

Army Headquarters and installations must comply with applicable cultural resources statutes, regulations, Executive Orders, and Presidential Memoranda. Army personnel at all levels must ensure that mission requirements are carried out in harmony with such statutory and regulatory requirements. Failure to fulfill these requirements could result in halting or delaying ongoing or proposed mission-essential projects and training and testing actions and could deplete limited financial and staff resources. The key to the successful balance of mission requirements and cultural resources compliance and management responsibilities is early planning and coordination to prevent conflicts between the mission and the resources.

National Historic Preservation Act (NHPA) of 1966 as amended. The NHPA establishes the federal government's policy to provide leadership in the preservation of historic properties and to administer federally owned or controlled historic properties in a spirit of stewardship. The Army must administer, manage, and treat historic properties in accordance with the NHPA. The Army must also identify, evaluate, and nominate historic properties for listing in the NRHP consistent with the policies and guidelines of AR 200-4 and DA PAM 200-4.

Section 106 of the NHPA contains the following provisions:

> (1) Under this section of the NHPA, the Army is responsible to identify, evaluate, and take into account the effects of all undertakings on historic properties in accordance with (IAW) the procedures set forth in 36 CFR 800. The ACHP is responsible for providing comments on undertakings that affect historic properties. The state historic preservation officer (SHPO) in each state or territory is a significant participant in the Section 106 compliance process by providing comments on efforts to identify, evaluate and treat any effects on historic properties. If an undertaking on Army lands may affect properties having historic value to a federally recognized Indian tribe, such tribe shall be afforded the opportunity to participate as interested persons during the consultation process defined in 36 CFR 800. Traditional cultural leaders and other Native Americans, Native Alaskans, and Native Hawaiians are considered to be interested persons with respect to undertakings that may affect historic properties of significance to such persons. If an undertaking may involve excavation of NAGPRA cultural items, the requirements of NAGPRA and 43 CFR 10 must

also be met prior to implementation of the undertaking.

(2) Failure to take the effects of an undertaking on historic properties into account IAW NHPA Section 106 and 36 CFR 800 can result in formal notification from the ACHP to the Secretary of the Army of foreclosure of the ACHP's opportunity to comment on the undertaking pursuant to the NHPA. A notice of foreclosure can be used by litigants against the Army in a manner that can halt or delay critical mission activities.

(3) The Army will ensure that the efforts to identify, evaluate, and treat historic properties follow the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* and are conducted under the supervision of personnel who meet the applicable professional qualifications standards set forth in 36 CFR 61. Disagreements between the Army and the SHPO regarding the eligibility of a property for listing on the NRHP shall be resolved through the procedures at 36 CFR 63.2(d).

(4) Programmatic Agreements (PAs) and Memoranda of Agreement (MOAs) executed pursuant to NHPA Section 106 and 36 CFR 800 are compliance agreements that set forth how the Army will satisfy the responsibilities of Section 106 of the NHPA in the context of an Army undertaking that will affect an historic property.

Section 110 of the NHPA imposes specific responsibilities on the Army regarding historic preservation. Section 110 (a)(1) requires that the affirmative preservation responsibilities in Section 110 must be undertaken in a manner consistent with the installation's mission. Such responsibilities include but are not limited to the following:

(1) Establishing an historic preservation program to include the identification, evaluation, and nomination of historic properties to the NRHP in consultation with the ACHP, SHPO, local governments, Indian tribes, Native Alaskans, Native Hawaiian organizations, and the interested public as appropriate.

(2) Prior to acquiring, constructing, or leasing buildings, using available historic properties to the maximum extent feasible.

(3) Documenting historic properties that will be altered or destroyed as a result of Army action. Such actions must be reviewed in accordance with NHPA Section 106.

(4) In transferring Army historic properties, ensuring that the significant historic values of the property are appropriately preserved.

(5) The Secretary of the Army documenting decisions to proceed with Army undertakings that adversely affect historic

properties when the installation commander has been unable to reach agreement through execution of an MOA or PA with the ACHP and SHPO. Procedures for commanders to follow when such a situation arises in the context of an NHPA undertaking can be found in Section 3-1d of AR 200-4.

Section 101(d)(2) of the NHPA provides for the assumption by federally recognized Indian tribes of all or any part of the functions of a SHPO with respect to tribal lands (e.g., all lands within the exterior boundaries of any Indian reservation and all dependent Indian communities). Section 101(d)(6) requires Army activities, in carrying out their Section 106 responsibilities, to consult with federally recognized Indian tribes, Native Alaskans, and Native Hawaiian organizations that attach religious or cultural significance to an historic property. The Army must consult with federally recognized Indian tribes and Native Hawaiian organizations in the Section 106 process to identify, evaluate, and treat historic properties that have religious or cultural importance to those groups.

Section 111 of the NHPA requires the Army to establish and implement to the extent practical alternatives for historic properties, including adaptive use, that are not needed for current or projected installation mission requirements.

Section 112 of the NHPA requires that the Army ensures that all actions taken by employees or contractors meet professional historic preservation standards established by the Secretary of the Interior.

Antiquities Act of 1906, Archeological Resources Protection Act of 1979 (ARPA), Archeological and Historic Preservation Act of 1974 (AHPA). The Antiquities Act of 1906 and ARPA prohibit the excavation, collection, removal, and disturbance of archaeological resources (as defined by ARPA) and objects of antiquity (as referenced in the Antiquities Act) on federally owned Army property without a permit issued by the Army Corps of Engineers District Real Estate Office on the approval of the installation commander. Violation of ARPA may result in the assessment of civil or criminal penalties and forfeiture of vehicles and equipment that were used in connection with the violation.

Paleontological Resources. The AHPA specifically provides for the survey and recovery of scientifically significant data that may be irreparably lost as a result of any alteration of the terrain from any federal construction projects, or federally licensed project, activity, or program. Known paleontological resources must also be addressed in any NEPA documentation prepared for actions that might affect or cause irreparable loss or destruction of such resources.

When the Army finds or is notified in writing by an appropriate authority that its activities might cause irreparable loss or destruction of scientifically significant paleontological resources, the Army must notify the Secretary of the Interior in writing and will provide information concerning the activity in accordance with the AHPA. Such notification may

be incorporated as part of the NEPA public review and comment process for the subject activity.

ARPA permits for archaeological investigations that might result in the excavation or removal of Native American human remains and other cultural items as defined in NAGPRA or in the excavation of archaeological resources that are of religious or cultural importance to federally recognized Indian tribes, Native Alaskans, or Native Hawaiians, must be issued in accordance with AR 405-80 and AR 200-4. The installation's supporting District Real Estate Office issues the permit after the installation commander conducts consultation in accordance with 43 CFR 10.5 and 32 CFR 229.7 with the culturally affiliated Indian tribes, Native Alaskans, or Native Hawaiian organizations.

The Army must ensure that ARPA permits:

(1) Comply with the requirements of 32 CFR 229, 43 CFR 10;
(2) Require that any interests which federally recognized Indian tribes, Native Alaskans, or Native Hawaiian organizations may have in the permitted activity are addressed in a manner consistent with the requirements of NHPA and NAGPRA prior to issuance of the permit;
(3) Require permitted activities be performed according to applicable professional standards of the Secretary of Interior and
(4) Require that the excavated archaeological artifact collection and associated records are permanently curated in a curation facility that meets the requirements of 36 CFR 79.

Archaeological resources, objects of antiquity, and significant scientific data from federal installations belong to the installation, except where NAGPRA requires repatriation to a lineal descendant, Indian tribe, or Native Hawaiian organization. Archaeological resources, objects of antiquity, and significant scientific data from nonfederal land belong to the state, territory, or landowner. Such resources from lands used by the Army but for which fee title is held by another agency are the property of the agency designated as the land manager in the land use instrument (e.g., Public Land Order, Special Use Permit, etc.). The Army should ensure that land use instruments allowing for military use are reviewed to determine proper roles and responsibilities.

Native American Graves Protection and Repatriation Act of 1990 (NAGPRA). The intent of NAGPRA is to identify proper ownership and to ensure the rightful disposition of cultural items (as defined in Section 2 of NAGPRA) that are in federal possession or control. NAGPRA mandates that the Army summarizes, inventories, and repatriates cultural items in its possession or control to lineal descendants or to culturally affiliated federally recognized Indian tribes, Native Alaskans, or Native Hawaiian organizations. NAGPRA also requires that certain procedures be followed when there is an intentional excavation of or an inadvertent discovery of cultural items. The installation commander

must ensure compliance with NAGPRA (23 USC 3002) and its implementing regulation (43 CFR Part 10).

The installation commander may enter into Comprehensive Agreements (CAs) with federally recognized Indian tribes, Native Alaskans, and Native Hawaiian organizations for the purposes of compliance with NAGPRA and 43 CFR Part 10. CAs should establish responsibilities and address all installation land management activities that could result in the intentional excavation or inadvertent discovery of cultural items; establish standard consultation procedures; and provide for the determination of custody, treatment, and disposition of cultural items.

Absent a CA, the Army must take reasonable steps to determine whether a planned activity might result in the intentional excavation or inadvertent discovery of cultural items from federally owned or controlled Army lands. When it is determined that cultural items might be encountered, before issuing approval to proceed with the activity the Army must carry out the consultation procedures and planning requirements at 43 CFR 10.3 and 10.5. Following consultation per 43 CFR 10.5 as part of the intentional excavation or inadvertent discovery of cultural items, a written Plan of Action must be prepared in accordance with 43 CFR 10.5(e). Such procedures and actions should be coordinated with the requirements of the NHPA and ARPA when such excavations or discoveries might involve historic properties and/or archaeological resources.

If an *inadvertent discovery* of cultural items occurs in connection with an ongoing activity on Army lands and there is no CA in effect that sets forth agreed-upon procedures for such instances, the Army must comply with 43 CFR 10.4(a-d). Such compliance measures include but are not limited to notifications; cessation of the activity for 30 days in the area of the discovery; protection of the discovery; consultation with Indian tribes, Native Alaskans, or Native Hawaiian organizations affiliated with the discovery in accordance with 43 CFR 10.5; and preparation of a written Plan of Action. The Army must ensure that all authorizations to carry out activities on federally owned or controlled installation lands, including leases and permits, include a requirement for the holder of the authorization to notify the commander immediately upon the inadvertent discovery of cultural items and to protect such discoveries until applicable compliance procedures are satisfied.

Installation commanders must ensure that intentional excavation and response to any inadvertent discovery of NAGPRA cultural items are carried out in compliance with all applicable statutory and regulatory requirements of NAGPRA, ARPA, and NHPA. Each statute mandates compliance with independent requirements. Compliance with one statutory requirement, therefore, may not satisfy other applicable requirements.

Summary, inventory, and repatriation of cultural items that are in existing collections under Army possession or control must occur in accordance with NAGPRA Sections 5, 6, and 7 and 43 CFR Part 10. In instances where there is a dispute as to the ownership of cultural items, the Army must safeguard the cultural items until the dispute is resolved in accordance with NAGPRA Section 7(e). The installation commander must notify the

MACOM and HQDA (AEC) in the event of a dispute regarding ownership of cultural items.

All activities carried out to comply with NAGPRA and 43 CFR 10 must occur only with federally recognized Indian tribes, Native Alaskans, and Native Hawaiian organizations, and lineal descendants as defined and provided for by NAGPRA.

American Indian Religious Freedom Act of 1978 (AIRFA) and Executive Order (EO) 13007 Indian Sacred Sites. Under AIRFA and EO 13007, the Army must develop and implement procedures to protect and preserve the American Indian, Eskimo, Aleut, and Native Hawaiian right of freedom to believe, express, and exercise these peoples' traditional religions, including, but not limited to, access to sacred sites, use and possession of sacred objects, and freedom to worship through ceremonials and traditional rites. Installation commanders are also required to establish procedures to facilitate consultation with federally recognized Indian tribes and Native Hawaiian organizations, as appropriate.

Installation commanders must consult with Indian tribes and Native Hawaiians to identify sacred sites that are necessary to the exercise of traditional religions and must provide access to Army installations for Indian tribe, Native Alaskan, and Native Hawaiian practice of traditional religions, rights, and ceremonies. The Army may impose reasonable terms, conditions, and restrictions on access to such sites when the commander deems it necessary for the protection of personal health and safety, or to avoid interference with the military mission, or for other reasons of national security. The installation commander must maintain the confidentiality of sacred site locations.

The Army is required to avoid adversely affecting the physical integrity of sacred sites and must establish procedures to ensure reasonable notice is provided to federally recognized Indian tribes, Native Alaskans, and Native Hawaiian organizations when proposed actions or land management policies and practices may restrict future access to or ceremonial use of or adversely affect the physical integrity of sacred sites. If a sacred site might be affected by Army land management policies or practices, the installation commander must also ensure that the compliance requirements of the NHPA are met if the sacred site meets the NHPA definition of an historic property.

36 CFR 79 Curation of Federally Owned and Administered Archeological Collections. The Army must ensure that all "collections," as defined in 36 CFR 79.4(a), are processed, maintained, and curated in accordance with the requirements of 36 CFR Part 79. However, NAGPRA cultural items and human remains in the Army's possession and control must be disposed of in a manner consistent with the requirements of NAGPRA and 43 CFR Part 10. Army archaeological collections may be processed, maintained, and curated on and by the Army or another federal agency, state agency, or other outside institution or nongovernmental organization, in cooperative repositories maintained by or on behalf of multiple agencies, or in other facilities, under contract, cooperative agreement, or other formal funding and administrative arrangement provided the standards of 36 CFR Part 79 are met.

3.11.3 Prehistoric and Historic Resources

Prehistoric Period Resources. Prehistoric occupation in the United States is divided generally into three major periods depending on region: the Paleo-Indian Period, dating from ca. 12,000 B.C. to ca. [varies regionally] B.C., the Archaic Period (ca. [varies regionally] B.C. to ca. [varies regionally] B.C.), and, in the East and Midwest, the Woodland Period; in the West, the Formative Period, or the Fremont Period, and the Late Prehistoric Period; and in the South, the Woodland and Mississippian Periods. The most recent periods vary significantly, with each region and state defining different periods and dates. Additional periods that are specific to smaller regions have been defined but are not discussed here. The installations under discussion here are 25 installations located in 21 states. Each installation is located in a generally defined archaeological region that has been recognized by archaeologists. The regions are shown in Table 3-20. Archaeological remains or sites from each of the periods discussed below might be found within the installations, depending on topography (e.g., degree of slope, distance from fresh water) and amount of soil disturbance due to natural (e.g., erosion) or cultural (e.g., construction, agriculture, forestry, or military tasks) activities.

Paleo-Indian Period (ca. 12,000 B.C. to ca. [varies regionally] B.C.). The Paleo-Indian Period is the earliest evidence of humans in the New World. The climate during this time period was cooler than the present environment. Large animals, such as mammoth and extinct species of bison, flourished. Paleo-Indian peoples were nomadic hunters and gatherers who lived in small groups and ate wild plants and animals. This

Table 3-20.
Regional Locations of Representative Installations

Installation	State	Archaeological Region
Fort Benning	GA	Southeast
Camp Blanding	FL	Southeast
Fort Bliss	TX	Southwest
Fort Bragg	NC	Southeast
Fort Campbell	KY	Southeast
Fort Carson	CO	West
Fort Chaffee	AR	Southeast
Fort Dix	NJ	Mid-Atlantic
Fort Drum	NY	Mid-Atlantic/Northeast
Fort A.P. Hill	VA	Mid-Atlantic/Southeast
Fort Hood	TX	Southwest
Fort Indiantown Gap	PA	Mid-Atlantic
Fort Irwin	CA	West
Fort Knox	KY	South
Fort Lewis	WA	Northwest
Fort McClellan	AL	Southeast

Table 3-20.
Regional Locations of Representative Installations

Installation	State	Archaeological Region
Orchard Training Area	ID	Northwest
Fort Pickett	VA	Mid-Atlantic/Southeast
Fort Polk	LA	Southeast
Fort Riley	KS	Midwest/West
Camp Shelby	MS	Southeast
Fort Sill	OK	West
Fort Stewart	GA	Southeast
Schofield Barracks	HI	Pacific
Fort Wainwright	AK	Far Northwest

period is distinguished by a low population density with groups residing in seasonal or base camps; as a result, Paleo-Indian sites are rare and usually very small in size. The Paleo-Indian Period is also noted for diagnostic fluted projectile points and the exploitation of Pleistocene megafauna, such as mammoths and giant sloth.

Archaic Period ([varies regionally] B.C.). Archaeologists divide the Archaic Period into three time frames—Early, Middle, and Late. Between 10,000 years before the present (BP) and 5,000 BP, substantial ecological changes occurred across the North American continent. These changes were accompanied by a change from Paleo-Indian to Archaic traditions. During the Archaic Period, the cold dry environment that had existed during the Paleo-Indian Period changed to a warmer and wetter environment. Mammals included mountain sheep, deer, and smaller mammals and birds. Groups responded to these changes, and archaeological evidence shows increased use of the new environment. These groups lived a nomadic life, moving seasonally to make use of the variety of flora and fauna available in different locations or ecological zones at different times of the year. Milling stones and items made of wood, bark, and fiber are common during this Period. During the Late Archaic Period, the ecology and climate became much the same as they are today, with a higher sea level and wetter climate than those of the previous period.

Woodland Period (varies regionally). This period is identified in the Mid-Atlantic, Northeast, Southeast, and Midwest. It is divided into three periods—the Early Woodland, the Middle Woodland, and the Late Woodland. The Woodland Period is characterized by the first appearance of true-fired ceramics. Food storage pits provide archaeological evidence that the population became more sedentary during this period, and plant remains indicate that plants were domesticated during this period.

Mississippian Period (varies regionally). This period is identified in the Southeast by the presence of certain ceramic types and stone tools, large-scale earthworks, and the remains of villages.

Late Prehistoric Period (varies regionally). This period is identified by archaeologists in the Southwest, particularly Texas and Colorado. During this period, people changed from somewhat egalitarian, nomadic hunter-gatherers relying on wild plants and animals to people who practiced agriculture and lived in more hierarchical chiefdom societies. Agricultural remains include maize; other remains include ceramic pottery, storage pits, hearths, and small triangular projectile points.

Formative Stage and Post-Formative Stage (varies regionally). These stages are identified in some areas of the West. During the Formative Stage, agriculture was introduced into the region. Groups became more sedentary, living longer in one location. They lived in small villages, and remains of their pit houses and masonry structures can be identified archaeologically. These stages are characterized archaeologically by the presence of ground stone artifacts, used for processing food; specific ceramic types; and remains of structures, including pit houses. During the Post-Formative Stage, historically known Native American groups lived in the West.

Fremont Period (varies regionally). This period is recognized in Colorado and in the Great Basin. It is largely defined by farming (i.e., squash, sunflower, beans, and maize) but also included full- and part-time farmers and foragers, depending on location and season. The Period is also known for the appearance of semisubterranean structures and storage pits, and aboveground granaries.

Historic Period Resources

***Contact Period*.** Historic Native Americans lived throughout the United States during the period from 1492 (landfall of Columbus) onward. Contact between the different cultures (European, African, and Native American) varied from region to region. The earliest contacts were along the eastern and western coasts, where the Spanish first landed.

In the Southeast, first contact was made when Hernando de Soto and his men explored that area between 1540 and 1542. They traveled from present-day Tampa Bay through Florida, Georgia, Tennessee, Alabama, Mississippi, and Arkansas, encountering Mississippian peoples.

The interior parts of the country did not experience contact until centuries later; in the West, earliest contact among Native American groups and people of European and African descent was made by Lewis and Clark (1804-1806), as well as by French and English fur trappers and French Catholic missionaries (for example, in the upper Midwest and Northwest). Native American groups experienced extreme population decline and dislocation during this period, as a result of warfare and disease. The Contact Period ends at different times in different regions. Information on dates and tribes that lived on what is now the installation should be available in the ICRMP for each installation. Contact Period resources can include archaeological sites, objects, and standing structures or remains of structures.

Historic Period. The start of this period varies from region to region, and the period continues until the present time. Each state has a set of historic contexts, such as homesteading era, railroading era, rural agricultural era, on World War II era. Each of these has been defined by the SHPO and is used as a context for evaluating the NRHP eligibility and significance of archaeological sites, objects, and standing structures. Historic Period contexts are usually found in the ICRMP for the installation; if no ICRMP is available, the SHPO will have this information. Historic Period sites can include archaeological sites, objects, standing structures or remains of structures, roads, or railroad tracks. In most cases, the resource must be at least 50 years old; however, some exceptions, such as structures or scientific equipment considered significant because of their association with the Cold War Era, might be NRHP-eligible.

3.11.4 Previous Consultations and Reports

Previous consultations include surveys to identify NRHP-eligible archaeological sites and standing structures, traditional cultural properties, or paleontological resources; consultations with the ACHP and the SHPO, including negotiated and signed PAs and MOAs concerning procedure for survey, inadvertent discovery, or maintenance of cultural resources; consultations with Native American, Native Alaskan, or Hawaiian groups and tribes; and completion of Integrated Cultural Resources Management Plans (ICRMPs).

3.11.5 Native American Resources

Native American resources include traditional cultural properties; human remains and sacred objects that may be subject to NAGPRA regulations; sacred sites, including geographical locations such as hills, rivers, or unidentified natural landscapes that may exist within the Army installations; archaeological sites; buried cemeteries or other discrete human burials; plants or animals that are collected for religious or traditional ceremonies or activities; and any currently held archaeological holdings or collections that might include sacred objects or human remains. These resources could exist within the 25 installations.

3.11.6 Paleontological Resources

Depending on the geology of a specific installation and the amount of soil disturbance, significant paleontological resources may be present in a project area.

3.12 HAZARDOUS MATERIALS AND HAZARDOUS WASTES

3.12.1 Definition and Description

Hazardous material is defined as any substance with the physical properties of ignitability, corrosivity, reactivity, or toxicity that might cause an increase in mortality, serious irreversible illness, and incapacitating reversible illness or that might pose a substantial threat to human health or the environment. Hazardous waste is defined as

any solid, liquid, contained gaseous, or semisolid waste or any combination of wastes that poses a substantial present or potential hazard to human health or the environment.

Evaluation of environmental risks from hazardous materials and wastes focuses on underground storage tanks and aboveground storage tanks and the storage, transport, and use of pesticides and herbicides; fuels; petroleum, oils, and lubricants (POLs), and a variety of chemicals. Risks may also extend to generation, storage, transportation, and disposal of hazardous wastes when such activities occur at or near the project site of a proposed action. In addition to being a threat to humans, the improper release of hazardous materials and wastes can threaten the health and well-being of wildlife species, botanical habitats, soil systems, and water resources. In the event of release of hazardous materials or wastes, the extent of contamination varies based on type of soil, topography, and water resources.

Through its Installation Restoration Program (IRP), the Army evaluates and cleans up sites where hazardous wastes have been spilled or released to the environment. The IRP provides a uniform, thorough methodology to evaluate past disposal sites, to control the migration of contaminants, to minimize potential hazards to human health and the environment, and to clean up contamination. Description of IRP activities provides a useful gauge of the condition of soils, water resources, and other resources that might be affected by contaminants. It also aids in identifying properties and their usefulness for given purposes (e.g., activities dependent on ground water usage might be foreclosed where remediation of a ground water contaminant plume remains to be complete).

Special hazards are those substances that might pose a risk to human health but are not regulated as contaminants under the hazardous waste statutes. Included in this category are asbestos, radon, lead-based paint (LBP), polychlorinated biphenyls (PCBs), and unexploded ordnance (UXO). The presence of special hazards or controls over them may affect or be affected by implementation of a proposed action. Information on special hazards describing their locations, quantities, and condition assists in determining the significance of the effects of the proposed action.

3.12.2 Army Hazardous Materials Management

The goals of the Army's hazardous materials program are to reduce risk to public health and the environment, prevent pollution, and comply with applicable regulations for hazardous and toxic materials and wastes. Army policies and regulations concerning activities in which hazardous or toxic materials are handled, used, or stored state that the use of hazardous and toxic materials and the generation of hazardous or toxic wastes must be avoided, reduced, or eliminated.

3.12.2.1 Treatment, Storage, and Disposal of Wastes

Regulations applicable to storage of hazardous and toxic materials and treatment and disposal of hazardous and toxic wastes are designed to protect human health and the environment. Three federal laws primarily influence the Army's hazardous and toxic materials and waste management and have led to numerous regulatory compliance requirements: The Resource Conservation and Recovery Act (RCRA), which pertains to solid and hazardous waste; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which pertains to spills and abandoned waste sites; and the Toxic Substances Control Act (TSCA), which pertains to use, storage, and disposal of hazardous chemicals. Many regulatory functions have been turned over to state agencies operating under state laws that are as stringent or more stringent than federal laws.

The Pollution Prevention Act of 1990 (PPA) established a hierarchy of actions or ordered set of preferences for addressing wastes. Under the PPA's precepts, pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be the last resort and should be conducted in an environmentally safe manner.

The PPA represents a major departure from most other environmental legislation. It recognizes the fundamental difference between source reduction (avoiding the creation of wastes that are difficult or costly to manage) and waste management and pollution control (having to deal with a regulatory system designed to handle problem waste).

The Army's proactive adherence to the precepts of the PPA gives rise to several benefits. These include reduced risk of exposure to potentially harmful contaminants, pollutants, and hazardous substances; reduced disposal costs; reduced liability for noncompliance with regulatory provisions; and reduced risk to health and safety.

3.12.2.2 Underground Storage Tanks

Army policy provides for the removal, repair, or replacement of damaged, leaking, or improperly functioning underground storage tanks (USTs) or associated pollution prevention devices. USTs must include monitoring devices for leak detection and be fitted with cathodic protection, catch basins, and overfill warning devices. The Army developed the TANKMAN system to provide installations with an on-line or real-time management tool that provides data on USTs. The use of TANKMAN software standardizes data reporting requirements into an Army-wide master database.

3.12.2.3 Pesticides

FIFRA requires the registration of pesticides to ensure that, when used according to label directions, they will not present unreasonable risks to human health or the

environment. Other federal regulations governing pesticide use and management include 29 CFR Part 1910, *OSHA Safety and Health Standards*; 40 CFR Chapter 1, Subchapter E, *Pesticide Programs*; 40 CFR Part 165, *Regulations for the Acceptance of Certain Pesticides and Recommended Procedures for the Disposal and Storage of Pesticide Containers*; and 40 CFR Part 171, *Certification of Pesticide Applicators*. Each state has its own regulations governing pesticide use, which is adhered to on Army installations. DoD sets forth pesticide management policy in DoD Directive 4150.7, *Pest Management Program*, and DoD 4160.21-M, *Defense Utilization and Disposal Manual*, Chapter 9, Hazardous Property Management. Army policy is provided in AR 200-1, *Environmental Protection and Enhancement*, and AR 200-5, *Pest Management*.

Preventive actions are key to pest management at Army installations. Under Army directives, Preventive Medicine officials conduct a proactive program that includes surveying pest populations and reporting the results to the facilities engineer, conducting an installation pesticide monitoring program, obtaining timely identification of pests and information on the susceptibility of pests to pesticides, establishing health and personnel safety criteria for pesticide operations, and providing pest management certification training.

3.12.2.4 Lead-Based Paint

Federal, state, and local regulations, both procedural and substantive, govern the management of lead-based paint (LBP), LBP additives, and LBP hazards. Army policy is to manage LBP in place unless it presents an imminent health threat as determined by the installation medical officer or unless operational, economic, or regulatory requirements dictate its removal.

Army policy also imposes requirements to reduce the release of lead, lead dust, or LBP into the environment from deteriorating paint surfaces, building maintenance, or other sources on Army installations or on Army-controlled property.

Army wastes contaminated with LBP are disposed of properly. Wastes are characterized to determine whether they are classifiable under applicable regulations as hazardous, special, or solid.

The DOD and the EPA have developed *Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property - A Field Guide,* Interim Final, December 1999, for achieving consistency in the application of lead-based paint requirements during the return of DOD excess infrastructure to productive use. The procedures in the guide are used primarily to address the requirements of Title X, the Residential Lead-Based Paint Hazard Reduction Act, a portion of the Housing and Community Development Act of 1992. It also includes implementing regulations under TSCA Section 403 and HUD Section 1012/1013. This guide addresses housing built before 1960, between 1960 and 1978, child-occupied facilities, and other target housing. The Army is actively complying with this new field guide.

3.12.2.5 Asbestos

During demolition, maintenance, repair, remediation, or renewal of buildings, asbestos can be released into the air. Asbestos is a friable material; that is, crumbling or breakage of asbestos-containing materials can release asbestos fibers into the air. Asbestos fibers can be released from various building materials, such as pipe and boiler wrap and other insulating materials and acoustic ceiling tiles.

NESHAPs regulate the demolition and renewal of buildings with asbestos-containing material. The EPA and states have policies that address leaving asbestos in place and thus not disturbing the material if its removal and disturbance would pose a health threat.

3.12.2.6 PCBs

The disposal of PCB compounds is regulated under TSCA, which bans the manufacture and distribution of PCBs with the exception of PCBs used in enclosed systems. By definition, PCB equipment is that which contains 500 parts per million (ppm) PCBs or more, PCB-contaminated equipment is that which contains PCB concentrations greater than 50 ppm but less than 500 ppm, and PCB items are those which contain PCB concentrations of 5 to 49 ppm. The EPA regulates the removal and disposal of all sources of PCBs containing 50 ppm or more; the regulations are more stringent for PCB equipment than for PCB-contaminated equipment.

3.12.2.7 Radon

The effects of exposure to radon are uncertain, primarily because it is difficult to isolate the effects on human beings of exposures to particular sources of radiation. It is now widely accepted that effects of radiation can occur at any dose, no matter how small—a theory called the linear, no-threshold hypothesis. According to this theory, there is no level of exposure below which no effect occurs. If the theory is correct, all exposure to radiation presents some health risk. The risk of lung cancer caused by exposure to radon through its inhalation is currently a topic of concern.

The Army has implemented a Radon Reduction Program to determine and control the levels of radon exposure of military personnel and their dependents. The Army has completed testing of most of its facilities as part of this program.

Army policy provides for ongoing radon management efforts. In accordance with AR 200-1, the Army maintains and updates records of completed radon assessments, includes radon testing results with real property and housing data to notify tenants and transferees of elevated radon levels. Army policy provides that indoor radon levels to be measured on newly constructed units and units converted to housing or continuously occupied structures (such as hospitals) located in high-radon-level areas are to be tested prior to occupancy. Where elevated levels of radon are encountered, Army facilities managers are to adhere to generally accepted abatement measures.

3.13 HUMAN HEALTH AND SAFETY

3.13.1 Definition and Description

A safe environment is one in which there is no or an optimally reduced potential for death, serious bodily injury or illness, or property damage. Human health and safety addresses (1) workers' health and safety during demolition activities and facility construction, (2) public safety during demolition and construction activities and during subsequent operation of facilities, and (3) aircraft and flight safety. Aircraft safety focuses on matters such as the potential for aircraft mishaps, airspace congestion, bird-aircraft strike hazards, munitions handling and use, flight obstructions, weather, and fire risks.

Construction work site safety is largely a matter of adherence to regulatory requirements imposed for the benefit of employees and implementation of operational practices that reduce risks of illness, injury, death, and property damage. The health and safety of on-site military and civilian workers are safeguarded by numerous DoD and Army regulations designed to comply with standards issued by the Occupational Safety and Health Administration and the EPA. These standards specify the amount and type of training required for industrial workers, the use of protective equipment and clothing, engineering controls, and maximum exposure limits for workplace stressors.

Various stressors in the environment can adversely affect human health and safety. Identification and control or elimination of these stressors can reduce risks to health and safety to acceptable levels.

- *Physical Stressors*. Physical hazards in the environment can cause disability, disease, or death. These stressors encompass a wide range of factors, such as dust, humidity, temperature, noise, and radiation. Impacts of physical stressors can also be highly dependent on season and climate. Dust can cause a fibrosis when deposited in the lungs. Some dust, such as cement dust, can be a nuisance but not directly disease-causing. Dust is associated with any activities that disturb the soil, such as industrial operations and demolition or construction of facilities. Acceptable levels of temperature, humidity, and glare are important to efficient task performance, prevention of fatigue, and general comfort. Length of exposure to extremes of temperature and humidity is critical. Mechanical vibration and noise can cause hearing loss and produce psychological and physical disturbances. Radiation includes alpha, beta, and gamma (X) rays; ultraviolet radiation; infrared microwaves; and laser radiation. Prolonged exposure to radiation can induce skin burns, elevate temperature, and cause death.

- *Behavioral Stressors*. Behavioral stressors include the effects of military activities on such psychological characteristics as emotion; motivation; the learning process; general behavior; and psychological needs such as freedom, space, privacy, and societal acceptance. Behavioral stressors can cause mental effects ranging from direct physical damage to the brain tissue to temporary irritability. Specific agents

that have been related in some way to the degradation of mental health include exposure to certain levels of lead, mercury, carbon monoxide, and some insecticides; excessive noise; inadequate housing and privacy; inadequate light and ventilation; and the lack of recreation, mental stimulation, and physical contact.

- *Psychological Stressors*. Some chemical and physical elements and situations can cause mental tension and strain. These psychological stressors are closely related to behavioral stressors. Psychological stressors can be physical in nature, such as traffic congestion, excessive noise, air pollution, or inadequate working and living facilities. They can also be emotional in nature, such as the effects of discrimination or sexual harassment. Stress is important from a health and safety viewpoint because it directly affects the quality of a person's mental and physical health, adversely affects task performance, and greatly increases the likelihood of accidents.

- *Chemical Stressors*. Several chemical substances have the potential to produce undesired or toxic health effects. Some chemicals act locally and some act systemically (requiring absorption into the blood stream). Locally acting toxicants, whether transmitted via the air or via direct contact, are often corrosive in nature and can adversely affect the skin, eyes, respiratory tract, or gastrointestinal tract. Depending on the chemical, systemically acting chemicals can enter the body in various ways, such as through the lungs, skin, or gastrointestinal tract. Chemical stressors can also be transmitted by air ; by ground water or surface water used for drinking, irrigation, or recreation; or by direct contact.

- *Endocrine Disrupters.* A relatively new but increasingly important health concern is "Endocrine Disrupters" (ED). EDs are generally caused by synthetic chemicals (e.g., pesticides), which, when absorbed into the body, can cause hormonal disruption. Disruption of the endocrine system can occur in various ways. For example, some chemicals may mimic a natural hormone, "fooling" the body into overresponding to the hormone. Other chemicals may block the effects of a hormone in parts of the body that are sensitive to it. Still others may directly stimulate or inhibit the endocrine system, leading to overproduction or underproduction of hormones. The EPA is investing significant resources in researching which chemicals may be involved, the patterns of exposure, the mechanisms of action in humans and wildlife, and the best means for testing to predict or screen for these effects. The EPA has also banned a number of the more environmentally persistent chemicals that have raised concerns about hormonal effects (PCBs, DDT, chlordane, aldrin/dieldrin, kepone, endrin, heptachlor, toxaphene, and2,4,5-T), and is working with the international community to limit production and use of these chemicals worldwide. Limiting the presence of endocrine disrupters should, therefore, be included in planning for facilities, systems, and equipment associated with the transforming force.

Safety and accident hazards can often be identified and reduced or eliminated. Necessary elements for an accident-prone situation or environment include the

presence of the hazard itself together with the exposed (and possibly susceptible) population. The degree of exposure depends primarily on the proximity of the hazard to the population. Activities that can be hazardous include transportation, maintenance and repair activities, and the creation of highly noisy environs. Construction hazards can be considered from the standpoint of both design criteria and the hazards associated with the construction process. The proper operation, maintenance, and repair of vehicles and equipment carry important safety implications. Any facility or area human use with a potential explosion or other rapid oxidation process creates unsafe environs for nearby populations. Extremely noisy environs can also mask verbal or mechanical warning signals, such as sirens, bells, or horns.

3.13.2 Army Human Health and Safety Management

The Assistant Secretary of the Army for Installations and Environment has overall responsibility for the Army's Human Health and Safety programs. Two Army regulations govern these programs: AR 385-10 *(The Army Safety Program)* and AR 40-5 *(Preventive Medicine)*.

AR 385-10 prescribes Department of the Army policy, responsibilities, and procedures to protect and preserve Army personnel and property against accidental loss. It provides for public safety incident to Army operations and activities and safe and healthful workplaces, procedures, and equipment. This regulation assures statutory and regulatory compliance with the Occupational Safety and Health Act of 1970 as implemented by Executive Order 12196. This regulation applies to the active Army, the Army National Guard, the Army Reserve, and Army civilian employees. During mobilization, chapters and policies contained in this regulation may be modified by the proponent.

Army Regulation 40-5 is a consolidation of several regulations that cover the Army's preventative medicine program. It establishes the practical measures for the preservation and promotion of health and the prevention of disease and injury. This regulation implements Executive Order 12196 and DoD Instructions 6050.5, 6055.1, 6055.5, and 6055.12. This regulation applies to all facilities controlled by the Army and to all elements of the Army. This includes military personnel on active duty, Army Reserve or National Guard personnel on active duty or in drill status, Military Academy cadets, Army Reserve Officer Training Corps cadets when engaged in directed training activities, foreign national military personnel assigned to Army components, and civilian personnel and nonappropriated fund employees who are employed by the Army on a worldwide basis.

Several other Army regulations are also important to the Army's Human Health program: AR 602-1 Human Factors Engineering Program, AR 602-2 Manpower and Personnel Integration (MANPRINT) in the Systems Acquisition Process, and AR 40-10 Health Hazard Assessment Program in support of the Army Materiel Acquisition Decision Process.

AR 602-1 covers the policies and procedures for human factors engineering (HFE) in the Department of the Army. It covers materiel acquisition procedures that influence the process of integrating the soldier and the material being acquired into a cost-effective system and emphasizes front-end planning, nondevelopmental item (NDI) acquisition, and material change management.

AR 602-2 is the basis for establishing effective integration of manpower, personnel, training, human engineering, health hazards, system safety and soldier survivability considerations into the acquisition of Army Materiel, Information, or Clothing and Individual Equipment (CIE) systems. It prescribes policies and assigns responsibilities for the Army MANPRINT program. The MANPRINT program influences the design of systems and associated support requirements so that developmental, nondevelopmental, and modified systems can be operated, maintained, and supported to improve total system performance and reduce cost of ownership by focusing on the capabilities and limitations of the human.

AR 40-10 describes the Army's Health Hazard Assessment Program in support of the Materiel Acquisition Decision Process. It lists the objectives, and policies, defines responsibilities, describes specific procedures, and discusses the preparation and distribution of the Health Hazard Assessment Report.

3.14 SOCIOECONOMIC RESOURCES

3.14.1 Definition and Description

Socioeconomics are defined as the basic attributes and resources associated with the human environment, particularly population and economic activity. Population levels are affected by regional birth and death rates and immigration and emigration. Economic activity typically encompasses employment, personal income, and industrial or commercial growth. Changes in these two fundamental socioeconomic indicators may be accompanied by changes in other components, such as housing availability and the provision of public services. Socioeconomic data at county, state, and national levels permits characterization of baseline conditions in the context of regional, state, and national trends.

- *Regional Economic Activity***.** Data in three areas provide key insights into socioeconomic conditions that might be affected by a proposed action. Data on employment may identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on personal income in a region can be used to compare the "before" and "after" effects of any jobs created or lost as a result of the proposed action. Data on industrial or commercial growth or growth in other sectors provide baseline and trend line information about the economic health of a region.

- *Installation Expenditures in Regional Economy*. In appropriate cases, data on an installation's expenditures in the regional economy help to identify the relative importance of an installation in terms of its purchasing power and jobs base.

- D*emographics*. Demographics identifies the population levels and changes to population levels of a region. Demographics data may also be obtained to identify, as appropriate to evaluation of a proposed action, the nearby population's characteristics in terms of race, ethnicity, poverty status, educational attainment level, and other broad indicators.

- *Quality of Life*. Quality of life data identify both necessities and amenities a population may have at its disposal. Quality of life typically pertains to availability of housing, type of housing (homeowner or rental), and costs of housing. Data may also be obtained to indicate the number of public and private schools, including trade schools and institutions of higher learning. Information may also be provided regarding the availability and proximity to population centers of shopping and community services. Finally, data may indicate the availability and type of recreational opportunities available to a community to indicate a region's quality of life.

- *Public Safety*. Public safety focuses on the availability of police, fire, and medical services.

- *Environmental Justice*. On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This Executive Order states: "To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands." The essential purpose of the Executive Order is to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, tribal, and local programs and policies. Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations near the sight of a proposed action. Such information aids in evaluating whether a proposed action would render vulnerable any of the groups targeted for protection in the Executive Order.

- *Aesthetics.* Visual resources are usually defined as areas of unique beauty. Visual resources typically are found in natural landscapes or the human aspect of land use.

  Natural landscapes are defined by a combination of geologic landforms, topography, water resources, and vegetation. Natural landscapes tend to be found in areas that have not been disturbed or developed. Natural landscapes commonly occur in wilderness areas, national and state forests, national grasslands, wildlife preserves and refuges, parks, and areas designated as wild and scenic rivers.

  The human aspect of land use may result in the creation of visual resources. In rural areas, visual resources can often be found where agricultural, forestry, or ranching land uses are characteristic. Scenic highways and scenic byways also contribute to the value of visual resources. In urban areas, visual resources are often found in the aesthetics of architecture or in districts or structures listed in the National Register of Historic Places.

  Changes in visual character are influenced by social considerations, including public value placed on the resource, public awareness of the area, and general community concern for visual resources in the area. These social considerations are addressed as visual sensitivity, which is defined as the degree of public interest in a visual resource and concern over adverse changes in the quality of that resource.

  Landforms, water surfaces, vegetation, and artificial features such as buildings and other structures are often considered characteristic of an area if they are inherent to the structure and function of the landscape. These features form the overall impression that an observer receives of an area or its landscape character.

- *Economic Development (Construction)*. Construction activity on Army installations would generate economic development in the region. Construction involves all types of construction activities, including the creation of buildings (e.g., office buildings, single-family homes, or apartment buildings), training facilities (e.g., multipurpose ranges), and infrastructure (i.e., roads, waste treatment facilities, etc.). The impact of construction activity on the local economy is felt through changes in civilian employment, local business sales volumes, personal income, and population. New construction could be expected to create new jobs, potentially increasing population and local income and spending. Typically, these impacts to the economy would be short-term.

- *Housing*. The availability of affordable quality housing is a key function of quality of life for soldiers and their families. Housing for Army personnel includes on-post and off-post facilities. On-post facilities are categorized as either family housing or unaccompanied personnel housing. The availability of housing depends on the number of personnel stationed at the installation and the amount and type of on-post housing. Information on the quantity and quality of off-post housing can be obtained from U.S. Census Bureau data and local governments.

- *Public Services*. Public services include law enforcement, fire protection, and medical services. A change in the distribution of forces across Army installations (stationing) or construction of new housing could create changes in population that would affect the demand for public services. Information is provided on the availability of the services, whether they are operating at full capacity, and if they would have the ability to expand to accommodate growth in the regional economy. Special issues pertaining to public services include determining who has legal authority over military housing areas (i.e., the federal government or the local community) and how payments are made to cover these expenditures.

- *Protection of Children*. On April 17, 1997, President Clinton issued Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. This Executive Order seeks to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities, and standards. When needed, the Army takes precautions for the safety of children; for example, by the use of fencing, limitations on access to certain areas, and provision of adult supervision.

- *Region of Influence (ROI)*. (Or define under "Regional Economic Activity") A geographic area for which the social and economic effects of project alternatives are analyzed. The criteria used to determine an ROI usually include the residency distribution of employees of the military installation, the employees' commuting distances and times, and the location of businesses providing goods and services to the installation. The ROI usually consists of one or more counties.

3.14.2 Army Management of Socioeconomic Resources

Management of Socioeconomics. The assessment of socioeconomic impacts resulting from Army actions can be one of the more controversial issues related to an Army action. The economic and social well-being of a local community can be dependent upon the activities of the installation. Disruptions to the status quo can become politically charged and emotion-laden. The objective of the Army's NEPA analysis is twofold. First, an open and realistic assessment of the potential effects must be performed, evaluated, and documented. Second, the process must be communicated to the general public in a manner that removes or reduces the emotion and politics and focuses on actual impacts and mitigation actions.

Socioeconomic impacts are assessed using the Economic Impact Forecast System (EIFS) model. The EIFS model is a computer-based economic tool that calculates multipliers to estimate the direct and indirect effects resulting from a given action. The Army, with the assistance of many academic professional economists and regional scientists, developed EIFS to address the economic impacts of NEPA-requiring actions and to measure their significance. Changes in installation employment and spending represent the direct effects of the action. Based on the input data and calculated multipliers, the model estimates changes in sales volume, employment, income,

population, housing, and school enrollments accounting for the direct and indirect effects of the action for a defined ROI.

If the socioeconomic impact analysis of the proposed action indicates "significance," the EIFS model results should be supplemented with a more detailed analysis. While such instances are rare, the greater detail and accuracy will be valuable in further mitigation planning. With EIFS, a higher input-output model is available for use. Called the Automated Input-Output Multiplier System (AIMS), the model adheres to the EIFS philosophy in ease of use but can provide sector-specific data for further analysis of significant impacts resulting from Army actions.

The mitigation of socioeconomic impacts is most often accomplished through time-phasing of the action. Spreading the action over a few years is often a good mechanism to lessen the "jolt" or severity of the economic impact and is often a pragmatic result of the logistics associated with realignment. The impact is often spread over a number of years to account for the need for facilities (such as housing) at gaining installations, a smooth transition, and other factors.

Management of Environmental Justice and Protection of Children Issues. Environmental justice issues and the protection of children must be considered and addressed in the NEPA process during the identification and analysis of the potential environmental and socioeconomic impacts of proposed Army actions. It is important for the Army to be sensitive to considerations of children and environmental justice throughout preparation of an EA or EIS. It is especially appropriate for this issue to be included in public scoping because during this early step in the NEPA process, minority and low-income populations can be identified, their participation facilitated, and their concerns determined. At this point in the process, any children that could be affected by the proposed action and how they would be affected can also be identified.

Minority, low-income groups, and children are integrated into the NEPA process at the beginning through public involvement. Public involvement meets two requirements of Executive Orders 12898 and 13045. First, it aids in identifying minority and low-income groups and actions that might put children at risk; second, it provides the means for these groups to participate in decision-making. Persons or organizations known or thought to have a potential interest in the proposed action are identified, informed, and given the opportunity to participate in the decision-making process through invitation to attend a public scoping meeting and through a coordination letter that invites submission of written comments to the Army.

Guidance in addressing environmental justice issues is provided in the Council on Environmental Quality's "Environmental Justice Under the National Environmental Policy Act" (1997) and DoD's "Strategy on Environmental Justice" (1995).

The following tables list race, ethnicity, and poverty statistics for each installation. The region of influence (ROI) for each site is first defined in Table 3-21. Then, Tables 3-22 through 3-45 show the percentage of population by race, ethnicity, and persons below

poverty for the ROI of each installation and, for comparative purposes, for the state (or states) where the installation is located and for the U.S. a whole. The source of the data for Tables 3-22 through 3-45 is the U.S. Census Bureau *State and County QuickFacts* (2001). Race and ethnicity data is for the year 2000. Note that persons of Hispanic or Latino origin may be of any race. Poverty data is for 1997, the most recent year available. The Census Bureau bases the poverty status of families and individuals on 48 threshold variables, including income, family size, number of family members under the age of 18 and over 65 years of age, and amount spent on food.

The following installations had at least a 5 percent or higher proportion of minority residents compared to the state and/or national minority rate: Fort Benning, GA, Fort Bliss, TX; Fort Bragg, NC; Fort Carson, CO; Fort Hood, TX; Fort Irwin, CA; Camp Shelby, MS; Fort Sill, OK; Fort Stewart, GA; Schofield Barracks/Puhakuloa, HI; Fort McClellan, AL; Fort Pickett, VA; and Fort A.P. Hill, VA. The following installations had a 5 percent or higher poverty rate than the state and/or national poverty rate: Fort Bliss, TX; Camp Shelby, MS; Fort Stewart, GA; and Fort Pickett, VA.

Table 3-21
Counties in the ROI for Each Installation

Installation	County or Counties in the ROI
Fort Benning	Chatahoochee and Muscogee, GA; Russell, AL
Camp Blanding	Clay, FL
Fort Bliss	El Paso and Hudspeth, TX; Dona Ana and Otero, NM
Fort Bragg	Cumberland, NC
Fort Campbell	Christian and Trigg, KY; Montgomery and Stewart, TN
Fort Carson	El Paso, Fremont, and Pueblo, CO
Fort Drum	Jefferson, NY
Fort Hood	Bell and Coryell, TX
Fort Irwin	San Bernardino, CA
Fort Knox	Bullitt, Hardin, and Meade, KY
Fort Lewis/Yakima	Pierce and Thurston, WA
Orchard Training Area	Ada and Elmore, ID
Fort Polk	Beauregard, Rapides, and Vernon, LA
Fort Riley	Clay, Geary, and Riley, KS
Camp Shelby	Forrest, MS
Fort Sill	Comanche, OK
Fort Stewart	Liberty, GA
Schofield Barracks/Puhakuloa	Honolulu, HI
Fort Wainwright/Richardson	Fairbanks North Star Borough, AK
FIG/Dix	Lebanon, PA/Burlington and Ocean, NJ
Fort McClellan	Calhoun, AL
Fort Pickett	Nottoway, VA
Fort Chaffee	Crawford, Franklin, Logan, and Sebastian, AR
Fort A.P. Hill	Caroline, VA

Table 3-22
Fort Benning, GA ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Alabama	Georgia	United States
White	55.1%	71.7%	65.1%	75.1%
Black or African American	38.1%	26.0%	28.7%	12.3%
American Indian and Alaska Native	0.5%	0.5%	0.3%	0.9%
Asian	1.2%	0.7%	2.1%	3.6%
Native Hawaiian and Other Pacific Islander	0.2%	NA	0.1%	0.1%
Other Race	2.6%	0.7%	2.4%	5.5%
Two or More Races	2.3%	1.0%	1.4%	2.4%
Hispanic or Latino	5.5%	1.7%	5.3%	12.5%
Persons Below Poverty (1997)	17.4%	16.2%	14.7%	13.3%

Table 3-23
Camp Blanding, FL ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Florida	United States
White	87.4%	78.0%	75.1%
Black or African American	6.7%	14.6%	12.3%
American Indian and Alaska Native	0.5%	0.3%	0.9%
Asian	2.0%	1.7%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%	0.1%
Other Race	1.3%	3.0%	5.5%
Two or More Races	2.0%	2.4%	2.4%
Hispanic or Latino	4.3%	16.8%	12.5%
Persons Below Poverty (1997)	7.7%	14.4%	13.3%

Table 3-24
Fort Bliss, TX ROI Race, Ethnicity, and Poverty Status 2000

	ROI	New Mexico	Texas	United States
White	75.7%	66.8%	71.0%	75.1%
Black or African American	2.2%	1.9%	11.5%	12.3%
American Indian and Alaska Native	2.4%	9.5%	0.6%	0.9%
Asian	0.8%	1.1%	2.7%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%	0.1%	0.1%
Other Race	15.8%	17.0%	11.7%	5.5%
Two or More Races	3.1%	3.6%	2.5%	2.4%
Hispanic or Latino	62.2%	42.1%	32.0%	12.5%
Persons Below Poverty (1997)	26.3%	19.3%	16.7%	13.3%

Table 3-25
Fort Bragg, NC ROI Race, Ethnicity, and Poverty Status 2000

	ROI	North Carolina	United States
White	55.2%	72.1%	75.1%
Black or African American	34.9%	21.6%	12.3%
American Indian and Alaska Native	1.5%	1.2%	0.9%
Asian	1.9%	1.4%	3.6%
Native Hawaiian and Other Pacific Islander	0.3%	NA	0.1%
Other Race	3.1%	2.3%	5.5%
Two or More Races	3.1%	1.3%	2.4%
Hispanic or Latino	6.9%	4.7%	12.5%
Persons Below Poverty (1997)	15.5%	12.6%	13.3%

Table 3-26
Fort Campbell, KY ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Kentucky	Tennessee	United States
White	81.7%	90.1%	80.2%	75.1%
Black or African American	13.5%	7.3%	16.4%	12.3%
American Indian and Alaska Native	0.5%	0.2%	0.3%	0.9%
Asian	1.1%	0.7%	1.0%	3.6%
Native Hawaiian and Other Pacific Islander	0.3%	NA	NA	0.1%
Other Race	1.2%	0.6%	1.0%	5.5%
Two or More Races	1.9%	1.1%	1.1%	2.4%
Hispanic or Latino	3.0%	1.5%	2.2%	12.5%
Persons Below Poverty (1997)	14.0%	16.0%	13.6%	13.3%

Table 3-27
Fort Carson, CO ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Colorado	United States
White	83.4%	82.8%	75.1%
Black or African American	4.6%	3.8%	12.3%
American Indian and Alaska Native	1.3%	1.0%	0.9%
Asian	1.2%	2.2%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%	0.1%
Other Race	6.3%	7.2%	5.5%
Two or More Races	3.0%	2.8%	2.4%
Hispanic or Latino	19.9%	17.1%	12.5%
Persons Below Poverty (1997)	14.9%	10.2%	13.3%

Table 3-28
Fort Drum, NY ROI Race, Ethnicity, and Poverty Status 2000

	ROI	New York	United States
White	88.7%	67.9%	75.1%
Black or African American	5.8%	15.9%	12.3%
American Indian and Alaska Native	0.5%	0.4%	0.9%
Asian	0.9%	5.5%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	NA	0.1%
Other Race	2.1%	7.1%	5.5%
Two or More Races	1.8%	3.1%	2.4%
Hispanic or Latino	4.2%	15.1%	12.5%
Persons Below Poverty (1997)	15.9%	15.6%	13.3%

Table 3-29
Fort Hood, Texas ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Texas	United States
White	64.4%	71.0%	75.1%
Black or African American	21.1%	11.5%	12.3%
American Indian and Alaska Native	0.8%	0.6%	0.9%
Asian	2.2%	2.7%	3.6%
Native Hawaiian and Other Pacific Islander	0.5%	0.1%	0.1%
Other Race	7.4%	11.7%	5.5%
Two or More Races	3.7%	2.5%	2.4%
Hispanic or Latino	14.7%	32.0%	12.5%
Persons Below Poverty (1997)	14.6%	16.7%	13.3%

Table 3-30
Fort Irwin, CA ROI Race, Ethnicity, and Poverty Status 2000

	ROI	California	United States
White	58.9%	59.5%	75.1%
Black or African American	9.1%	6.7%	12.3%
American Indian and Alaska Native	1.2%	1.0%	0.9%
Asian	4.7%	10.9%	3.6%
Native Hawaiian and Other Pacific Islander	0.3%	0.3%	0.1%
Other Race	20.8%	16.8%	5.5%
Two or More Races	5.0%	4.7%	2.4%
Hispanic or Latino	39.2%	32.4%	12.5%
Persons Below Poverty (1997)	17.9%	16.0%	13.3%

Table 3-31
Fort Knox, KY ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Kentucky	United States
White	90.8%	90.1%	75.1%
Black or African American	5.5%	7.3%	12.3%
American Indian and Alaska Native	0.4%	0.2%	0.9%
Asian	09.%	0.7%	3.6%
Native Hawaiian and Other Pacific Islander	0.2%	NA	0.1%
Other Race	0.8%	0.6%	5.5%
Two or More Races	1.5%	1.1%	2.4%
Hispanic or Latino	2.1%	1.5%	12.5%
Persons Below Poverty (1997)	11.1%	16.0%	13.3%

Table 3-32
Fort Lewis/Yakima, WA ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Washington	United States
White	82.1%	81.8%	75.1%
Black or African American	4.7%	3.2%	12.3%
American Indian and Alaska Native	1.5%	1.6%	0.9%
Asian	4.8%	5.5%	3.6%
Native Hawaiian and Other Pacific Islander	0.7%	0.4%	0.1%
Other Race	2.0%	3.9%	5.5%
Two or More Races	4.5%	3.6%	2.4%
Hispanic or Latino	5.0%	7.5%	12.5%
Persons Below Poverty (1997)	10.0%	10.2%	13.3%

Table 3-33
Orchard Training Area, ID ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Idaho	United States
White	89.2%	91.0%	75.1%
Black or African American	1.9%	0.4%	12.3%
American Indian and Alaska Native	0.8%	1.4%	0.9%
Asian	1.7%	0.9%	3.6%
Native Hawaiian and Other Pacific Islander	0.2%	0.1%	0.1%
Other Race	3.6%	4.2%	5.5%
Two or More Races	2.8%	2.0%	2.4%
Hispanic or Latino	8.3%	7.9%	12.5%
Persons Below Poverty (1997)	10.8%	13.0%	13.3%

Table 3-34
Fort Polk, LA ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Louisiana	United States
White	74.8%	63.9%	75.1%
Black or African American	20.1%	32.5%	12.3%
American Indian and Alaska Native	1.0%	0.6%	0.9%
Asian	1.0%	1.2%	3.6%
Native Hawaiian and Other Pacific Islander	0.3%	NA	0.1%
Other Race	1.1%	0.7%	5.5%
Two or More Races	1.9%	1.1%	2.4%
Hispanic or Latino	2.9%	2.4%	12.5%
Persons Below Poverty (1997)	17.4%	18.4%	13.3%

Table 3-35
Fort Riley, KS ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Kansas	United States
White	82.2%	86.1%	75.1%
Black or African American	9.8%	5.7%	12.3%
American Indian and Alaska Native	0.6%	0.9%	0.9%
Asian	2.2%	1.7%	3.6%
Native Hawaiian and Other Pacific Islander	0.2%	NA	0.1%
Other Race	2.1%	3.4%	5.5%
Two or More Races	2.9%	2.1%	2.4%
Hispanic or Latino	4.6%	7.0%	12.5%
Persons Below Poverty (1997)	14.1%	10.9%	13.3%

Table 3-36
Camp Shelby, MS ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Mississippi	United States
White	64.3%	61.4%	75.1%
Black or African American	33.6%	36.3%	12.3%
American Indian and Alaska Native	0.2%	0.4%	0.9%
Asian	0.7%	0.7%	3.6%
Native Hawaiian and Other Pacific Islander	NA	NA	0.1%
Other Race	0.4%	0.5%	5.5%
Two or More Races	0.8%	0.7%	2.4%
Hispanic or Latino	1.3%	1.4%	12.5%
Persons Below Poverty (1997)	18.3%	18.1%	13.3%

Table 3-37
Fort Sill, OK ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Oklahoma	United States
White	65.2%	76.2%	75.1%
Black or African American	19.0%	7.6%	12.3%
American Indian and Alaska Native	5.1%	7.9%	0.9%
Asian	2.1%	1.4%	3.6%
Native Hawaiian and Other Pacific Islander	0.4%	0.1%	0.1%
Other Race	3.5%	2.4%	5.5%
Two or More Races	4.7%	4.5%	2.4%
Hispanic or Latino	8.4%	5.2%	12.5%
Persons Below Poverty (1997)	17.6%	16.3%	13.3%

Table 3-38
Fort Stewart, GA ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Georgia	United States
White	46.6%	65.1%	75.1%
Black or African American	42.8%	28.7%	12.3%
American Indian and Alaska Native	0.5%	0.3%	0.9%
Asian	1.8%	2.1%	3.6%
Native Hawaiian and Other Pacific Islander	0.4%	0.1%	0.1%
Other Race	4.4%	2.4%	5.5%
Two or More Races	3.4%	1.4%	2.4%
Hispanic or Latino	8.2%	5.3%	12.5%
Persons Below Poverty (1997)	18.8%	14.7%	13.3%

Table 3-39
Schofield Barracks/Puhakuloa, HI ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Hawaii	United States
White	21.3%	24.3%	75.1%
Black or African American	2.4%	1.8%	12.3%
American Indian and Alaska Native	0.2%	0.3%	0.9%
Asian	46.0%	41.6%	3.6%
Native Hawaiian and Other Pacific Islander	8.9%	9.4%	0.1%
Other Race	1.3%	1.3%	5.5%
Two or More Races	19.9%	21.4%	2.4%
Hispanic or Latino	6.7%	7.2%	12.5%
Persons Below Poverty (1997)	10.2%	11.1%	13.3%

Table 3-40
Fort Wainwright/Richardson, AK ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Alaska	United States
White	77.8%	69.3%	75.1%
Black or African American	5.8%	3.5%	12.3%
American Indian and Alaska Native	6.9%	15.6%	0.9%
Asian	2.1%	4.0%	3.6%
Native Hawaiian and Other Pacific Islander	0.3%	0.5%	0.1%
Other Race	1.7%	1.6%	5.5%
Two or More Races	5.4%	5.4%	2.4%
Hispanic or Latino	4.2%	4.1%	12.5%
Persons Below Poverty (1997)	9.1%	11.2%	13.3%

Table 3-41
FIG/Dix, NJ ROI Race, Ethnicity, and Poverty Status 2000

	ROI	New Jersey	United States
White	78.4%	72.6%	75.1%
Black or African American	15.1%	13.6%	12.3%
American Indian and Alaska Native	0.2%	0.2%	0.9%
Asian	2.7%	5.7%	3.6%
Native Hawaiian and Other Pacific Islander	NA	NA	0.1%
Other Race	1.5%	5.4%	5.5%
Two or More Races	2.1%	2.5%	2.4%
Hispanic or Latino	4.2%	13.3%	12.5%
Persons Below Poverty (1997)	5.8%	9.3%	13.3%

Table 3-42
Fort McClellan, AL ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Alabama	United States
White	78.9%	71.1%	75.1%
Black or African American	18.5%	26.0%	12.3%
American Indian and Alaska Native	0.4%	0.5%	0.9%
Asian	0.6%	0.7%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	NA	0.1%
Other Race	0.6%	0.7%	5.5%
Two or More Races	1.0%	1.0%	2.4%
Hispanic or Latino	23.6%	25.3%	12.5%
Persons Below Poverty (1997)	1.6%	1.7%	13.3%

Table 3-43
Fort Pickett, VA ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Virginia	United States
White	57.2%	72.3%	75.1%
Black or African American	40.6%	19.6%	12.3%
American Indian and Alaska Native	0.1%	0.3%	0.9%
Asian	0.4%	3.7%	3.6%
Native Hawaiian and Other Pacific Islander	NA	0.1%	0.1%
Other Race	1.0%	2.0%	5.5%
Two or More Races	0.7%	2.0%	2.4%
Hispanic or Latino	1.6%	4.7%	12.5%
Persons Below Poverty (1997)	21.2%	11.6%	13.3%

Table 3-44
Fort Chaffee, AR ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Arkansas	United States
White	91.8%	80.0%	75.1%
Black or African American	2.2%	15.7%	12.3%
American Indian and Alaska Native	1.3%	0.7%	0.9%
Asian	1.3%	0.8%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%	0.1%
Other Race	1.6%	1.5%	5.5%
Two or More Races	1.9%	1.3%	2.4%
Hispanic or Latino	3.2%	3.2%	12.5%
Persons Below Poverty (1997)	16.6%	17.5%	13.3%

Table 3-45
Fort A.P. Hill, VA ROI Race, Ethnicity, and Poverty Status 2000

	ROI	Virginia	United States
White	62.6%	72.3%	75.1%
Black or African American	34.4%	19.6%	12.3%
American Indian and Alaska Native	0.8%	0.3%	0.9%
Asian	0.4%	3.7%	3.6%
Native Hawaiian and Other Pacific Islander	NA	0.1%	0.1%
Other Race	0.5%	2.0%	5.5%
Two or More Races	1.4%	2.0%	2.4%
Hispanic or Latino	1.3%	4.7%	12.5%
Persons Below Poverty (1997)	14.3%	11.6%	13.3%

This page intentionally left blank.

4.0 ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

4.1 INTRODUCTION

This section presents the Army's evaluation of direct, indirect, and cumulative environmental and socioeconomic effects that would be likely to occur upon implementation of the Army's program for transformation. Twelve resource areas are considered for potential effects: land use, real property (facilities and infrastructure), airspace, air quality, noise, water resources, geology and soils resources, biological resources, cultural resources, hazardous materials and wastes, human health and safety, and the sociological environment. The "no action" alternative is also evaluated.

The effects of the preferred alternative (proposed action) are evaluated by reference to the seven broad groups of transformation-related activities described in Section 2.1.5. The seven activity groups pertain to systems acquisitions, construction, land transaction, deployment, stationing, training, and institutional matters. The activity groups encompass and reflect the major components of operations associated with transforming the Army that have the greatest potential to affect the environment. The description of the environmental consequences of each resource area contains only those activity groups that present potential effects. At the conclusion of each resource evaluation in Sections 4.3 through 4.14, a general discussion of the effects of the "no action" alternative is provided. Cumulative effects and potential mitigation measures are also addressed.

The Army recognizes important constraints in its predicting effects. Most notably, the doctrine, operations, and physical aspects (equipment and real property) of the "end state" of transformation (the Objective Force) can only be estimated. For instance, the type, size, weight, shape, and speed of the principal combat vehicles, aircraft, and weapon systems of the Objective Force are presently undefined. As transformation unfolds, changes and refinements in transformation planning will continually occur. Accurate description and quantification of the nature and import of the changes become more elusive with longer time horizons. Effects likely to occur in the short term are more predictable than those that would occur in later years. Together, these factors increase the importance of the Army's adoption of principles supporting environmental sustainability and the use of an adaptive environmental management system to meet ever-changing circumstances.

4.2 THE TOTAL ARMY

This section provides an estimation on what the Army may look like in the future. It has been prepared as a basis for evaluation of effects that would occur during transformation. Specific descriptions such as weapon systems and equipment of the future, force levels, training requirements, the nature of circumstances external to the United States, and certainly future congressional resource allocations remain to be determined.

4.2.1 Mission

Over the course of transformation, the basic role of the Army as the Nation's primary strategic land force is not expected to change. With the rise of adversaries' use of strategies and tactics that seek to offset the combat strengths of the Army, there may be an increase in the types of missions the Army would be called upon to execute and new types of responses. In addition to it being prepared to fight and win wars, the Army may be called upon to conduct peacekeeping operations and small-scale operations on a more frequent basis. The occurrence of these changes depends on conditions throughout the world that are largely beyond the control of the United States. Throughout the period of transformation, the Army must retain the capabilities needed to meet the types of missions that it historically has performed.

4.2.2 Army Organization

Transformation would result in changes in the organization and personnel structure of the Army's warfighting elements. Conversion of brigades from existing “heavy” and “light” structures would result in organizations having approximately 3,500 personnel and more than 900 vehicles. Tables 4-1 and 4-2 show the personnel and major equipment of an Interim BCT as presently envisioned.[1]

Table 4-1
Interim BCT Personnel Strength

Unit	Personnel Strength
Headquarters, Headquarters Company	119
Maneuver Battalion	666
Maneuver Battalion	666
Maneuver Battalion	666
Reconnaissance, Surveillance, Target Acquisition Squadron	409
Signal Company	71
Antitank Company	51
Military Intelligence Company	71
Artillery Battalion (155mm)	273
Engineer Company	118
Brigade Support Battalion	382

[1] The Army continues to develop optimal organization and equipment for the organizations of the Objective Force. Information shown for the Interim BCT is subject to evaluation and change.

Table 4-2
Interim BCT Major Equipment

Type of Equipment	Quantity
Interim Armored Vehicles (IAV) Variants	
Infantry Carrier Vehicle	108
Mortar Carrier	36
Antitank Guided Missile	9
Reconnaissance	48
Fire Support	13
Engineer Squad	9
Commander's	39
Mobile Gun System	36
NBC Reconnaissance	3
Trucks	593
Weapons	
Howitzers, 155mm (towed)	18
Mortar, 120mm	12
Mortar, 81mm	18
Aircraft	
Unmanned Aerial Vehicles	3

The Army would retain its Legacy Force for more than a decade pending development, production, and fielding of the Future Combat System (FCS). The personnel structure and equipment of Legacy Forces organizations would not be expected to change materially in that time. Ultimately, both heavy forces and light forces would be reorganized and re-equipped to achieve the responsiveness, deployability, and other characteristics of the Objective Force.

Organizational changes in the Army's operating forces would occur first at the brigade level. Changes would also occur at echelons above brigades (divisions, corps, and Armies). The Army would revise its personnel and equipment structure pertaining to "division assets," such as tactical airlift (rotary wing aircraft), general support artillery, and logistics support. The nature of these changes, which would depend in part on experience gained with the Initial and Interim BCTs, remains to be determined.

The Army's operating forces are stationed at those installations that can provide adequate facilities (maneuver areas and ranges) and infrastructure support. For the foreseeable future, the Army would expect to conduct its transformation of existing operating forces "in-place." Relocation of units would not be anticipated. Organizations of the institutional Army (e.g., recruitment and schools functions) would also evolve as a result of transformation. For instance, some types of formal training schools might be consolidated, while others might be opened to deal specifically with new equipment or doctrine (i.e., the maintenance and employment of unmanned aerial vehicles).

4.2.3 Doctrine

The proposed transformation would involve substantial changes in doctrine for the day-to-day operation of the Army and for its execution of combat and noncombat missions. Systems acquisition would result in fielding of new equipment which, in turn, would affect the organizational and operational concepts of nearly every echelon of organization. For instance, the concepts for the Initial and Interim BCTs would be modified in light of fielding of a wheeled Interim Armored Vehicle (IAV) and a wheeled Mobile Gun System (MGS). As the Army would move toward an Objective Force, there would undoubtedly be further modification in doctrine governing joint and multilateral operations.

4.2.4 Installations

Army installations would be expected to undergo substantial changes as a result of the transformation program. Current land-use patterns and new training requirements would place a premium on the availability and adequacy of land for ranges, maneuver training, and other uses. Depending on mission-essential training tasks and determination of acreage required to train units adequately, training could shift in focus. Installations would create facilities to enable more training for operations in urban environments. Installations could also increase their capabilities to deploy forces rapidly. This would require construction or modification of airfields or ports, as well as creation of infrastructure such as warehousing capacity and marshalling areas to support more rapid throughput of deploying units. The role of simulation in reducing requirements for physical maneuver acreage and range facilities would likely increase over time, but its magnitude and site-specific applicability remains to be determined.

4.2.5 Major Systems

Systems acquisition provides one of the more visible indicators of the progress and nature of transformation activity. For at least the next decade, the Army would retain, basically intact, its heavy forces (in the Army's heavy divisions) which rely on presently fielded equipment and vehicles, most notably the Abrams tank and the Bradley Fighting Vehicle. Major new systems for the Interim Force, such as the IAV, MGS, and possibly some robotics and unmanned aerial platforms, would begin to be fielded as early as 2003.

The characteristics of the FCS remain to be determined. Most likely, the FCS would include unmanned robotic weapons platforms that soldiers in command vehicles would control based on battlefield intelligence obtained by aerial drones. Remotely controlled ground sensors on unmanned platforms could also locate and identify enemy targets. Ground commanders would have available to them both direct and indirect fire weapons systems. The weight of the FCS would likely not exceed 20 tons, enabling transport by C-130 or similar aircraft. A determination of the technological feasibility concerning the FCS could be made in the 2003 to 2005 time frame, with procurement expected to begin between 2008 and 2010.

Advances in technology would continue to play a dominant role in shaping the systems that the Army would adopt. Areas that would receive research and development attention for their possible application to Army operational systems include hybrid diesel-electric vehicle power plants, fuel cells, nanotechnology and microelectromechanical systems, and directed energy weapons and defensive systems.

4.2.6 Training

Training would continue to be the Army's principal peacetime activity. Individual and collective (unit) training requirements would be expected to increase over present levels to attain requisite proficiencies in use of new equipment and application of changed doctrine as rapidly as possible. Mission-essential task lists would be revised to reflect new weapons, vehicles, and other equipment. As noted above, the role of simulation training would continue to increase.

4.2.7 Army Stewardship of Environmental Resources

Stewardship of environmental resources would continue throughout transformation to preserve, conserve, and rehabilitate assets that support the Army mission. Institutional matters would be expected to bring new focus to two particular areas: recognition and implementation of environmental sustainability principles and greater use of adaptive management techniques. The development and implementation of an effective Army-wide environmental management system (EMS) would provide increased assurance of the Army's taking appropriate actions with respect to environmental matters by making them an integral part of the transformation process. The use of NEPA analysis to provide for timely, coherent, informed planning to support implementation of transformation would occur on an as-required basis. Because of their importance to successful achievement of the Army vision, especially transformation, each of these four areas is discussed further below.

Sustainability. Sustainable development is often defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." For the Army, sustainability encompasses more than principles related to development; sustainability includes concerns for perpetual use of land and natural resources, often in an undeveloped state. The Army has begun work toward implementing sustainable development concepts. In April 2000, the Army issued a memorandum on "Sustainable Development and Design," in which that concept was defined as "the systematic consideration of current and future resources, the economy, and quality of life." The memorandum states as Army policy the incorporation of sustainable design and development into installation planning and infrastructure projects. Sustainable facilities are the cornerstone of the Army's training base.

Adaptive Management. Adaptive management is based on the premise that ecosystems are complex and inherently unpredictable. The adaptive approach, already used by Army land and natural resource managers, embraces the uncertainties of system responses and attempts to structure management actions as planned and

monitored experiments from which learning is a critical product to be employed in subsequent management actions for the benefit of the system. Adaptive management involves four iterative continual types of actions: monitoring and gathering of information; evaluating (lessons learned); planning and setting directions; and acting, often collaborating with other agencies and neighboring communities. The Army employs the mitigation-monitoring program in AR 200-2 (*Environment Effects of Army Actions*) when carrying out projects affecting environmental resources. Depending on the Army's exploitation of opportunities to adopt adaptive management strategies, future actions would be accompanied by increased emphasis on the use of adaptive management strategies through installations' integrated natural and cultural resource management plans and the ITAM program.

Environmental Management Systems (EMS). The Army is presently developing an EMS, a tool for systematic management of environmental activities, products, and services. The EMS will be based on the *International Organization for Standardization Environmental Management System Specification Standard 14001* (ISO 14001 Standard) which includes five basic elements: environmental policy, planning, implementation and operation, checking and corrective action, and periodic management review.

Implementation of an EMS not later than December 31, 2005, is required by Executive Order 13148 (*Greening the Government Through Leadership in Environmental Management*). The Army plans to meet this requirement by adopting a mission-focused approach to its EMS. The proposed strategy is a phased implementation of the internationally recognized EMS Standard, ISO 14001, that is specifically aimed at improving overall mission performance, rather than purely environmental performance. The pending EMS is both a requirement and a strategic resource that would occur at the early stages of transformation of the Army. As it comes into being, EMS holds the promise of improving the overall mission activities at installations and providing a systematic approach for mitigating transformation-related effects and capitalizing on transformation's benefits.

The ISO 14001 Standard begins by inventorying the environmental aspects and effects of all operations, determining their significance, and setting priorities. The next step is the setting of goals, targets, and objectives for reducing significant environmental effects. The entire management system then drives toward achieving those goals. This process continues over time with periodic reviews of goals and targets, inventories, and the means for achieving the goals and targets. Use of the ISO 14001 Standard as the template for the Army's EMS improves interoperability throughout the Army and externally, provides a tool for outreach, and represents a proactive stance to cost and risk management. It also moves "environment" from what has historically been seen as an overhead function to a proactive mission resource, and it moves the Army to the standard of industry best practice.

NEPA. Ultimately, implementation of transformation would bring about change throughout the entire Army. Accordingly, the Army anticipates preparation of site-

specific installation- and project-level transformation-focused environmental impact analyses, tiered from this PEIS. Analyses would focus on outputs associated with the introduction of transformation at each installation or for the introduction of new systems. Specific matters that would be addressed in the tiered documentation would include stationing actions (descriptions of manpower strengths and equipment lists); training and its effects on the natural environment (based on predicted operational tempo); facilities, in terms of assignment, construction and demolition, and infrastructure adequacy; designation and management of maneuver areas and test ranges; and other programs and actions, such as the development and testing of new systems, having the potential for specific effects on the environment. Army proponents may stress two initiatives to reduce adverse effects: greater attention to and implementation of sustainability principles and increased use of collaborative adaptive management.

4.3 LAND USE

Proposed Action

Summary. Long-term direct adverse and beneficial effects would be expected. Land use would be expected to change based on the requirements of the Interim Force and, ultimately, the requirements of the Objective Force. As a result of implementing the type and magnitude of changes envisioned, the intensity and nature of installation land use and, in some cases, adjacent land use, would also be expected to change for activities such as systems acquisition, deployment, stationing, and training.

Systems Acquisition. Direct long-term adverse and beneficial effects would be expected. During the transition from the Legacy Force to the Interim Force, modifications of existing systems would not change land use at representative installations. Modernized and recapitalized equipment would be used in areas already classified for similar land use (i.e., airfields, training/range areas). Establishment of the Objective Force could require changes in land use at representative installations due to the introduction of new tactical doctrine utilizing the capabilities of new systems. Depending on the tactics employed for the newly-fielded systems, the changes could represent both adverse and beneficial effects. For instance, new systems could require reorienting existing ranges, resulting in changes in corresponding ranges, safety fans, and buffer zones. Compatibility of land use adjacent to installations could also become an issue. Beneficial effects could also occur with the addition of new systems such as simulators, if the system takes the place of real-time training within a training area.

Land Transactions. Long-term direct adverse and beneficial effects would be expected. Over the long term, acquisition, asset management, and disposal actions would involve alterations in existing land use patterns at representative installations. Acquisition of additional lands to support Interim Force and Objective Force requirements could, in the event such action were found to be necessary, reduce the availability of lands to other landowners or controlling agencies and for other purposes. In discrete locations, the creation of maneuver areas and ranges would reduce the inventory of land for multiple-use management, for potential tax revenues, or for other

ends. Land use compatibilities would continue to present management issues for lands presently held by the Army. That is, it would be expected that development of the Interim Force and Objective Force would involve highly robust training regimes characterized by use of heavy weapons, high mobility vehicles, and supporting aircraft. Continued public- and private-sector development of lands adjacent to Army installations could result in the persistence of encroachment. These outcomes would reflect adverse effects to land use. Additional base closure and realignment would result in disposal of property to allow economic development and management under public and private ownership. This would reflect long-term beneficial effects to land use.

Deployment. Short-term direct adverse effects would be expected. While overall installation land use would not be expected to change during deployments, an increase in the intensity of existing land use at an installation would be expected. Deployment could also require use of land adjacent to or near a representative installation. Although the intensity of land use would change, the duration is expected to be relatively short. The time frame is dependent on deployment requirements.

Stationing. Short- and long-term direct minor adverse effects would be expected. The distribution of forces across representative installations in support of Army transformation could require changes in existing land use patterns.

Training. Short- and long-term direct adverse effects would be expected. While overall installation land use would not be expected to change during training of the Interim Force, an increase in the intensity of existing land use at an installation would be expected. Land use requirements for the Objective Force are not yet known.

No Action Alternative

No large-scale additional or rapid increase in effects to land use would be expected. Changes in weapons systems, doctrine, and training would inevitably occur. Those changes would be of such infrequency or magnitude, however, as to have no substantial impacts to land use or compatibilities with adjoining properties.

4.4 REAL PROPERTY AND INFRASTRUCTURE

Proposed Action

Summary. Activities affecting real property and infrastructure would cause direct effects to several other resources such as land use. These effects would be both short-term and long-term. Additional base realignment and closure actions could reduce the inventory of real property and infrastructure. Disposal of excess properties would represent cost avoidance of their maintenance; if wholly or partially allocated to the Army, the savings could be applied to remaining assets or to other purposes, as appropriate.

Systems Acquisition. The fielding of new systems would affect real property and infrastructure. Tactical doctrine for use of new systems would likely alter demand for maneuver space. New weapon systems might require upgrades to existing ranges or the construction of new ranges at basing facilities. Upgrades may be in the form of digitizing the ranges (installing cables and wireless transmission facilities), expanding safety fans, or changing firing points and creating new safety fans. Multipurpose Training Ranges or Multipurpose Range Complexes may be built to accommodate new weapon systems. New weapon systems and vehicles might require additional or differently configured maintenance facilities. New types of systems, such as unmanned aerial vehicles or robotics, would likely require facilities expressly designed for their storage and maintenance. See the following discussion on construction for the consequences of these types of situations.

Construction. Direct adverse effects would be expected. The construction of new buildings, roads, and ranges would affect real property and infrastructure by adding to the inventory that must be maintained and changing the stress on the carrying capacity of existing utilities systems. Indirect effects of increasing real property and infrastructure resources through construction would include adverse impacts to air quality, the noise environment, surface waters, vegetation, and wildlife habitat.

Deployment. Direct adverse effects would be expected. Deployments involve intense, highly focused, time-critical activities. Deployment of forces would affect real property and infrastructure by requiring upgrades or new construction of airfields, staging areas at airfields, railheads, or ports to accommodate all required activities in a timely manner. Real property and infrastructure improvements would be based on peak deployment activity loads. See the preceding discussion on construction for identification of environmental consequences.

Training. Direct adverse effects would be expected. Training would affect real property and infrastructure by requiring the upgrading or construction of new ranges to accommodate new training methods and weapon systems. Expansion of maneuver areas to accommodate operational concepts of the Interim BCTs and subsequent forces would require the establishment of cross-country courses. The characteristic of a more mobile force would also affect infrastructure by requiring more roads. See the preceding discussion on construction for identification of environmental consequences.

No Action Alternative

No additional or increased effects to real property and infrastructure would be expected. The Army would continue to expend funds for acquisition of real property assets, for repair and maintenance of facilities, and for management of its real property and infrastructure. The effects of future base realignment and closure could also occur under this alternative.

4.5 AIRSPACE

Proposed Action

Summary. Army transformation would result in short- and long-term direct adverse effects to airspace use. Construction or modification of airfields and training and maneuver areas could result in changes to existing airspace use. Airspace use would be most affected by the brief intense activities of deployment exercises and by routine training exercises of varying intensities. Effects to airspace use would be dependent also upon the degree of use of modified or new systems and their associated support requirements (e.g., unmanned aerial vehicles).

Construction. Short- and long-term indirect adverse effects would be expected. Construction or modification of airfields could result in the need for modifications in airspace permits or related MOAs and MTRs. Construction of new training and maneuver areas could also require airspace modifications. Construction of new and modifications of existing airfields and training and maneuver areas could require changes in the AICUZ, Clear Zone, and the APZ designations for an installation.

Deployment. Short-term direct adverse effects would be expected. Deployment could result in temporary modifications to airspace use. The level and duration of the modifications of airspace use would be dependent on the intensity of the deployment exercise.

Training. Short- and long-term direct adverse effects would be expected. As with construction activities, training exercises for the Interim Force and Objective Force would require increased use of existing airspace or use of additional airspace. Fielding of new tactical unmanned aerial vehicles such as the Shadow 200 would occur. Doctrinal changes would place sections of tactical unmanned vehicles under the control of Interim BCT commanders. Together, these factors would result in considerably greater use of special use airspace over and adjacent to Army installation. Where existing airspace is insufficient or already saturated with military activity, installation commanders would have to seek additional special use airspace designations from the Federal Aviation Administration. Future new systems or modifications to existing systems could also affect airspace use, resulting in greater demand for exclusive military use of the resource.

No Action Alternative

No additional effects would be expected. There would be little change in airspace use with respect to the Army's rotary-wing assets. Division and corps commanders presently exercise operational control over unmanned aerial vehicles. The extent of training with these limited assets would not be expected to change materially over the short term.

4.6 AIR QUALITY

Proposed Action

Summary. Implementation of transformation in the Army would over the long-term result in a moderate overall improvement in ambient air quality at Army installations. Net improvement in air quality over present conditions would be attributable to continuing changes in vehicles, equipment, and processes; reductions in use of mobile sources in field training as the use and effectiveness of simulation training increases; and improved adherence to compliance standards through use of better management techniques.

In the short term, the Army's retention of and predominant reliance on the Legacy Force would have little effect on ambient air quality. Training in the use of existing and interim systems (vehicles, weapons, and other equipment) would not be expected to involve any material changes in generation of air emissions. Similarly, performance and maintenance of existing systems would not materially change except, perhaps, as a result of improvements in fuel efficiency. Numbers of mobile and stationary sources across the Army's inventory of installations would remain essentially static. There would be little, if any, variance in the numbers of tactical vehicles and privately-owned vehicles (commuters) or in the numbers of "process" emissions from maintenance shops and other sources (e.g., on-post dry cleaning establishments). In the short term, emissions from stationary sources could be reduced as the Army moves toward removal of WW II-era facilities and construction of new consolidated facilities having more efficient heating and cooling systems.

Changes in Army installations' ambient air quality would be expected to track the progression of transformation. It is anticipated future weapon systems would increasingly reflect successes in pollution prevention and reductions in air emissions. Beneficial effects to air quality would occur with the development and maturation of sustainability principles and the Army's environmental management systems. It is possible that toward the end of the transformation period, technologies such as use of fuel cells for production of electricity will have gained widespread acceptance, thus providing Army installations opportunities to dramatically reduce stationary source emissions.

Table 4-3 summarizes the potential effects on air quality of select events and changes for the short term (out to 5 years), the midterm (5 to 15 years), and the long term (more than 15 years).

Precise comparison through modeling of present and future air emissions is not available because the systems the Army would use in the future are, for the most part, only in the conceptualization and early design stages. For the IAV and MGS, air emissions data, maintenance cycles and procedures, and training operational tempo remain to be determined.

Actions supporting transformation of the Army would comply with requirements of the General Conformity Rule established in Section 176(c) of the Clean Air Act. To assure that federal activities do not hamper local efforts to control air pollution, the General Conformity Rule prohibits initiating any action that does not conform to an approved local, state, or federal implementation plan. Conformity means conformance to local plans for eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and to achieving attainment of such standards. Actions occurring in NAAQS attainment or maintenance areas require a Conformity Determination when the total direct and indirect emissions caused by the action would equal or exceed thresholds specified by the EPA. When the action would qualify for one of the exemptions in the rule or when emissions would not be de minimis (not meeting the specified thresholds), Army policy requires preparation of a Record of Nonapplicability to reflect a proponent's consideration of the Conformity Rule's requirements. Neither a Conformity Determination nor a Record of Nonapplicability has been prepared in conjunction with this PEIS because the Army is only at the threshold of efforts to achieve an Objective Force and because there are insufficient data to assess. Analyses tiered from this PEIS prepared for site- and project-specific proposals would include full compliance with the General Conformity Rule.

Table 4-3
Effects On Air Quality

Term	Activity	Effects
Short Term		
	Retention of Legacy Force	No effects
	Pollution prevention	Beneficial effects
	Demolition of older buildings	Beneficial effects through retirement of less efficient heating plants
	Fielding of IAV/MGS	Beneficial effects from incorporation of pollution prevention strategies
	Operation of IAV/MGS	Possible greater generation of fugitive dust in off-road operation
Midterm		
	Demolition of older buildings	Beneficial effects through retirement of less efficient heating plants
	Adoption of sustainability principles	More efficient uses of energy and fewer air emissions
	Use of lower sulphur-content fuels	Reduction in NAAQS criteria pollutant emissions
	Deployment training	Temporary increases in air emissions during intense activity periods
	Simulation training expansion	Beneficial effects through avoidance of vehicle use
	Regulatory changes	Reduced emissions as Army complies with changes pertaining to diesel exhaust. Carbon dioxide, and fuel sulfur-content regulations

Table 4-3
Effects On Air Quality

Term	Activity	Effects
Long Term		
	Development/use of fuel cells	Production of energy without combustion by-products/air emissions
	Objective Force training	Fewer vehicle emissions
	Wheeled vehicle fleet	Reduced vegetation damage resulting in less exposure of soils susceptible to creation of fugitive dust
	Use of UAVs	Reduced battlefield ground traffic and generation of emissions

The following discussions address specific facets of activity groups that could affect air quality.

Systems Acquisition. Direct beneficial and adverse effects would be expected. Army activities to recapitalize and modernize weapons systems and other equipment would occur throughout transformation and would be expected to result in a net reduction in air emissions. Program managers' incorporation of pollution prevention initiatives into the systems acquisition process would result, in the long term, in reduction in air emissions.

The IAV and MGS for the Interim BCTs would be wheeled. Their development and fielding would involve several issues related to air quality. The procurement program manager would consider these issues in the Programmatic Environmental, Safety, and Health Evaluation that supports the systems acquisition. Matters that would be addressed include, for instance,

- *Choice of Fuels.* JP-8, prescribed for all theater combat operations, is a derivative of diesel fuel. Changes to rules regulating the percentage content of diesel fuel could affect operations of the IAV. Also, in December 2000, the EPA established a control program to regulate heavy-duty vehicles and diesel fuel as a single system. The EPA has granted exemptions to JP-8 and to tactical vehicles. Since there is controversy surrounding the rules and they might be challenged, the efficacy of the exemptions cannot be assumed.

- *Applicability of Regulations.* The EPA presently exempts from regulation military tactical vehicles (defined as those being armored or having weapons mounted onboard). However, removal of vehicle engines for placement in test cells trigger stationary source rules involving emissions inventories, permits, and potential-to-emit considerations under Title V of the Clean Air Act. Fielding of the IAV and MGS to installations located in nonattainment or maintenance areas could, additionally, trigger requirements related to the General Conformity Rule of Section 176(c) of the Clean Air Act.

- *Fugitive Dust.* Wheeled vehicles, which are lighter and faster than tracked vehicles, would be operated extensively on unpaved roads or over rough or open terrain. Fugitive dust generated during military maneuvers, which is not exempted from air pollution regulations, must be included in each installation's air pollution emission inventory. Even though wheeled vehicles such as the IAV and MGS weigh less than Abrams tanks or Bradley Fighting Vehicles, they impose greater total pressure on the ground surface. This results in potentially greater effects to the immediate surfaces and potentially greater generation of fugitive dust. Table 4-4 compares the static ground pressure of a wheeled and a tracked vehicle.

Over the course of transformation, continued Army and DoD research would be expected to find suitable alternatives to all chlorofluorocarbons (CFCs) uses. CFCs, which historically have been widely used in air conditions, chillers, fire suppression systems, and precision metal parts cleaning, are compounds that have been identified as ozone-depleting substances. Their replacement would eliminate another potential source of harmful releases. With the exception of mission-critical use of Halon 1301 to support explosion suppression in Legacy ground combat systems, the Army Ozone Depleting Chemicals (ODCs)

Table 4-4
Vehicle Static Ground Pressure

Vehicle	Weight	Total Surface Contact Area	Surface Pressure*
Abrams Tank	140,000 lbs	54.0 sq ft	18.0 psi
IAV	38,000 lbs	4.88 sq ft	54.0 psi

* Surface pressure, measured in pounds per square inch, is derived by dividing the vehicle's gross weight by the surface area of the tracks or tires in contact with the ground. Each tank has two tracks, each with a "footprint" of approximately 18 feet by 18 inches. Each IAV would have eight tires, each of which would have a footprint of approximately 11 inches by 8 inches.

Elimination Program has eliminated Class 1 ODCs used in the operation or maintenance of weapon systems. Class I ODCs would not be approved for use in any future weapon systems. Remaining Class 1 ODCs in facilities are being recovered as systems are scheduled for replacement.

Construction. Direct adverse effects would be expected. Facilities construction to support transformation would affect air quality in the same manner as at present but at slightly elevated levels. Construction activities would increase slightly to support specialized types of training, such as combat in urban areas. There would also be an increase in deployment departure point-related construction to improve the throughput capacity of airfields, railheads, and ports. This construction would result in creation of additional warehousing, fuel storage, and staging areas.

Effects to air quality as a result of construction would involve generation of fugitive dust and construction vehicle emissions. Fugitive dust would occur as a result of demolition of existing structures when needed and as a result of site preparation (i.e., grading). The amount and variety of construction vehicle emissions would be dependent on the magnitude of any given project and the types of equipment required for its completion. Effects to air quality would, as a general rule, be of short-term duration.

Deployment. Direct adverse impacts would be expected. Transformation activities related to deployments would infrequently result in intense but minor increases in air emissions produced by aircraft and vehicles. Achievement of the Army vision's goals of responsive deployment time frames (a BCT in 96 hours, a division within five days, and five divisions within 30 days) would require increased numbers of both nontactical and tactical movements. These movements would result in intense periods of activities at airfields, railheads, and ports. Increased air emissions of hydrocarbons, carbon monoxide, nitrogen oxides, and particulate matter would occur at these sites for the duration of the deployment operations.

Training. No additional impacts to air quality would be expected. The effects of training on air quality throughout the proposed transformation of the Army would be approximately consistent with those presently experienced. For the near term and midterm, the Legacy Forces would continue to operate in essentially the same manner with the same, recapitalized, or modernized equipment. In the near term and midterm, the Interim Force would conduct its training based on the Brigade O&O (as well as O&O Concepts for other echelons, as they are developed). The brigades of the Interim Force would represent approximately ten percent of the Army's brigades; their personnel would represent less than five percent of the Army's manpower strength. This identifiable fraction of the Army would conduct training to enable achievement of the force characteristics cited in the Army vision. The training likely would involve more practice in the skills required for urban terrain combat, more practice in rapid deployments, and more simulation training for individual essential skills. Taken on whole, these activities would not be likely to create measurable changes in air emissions.

Potential effects on air quality resulting from training of the Objective Force are decidedly more difficult to predict and evaluate. Pending the outcome of science and technology reviews and subsequent development of the FCS, the principal systems of the Objective Force cannot be identified. A few factors, however, suggest there would be fewer adverse air emissions during training of the Objective Force:

- The Objective Force would train and operate with an all-wheeled vehicle fleet. The lighter power plants for these vehicles would produce fewer exhaust emissions.

- Tracked vehicles turn by "skidding"; while turning, there is one set of tracks motionless or moving more slowly than the other. Skidding scrapes the uppermost ground surface, exposing soils. With the IAV and MGS, on the other hand, the two forward axles turn, enabling the driver to "steer" much like any wheeled vehicle.

Elimination of heavy tracked vehicles from the vehicle inventory would also likely result in less vegetative destruction leading to soils exposure and loss through erosion.

- The introduction of aerial unmanned vehicles over the battlefield would reduce considerably the need for vehicular mobility to position troops for reconnaissance missions. The emissions of one or two UAVs would be expected to be far less than the exhaust emissions of armored personnel carriers or other battlefield transport means.

Institutional Matters. Institutional matters pose considerable opportunity for achievement of broad reductions in air emissions Army-wide. The three most relevant factors are:

- *Heating and Cooling Plant Removal/Replacement.* As a result of expansion of energy infrastructure in the private sector, the Army is able at reasonable cost to obtain natural gas and to install cleaner burner heating plants in its modernized and new facilities. In the short term and midterm as the Army continues to remove its older facilities there would be a steady decrease in the levels of undesirable air emissions produced by coal- and oil-fired boilers.

- *Development of Fuel Cell Technologies.* Fuel cells cleanly produce electricity and do not involve the adverse environmental consequences inherent in combustion of energy resources. Their wide adoption and use, however, are presently thwarted by safety, cost, and supporting infrastructure issues. Resolution of these issues would create a breakthrough situation, enabling the rapid rise of this environmentally friendly source of power production. In the interim, science and technology efforts prompted by transformation would continue feasibility exploration and development of "nongrid" uses of fuel cell technologies, such as for communications power sources and large diesel generator sets. Each adoption of use of fuel cells would represent additional emissions avoidance.

- *Implementation of Sustainable Design Principles.* The Army's sustainable design program seeks to promote energy-efficient siting, construction, and operation of facilities. As Army planners and designers gain further experience in these pursuits, greater amounts of energy will be conserved. Such energy conservation would reduce the amounts of energy-obtained from existing production sources and, accordingly, reflect decreases in air emissions from those sources.

No Action Alternative

No additional effects would be expected. Levels of air emissions presently produced by Army activities would generally continue, subject to slight incremental increase or decrease due to changes that would occur even in the absence of a program for transformation. The Army would continue to recapitalize and modernize its equipment and vehicles inventories, regulatory requirements would continue to evolve (generally

becoming more stringent), and the mobile and stationary sources associated with training and day-to-day facilities operations would continue to generate emissions of varying types and quantities. Air emissions resulting from Army operations would occur within the context of, and as authorized by, relevant air quality permits issued by appropriate authorities.

4.7 NOISE

Proposed Action

Summary. Army transformation would result in both direct adverse and beneficial effects. Short-term minor adverse effects could occur due to activities associated with construction, accelerated training, and deployment. Short-term adverse noise effects would likely occur during increased training exercises associated with unit conversions. However, in the long term, overall beneficial effects would likely occur with the use of new systems based on technological advances (i.e., reductions in engine noise).

Systems Acquisition. Direct beneficial effects would be expected. Modernization of existing equipment and the introduction of new systems could alter the current noise environment at installations. It is expected that the noise generated from modernized equipment would be similar or less than current levels. Based on advancement in technologies, new systems could produce less noise than current noise levels.

Construction. Short-term direct adverse effects would be expected. Construction and demolition activities (e.g., operation of heavy equipment, truck traffic) would contribute to temporary increases in noise levels but not to overall noise levels.

Deployment. Short-term direct adverse effects would be expected. Deployment by air would result in temporary increases in noise levels associated with staging area and airfield activities. These increases would generally be confined to the immediate vicinity of the departure airfield. The level and duration of the noise effects would be dependent on the intensity of the deployment exercise (e.g., whether activities would occur in the nighttime hours).

Training. Long-term direct beneficial effects would be expected. For Interim Force training, noise levels would likely be unaltered during exercises at training and maneuver areas since the Army would still employ most of its principal legacy systems and vehicles (Abrams tanks and Bradley Fighting Vehicles, howitzers, and utility and attack aircraft). Over the longer term, however, introduction of new systems such as the FCS would occur. The greater mobility and effective firing ranges of the newer systems result in greater dispersion of the noise generating sources. This dispersion would likely reduce the perceived noise levels of any single receptor at a given location. Moreover, it would be anticipated that future systems would be designed for quieter operation (to better avoid detection by opposing forces), resulting in less noise generation. Increased use of simulation training would favorably affect the noise environment through possible reductions in the number of live-fire exercises.

No Action Alternative

No additional effects would be expected. Noise levels of Army activities would generally continue, subject to slight incremental increase or decrease due to changes in training doctrine or employment of equipment.

4.8 WATER RESOURCES

Proposed Action

Summary. The activities associated with transformation would cause both direct and indirect adverse effects to water resources with considerable variability among locations. Effects would be of both short-term and long-term duration.

Systems Acquisition. Short-term and long-term direct and indirect adverse effects would be expected. Fielding of new systems would require operational testing that would be vigorous but controlled. Testing could result in direct effects on the physical stability of water bodies and water quality. Increased sedimentation, introduction of hydrocarbons and chemicals associated with mechanized systems, and disturbance of valuable aquatic habitat would be expected. Sensitive habitats (e.g., floodplains, wetlands, vernal pools) may be impacted directly through testing and indirectly by nonpoint source pollution caused by testing in nearby areas. Long-term effects can be expected to ground water resources, as spilled chemicals, hydrocarbons, and other synthetic substances are transferred through the soil and surface water bodies to ground water sources. Disposal of new systems may also result in long-term effects due to potential leaching or leaking of chemicals into both surface water and ground water.

Construction. Short-term and long-term indirect adverse effects would be expected. Construction of new buildings, ranges, and infrastructure would comply with all relevant federal and local laws and regulations. New development would normally be restricted from sensitive areas and not directly affect water resources. Indirect effects could be expected, however. Nonpoint source pollution generated from construction activities in areas close to water resources may include sedimentation from disturbed ground cover and introduction of hydrocarbons from construction vehicles. Repair and maintenance activities could be expected to generate similar indirect effects with nonpoint source pollution. In addition, possible runoff of herbicides and pesticides associated with some maintenance activities could also be considered as an indirect affect. Demolition and deconstruction would also be expected to generate nonpoint source pollutants, potentially affecting water bodies. Possible pollutants would include runoff of construction debris, sedimentation of water bodies from disturbed ground cover, and introduction of hydrocarbons from construction vehicles. Long-term effects would be expected as pollutants are transferred through the soil and surface water bodies to ground water sources. Long-term effects to aquatic habitat would also be expected as fish spawning areas become covered in sediment.

***Land Transactions*.** Long-term, indirect, beneficial effects and long-term, indirect, adverse effects would be expected to occur. Land acquisition would bring the additional level of federal protection to water resources. Programs under Army regulations for protection and enhancement of natural resources would be applied to any lands transferred from another federal agency or acquired from private landowners. Similarly, land disposal could create a long-term adverse affect on water resources, as they will no longer be held to strict Army regulations for natural resource protection. Water resources could also be subject to regulatory conflicts (e.g., water rights) and land-use conflicts for the entity purchasing the land.

Training. Short-term and long-term direct and indirect adverse effects would be expected. Training activities would result in short-term direct affects to the physical stability of water bodies and water quality. Increased sedimentation, introduction of hydrocarbons and chemicals associated with mechanized systems, and disturbance of valuable aquatic habitat would be expected. Sensitive habitats (e.g., floodplains, wetlands, vernal pools, fish spawning areas) may be impacted directly through training activities and indirectly by nonpoint source pollution caused by training in nearby areas. Long-term effects could be expected to ground water resources as spilled chemicals, hydrocarbons from vehicles, and other synthetic substances/debris are transferred through the soil and surface water bodies to ground water sources. Water quantity may also be adversely affected, as increased water usage would be expected during training exercises.

Institutional Matters. Long-term beneficial effects would be expected. As the management prescriptions included in integrated natural resource management plans are followed for water resources, beneficial effects would be expected. Legacy programs and existing permitting authorities would also continue to protect and enhance water resources.

No Action Alternative

Long-term direct beneficial effects would be expected. Army environmental stewardship efforts seek the enhanced conservation and protection of natural resources at Army installations. Consistent with this goal, the Army has begun to implement or is now at the threshold of implementing important programs and initiatives, such as Integrated Training Area Management, Integrated Natural Resources Management Plans, an EMS, and implementation of range sustainability principles. Programs and initiatives such as these, which would commence even in the absence of the proposed action, are expected to produce positive benefits to the targeted resources.

4.9 GEOLOGY AND SOILS

Proposed Action

Summary. Activities associated with transformation would cause direct adverse effects to soil resources. Differences from current practices would be related to use of wheeled

vehicles instead of tracked vehicles, expected increases in off-road training miles, and potential use of new, currently vegetated areas for construction, training, or deployment. Optimal use of soil resources would require that soil use be considered along with use of other resources so that it could be used sustainably for dedicated purposes and/or not damaged to the point where it could not be returned to other uses (such as natural areas or agricultural lands) when required.

Systems Acquisition. Effects related to systems acquisition are mostly unknown or vary considerably depending on circumstances. BCTs would use wheeled IAVs in the near term. Differences in environmental effects of tracked vehicles and wheeled vehicles have been discussed previously (see Section 4.6). Wheeled vehicles are lighter than tracked vehicles and would be operated extensively on unpaved roads or over rough or open terrain. Even though wheeled vehicles such as the IAV and MGS would weigh less than Abrams tanks or Bradley Fighting Vehicles, they would impose greater surface pressure[2]. The resulting surface pressure for the Abrams Tank is 18.0 psi, and for the wheeled IAV the surface pressure is 54.0 psi. This results in potentially greater effects to the immediate surfaces.

Tracked vehicles turn by "skidding"; while turning, there is one set of tracks motionless or moving more slowly than the other. Skidding scrapes the uppermost ground surface, exposing soils. With the IAV and MGS, on the other hand, the two forward axles turn, enabling the driver to "steer" much like any wheeled vehicle. Elimination of heavy tracked vehicles from the vehicle inventory would also likely result in less vegetative destruction leading to soils exposure and loss through erosion.

In general, wheeled vehicles with greater range and mobility would be expected to travel more miles during training. Future weapon systems capable of striking at long distances would be expected to use as much or more maneuver area than Legacy Force systems. To conduct training under realistic conditions, BCTs would be expected to make use of the greater mobility and striking range of their combat systems. Increased disturbance of soils and natural drainage systems would be expected if IAVs and future combat systems travel off established roads and into natural areas to achieve training realism.

Construction. Direct adverse effects would be expected. Construction of new facilities or expansion of existing facilities would be expected to remove vegetation and disturb soil. If most new construction were to take place in cantonment areas, new effects to soil would be minor or none. Using current construction BMPs, effects to soil would be minimal. In construction of new roads or widening old roads outside cantonment areas, there would be potential for soil disturbance, with the degree of disturbance depending

[2]Surface pressure, measured in pounds per square inch, is derived by dividing the vehicle's gross weight by the surface area of the tracks or the tires in contact with the ground. Each tank (the Abrams Tank weighing approximately 140,000 lbs) has 2 tracks, each with a "footprint" of approximately 18 feet by 18 inches. Each IAV (weighing approximately 38,000 lbs.) would have eight tires, each of which would have an estimated footprint of approximately 11 inches by 8 inches.

on sensitivity of the soil to erosion and on the implementation of existing construction BMPs.

Temporary soil disturbance created during construction activities might result in erosion and delivery of sediment to streams and wetlands. Excessive sediment deposition in streams and wetlands over long periods of time could alter the hydrology and morphology of the system.

Disturbance of topsoil makes agricultural use of land at a later time less likely to be successful. Once an area undergoes a certain amount of construction activities, it is difficult to return the land to natural vegetation or to agricultural use.

Deployment. Direct adverse effects would be expected. Increasing the speed of troop deployment under transformation would be expected to make necessary the expansion of existing airfields and support facilities. Effects to soil could be avoided or minimized in most cases, depending on circumstances.

Training. Direct adverse effects to soil would be expected. BCTs would be expected to operate IAVs and other tactical vehicles off-road as often or more often than Legacy Forces (Fort Lewis, 2000). Off-road travel by IAVs would have the potential to crush existing vegetation and to compact soil, making soil less able to support vegetation and more susceptible to erosion. Once soil is disturbed, it is more difficult for vegetation to reestablish itself. On one representative installation, repeated off-road vehicle movement through training areas has led to the replacement of native vegetation that tolerates only occasional disturbance with native or nonnative species with life cycles adapted to frequent disturbance (Fort Lewis, 2000). Plant species adapted to frequent structural damage and disturbed soils are often referred to as weeds. While this term is somewhat subjective, there are important reasons why Army land managers should preserve mature native vegetation and minimize conversion of training land vegetation to weed species.

Training activities resulting in loss of vegetative cover often lead to soil erosion and sediment delivery to streams. Drier climates with shorter growing seasons tend to feature more fragile vegetation and soils than wetter climates and climates with longer growing seasons. Slope, aspect, and soil type can be important factors in soil erodability at the installation level.

Institutional Matters. Effects related to institutional matters are not predictable. Protection and management of soil resources on representative installations is a cooperative effort among many interests. ITAM programs quantify and mitigate the effects of training on vegetation, soils, and wildlife. Range Control manages access of troops to training lands. On-base forestry programs and agricultural leases can beneficially affect habitat quality. Staffing and implementation of an EMS will materially aid the ability of the Army to protect soil resources during the transformation process.

No Action Alternative

No additional or increased effects would be expected. Changes in landform and soil losses through sedimentation in connection with construction activities would be expected to continue at generally their present levels. Training exercises would be generally expected to continue at their present locations, frequencies, and durations. Incidental adverse effects to soils associated with training would be subject to protective and rehabilitative measures through the Land Rehabilitation and Maintenance component of the Integrated Training Area Management Program.

4.10 BIOLOGICAL RESOURCES

Proposed Action

Summary. The activities associated with transformation would cause adverse and beneficial effects to biological resources. These effects would be both short-term and long-term. Training and construction activities would create the majority of adverse effects. Army land stewardship initiatives aimed at range and maneuver area sustainability would be expected to ameliorate adverse effects and generate beneficial effects.

Construction. Direct adverse effects would be expected. Construction of new facilities or expansion of existing facilities would be expected to remove vegetation and displace wildlife species. If most new construction takes place in cantonment areas, then effects to wildlife habitat, native vegetation, and wetlands would be negligible or none. Construction of new roads or widening old roads outside cantonment areas might fragment existing wildlife habitat. Species that thrive in habitat edges would be expected to benefit, while species needing large tracts of contiguous habitat would be expected to decline. While traditional field exercises temporarily disturb vegetation and wildlife, construction of urban warfare training areas outside cantonment areas would most likely result in near permanent wildlife habitat loss in the long term. Temporary soil disturbance created during construction activities might result in erosion and delivery of sediment to streams and wetlands. Excessive sediment deposition in streams and wetlands could stress some aquatic plants and smother benthic invertebrates and fish eggs. Long-term sedimentation to a stream or wetland could alter the hydrology and morphology of the system such that habitat conditions are no longer adequate for the survival of aquatic wildlife present before sedimentation occurred.

Land Transactions. Direct adverse and beneficial effects would be expected. Land management approaches differ among private, state, and federal landholding entities. The applicability of requirements concerning species protection would change if land changed into or out of DoD ownership. Under the Endangered Species Act, species protection on federal land is more comprehensive than on private land because federal land managers must consult with the appropriate state and federal wildlife agencies when their actions may jeopardize species. All federal agencies, including the Army, are directed to protect threatened and endangered species and their habitat. Critical

habitat designations affect only federal agency actions or federally funded or permitted activities (FWS, 2001). Protection for threatened and endangered species on private and state lands relies heavily on incentive programs and partnerships between federal, state, and private interests to protect species and their habitat. Some beneficial effects would be expected for protected species on land passing into Army ownership, while effects to species on land passing out of Army ownership are unknown and could depend on the environmental policies of the purchaser.

Management of game animals and timber harvest would also be expected to change if private land was purchased by the Army or if Army lands were disposed of to private or state ownership. Army activities such as construction and training can cause adverse effects to various environmental resources, including biological resources. However, Army land stewardship programs exist to address known and potential effects. Under one scenario, beneficial effects would be expected during Army land acquisition because Army land stewardship initiatives would apply to recently purchased lands. Conversely, land disposed of by the Army would lose protections afforded by Army land management practices. Ultimately, the impact to wildlife and vegetation from land transactions would depend on whether overall natural resource management would improve or deteriorate as a result of the land transaction.

Effects to wetlands would not be expected due to land transactions. Wetlands are protected by Clean Water Act legislation wherever they occur. Permits to dredge or fill wetlands must be obtained from the Army Corps of Engineers by federal, state, local, and private landowners. Wetlands regulations apply similarly to both federal and nonfederal lands.

Deployment. Negligible adverse effects would be expected. Increasing the speed of troop deployment under transformation would be expected to make necessary the expansion of existing airfields and support facilities. Effects to wildlife habitat and natural vegetation would be minimal if airfield improvements take place in already disturbed areas. However, if new airfields are constructed in existing natural areas, then wildlife habitat and natural vegetation would be lost to development.

Stationing. Indirect adverse effects would be expected. Stationing would not be expected to directly impact biological resources. Stationing effects would be expected to be the result of construction and field training activities undertaken by troops stationed at representative installations.

Training. Direct adverse effects to vegetation would be expected. BCTs would be expected to operate IAVs and other tactical vehicles off-road as often or more often than Legacy Forces (Fort Lewis, 2000). Off-road travel by IAVs has the potential to crush existing vegetation and compact soil. Once soil is disturbed, it is more difficult for vegetation to reestablish itself. On one representative installation, repeated off-road vehicle movement through training areas has led to the replacement of native vegetation that tolerates only occasional disturbance with native or nonnative species with life cycles adapted to frequent disturbance (Fort Lewis, 2000). Plant species

adapted to frequent structural damage and disturbed soils are often referred to as weeds.

There are important reasons why Army land managers should preserve mature native vegetation and minimize conversion of training land vegetation to weed species. From an ecological perspective, elimination of mature natural vegetation deprives certain wildlife species that are dependent on that vegetation the habitat they need to live and reproduce. Chronic destruction of native vegetation can decrease diversity of rare and common plant species in the long term. Vegetation removal can also lead to soil erosion and sedimentation to streams. From a training perspective, mature native vegetation provides troops with realistic training conditions. Mature vegetation, specifically shrublands and forests, provides concealment for troops during training exercises. Troops trained mostly in open fields of weeds might not be as prepared to fight as those trained in a variety of terrain characteristics, including mature native vegetation.

The fragility of vegetative communities to incur vehicle damage would be expected to be dependent on the climatic conditions of each representative installation. Drier climates with shorter growing seasons tend to feature more fragile vegetation than wetter climates and climates with longer growing seasons. Vegetation fragility may also vary across the land area of each installation. Slope, cardinal direction of slope (aspect), and soil type can be important factors in plant growth and survival at the installation level.

Minor adverse effects to wildlife would be expected. Limited incidence of road kill by vehicles would be expected, especially during training after dark. Vehicles operating off-road might also destroy burrows and entrances of mammal and reptile dens. Long-term and cumulative effects to bird survival and reproduction would most likely be related to habitat alteration through destruction of native vegetation by off-road vehicle movement and digging (Fort Lewis, 2000). Birds requiring tracts of contiguous vegetation would be adversely affected, while bird species preferring edge habitats would suffer fewer effects. Mechanical digging to create defensive positions would be expected to cause localized damage to plant roots and animal burrows. Noise from practice and live munitions would be expected to momentarily startle wildlife. Long-term and cumulative wildlife sensitivity to noise is specific to each species and, with respect to many species, is not well understood. Time of year is an important consideration for calculating effects of noise and physical disturbances. Disturbances during breeding seasons would be expected to have a greater impact on wildlife reproduction than disturbances at other times of the year.

Long-term adverse effects of training to wetlands and protected species would be expected. Wetlands and species habitat have been identified on most of the representative installations. Wetlands fall under the federal protection of the Clean Water Act. Army activities that might alter wetlands are subject to review by the Army Corps of Engineers. Protected species are, by definition, rare; in most cases they do not require large percentages of installation training land to survive (although some bird

species do not conform to this observation). Installation environmental staff discourage disruptive training activities in wetlands and protected species habitat by use of signage, road closures, and installation environmental awareness initiatives. In some sensitive habitats, training is limited to foot traffic only (Fort Lewis, 2000). While direct physical harm to wetlands might be mostly avoidable, some long-term adverse effects would be expected. For example, effects to soils and vegetation upstream of wetlands can cause alteration to the hydrology of the catchment area supplying surface and ground water to the wetland. Long-term adverse effects are also possible for protected wildlife species that stray beyond delineated areas during the course of an entire year. Some adverse effects could occur if protected wildlife species stray into unrestricted areas during training exercises. If populations of protected species increase and expand their range outside areas that have been identified and delineated by environmental personnel, encroachment conflicts would be expected to develop between protected species and training needs.

Institutional Matters. Long-term direct beneficial effects would be expected. Protection and management of biological resources on representative installations is a cooperative effort between many different interests. ITAM programs quantify and mitigate the effects of training on vegetation, soils, and wildlife. Range Control manages access of troops to training lands. On-base forestry programs and agricultural leases can strongly influence habitat quality. Other organizations, such as the Army Corps of Engineers, provide oversight and consultation to installations to resolve wetlands issues. Staffing and implementation of environmental management systems by the entities mentioned above affects the ability of the Army to protect biological resources during the transformation process. It would be expected that throughout transformation, the Army would identify additional measures to ensure the appropriate execution of its stewardship obligations.

No Action Alternative

Long-term direct beneficial effects would be expected. Army environmental stewardship efforts seek the enhanced conservation and protection of natural resources at Army installations. Consistent with this goal, the Army has begun to implement or is now at the threshold of implementing important programs and initiatives, such as Integrated Training Area Management, Integrated Natural Resources Management Plans, an EMS, and implementation of range sustainability principles. Programs and initiatives such as these, which would commence even in the absence of the proposed action, are expected to produce positive benefits to the targeted resources.

4.11 CULTURAL RESOURCES

Proposed Action

Summary. Long-term direct adverse and beneficial effects would be expected. Throughout the period of transformation, the Army would continue to exercise diligence with respect to archaeological sites, traditional cultural and historic properties, and

paleontological resources presently within its control. Notwithstanding the Army's responsible management pursuant to federal law and regulations, however, actions within the construction and training activity groups pose various risks of harm to cultural resources. Installation commanders' adherence to Integrated Cultural Resources Management Plans would minimize these potential risks. Land transactions involving private land could result in beneficial effects through the provision of federal protections to cultural resources on any private land that might be purchased.

Construction. Long-term direct adverse effects would be expected. Construction activities associated with the Army's huge inventory of lands, facilities, and infrastructure pose risks to archaeological sites, traditional cultural properties, and paleontological resources. Earth-moving activities (digging, bulldozing, grading, etc.) at construction sites would heavily disturb soils and could result in adverse impacts to these resources. Maintenance, repair, alteration, and demolition activities pose risks to historic structures and districts. Consultation pursuant to Section 106 of the National Historic Preservation Act would minimize potential effects on historic resources.

Land Transactions. Long-term direct beneficial effects would be expected. Acquisition of additional lands, should it be found necessary, could bring the extra level of protection to cultural resources that is afforded by federal law and regulations. Lands acquired by the Army, whether acquired from nonfederal sources or transferred from other federal agencies, would be subject to management under the federal statutes that provide for preservation of archaeological sites, traditional cultural properties, and paleontological resources. In real property disposal actions, the Army may encumber property with restrictions requiring future owners to preserve specifically identified resources found on the land.

Training. Long-term direct adverse effects would be expected. Archaeological sites, traditional cultural properties, and paleontological resources could be exposed and consequently impaired through various types of training activities, such as earth-moving (e.g., troops' digging of defensive positions), use of explosives, and cross-country operation of vehicles. Consistent with locally prepared Integrated Natural Resources Management Plans, use of signs to mark areas known to have resources, road closures, and installation environmental awareness initiatives would help to preserve cultural resources. These measures would reduce but likely not eliminate completely potential risks of their loss or impairment.

No Action Alternative

Long-term direct adverse and beneficial effects would be expected. The potential for adverse effects on cultural resources exists without regard to implementation of the proposed action. The preceding discussion concerning the proposed action is equally applicable to the "no action" alternative.

4.12 HAZARDOUS MATERIALS AND HAZARDOUS WASTES

Proposed Action

Summary. Direct beneficial and adverse effects would be expected. The beneficial effects would occur within the context of systems acquisition and land activities. Adverse effects would occur with respect to increased facility construction and modification.

Systems Acquisition. Systems acquisition activities in support of Army transformation would be expected to involve beneficial effects concerning hazardous materials and hazardous wastes. Development, testing, production, fielding, and disposal of weapons systems and equipment generally involves the use and production of varying quantities of hazardous materials and wastes in laboratory, manufacture, test range, and installation settings. The nature of hazardous materials and wastes involved in systems acquisition would be expected to decrease over time with the continuing attention that the systems acquisition community devotes to pollution prevention initiatives. Weapons and equipment development and testing have the potential to benefit from increased uses of computer simulation. Where such simulations are feasible, developmental and testing activities can occur without posing risks to the natural environment.

Construction. Direct adverse effects would be expected. Transformation of the Army would require creation of substantial urban and semi-urban settings to support the types of training necessary to meet future mission requirements. In general, the Army acquires its needed facilities through use of existing facilities as they are, renovation of existing facilities, leasing, or construction of new facilities. Many construction projects involve demolition prior to renovation or construction, as well as considerations of underground storage tanks (USTs), lead-based paint (LBP), asbestos, polychlorinated biphenyls (PCBs), and radon. Each may involve some use of hazardous materials or the generation of hazardous wastes. Table 4-5 identifies these kinds of considerations.

Facility renovation, demolition, and construction would be expected to occur at all installations subject to the transformation process. Hazardous materials and wastes would be used, generated, stored, and disposed of in connection with these activities. This would create additional demand for storage and disposal capacity; the demand would have to be accommodated at the local level at each installation. The use, storage, and disposal of materials and wastes associated with construction involve issues that are addressed by existing comprehensive Army policies, regulations, and guidelines which have, in the past, proven to be adequate to provide for their management in an environmentally sound manner. Activities would follow the label instructions for storage, use, application and disposal in the proper management of all hazardous materials.

Land Transactions. Direct beneficial effects would be expected. Throughout the period of transformation, the Army would continue its IRP to return contaminated lands to fully usable status. Hazardous waste issues related to land transactions that must be

Table 4-5
Facilities: Hazardous Materials and Wastes Issues

Action Alternative	Issues
Use of existing facilities	UST maintenance and replacement
	Existing LBP
	Existing asbestos
	Existing equipment with PCBs
	Radon
Renovation of existing facilities	UST replacement and disposal
	LBP removal/disposal
	Asbestos disposal
	Replacement of PCB-containing equipment
	Radon
Demolition of existing facilities	UST disposal
	LBP disposal
	Asbestos disposal
	Disposal of PCB-containing equipment
Construction of new facilities	Installation of new USTs
	Radon

considered include ensuring that hazardous contamination does not prevent land from being used for its intended use by posing an unacceptable risk to the environment or human health. Typically, cleanup of contamination when its use classification is changed or when it is transferred from Army to non-Army use is required. The Army adheres to EPA and state requirements in all land transactions, and the Army is committed to full public involvement when land transactions could potentially affect the public.

No Action Alternative

Long-term direct beneficial effects would be expected. Existing programs for the management of hazardous materials and wastes would continue. Abatement actions to deal with threats arising from past hazardous wastes practices would also continue. Hazardous materials management and pollution prevention programs for weapons systems and facilities would reduce or eliminate future environmental impacts.

4.13 HUMAN HEALTH AND SAFETY

Proposed Action

Summary. Long-term direct adverse and beneficial effects would be expected. Beneficial effects would be expected with respect to systems acquisition, training, and

institutional matters. Adverse effects would be expected with respect to construction and deployment.

Systems Acquisition. Direct beneficial impacts would be expected. The MANPRINT program would continue to be applied in the development, testing, production, fielding, and decommissioning of new systems. As appropriate, new systems would be accompanied by equipment-specific safety procedures designed to enhance operator safety and to minimize environmental impacts. These considerations would be guided primarily by AR 385-10 (*The Army Safety Program*) and AR 40-5 (*Preventive Medicine*).

Improvements in systems to increase their lethality (an Objective Force characteristic) would likely involve certain weapons' having greater ranges or more effective and destructive explosive power. These would likely require modification of existing ranges or new ranges to accommodate their use. Modification or construction of ranges would include full consideration of impact area, firing fan, and safety buffer requirements to enhance soldiers' safety and to reduce or minimize effects on environmental resources.

Construction. Direct adverse impacts would be expected. Transformation would be expected to increase requirements for construction, demolition, and repair of buildings, roads, and ranges. Such increases would be accompanied by proportionate increases risks with respect to accidents and worker safety.

Deployment. Direct adverse impacts would be expected. Deployment of forces would impact on human health and safety by increasing the risk of accidents due to the intense, highly focused, time-critical activities associated with deployment of forces. Loading and unloading means of movement (aircraft, trucks, and railcars) and moving equipment and personnel by rail, sea, and air increase the opportunity for procedures to be missed or overlooked. Such errors or oversights increase probabilities for accidents.

Training. Direct beneficial effects would be expected. Introduction of new weapon systems, equipment, and vehicles would continue to be accompanied by thorough training. Individuals' qualifications with respect to the new items would tend to be, as at present, step-wise. A soldier may first be provided classroom instruction and then "hands-on" instruction in disassembly, assembly, and maintenance of an item. These would be followed by dry-fire and then live-fire. Commanders would continue to give their closest attention to the safety of their personnel. Given the vast amounts and various kinds of training Army personnel would be engaged in, increased use of simulation training would be expected to have only a negligible impact on health and safety.

Institutional Matters. Direct beneficial effects would be expected. The Army's MANPRINT program was specifically developed to design future weapons systems from the standpoint of human capabilities and limitations. This program would continue to provide beneficial impacts to human health and safety.

No Action Alternative

No increase in effects would be expected.

4.14 SOCIOECONOMIC RESOURCES

Proposed Action

Summary. At the national level of assessment addressed in this PEIS, no effects to socioeconomic resources would be expected. Although work force levels at individual installations or within communities linked strongly to some defense industries could be affected by transformation, overall troop levels and associated civilian employment would likely remain essentially unchanged. The Nation's military force levels are determined by national security policy decisions and would not be affected by the proposed action. Employment changes could, however, take place at the installation or local community level and, in such cases, the resulting economic effects would be assessed in a site-level EA or EIS.

Similarly, other actions performed in conjunction with transformation could have local or regional economic effects. For example, construction activity at a specific installation could lead to a short-term increase in regional economic activity with associated effects in the ROI to income and employment. Such effects would also be assessed in a site-level EA or EIS, when the specifics of a proposed action would be defined. Although it is possible that transformation could lead to an overall increase in construction activities performed by the Army, the economic effects of these activities on the national economy would be extremely small.

Implementation of the proposed action would be consistent with the goals for achievement of environmental justice as articulated in Executive Order 12898. Transformation would occur wherever the Army has a presence and would affect all soldiers, civilian employees, and neighboring communities. Impacts related to activities supporting transformation would not be disproportionate on any group, and there would be no exclusions of persons, denial of benefits, or discrimination because of their race, color, or national origin. Implementation would also comport with the objectives of Executive Order 13045. The Army would ensure that its actions would not pose any risks of safety to children, whether resident on an installation or present as a visitor.

No Action Alternative

No change in effects would be expected, as change would occur on a more evolutionary scale.

4.15 CUMULATIVE EFFECTS

There is a growing recognition that the combined incremental effects of various human activities on a resource—cumulative effects—can pose a threat to the resource. While

each such effect may be insignificant by itself, adverse effects from multiple sources occurring at different times can build up and can result in serious degradation of a resource.

The Council on Environmental Quality's regulations for implementing the procedural provisions of NEPA defines cumulative effects as the "effects on the environment, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions." The consideration of cumulative effects is included in Army analyses prepared under NEPA.

For a program such as Army transformation (or an evolutionary change such as would occur under the "no action" alternative), activities with the potential for producing adverse effects would be occurring at many different locations nationwide. At this scale, cumulative effects to a resource contributed to by an Army program activity would have either to affect the resource on a nationwide basis (or, arguably, on a regional basis) or be likely to affect all or most such resources near a specific installation or installations. Implementation of a program to transform the Army may result in cumulative effects of both types, some positive and some negative. On the positive side, it is likely that in the process of achieving the Objective Force there will be an overall reduction in emissions from military vehicles and aircraft nationwide as a result of the fielding of more fuel-efficient or alternative fueled systems. Similarly, many new systems will be designed for quieter operations, primarily in the interest of reducing early detection from opposing forces. It is also possible that, over time, as advances in realistic combat simulation technology are made, there could be some reduction in the total amount of land needed for maneuver training and in the frequency of its use. On the other hand, increases in the use of airspace by UAV, near-term land requirements for effective field training of the Interim Force and the construction of deployment and staging hardstands, and other transformation-related construction could contribute to adverse cumulative effects locally to some resources at some installations.

The Army is committed to a course of change that recognizes the importance of the components of the environment as resources that must be preserved for both their ability to support training and their present and future utility to the Nation. Initiatives such as the *United States Army Environmental Strategy into the 21st Century*, the *Strategic Environmental Assessment of Army Transformation*, the *Army Environmental Campaign Plan*, and numerous Integrated Natural Resources Management Plans demonstrate the Army's intensive efforts to address environmental issues through comprehensive and coherent approaches. In addition, the Army is developing and implementing actions centered on sustainability principles and will implement an Environmental Management System.

The CEQ definition of cumulative effects is not specific as to where the effects occur to which the Army's effects would incrementally contribute. The Army's initiatives acknowledge the importance of managing environmental resources on an ecosystem basis. This broad perspective takes into account that ecosystems are not defined by

installation fences, political boundaries, or administrative divisions of land. From a cumulative effects perspective, off-base activities may affect resources in ways that would incrementally add to the effects resulting from activities on Army installations. Thus, burdens imposed on environmental resources by off-base activities become part of the equation to be solved. As the Army continues to conduct its affairs within this kind of framework, it would be expected that cumulative effects would be minimized as to both their frequency of occurrence and magnitude.

Difficulties in prediction of cumulative effects are compounded by imprecise understanding of what might happen on a broad scale in the future that, external to the Army, would affect environmental resources. On the Army's part, transformation would move it progressively closer to its being a force that is more responsive, deployable, agile, versatile, lethal, survivable, and sustainable. The Army has articulated the characteristics it knows it must acquire to achieve dominance across the full spectrum of operations. Outside the Army, however, there is generally less coherence in the direction of progress. Predictions of the future are suspect and often incorrect.

Temporal boundaries for cumulative effects of transformation would extend over the course of the next 30 years. The spatial boundaries for cumulative effects would be nationwide, with effects most likely becoming increasingly apparent with proximity to Army installations. On even these scales, regional trends analysis—assessment of resources over time—provides a helpful means for considering cumulative effects. Trends analysis helps to gauge future effects (externally generated) to which Army actions could incrementally contribute.

There is a nearly infinite number of data from which trends might be discerned. The following, which represent a fraction of that universe of data, helps identify some of the circumstances in which the effects of transformation of the Army would occur and from which there could be contributions to regional cumulative effects.

- *Population Growth.* In 1940, in an era when many of the Army's installations were established in sparsely populated locations, the population of the United States was 132 million persons. The most recent census found the U.S. population to be in excess of 281 million persons. A portion of that 113 percent increase in population has taken up residence close to many of those same installations—which cannot simply relocate to yet-sparser areas. It can be expected that population growth will continue and that it will continue to create pressures in the immediate vicinity of Army installations. The effects of Army activities and the activities of the "newly arrived" will overlap and become observable as cumulative effects. These may be most noticeable with respect to air quality, noise, traffic congestion, water quality (demands on aquifers and degradation of waters receiving treated effluent), ecosystems (fragmentation), and wildlife (displacement).

- *Energy.* The historical trend in consumption of energy shows steady increase. Gasoline prices, availability of fuels for generation of electricity, siting of power

plants, and changes in regulatory approaches present problems that more and more frequently serve as the lead story for nightly newscasts. The Army's need to reduce its logistical sustainment burdens may result in accelerated efforts to develop and implement systems that are more efficient. To the extent that the Army's transformation would act as a catalyst for development of hybrid diesel-electric vehicles or for use of fuel cells, there would be positive cumulative effects on energy resources.

- *Protected Species.* A fundamental tenet of the Nation's species protection laws is based on an understanding of the importance of biodiversity and a recognition that extinction is "final." From a variety of causes, the historical trend has been that more species require protected status designation and that more land be designated as critical habitat. The Army considers its responsibility to fight wars and win as a nonnegotiable obligation. Training, an inseparable aspect of Army preparedness, can often be constrained by the presence of protected species on Army training lands. The Army recognizes the need to accommodate both its responsibilities as the Nation's defender and as steward to endangered and threatened wildlife and plant species. To the extent the Army succeeds in this, there is an example to others of commitment and methods that may be emulated off-post.

- *Management of Lands for Multiple Uses.* Agencies controlling sizable land holdings have employed strategies for management of lands for multiple uses for only a few decades. Agencies seek to accommodate diverse interests seeking use of the public domain for mineral extraction, timber production, wildlife conservation, aesthetics, recreation, and other purposes. The expected higher tempo of training and robust characteristics of forces needed for the Interim and Objective Forces could strain the capacities of present Army land holdings and require use of additional lands for some types of training. These circumstances could potentially reduce the availability of those other lands for as many uses as they now bear. This might be most noticeable in the amount of acreage available in some locations for recreation, agriculture, and grazing.

- *Airspace.* Aviation activities in the United States continue to increase. As safe aviation operations depend in large part on separation of aircraft, there may be potential for increased crowding as more military, commercial, and general aviation aircraft fill the skies. Increased use of unmanned aerial vehicles will exacerbate the situation, especially because their use would occur primarily in special use airspace. Where there is presently insufficient special use airspace over or near Army installations, the Army would seek additional designations from the Federal Aviation Administration. The allocation of the resource to Army use could reduce the airspace available to nonmilitary aircraft and could compound the difficulties in maintaining some air corridors.

4.16 MITIGATION

Mitigation is the avoidance, reduction, or compensation for adverse effects arising as a result of implementation of a proposed action. As a function of its stewardship of environmental resources, the Army seeks to carry out its activities in the manner best suited to ensure the continued availability of its resources. The Army recognizes that its resources are finite and require appropriate stewardship for their sustainability. Whenever appropriate, it designs its actions to avoid, reduce, or compensate for adverse environmental effects.

This PEIS has been prepared at the inception of a very long process which, by its nature, would require that extensive planning and step-wise execution occur over approximately 30 years. In the short-term, the Army has initiated actions to create and equip the Initial BCTs. They would be followed by identification of brigades to serve as Interim BCTs. Those brigades would be equipped with the IAV and MGS, major new combat systems the environmental effects of which are not yet fully understood due to a lack of realistic training experiences. The Objective Force would be structured and equipped to meet the seven force characteristics identified in the Army vision. The potential environmental effects of creating, training, and employing the Objective Force are only generally estimable.

Identification of specific mitigation measures for the adverse impacts identified is not practicable. To attain its underlying goal to treat its resources in a manner that best assures their long-term availability, the Army would continue to act responsibly to avoid, reduce, or compensate for effects arising throughout the transformation process. All of the ongoing environmental initiatives described in conjunction with the no action alternative for the various resource areas would act to mitigate the adverse effects of transformation activities. At the present juncture, the Army can take four types of action to minimize the effects that transformation might generate.

- *Mitigations in Conjunction with Site-Specific NEPA Analyses.* The Army would continue to carry out fully its obligations under NEPA. Prior to implementation of transformation-related projects (e.g., development, production, and fielding of new weapon systems) or proposed actions at specific sites, the Army would analyze each action to evaluate potential environmental effects. Identification of site- or project-specific mitigation would occur through this process.

- *Fostering a "Sustainable Environment" Ethic.* The Army would continue on its present course to implement sustainability principles on both its ranges and the built environment, and with respect to actions taken that affect natural resources. Development of an Army-wide ethic that fosters considerations of sustainability is presently at an early stage with the initiation of facilities sustainable design and integrated, adaptive management of natural resources on an ecosystem basis.

- *Implementing an EMS.* An EMS would provide an overarching architecture for informed decision-making with respect to environmental issues. Implementation of a comprehensive EMS Army-wide would be expected to occur before 2006.

- *Using Best Management Practices.* Best management practices are various site- and project-specific stratagems that planners, engineers, natural resources managers, and other professionals use to avoid or minimize adverse effects while carrying out projects. Best management practices include such actions as use of erosion control measures during construction, reliance on checklists, adherence to accepted protocols, and oversight of work by trained and experienced supervisors. Consistent use of best management practices reduces risk of creating situations that might lead to consequences that would be adverse to the environment.

- *Programmatic Environmental Safety and Health Evaluation*. The Army would continue to adhere to DoD acquisition regulations requiring weapon systems acquisition managers to conduct programs to review environmental compliance requirements, comply with NEPA, assess safety and health hazards, manage hazardous materials, and prevent pollution.

4.17 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Consistent with the need to ensure national security, the Army, through its proposed action, would continue to constitute, equip, upgrade, train, maintain, and employ its Legacy Forces. To meet changing world conditions, the Army would also develop and introduce new systems, refine its doctrine development systems, and train its personnel for readiness to respond to the National Command Authority (e.g., through a program of transformation). The collective whole of these actions inherently involves activities that generate adverse environmental effects. To the same extent that national defense is an inevitable obligation accompanying the Nation's maintenance of freedom and protection of its interests, the occurrence of some adverse environmental effects in association with peacetime military activities is unavoidable.

This PEIS has identified the likely adverse environmental effects associated with the Army's overall maintenance of readiness. Use of vehicles and equipment in garrison and in the field during training, construction of facilities to support various ongoing and new requirements, and introduction of new systems with attendant new doctrine, performance characteristics, and training requirements directly and indirectly affect the natural environment entrusted to the Army. As shown in the PEIS, virtually all aspects of the ecosystems in which the Army operates would be affected to some degree by transformation. Most of the effects would be of limited duration or affect discrete locations and, in many instances, would be amenable to a lessening of their severity through site-specific mitigation. The Army will perform site- and project-specific analyses to identify those effects and to evaluate their significance and the possible need for appropriate mitigation.

4.18 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible or irretrievable resource commitments are related to the use of nonrenewable resources and the effects that use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of a proposed action (e.g., extinction of a threatened or endangered species).

Maintaining national defense preparedness in today's world and for the foreseeable future is, by its very nature, an activity that is consumptive of the earth's resources and one that can damage human and natural environments to varying degrees. Although some activities associated with implementation of Army transformation might locally result in significant adverse environmental effects, as described above, none would be undertaken without prior analysis as required by the NEPA nor without reasonable efforts to appropriately mitigate such effects. Recycling and reuse may enable partial retrieval of some materials used in new systems (e.g., aluminum, steel, etc.). Commitments of energy and other resources, although intentionally minimized for economy as well as conservation, should be considered irreversible and irretrievable. Land and natural resources (flora, fauna, water) would be used by the Army with short-term goals of sound stewardship and minimal damage and with a long-term goal of sustainability and the avoidance of irreversibility.

4.19 SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The environmental initiatives that would be incorporated into the Army's transformation specifically focus on the environmental sustainability of Army installations, the training base and "power projection platforms" that form the communities in which soldiers and their families live, work, and play.

In the spirit of the Sikes Act, these initiatives would also be intended to make the Army a "good neighbor" and a "joint steward" with local communities, land users, and land managers. The maintenance and enhancement of the long-term productivity of land and facilities used by the Army is at the heart of the concept of environmental sustainability to which the Army subscribes. Many installations have been in continuous use by the Army for more than 100 years. Army use of these lands, while at times resulting in adverse environmental effects, including the need to remediate to rectify damage from past waste disposal practices and to take corrective action in regulatory violations, has, on the whole, been positive, particularly with respect to protection of some of the Nation's most sensitive natural and cultural resources. Army transformation would take place with the benefits of vastly improved knowledge of ecosystems, an institutional commitment to sustainability through adaptive environmental program management, and implementation of a strong environmental management system.

5.0 REFERENCES

Army Times. 2001. *Pegasus to Fly at China Lake.* http://www.armytimes.com/stories/army_story_232535.html. Accessed February 27, 2001

Army Times. 2001. *Marine Corps Times Reports on Secret Weapon Program*. http://www.marinetimes.com/stories/mar_story_229238.html. Accessed February 27, 2001.

Bailey, R.G. 1995. *Description of the Ecoregions of the United States*. 2nd edition. Misc Pub. No. 1391. Washington, DC: USDA Forest Service. 108 p. with separate map at 1:7,500, 000.

Bass, Ron. 2000. *Integrating NEPA with Other Environmental Laws*. Presented at the National Association of Environmental Professionals 25th Annual Conference. June 28, 2000.

Camp Shelby. 1986. *Environmental Assessment for the Proposed Fielding of the M-1 and M60A3 Tank and the Bradley Fighting Vehicle Within Previously Used and New Areas, Camp Shelby, Mississippi, 1986-1991*. April 1, 1986.

Char, A. 2001. Revised Hawaiian Islands comments for transformation PEIS. Personal communication. April 2001.

Conservation Foundation. 1988. *Protecting America's wetlands: An action agenda.* The Conservation Foundation, Washington, DC.

Edwards, Thomas J. and Richard W. Price. 2000. *Readiness: Year 2000 and Beyond.* http://www.almc.army.mil/alog/MarApr00/MS532.htm. Accessed May 30, 2000.

Environmental Systems Research Institute (ESRI). 1998. *ESRI Digital Data for GIS*. Environmental Systems Research Institute, Redlands, California.

Erwin, Sandra I. "Land-Warrior Follow-On Planned for '04." *National Defense*. September 2000.

Executive Order. *Consultation and Coordination with Indian Tribal Governments*. November 2000.

Fort Benning. 2000. *Brigade Combat Team Task Force- Bridging the Full Spectrum Threat.* http://www-benning.army.mil/BCTTF/bridge.html Accessed August 8, 2000.

Fort Lewis. 1994. *Final Environmental Impact Statement, Stationing of Mechanized or Armored Combat Forces at Fort Lewis, Washington.* February 1994.

Fort Lewis. 2000. *Draft Final Environmental Assessment Interim Brigade Combat Team Transformation at Fort Lewis, Washington*. Prepared by CH2M HILL for Public Works Environmental Office, Fort Lewis. December, 2000.

Gourley, Scott. *Army's New Ride.* http://www.military.com/Content/MoreContent/?file=PMlav Accessed February 27, 2001.

Headquarters, Department of the Army. 1994. *FM100-22 Installation Management*. October 11, 1994.

Headquarters, Department of the Army. 2000. "Transforming the Force." *Army AL&T.* March-April 2000.

Headquarters, Department of the Army. 2000. "Joint Contingency Force- Advanced Warfighting Experiment." *Army AL&T.* July-August 2000.

Hess, Pamela. 2001. *Think Tank: Cut Military Forces*. http://www.military.com. Accessed February 1, 2001.

INRMP Status Report (Sikes Act Only).

Kennedy, Harold. 2000. "New Army Training Site Aims for Realism." *National Defense*. September 2000.

Martin, Paul A., USAEC. 2001. High Priority Watersheds: Army Installations in Category 1 Watersheds. Personal communication. April 2001.

Maze, Rick. 2001. "Can the military keep its walls from crumbling down?" *Army Times.* February 12, 2001.

McKenzie, Jr., Kenneth F. 2000. *The Revenge of the Melians: Asymmetric Threats and the Next QDR.* McNair Paper 62. Institute for National Strategic Studies, Washington DC.

Mufson, Steven. 2001. *Overhaul of National Security Apparatus Urged: Commission Cites U.S. Vulnerability*. Washington Post. http://washingtonpost.com/wp-dyn/articles/A8824-2001Jan31.html

No Author. *Electric Warriors.* http://www.military.com/Content/MoreContent/?file=PMlavside

No Author. *Military Installations.* http://www.military.com/InstallationGuides/ChooseInstallation/1,11400,,00.html

Office of Transportation. 2000. *Fuel Cell Technologies*. http://www.ott.doe.gov/oaat/fuelcell_tech.html Accessed August 18, 2000.

Phelps, Richard A. 1998. *Environmental Law for Department of Defense Installations Overseas*. United States Air Forces in Europe. May 1998.

Schneider, C.B., and S.W. Sprecher. 2000. *Wetlands Management Handbook*. ERDC/EL SR –00-16. Wetlands Regulatory Assistance Program, Environmental Laboratory, U.S. Army Engineer Research and Development Center. Vicksburg, MS.

Schreiber, E.R., and M.A. Reed. 1999. *Installation Summaries From the 1998 Survey of Threatened and Endangered Species on Army Lands*. CERL Technical Report 99/78, September 1999.

Shipbaugh, Calvin. 2000. *Thinking Small: Technologies That Can Reduce Logistics Demand.* http://www.almc.army.mil/alog/MarApr00/MS523.htm Accessed May 30, 2000.

Snyder, Neal. 2000. *DoD Reviews Environmental Management Systems*. http://aec.army.mil/prod/usaec/op/update/spr00/spr0005.htm Accessed November 6, 2000.

Starling, Jim. 2001. "Computer games used to teach strategy, tactics." *Army Times.* February 12, 2001.

Strategic Environmental Research and Development Program. 1999. *Sensors for VOC/Nox and Metal Particulate Emissions Monitoring.* Compliance CP-1060.

Strategic Environmental Research and Development Program. 2000. *Characterization of PM2.5 Dust Emissions from Training/Testing Range Operations*. Compliance CP-1190.

Strategic Environmental Research and Development Program. 2001. *Improved Incorporation of Health and Safety to Facilitate Accelerated Implementation of Innovative Environmental Technologies.* Compliance CP-819.

Tiboni, Frank. 2001. "'Smart' WAMs can track, destroy tanks." *Army Times*. February 12, 2001.

Tucker, Michael S. 2000. *53 Army Pre-positioned Stocks*. http://www-cgsc.army.mil/milrev/English/MayJun00/tuck.htm. Accessed May 25, 2000.

U.S. Army Corps of Engineers. No date. Headquarters Integrated Facilities System, Executive Information System.

U.S. Army Corps of Engineers. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers, Mobile District. 1995. *Programmatic Environmental Assessment, Army Force Structure Realignment.* March 1995.

U.S. Army Corps of Engineers, Mobile District. 1996. *Programmatic Environmental Assessment for the Army Medical Command Facilities Remediation and Renewal Program.* March 1996.

U.S. Army Corps of Engineers. 1997. *The U.S. Army's Land-Based Carrying Capacity*. CERL Technical Note 97/142. September 1997.

U.S. Army Corps of Engineers. 1998. *NEPA Manual-Installation Operations and Training.* Prepared by USACE Mobile and Sacramento Districts with technical assistance from Tetra Tech. June 1998.

U.S. Army Environmental Center (USAEC). 2001. *Land-Based Carrying Capacity.* http://www.aec.army.mil/prod/usaec/et/conserv/lbcc.htm. Accessed January 9, 2001.

U.S. Department of the Army. No date. *Army Installations and Facilities*. http://www.army.mil/public/installations.htm

U.S. Department of the Army. No date. *Army Environmental Campaign Plan*.

U.S. Department of the Army. No date. *AR 40-5 Preventive Medicine.*

U.S. Department of the Army. No date. *AR40-10 Health Hazard Assessment Program in support of the Army Materiel Acquisition Decision Process.*

U.S. Department of the Army. No date. *AR 385-10 The Army Safety Program.*

U.S. Department of the Army. No date. *AR 602-1 Human Factors Engineering Program.*

U.S. Department of the Army. No date. *AR602-2 Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process.*

U.S. Department of the Army. 1997. *Army Regulation 200-1: Environmental Protection and Enhancement.* February 1997.

U.S. Department of the Army. 1999. *Department of the Army Budget Summary*. FY 1999 Annual Report to Congress.

U.S. Department of the Army. 1999. *Joint Demilitarization Study*. Joint Ordnance Commanders Group, Munitions Demil/Disposal Subgroup. July 1999.

U.S. Department of the Army. 2000. *Emerging Non-Traditional Security Issues Plans and Policies.* August 31, 2000.

U.S. Department of the Army. 2000. *Mission Needs Statement for Rapidly Deployable Armored Combat Forces.* February 2000.

U.S. Department of the Army. 2000. *The Interim Brigade Combat Team Organizational and Operational Concept.* April 2000.

U.S. Department of the Army. 2000. *Interim Armored Vehicle (IAV) Milestone II-Programmatic Environmental, Safety, and Health Evaluation (PESHE).* October 21, 2000.

U.S. Department of Defense. 2000. *Proposed Range Rule Overview*. http://www.denix.osd.mil/denix/Public/News/DUSDES/FactSheets/propos.html. Accessed August 24, 2000.

U.S. Department of Defense. 2001. *Nanotechnology Research Awards Announced.* http://www.defenselink.mil/news/Feb2001/b02232001_bt079-01.html. Accessed March 1, 2001.

U.S. Environmental Protection Agency (USEPA). 1992. *Major Air Pollutants*. http://www.infoplease.com/ipa/A0004695.html. Accessed March 31, 1999.

U.S. Environmental Protection Agency (USEPA). 2001. *Currently Designated Nonattainment Areas for All Criteria Pollutants.* http://www.epa.gov/oar/oaqps/greenbk/ancl.html

U.S. Environmental Protection Agency (USEPA). 2001. *Potential of Chemicals to Affect the Endocrine System.* http://www.epa.gov/toxteam/endoqa2.htm

U.S. Fish and Wildlife Service (USFWS). 1998. *Threatened and Endangered Species*. http://www.infoplease.com/ipa/A0004713.html. Accessed March 31, 1999.

U.S. Fish and Wildlife Service (USFWS). 2000. *Ecosystem Conservation*. http://ecosystems.fws.gov/. Accessed August 31, 2000.

U.S. Fish and Wildlife Service. 2001. *ESA Basics: Over 25 years of protecting endangered species*. http://endangered.fws.gov/pubs/esa%20basics.pdf Accessed 4/13/01.

U.S. Fish and Wildlife Service (USFWS). 2001. *President Clinton Issues Executive Order on Migratory Birds*. January 11, 2001.

U.S. Forest Service. 1994. *Ecological Subregions of the United States.* http://www.fs.fed.us/land/pubs/ecoregions/index.html July 1994. Accessed 3/27/01.

United States Geological Survey (USGS). 2001. *National Atlas Digital Map Layers Warehouse*. http://www.nationalatlas.gov/atlasftp.html.

United States Geological Survey. 2001. *Alaska Land Characteristics Data Set, Ecoregions*. National Mapping Information, EROS Data Center, Alaska Field Office. http://mapping-ak.wr.usgs.gov/research/ecoregion/ecoregmap.html Accessed 3/30/01.

Williams, Rochelle. No date. *White Paper on Air Pollution Impacts to the Army Interim Armored Vehicle.* U.S. Army Forces Command.

Yacobucci, Brent D. *RL30484: Advanced Vehicle Technologies: Energy, Environment, and Development Issues.* National Council for Science and the Environment. March 27, 2000.

6.0 LIST OF PREPARERS

Cheryl Antosh
Program Analyst
Years of Experience: 30

Susan Bartow
M.E.M. Aquatic Ecology, Duke University
B.A. Biology, Ithaca College
Years of Experience: 6

John Beckman
M.E.M. Water and Air Resources, Duke University
B.A. Biology, University of California, Santa Cruz
Years of Experience: 3

Paula Bienenfeld
Ph.D. Anthropology, State University of New York at Binghamton
M.A. Anthropology, State University of New York at Binghamton
B.A. Anthropology, University of Michigan
Years of Experience: 21

Michelle Cannella
B.S. Mineral Economics, Pennsylvania State University
Years of Experience: 5

Donald M. Conlon, P.E.
B.S. Biology, Florida State University
B.S.C.E. Auburn University
Years of Experience: 35

Tom Delaney
M.E.A. Engineering Administration, George Washington University
B.S. Environmental Engineering, Rensselaer Polytechnic Institute
Years of Experience: 29

Eric Dohner
M.S. Marine Science, University of South Florida
B.S. Marine Biology, Millersville State College
Years of Experience: 15

Sean Donahoe
M.S. Biology, West Virginia University
B.S. Biology, Fairmont State College
B.S. Mathematics, Fairmont State College
Years of Experience: 13

Scott Farley
J.D. Boston College Law School
B.A. Political Science, Boston College
Years of Experience: 10

John Fittipaldi
M.C.P. City Planning, The Georgia Institute of Technology
B.A. Liberal Arts and Science, Oglethorpe University
Years of Experience: 29

Terry Garnett
B.S. Environmental Science, Mary Washington College
Years of Experience: 12

Terry Haas
B.S. Anthropology, Virginia Commonwealth University
Years of Experience: 11

Ben Harris
M.B.A. San Jose State University
B.S. Economics, Christopher Newport College
Years of Experience: 20

Edward W. Hill
M.S. Environmental Health, University of Puerto Rico Medical Sciences College
B.S. Biology, Catholic University of Puerto Rico
Years of Experience: 31.5

Jennifer Jarvis
B.S. Environmental Resource Management, Virginia Polytechnic Institute and State University
Years of Experience: 3

Alan Karnovitz
M.S. Public Policy, University of Pennsylvania
B.S. Biology of Natural Resources, University of California, Berkeley
Years of Experience: 16

Beth Leamond
M.S. Environmental Engineering, Rensselaer Polytechnic Institute
M.S. Environmental Sciences, Indiana University
B.S. Geology, University of Cincinnati
Years of Experience: 13

James Lucas
B.A. History, University of Louisville
Years of Experience: 35

Kemp Luck
B.S. Natural Resources, North Carolina State University
Years of Experience: 3

Mark Lunsford
M.U.R.P. Master of Urban and Regional Planning, University of Colorado
B.A. Environmental Studies, North Central College
Years of Experience: 16.5

Tom Magness
M.S. Geography, University of Wisconsin
B.S. Civil Engineering, United States Military Academy
Years of Experience: 35

Martha Martin
B.A. English, Capital University
Years of Experience: 22

Paul Martin
B.A. Applied History, Carnegie Mellon University
Years of Experience: 10

Tom Nicholson
M.B.A. Georgia State University
M.S. Education, Georgia State University
B.S. Physical Education, Jacksonville State University
Years of Experience: 39

LTC Richard G. Nord
M.B.A., Marymount University
B.S. Economics, Winona State
Years of Experience: 22

Sam Pett
M.S. Environmental Science, University of Massachusetts-Boston
B.S. Wildlife Biology/Zoology, Michigan State University
Years of Experience: 10

Kristin Shields
B.A. Environmental Studies/Environmental Policy, Archaeology, Sweet Briar College
Years of Experience: 9

Patrick Solomon
M.S. Geography, University of Tennessee
B.A. Geography, Geneseo State University
Years of Experience: 6

Ron Webster
M.S. Civil Engineering, Texas Tech University
B.S. Agricultural Engineering, Texas Tech University
Years of Experience: 30

Pamela A. Whitman
M.S. Biology, West Virginia University
B.S. Biology, Concord College
Years of Experience: 17

Paul Wilbur, J.D.
J.D. Wayne State University Law School
B.A. English, University of Michigan
Years of Experience: 29

7.0 LIST OF AGENCIES AND PERSONS CONSULTED

Berwick, Dave. Advisory Council on Historic Preservation.

Eng, Bill. Headquarters, Department of the Army- Privatization.

Greczmeil, Horst. Council on Environmental Quality.

Hentz, Dick. Headquarters, Department of the Army- Housing.

Holmes, Chris. USDA Forest Service.

Lamoreau, Jean. Headquarters, Department of the Army- Military Construction.

Martin, Paul A. U.S. Army Environmental Center. April 23, 2001.

Rai, Vijai. U.S. Department of the Interior.

Tamlin, Pete. Headquarters, Department of the Army- Military Construction.

This page intentionally left blank.

8.0 DISTRIBUTION LIST

Dana Allen
Environmental Review Coordinator
EPA Region 8
999 18th Street, Suite 500
Denver, CO 80202-2466

Cindy Cody
Environmental Review Coordinator
EPA Region 8
999 18th Street, Suite 500
Denver, CO 80202-2466

Joe Cothern
Environmental Review Coordinator
EPA Region 7
901 North 5th Street
Kansas City, KS 66101

Marguerite Duffy
EPA

Roseria Duwyenie
RAB Co-Chair
Fort Wingate Army Depot

Brian Feeney
Horne Engineering Services, Inc.
Maryland

Kevin Ferguson
Army Missile Defense

Robert Hargrove
Environmental Review Coordinator
EPA Region 2
290 Broadway, Floor 25
New York, NY 10007-1866

John Harms
Private Citizen
Massachusetts

Poppy Harroer
EG&G
Woodbridge, VA

Betsy Higgins
Environmental Review Coordinator
EPA Region 1
One Congress Street
Boston, MA 02114-2023

Mike Jansky
Environmental Review Coordinator
EPA Region 6
1445 Ross Avenue, 12th Floor, Suite 1200
Dallas, TX 75202-2733

Jo Jiles
Environmental Review Coordinator
EPA Region 10
1200 Sixth Avenue
Seattle, WA 98101

Judith Leckrone Lee
Environmental Review Coordinator
EPA Region 10
1200 Sixth Avenue, ECO-088
Seattle, WA 98101

Larry McKinney
9 Cottage Lane
Valiso Viejo, CA

Gerald Miller
Office of Environmental Assessment
EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Anne Plummer
Pentagon

Denise Regney
Environmental Review Coordinator
EPA Region 3
Mail Code 3E530
1650 Arch Street
Philadelphia, PA 19106

David Shifflett
Langley Air Force Base
HQ, ACC

David Tomsovic
Environmental Review Coordinator
EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

Keri Weiner
Desert Protective Council
445 Maryland Street
Apt.9
San Diego, CA 92116

Ken Westlake
EPA Region 5
Mail Code B-19J
77 West Jackson Boulevard
Chicago, IL 60604-3507

This page intentionally left blank.