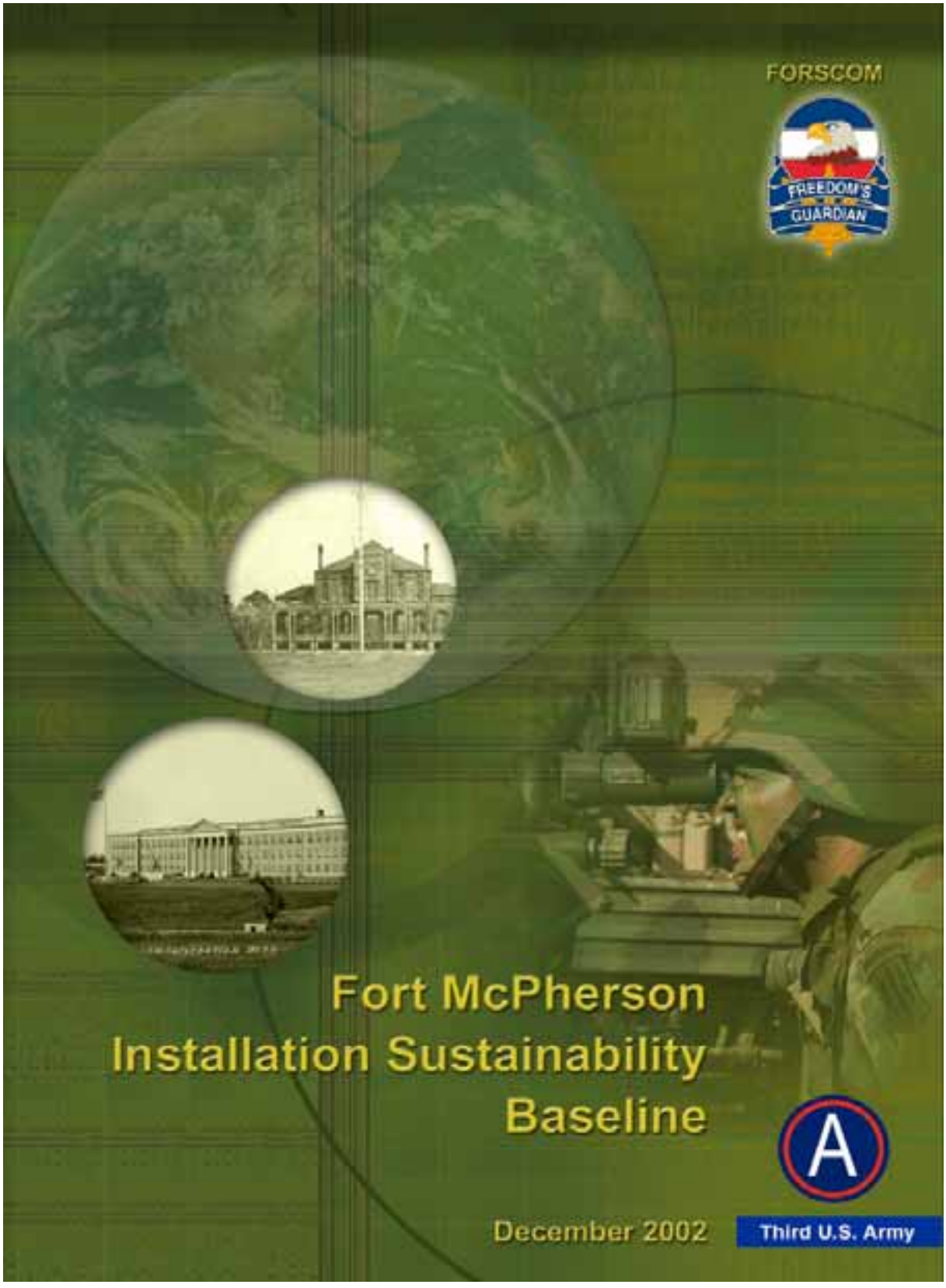
FORSCOM
FREEDOM'S GUARDIAN
Fort McPherson
Installation Sustainability
Baseline
A
December 2002
Third U.S. Army

Message from the Garrison Commander

We face challenges related to resources that affect the long-term capability of the installation to perform our mission—challenges that must be faced and addressed as Fort McPherson continues its mission into the future. This document identifies and describes these challenges.

A strong tradition of proactive, innovative, and enduring partnering efforts to meet pollution prevention challenges will demonstrate the leadership role of Fort McPherson, and its sub-installation, Fort Gillem, in the environmental arena as the Army moves into the 21st century. Sustainability of our installation is the future. The FORSCOM Commander explained in a 9 July 2001 memo:

> *"Forces Command (FORSCOM) has a proud record of environmental compliance and stewardship. However, complying with environmental regulations and focusing on management of environmental resources inside the fence line is not sufficient to protect us from training constraints or ensure the long-term sustainability of our operations. Encroachment, funding uncertainties, aging infrastructure, and deteriorating natural resources outside our gates all threaten our ability to successfully accomplish our mission."*

While some information presented will differentiate between Fort McPherson and Gillem, a single garrison staff manages the two installations and they share a common mission: "*to provide a quality home and work environment for active and reserve forces, retired military, civilians, and families, and provide our customers with world-class installation service and support.*" Fort McPherson is the home to several major staff organizations including Headquarters Forces Command (FORSCOM), Headquarters Third US Army, and Headquarters US Army Reserve Command (USARC), while Fort Gillem hosts Headquarters First US Army, the Army and Air Force Exchange Service (AAFES) Distribution Center, AAFES retail operations, the Federal Emergency Management Agency (FEMA), and several other smaller organizations. In total, Fort McPherson supports over 6,000 soldiers and civilian staff, 46,000 retirees and 70,000 family members.

Fort McPherson at a Glance

Location: South of Atlanta
Size: 497 acres
Buildings: 178 of which 65 are Historic
Work force: 1754 Active Duty, 2270 Civilians, and 1313 Reserves

Fort Gillem at a Glance

Location: Southeast of Atlanta
Size: 1426 acres
Buildings: 140 Buildings of which 67 are Historic
Work force: 570 Active Duty, 1850 Civilians, and 1862 Reserves

Message from the Garrison Commander

Resource limitations, mission changes, and dwindling funding pose significant challenges for us in the future. We must ensure that we are wise stewards of resources and the environment—that is our responsibility.

Performing as wise stewards is paramount and has already begun. We have an active recycling program, including the recycling of used oil and antifreeze. Demolition contractors are encouraged to recycle as much of the building as economically viable. An installation design guide that will incorporate sustainability concepts will be written this year.

During the Fort McPherson Sustainability Workshop, 11-13 Dec 2002, we will bring together the garrison staff, major tenant representatives, and other stakeholders to discuss the challenges facing Fort McPherson. During the workshop you will select 25-year environmental goals that will address the challenges and make Fort McPherson more sustainable. This baseline summarizes how Fort McPherson's mission affects and, in turn, is affected by the resources it needs and uses. I encourage each of you to become familiar with the material.

Fort McPherson has a proud heritage of service to the US Army since 1885. Here is my challenge to you: examine the challenges and data presented in this document; determine the end-state you want to achieve; set aggressive, attainable, and quantifiable 25-year goals; and identify the correct stakeholders to form the teams that will ensure this service continues indefinitely.

Harold E. Cooney
Colonel, US Army
Garrison Commander

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Introduction

The mission of Fort McPherson "is to provide a quality home and work environment for active and reserve forces, retired military, civilians, and families, and provide our customers with world-class installation service and support." To accomplish this mission, Fort McPherson must provide high-quality facilities that are conducive to the success of the specific missions of all on-post commands and organizations. As with all organizations, Fort McPherson must continue to provide these facilities with diminishing budgets, with increasing environment and health and safety requirements, and with aging and historic infrastructure.

These circumstances create additional challenges for the installation and its staff. Personnel who commute to and from the installation face one of the nation's most congested transportation systems. This costs valuable personal time for commuting. Further, automobiles and other petroleum-fueled systems contribute to the regional air quality degradation. Other regional environmental concerns that could translate into costs for Fort McPherson and its staff include water, waste disposal, and energy. All of these topics provide challenges to Fort McPherson in meeting its mission.

Fort McPherson has been successful in managing its environmental issues within the applicable regulatory requirements. To date, our environmental management approach has not considered the long-term issues associated with operating Fort McPherson in the context of its surrounding Atlanta metropolitan area. With this document and workshop, Fort McPherson begins the process of focusing on the long-term sustainability of Fort McPherson and its mission.

Sustainability

"Sustainability" is defined "as the maintenance of ecosystem components and functions for future generations." "Sustainable development" is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Within Army considerations, "sustainability" also refers to the efforts necessary to Sustain the Mission. These considerations have led Fort McPherson, like the other installations in FORSCOM, to explore ways to evaluate and plan for any considerations that threaten the long-term sustainability of the mission. Fort McPherson, as the Atlanta metro area's fifth largest employer, is also in the position to demonstrate the importance of sustainable behavior within its surrounding community. With these considerations in mind, Fort McPherson begins its journey towards sustainability.

The Natural Step Framework

In its effort to be sustainable, FORSCOM selected *The Natural Step* (TNS) framework in which to facilitate the sustainability process. In this framework, TNS principles form the basis for the Army's installation sustainability process (ISP). Using this baseline document as an initial starting point, the Sustainability Workshop will bring together the local stakeholders to formulate long-term sustainability goals for our installation. This baseline provides information for critical environmental issues that could impact the mission now and in the future. In the case of Fort McPherson, these issues concern resources, infrastructure, and transportation.

The Natural Step
Four System Conditions
for a Sustainable Society

In the sustainable society, nature is not subject to systematically increasing…

1) …concentrations of substances extracted from the Earth's crust,
2) …concentrations of substances produced by society, or
3) …degradation by physical means;

and in that society…

4) human needs are met worldwide.

Our Sustainability Challenges

By addressing these issues, For McPherson can make a substantial positive contribution to the greater environmental atmosphere and quality of life in the Atlanta metro region. These challenges illustrate not only the installation's environmental goals, but also the specific barriers to those goals.

Infrastructure – Facility construction, operation, maintenance, renovation, and demolition are expensive monetarily and environmentally. Effective green design of buildings significantly decreases the overall operations and maintenance costs, improves workplace quality, and reduces eventual demolition costs. How can Fort McPherson design and maintain its facilities to provide effective workspace, reduce operational and maintenance costs, and remain sensitive to the special requirements of the numerous historical buildings under its care?

Transportation – Increasingly, the citizens of Georgia are concerned about air quality in the state, specifically the levels of ozone, particulate pollution, and greenhouse gas emissions. Vehicles are a major contributor of these pollutants and the operation of Fort McPherson exasperates the problem. However, congestion affects the staff and decreases

their quality of life. How can Fort McPherson contribute to overcoming the overall transportation challenges faced by metro Atlanta?

Resources – Fort McPherson's Operations and Maintenance (O&M) budget was approximately $58 million in 2001. Approximately 5,900 tons of solid waste, including hazardous waste, is created and then disposed of each year. In addition to the Infrastructure and Transportation challenges, how can Fort McPherson reduce the total resources it uses, increase the efficiency of its resources to eliminate waste, and shift to renewable sources for the resources it does purchase?

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Challenge

Facility construction, operation, maintenance, renovation, and demolition are expensive monetarily and environmentally. Effective green design of buildings significantly decreases the overall operations and maintenance costs, improves workplace quality, and reduces eventual demolition costs. How can Fort McPherson design and maintain its facilities to provide effective workspace, reduce operational and maintenance costs, and remain sensitive to the special requirements of the numerous historical buildings under its care?

Key Considerations

- **Design** – Existing green designs can reduce operational costs and the environmental impacts resulting from the use of buildings. The U.S. Green Building Council (USGBC) has established the Leadership in Energy and Environmental Design (LEED) Green Building Rating System to evaluate the long-term sustainability of building construction. The U.S. Corps of Engineers (COE) has modified the LEED standards to address military-specific design considerations (SPiRiT standards).

- **Energy Efficiency** – Energy efficient buildings and management practices can conserve existing resources, save money, and provide a more comfortable workspace. Planned new construction and building renovations over the next several years will provide the opportunity to improve energy efficiency at Fort McPherson.

- **Historic Building Preservation** – Fort McPherson is home to over 130 historic structures. The renovations of such historic buildings must follow strict preservation guidelines. Renovations of these buildings incorporate some green designs.

- **Lands Maintenance** – The creation of new impervious surfaces, such as rooftops and parking lots, increases the volume and velocity of storm water runoff. In addition, these surfaces contaminate this runoff, increase soil erosion, and reduce aquifer recharge. Reducing the footprint of roadways and increasing sustainable landscaping are a few ways that infrastructure design can reduce impacts and save money.

- **Construction & Demolition Solid Waste (C&D)** – Demolition of buildings results in large amounts of solid waste debris disposal. Modern building deconstruction and recycling techniques may reduce the costs of demolition and landfilling, can salvage valuable materials, and may reduce environmental impacts. New facilities should be designed with consideration to their potential future deconstruction.

Importance to Fort McPherson

Mission – Adequate and affordable facilities for staff, the storage of materials, and the maintenance of equipment are important to the mission. Facilities play a large role in the productivity of the workforce by creating an environment that allows employees to communicate and cooperate effectively.

Quality of Life – Comfortable and suitable facilities for living and working are a necessity for health and good quality of life. A higher indoor quality of life can lead to greater worker productivity.

Cost – Replacement and annual maintenance of the infrastructure at Fort McPherson is expensive. A direct relationship exists between the costs of power and water use to the efficiency of the inside appliances and equipment.

Environment and the Community – Energy used to light, heat, and cool buildings generates air pollution, which green building design and construction can reduce. The design of green buildings can facilitate the use of materials, appliances, and equipment that are more efficient, thereby reducing significant amounts of energy and water consumption.

The operation and maintenance of buildings results in the use of hazardous materials and generates solid and hazardous wastes. Improved facility design, engineering, and technologies can reduce the generation and impact of hazardous wastes.

Proper placement of buildings and roads can prevent erosion and degradation of water quality. The reduction of impervious surfaces increases infiltration as storm water is absorbed into the soils, resulting in increased recharge of aquifers.

Introduction

Compared to other FORSCOM installations, Fort McPherson's infrastructure system is small. The Headquarters Forces Command, Third U.S. Army Headquarters, U.S. Army Reserve Command, First U.S. Army Headquarters, the Army and Air Force Exchange Service Distribution Center, and Federal Emergency Management Agency (FEMA) all reside at Fort McPherson. Fort McPherson is also home to many historic buildings that date back to the late 1800s. The buildings have been carefully restored and refurbished to provide comfortable work and living space, while remaining historically accurate to their original construction. Maintaining these buildings requires extra care and planning but gives the current residents and employees on the installation a strong sense of the Army's rich tradition.

Regulations at a Glance

National Environmental Policy Act (NEPA) – This legislation directs federal agencies to evaluate planned land use activities and resolve potential environmental issues before initiating use or activity.

Clean Air Act (CAA) – This legislation sets limits on the amount of certain pollutants that can be in the air in the United States. The CAA requires installations to apply for permits for activities that create air impacts.

Clean Water Act (CWA) – In 1972, the U.S. Congress enacted the first comprehensive legislation to control water pollution. Under the CWA, discharges to surface water must be permitted by the U.S. Environmental Protection Agency (EPA) and monitored by the discharger.

Safe Drinking Water Act (SDWA) – This legislation was developed to protect the public water supply. Source Water Protection emphasizes preventing contamination of drinking water resources and includes wellhead protection and sole source aquifer watershed control plans.

The Directorate of Installation Support (DIS) is responsible for the design, construction, operation and maintenance, demolition, and ultimate disposal of the installation's buildings. The DIS plans and programs the installation's real property management and development through the Real Property Master Plan (RPMP). The COE provides design, construction management, and project oversight. Fort McPherson currently has three projects under construction totaling $53 million and one scheduled for FY04 for $4.9 million. Further, the installation has 18 projects on its MCA priority list totaling $132 million between FY06-10. Finally, Fort McPherson plans to demolish approximately 168,000 square feet of excess buildings in the next two years costing nearly $1.5 million.

Activities and Impacts

Several environmental impacts arise from the inadequate design, construction, operation, maintenance, remodeling, and demolition of facilities. The design of buildings determines the type of construction materials and equipment necessary, thereby defining the operation and the maintenance costs of the building. These design costs account for 90 percent of the

total life cycle cost of a typical building. The design, placement, and construction of buildings and roads determine the quantity and quality of storm water during and after construction. The operation and maintenance of buildings result in energy and water use, air pollution, and various wastes from operation, repair, replacement, and occupant activities. Construction, renovation, and demolition create debris that must be disposed of. Figure 1 presents both the positive and negative environmental impacts associated with each of these activities.

Figure 1 – Infrastructure: Activities and Impacts

Construction and Renovation Design

Fort McPherson has three ongoing construction projects adding about 144,000 square feet of workspace and costing $53 million. These MCA projects include the USARC-Forest Park Reserve Center, the Criminal Investigation Forensic Laboratory, and an Explosive Ordnance Detonation (EOD) facility. The CID laboratory has a specially designed saw tooth roof and storage space to incorporate Photovoltaic (PV) panels to eventually provide all the laboratory's electricity. These types of features will demonstrate the importance of

institutionalizing sustainable construction and renovation as well. Fort McPherson's MCA program hopes to design and construct 11 new structures in the next 7 years, including moving Third Army Headquarters out of its WWI-vintage building into a new facility at Fort Gillem. Updating the current Installation Design Guide (IDG) will reflect the new SPiRiT guidelines. The revised IDG will incorporate sustainable design features that will significantly decrease the operation and maintenance costs throughout the life of the building. Presently, the cost of these projects totals $115 million. Although SPiRiT guidelines cost more at the beginning of the construction phase, they are more cost-effective because they reduce the long-term building operation and maintenance costs. Further, the conscious application of end-use planning could make the workspace much more conducive to worker productivity and require fewer future renovations. Finally, these same guidelines must be sensitive to the special requirements of historical buildings.

Energy and Water Consumption

In FY00, Fort McPherson consumed 2,286 MBTUs of electricity, about 300,000 BTUs of natural and propane gas, and 100 million gallons of water. These resources cost approximately $5.4 million. In FY01, consumption increased slightly, but the cost rose to almost $6 million primarily due to increases in natural gas prices. Fort McPherson relies upon commercial power from Georgia Power for 100 percent of its on-site electricity, costing $3.5 million annually. The electricity provides lighting and cooling for the buildings whereas the natural and propane gas heat the buildings and water. In the Atlanta climate, the electricity use increases dramatically in the summer, while the natural gas/propane use skyrockets in the winter. Fort McPherson is especially affected by these extremes. The installation spends approximately $2 million annually for these fuels. Approximately 80 percent of the natural gas use occurs in the four winter months and 60 percent of the electricity use occurs in the summer to heat and cool the large storage areas. Energy efficient building designs could be a means for reducing these peak requirements.

Fort McPherson buys all of its water from the city of Atlanta and discharges its wastewater to the city for treatment. The installation consumes just over 100Mgal (costing about $175,000) annually. Green design and renovation can help decreases these operations and maintenance costs.

Indoor Air Quality

Indoor air quality issues may be unique to Fort McPherson in that it houses several large staff organizations in very large buildings with potential air quality problems. For instance, the 272,000 square foot HQ FORSCOM building provides workspace for approximately 1,600 people. Adequate ventilation and indoor air quality present occupational safety challenges, but can be mitigated by design choices. For example, when the new Third

Army Headquarters building is designed (209,000 sq ft), indoor air quality will be greatly improved over the current situation in HQ FORSCOM.

Water Pollution

There are two types of water pollution—nonpoint and point sources. Nonpoint source pollution occurs at Fort McPherson when water runs over land or through the ground, picks up pollutants, and deposits them into creeks, lakes, or the groundwater. Point source pollution on Fort McPherson originates primarily from sewer system failures.

Many infrastructure components can be sources of nonpoint source pollution on Fort McPherson. These include: active construction sites, impervious areas, industrial facilities, roadways, and leaking underground storage tanks. Each of these has the potential for different types of discharge, pollutants, and impacts. Rooftop, asphalt, and gravel areas are all considered impervious to storm water infiltration and are a significant source of nonpoint source pollution. Oil, grease, sediment, heavy metals, nutrients, and other contaminants settle on these surfaces and wash into waterways every time it rains. With the tremendous area of non-porous materials covering Fort McPherson, the potential for any spill to reach the storm sewer is almost automatic. As a future possibility, the replacement of pavement with more porous surfaces would recharge the groundwater and reduce pollution entering the storm sewers.

Maintenance

Fort McPherson conducts maintenance activities, ranging from simple repairs to remodeling and new construction. Many of the buildings at Fort McPherson are more than 50 years old and contain asbestos and lead-based paint. Maintenance activities on these buildings can increase particulate matter emissions. Further maintenance, on HVAC and heating, or lack of systems can result in a sub-par performance and inefficient resource use resulting in higher operational costs.

Construction and Demolition Waste

New construction and demolition of existing structures generates solid waste that must be either recycled or landfilled. Construction contractors are responsible for removing all excess building materials from the installation. While Fort McPherson encourages contractors to recycle materials, they do not monitor the final disposition of waste materials during construction. In FY03-04, Fort McPherson plans to demolish 168,000 square feet of existing structures, which will result in the production of over 350 tons of waste (mostly wood). Fort McPherson does not dispose of the demolition waste. A private contractor that wins the bid is responsible for demolishing the building and removing all the waste. In the

past, contractors have reduced their bid to win the contract by finding markets for materials in the building. For example, the demolition of a building containing copper and steel costs only $40,000, after the sale of the valuable metal resources. Typically, the cost of a 120,000-square feet building is $1 million.

Forecast

On 7 Oct 02, the Southeast Region Office (SERO) of the Installation Management Agency (IMA) began operation in Building 171, a historic building that once was the hospital. The building had been renovated to house other agencies but the reorganization caused significant changes in space and allocation requirements. Situations like this will continue to challenge Fort McPherson's infrastructure planning in the future. In addition to the planned MCA projects, there will undoubtedly be several "unplanned" renovations to accommodate changing priorities. In such renovations, incorporating sustainability principles can reduce operational costs and the resulting environmental impacts.

Current Sustainability Activities

- **Design Charrette** – Fort McPherson held a design charette in FY00 to do "green" renovations on a historic structure, Building 171. Unfortunately, a lack of funding never allowed the "green" design features to become a reality.

- **Photovoltaic Panels** – The Criminal Investigation Forensic Laboratory at Fort McPherson was ideally sited to take advantage of the sun. Even though the funding was not available for Photovoltaic (PV) panels, the roof was modified and a special storage room for batteries was included in the design for sometime in the future when the PV panels can provide the electricity for all the lighting in the laboratory.

- **SPiRiT Guidelines** – Fort McPherson is planning a workshop with the Savanna District Corps of Engineers to update its Installation Design Guide (IDG) to incorporate the SPiRiT guidelines.

The Realm of Possibility

To become sustainable, Fort McPherson is encouraged to identify and plan for innovations that will support the goals established during the Installation Sustainability Workshop. To do this, participants should review the concepts and technologies that are within the realm of possibility now and in the future. This section provides a glimpse of what can be accomplished with existing technology and what can be expected from developing sustainability approaches.

Energy Efficient Buildings

Today	2 Years	5 Years	10 Years	15 Years	25 Years
Energy Star					
Army Green Design Demonstrations			Microscopic Energy Systems		
Continuous Commissioning		Desiccant Cooling			
Energy Supply and Management		Spectrally Selective Windows			
LEED and SPiRiT		Drain Water Heat Recovery		Superconductivity	
CFLs					
Front-Loading Washers					
Ground Source Heat Pumps				Grey Water Recycling	
Energy Plus					

- **Army Green Design Demonstrations** – Forts Hood, Carson, and Polk all have green building demonstrations in the planning and design stages. Fort Bragg is currently designing a low impact parking lot for its environmental education building.

- **Compact Fluorescent Lights (CFLs)** – A number of alternatives to traditional incandescent lights are commercially available. Compact fluorescent lights (CFLs) use between 50 and 70 percent less power than incandescent lights of the same intensity. EPA maintains a comprehensive list of CFLs at http://www.energystar.gov/products/cfls/.

- **Continuous Commissioning** – This is a process of improving building performance through independent hourly metering, monitoring, analysis, and system fine-tuning to maximize energy conservation. This approach, which involves comparing design intent with actual building operation, has yielded an additional 15 to 45 percent savings beyond traditional conservation measures. For additional information, visit http://www-esl.tamu.edu/cc/.

- **Desiccant Cooling Systems** – In the next few years, desiccant-cooling systems could be saving offices and large commercial buildings thousands of dollars each month in electricity bills. Desiccant coolers, which are used in conjunction with traditional HVAC units, remove moisture from the outside air, cooling the air and enabling the

primary unit to operate much more efficiently. For more information, see http://www.nrel.gov/desiccantcool/tech.html.

- **Drain Water Heat Recovery** – It is estimated that up to 80 percent of water-heating bills come from shower/bath water. An innovative technology called drain water heat recovery uses the latent heat in drain water to preheat cold water before it is sent through a conventional water heater. Drain water is typically 90 to 95°F when it is piped away from the shower or bath; 100 percent of that potential energy is wasted. These systems take warm drain water and run it through tiny spiraling pipes to preheat cold water to a higher temperature, thus reducing the total amount of energy a water heater must expend to heat fresh water. Installing a drain water heat recovery unit can reduce overall heating bills by as much as 40 percent. EPA estimates that, if 6 million hot water systems were outfitted with drain water heat recovery systems, carbon dioxide emissions could be reduced by 20 million tons every year (http://gfxtechnology.com/).

- **Energy Plus** – The Department of Energy developed this free software, which incorporates all the design features of a building into a model to simulate building energy use and outputs the results as a text file. It may be downloaded from http://www.eren.doe.gov/buildings/energy_tools/energyplus.

- **Energy Supply and Management** – The City of Chicago estimates that it will save more than $260 million by 2010 through the use of renewable energy, distributed energy sources, and better energy management (http://www.ci.chi.il.us/environment/).

- **Energy Star** – EPA maintains a database of high-efficiency appliances and office equipment. By simply investing in these readily available alternatives, businesses and homes can save hundreds of dollars in energy bills every year (http://www.energystar.gov/).

- **Front Loading Washers** – Laundry facilities account for 23 percent of residential water use as well as it accounts for a similar proportion of residential sewage production. Front loading washers, also known as horizontal-axis washers, use 40-75 percent less water; clean clothes better with a less concentrated soap solution, and extend the life of clothes because they are not agitated. In 1996-98, U.S. manufacturers introduced these washers, which are used extensively in Europe. While initial costs are double that of conventional washers, they pay back the additional investment in three to four years through reduced energy, hot water, and soap. Forts Lewis and Carson have installed horizontal-axis washers in barracks and guest quarters.

- **Green Renovation –** The current renovation of the Pentagon is being done according to green design principles. The first project was a separate $10M central receiving facility. Given the security requirements for the building, it was designed as an earth-sheltered building with a park on top for Pentagon employees to enjoy. The $1.1B renovation of the Pentagon itself is harnessing market forces to determine how to "green" the historic structure. The contractor has been given a list of performance criteria for the building, some of which address environmental impacts. Some are mandatory and some are not; however, if the contractor can suggest a way to meet the criteria that will save money over the expected lifetime of the building, and the government accepts the suggestion, then the contractor shares in the anticipated savings by increasing the percentage of profit.

- **Greywater Recycling** – "Greywater" from showers, sinks, tubs, and washing machines can be used for non-potable requirements, such as irrigation and toilet flushing. Such a system at the Roseland III office park in New Jersey reduced water use by 60 percent.

- **Ground Source Heat Pumps –** This technology has been around for 70 years, emits no CO_2, and produces fewer emissions than all other fossil fuels. Ground source heat pumps use the constant subsurface temperature to regulate building temperatures by passing air through the ground and then into the building. This type of system costs twice as much as a conventional system, but saves 50 to 75 percent in energy costs.

- **LEED System –** The U.S. Green Building Council's (USGBC) release in 2000 of the Leadership in Energy and Environmental Design (LEED) rating system provides a national standard for evaluating and comparing green building performance. The LEED standards (version 2.0) can be downloaded from http://www.usgbc.org.

- **Microscopic Systems** – Scientists at the Pacific Northwest National Laboratory (PNNL) and other research laboratories are developing a family of micro-sized energy systems that are manufactured in a manner similar to computer chips. Microscopic heat exchangers, evaporators, condensers, gas absorbers, turbines, bioreactors, chemical reactors, chemical separators, pumps, and valves exhibit extraordinary rates of heat and mass transfer. When combined into HVAC or process equipment, this translates into very high efficiencies and minimal pollution generation. These miniature components can be combined to create small heat pumps that can be integrated into window frames, with simple plug-in of replacement units should the originals fail. Small bio-fueled fuel cells will be developed that can be located wherever heat and electricity are needed. Miniature chemical separation units will be developed for on-site cleanup of tanks, wells, aquifers, and other polluted systems—imagine a pen-sized device that can be dropped into a drum of waste to eliminate PCBs.

- **Spectrally Selective Windows** – Spectrally selective and chromogenic windows represent the next generation of window technology. Spectrally selective windows have advanced coatings that filter certain wavelengths of radiation from incident sunlight, lowering overall solar heat gain significantly. Chromogenic windows are more advanced, with coatings that change their reflective properties based on ambient temperature or light conditions. Some estimates place the potential energy savings at 40 to 70 percent for electrically heated spaces.

- **SPiRIT Guidelines** – The Army has developed its own version of the LEED standards that takes into account military-unique aspects of building design. The Army's Sustainable Project Rating Tool (SPiRiT) is an adaptation of the LEED standards used by industry. The SPiRiT includes additional rating factors appropriate to military projects and facilities. Projects are rated for sustainability in eight facility categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, facility delivery process, current mission, and future missions. More information on the SPiRiT standards can be found at http://www.cecer.army.mil/sustdesign/SPiRiT.cfm.

- **Superconductivity** – Superconductivity, the ability of a material to conduct electricity with zero resistance and almost no loss of power, is a cutting-edge technology that may some day revolutionize the way we think about electricity (http://www.eren.doe.gov/superconductivity/). Today, almost 10 percent of all electricity generated is lost in transmission, radiated as heat from inefficient copper and aluminum wires. Superconductors will lead to the development of a number of new technologies:
    - Transmission wires will carry 100 times more current on a wire no larger than those we use now.
    - Super-efficient mass transit systems (similar to the MagLev train in Japan) will transport people at enormous speeds using a fraction of the energy required by current commuter trains.
    - Electric motors using superconductor wiring will operate at a fraction of the cost, improving industrial and residential energy efficiency while saving money.
    - Electric generators will be smaller and lighter and require less fuel to generate power.

Design

- **Innovative Building Materials** – The building industry and the building products manufacturing industry have aggressive research activities that are providing a host of environmentally friendly and sustainable products. These include soy-based adhesives and foam insulators, shellfish-derived coatings, gas-filled wall panels, and ceramic insulators. For additional information, go to http://www.nahbrc.org/ and click "Green Building" on the navigation bar.

    - The Home Builders Association provides a "Built Green Checklist" on its web site at http://www.builtgreen.org/. While developed for single-family housing use, the checklist is comprehensive and easy to understand, and may be used as a starting point for administrative buildings and barracks.
    - In collaboration with the General Services Administration, EPA successfully modernized a 1.2-million square foot office complex in Washington, D.C. For details of this complex, go to the following website: http://www.edcmag.com/edc/cda/articleinformation/features/bnp__features__item/0,4120,19197,00.html. (Note: each "gap" in the URL represents two consecutive underscore characters.)
    - The Assistant Chief of Staff for Installation Management requires Army activities to evaluate all facility construction and repair projects using the Sustainable Project Rating Tool (SPiRiT), which is the Army's version of the Leadership in Energy and Environmental Design (LEED) system developed by the U.S. Green Building Council.

- **Intelligent Buildings** – The intelligent building is the future of architecture. It looks like any other building from the outside, but employs sophisticated control systems to make building systems (heating, cooling, ventilation, lights, windows, and appliances) more convenient and efficient. Commercial office buildings are being designed wherein lighting, temperature, and humidity in the space occupied by each worker are regulated according to his/her preferences, and windows automatically darken to provide appropriate ambient lighting for the task. This technology is also appropriate for homes. In Bill Gates' private home, occupants wear an electronic pin that keeps track of them, so the house can adjust lighting, temperature, music, and/or television shows as they move about. Investors are pumping vast amounts of money into

intelligent building research. Intelligent buildings make good financial sense. For example, by turning off unnecessary lights and not heating unoccupied rooms, these buildings can reduce utility bills by 20 to 30 percent.

Historic Buildings Preservation

- **Geophysical Techniques** – The U.S. Army Construction Engineering Research Laboratory is conducting tests using geophysical techniques to make determinations on materials commonly buried at archaeological sites. Location, depth, dimension, and position of historical objects are recorded and mapped using geophysical techniques and equipment. More information can be found at the following website: http://www.cecer.army.mil/td/tips/product/details.cfm?ID=424.

- **Historic Preservation** – Historic preservation of buildings and sustainable design have complemented each other in many places. Window replacement, paint, and replacement of heating, ventilation, and air conditioning systems may allow for the incorporation of sustainable principles. For an example and more information, see http://www.saptek.com/sp/general/21-2-4.pdf.

- **Modeling Probability of Cultural Sites** – To guide archaeological investigations, the Center for Ecological Management of Military Lands (CEMML) at Colorado State University has developed a GIS-based model to identify areas of high, high-medium, medium, low-medium, and low probability for archaeological sites. Using remote sensing equipment, aerial photography technology, and modeling increases the likelihood of releasing and expanding land for military use (http://www.cemml.colostate.edu).

Land Maintenance

Today | 2 Years | 5 Years | 10 Years | 15 Years | 25 Years

- Irrigation Meters
- Low Impact Development Techniques
- Xersicaping

- **Irrigation Meters** – In western Texas, irrigation meters save one to two-thirds of water used for irrigation. A $1 block of gypsum, buried at the root zone, is connected through two wires to a clip-on meter that reads soil moisture. Drip irrigation, which delivers a small amount of water directly to the root zone of plants as needed, also drastically reduces water use.

- **Low Impact Development Techniques –** These can minimize impervious areas, thereby maximizing groundwater recharge (www.stormwatercenter.net).

- **Xeriscaping** – A landscape design method that creates elegant and water-efficient landscapes that require little or no irrigation, uses native plants that are as attractive as traditional ones.

Deconstruction

Today | 2 Years | 5 Years | 10 Years | 15 Years | 25 Years

- Local Industry Partnerships
- Salvage Rights

- **Local Industry Partnerships** – Redstone Arsenal has paid a local house mover and developer to move 89 two-story brick duplexes off the installation and into the local community, where they will be sold and reused. The cost was about $9,000 per house versus the $12,000 it would have cost to demolish them, resulting in a cost savings of $267,000.

The Army has signed a Memorandum of Agreement with Habitat for Humanity to allow them to "deconstruct" buildings on the demolition schedule and sell the salvaged

items to support Habitat home-building activities. A pilot project is being developed at Fort Hood with the Austin, Texas Habitat affiliate.

- **Salvage Rights** – Fort Knox sells the "salvage rights" to buildings that are on the demolition schedule. The purchaser of the rights can remove windows, doors, flooring, siding, plumbing, and copper wire—but must remove at least 50 percent of the volume of the building. The installation makes about $100,000/year on the sale of the salvage rights, but saves hundreds of thousands on reduced demolition costs and disposal costs. Fort McCoy has a similar program.

Fort McPherson 25-year Goals for Infrastructure

The Fort McPherson Garrison Command and staff, in conjunction with local stakeholders and technical experts, established the following infrastructure goals during the Sustainability Workshop on 11–13 December 2002:

Sustainable Design

Established and formalized integrated business process for identifying requirements, designing, building, maintaining and disposing of building infrastructure.

Energy Reliability

Reliable, secure, and independent energy source for Fort McPherson and Fort Gillem.

Infrastructure Group Membership

Name	Org	Movie
Ron Webster	AEPI	Lonesome Dove
Cindy Trout	SERO	Oh,God
Debbie Curtin	CERL	Gone with the Wind
Dana Perkins	JM Waller	Good Will Hunting
Tom Broadwater	AEC Liason to FORSC OM	True Grit
Corrinne Benedek	Southface Institute	Princess Bride
Luke Wyland	Fort McPherson	Somewhere in Time
Kevin Luster	SJA	The 3 Musketeers
Angel Coddo/Perez	DIS Housing	[no movie]
Luara Drasgow	CERL	Bull Durham
Beth Grashof	SERO	The Graduate
David Barber	Fort Mac ENV	The Last Emperor
Barry Hull	Fort Bragg	The Sandlot
Jack Schupp	Fort Mac	A Beautiful Mind
Marvin Head	DIS	Oh Brother where art thou?
Jules Paulk	Southface NRG Institute	Tango Lesson

List of Issues

Sustainable Design

- Building Maintenance
- Building lifecycle costs
- Failing infrastructure
- Privatization of H20/sewer, electric, gas
- Durability
- No integration of sustainable design/development into construction, renovation, demolition, etc…. NO GREEN DESIGN
- Greening of new construction, Innovative work on existing facilities
- Sustainable Design
- Old "Historic" infrastructure
- Renovation and preservation (Green design, recycle, reuse, disposal, remediation)
- New transient facilities
- Aging buildings failing structures
- Building energy use, reducing the energy; needed to operate buildings

Indoor Environments

- Indoor air quality (affects occupant health and productivity)
- Inadequate space to meet space requirements
- Building Triage (HM assess, what's salvageable, Tools to determine best alternative)

Building disposal

- Building Demolition
- Excess Structures (demolition, salvage, deconstruction…Need tools to determine best options)
- Construction debris, where does it go
- Reuse/Recycling of construction and demolition waste

Transportation

- Too many parking lots/impervious surfaces
- Traffic
- Telecommuting mass transit, (viable)
- Air Quality

Water

- Water Quality and Quantity
- Misuse/Waste of Potable Water
- Water consumptions….How to reduce?
- Landscape Native drought tolerant plants… Green Space, pedestrian space
- Storm water runoff & permeability

Community Partnerships

- Water runoff both coming on to and going off post
- Community Isolation and revitalization relations
- Get housing occupants out of historical quarters into low-rise condos due west of barracks facility. Open up historical quarters to public tours decorated with period furniture. A lot of energy savings and occupants a lot happier.
- Communication Infrastructure
- Telephone/Internet connections

Global (Fort McPherson) Issues

- Security
- Increase Installation Growth Potential
- Smart Contracting, other innovations

- Sustainability Awareness (SOPs; Eco-sense, Business principles)
- Competing for money against training installations

Energy Reliability for on base distribution

- Energy Use
- Energy Independence (distribution, secure independent energy, renewable (solar, fuel cell, micro turbines)
- Underground electrical feeders
- Energy Transmission

Energy Conservation

- Energy conservation in large buildings

Initial Strategic Goals and Proponents

Initial Strategic Goal #1: Water

•**Desired End State**: Reduce all water consumption using grey water, storm water, runoff and water efficient fixtures.
•**Metric**: Reduce by 80%
•**Timeframe**: 2027
•**Proponent Organization**: Directorate of Installation Support
•**Issue**: We are in a perpetual drought and must address: Misuse/Waste of Water; Water Quality and Quantity; Water conservation; Landscape Native drought tolerant plants… Green Space, pedestrian space; Storm water runoff & permeability

Initial Strategic Goal #2: Sustainable Design

•**Desired End State:** LEED Silver or above for renovations; LEED Platinum for New Construction; Eventual inclusion into Installation Design Guide.
•**Metric:** All projects meet LEED Standards
•**Timeframe:** Now, IDG by 2004
•**Proponent Organization:** Directorate of Installation Support
•**Issue:** Must integrate sustainable design/development into construction, renovation, building maintenance; based on lifecycle cost analysis. Specific issues at McPherson include aging buildings, failing infrastructure and historic properties.

Initial Strategic Goal #3: Building Design

•**Desired End State: R**educe Construction and Demolition waste through reuse and recycling.
•**Metric:** Reduce by 90%
•**Timeframe:** by 2010
•**Proponent Organization:** Directorate of Installation Support
•**Issue:** Construction and Demolition waste is 80% of the solid waste stream. Landfill capacity is decreasing in the state of Georgia. Language is not currently written into contracts for recycling and reuse of C&D waste.

Initial Strategic Goal #4: Energy Reliability

•**Desired End State:** Grid Free; Bury all electrical lines
•**Metric:** 100% off the grid; 100% electrical lines buried
•**Timeframe:** by 2027
•**Proponent Organization:** DIS
•**Issue:** Lack of reliable Energy, Energy Independence (distribution, secure independent energy, renewable (solar, fuel cell, micro turbines), Underground electrical feeders; Energy Transmission.

Initial Strategic Goal #5: Energy Conservation

•**Desired End State:** Reduce energy use below energy code for GA by increasing efficiency.
•**Metric:** Reduce by 35% by 2010; Reduce by 75% by 2027
•**Timeframe:** By 2027
•**Proponent Organization:** DIS
•**Issue:** Lack of Energy conservation in all buildings

Initial Strategic Goal #6: Transportation

•**Desired End State:** Less fossil fueled vehicles on post.
•**Metric:** 70% Reduction; 99% reduction
•**Timeframe:** By 2015; By 2027
•**Proponent Organization:** Garrison

•**Issue:** Too many parking lots/impervious surfaces; Traffic; Telecommuting mass transit, (viable); Air Quality

Initial Strategic Goal #7: Sustainability Awareness

•**Desired End State:** Sustainability awareness that is supported by policies, procedures, and metrics that is implemented and enforced (Best Value)
•**Metric:** Implementation of a sustainability management system (ISO 9001)
•**Timeframe:** By 2007
•**Proponent Organization:** DIS
•**Issue:** Lack of Sustainability Awareness (SOPs; Eco-sense, Business principles)

Initial Strategic Goal #8: Community Partnerships

•**Desired End State:** Establish a livable off Post Community (improved quality of life, schools, community support, asset sharing)
•**Metric:** 25% of installation employees living within 5 miles of Fort McPherson or Fort Gillem.
•**Timeframe:** By 2027
•**Proponent Organization:**
•**Issue:** Community Isolation and revitalization relations; Get housing occupants out of historical quarters into low-rise condos due west of barracks facility. Open up historical quarters to public tours decorated with period furniture.

Initial Strategic Goal #9: Sustainable Contracting

•**Desired End State:** Sustainable Affirmative Procurement Specifications, Guidelines, Energy Star and other energy specifications
•**Metric:** 100%
•**Timeframe:** by 2004
•**Proponent Organization:** SRCA
•**Issue:** Current contracting and procurement practices preclude sustainability principles (I.e. privatization, low-bid, appliance specifications, etc)

Initial Strategic Goal #10: Master Plannning

•**Desired End State:** Revise & Enforce Sustainable Installation Master Plan
•**Metric:** A master plan
•**Timeframe:** by 2004
•**Proponent Organization:** DIS

•**Issue:** We do not have or comply with a comprehensive installation master plan.

Initial Strategic Goal #11: Maintenance Management System

•**Desired End State:** Installation wide commissioning & evaluation of all buildings (strategy through IDG)
•**Metric:** Implementation of MMS
•**Timeframe:** By 2010
•**Proponent Organization:** DIS
•**Issue:** We have a reactive PM program. We don't have baseline data.

Final Strategic Goals and Teams

Sustainable Design

•**Desired End State:** Established and formalized integrated business process for identifying requirements, designing, building, maintaining and disposing of building infrastructure.
•**Metric:** 100% of Fort McPherson and Fort Gillem infrastructure meets sustainable design principles.

- LEED Silver for new renovations; Platinum for New Construction by 3rd QTR, FY03
- Sustainable Installation Master Plan enforced through a disciplined installation planning board by 2004.
- Installation Design Guide by 2004
- Installation wide evaluation of all buildings by 2006Building commissioning system by 2006
- Ancillary infrastructure by 2015
- Existing buildings will meet LEED by 2027

•**Timeframe:** 2027
•**Final Goal Wording:** 100% of Fort McPherson and Fort Gillem infrastructure meets sustainable design principles by 2027.
•**Issue:** Wrong projects in wrong place at wrong time that cost a lot of money; not following the master plan process (AR 415-28)

•**Proponent Organization:** Directorate of Installation Support

Team	Role
EP&S, DIS	Process Owner
Housing, DIS	Housing Issues
O&M Division, DIS	O&M Issues

IMA, SERO	Guidance and Advice
Building Managers	Users
CERL	Spirit/LEED Standard
Southface Energy Institute	Building Energy
SRCC	Contracting
Texas A&M	Continuous Commissioning Issues
Georgia Tech	Sustainable Design
Environmental Division, DIS	Environmental Issues
Safety Office	Safety
CHPPM	Occupational Health, indoor air quality
SJA	Legal Issues
Local Communities	TBD

Energy Reliability

•**Desired End State:** Reliable, secure, and independent energy source for Fort McPherson and Fort Gillem.•**Metric:** 100% capability to achieve mission off the grid

- Reduce energy use by 35% by 2010
- Bury family housing electrical lines by 2007 and all electrical lines buried by 2013;
- Reduce energy use by 75% by 2027•**Timeframe:** 2027

•**Final Goal Wording:** A reliable, secure, and independent energy source for Fort McPherson and Fort Gillem by reducing energy use, burying energy lines and establishing independent generation capabilities by 2027.

•**Issue:** Lack of reliable Energy, Energy Independence (distribution, secure independent energy), renewable (solar, fuel cell, micro turbines), underground electrical feeders, secure energy transmission and energy conservation in all buildings

•**Proponent Organization: Directorate of Installation Support**

Team	**Role**
EP&S, DIS	Process Owner
Housing, DIS	Housing, area coordinator, building managers
O&M Division, DIS	O&M Issues
IMA, SERO	Guidance and Advice
Building Managers	Users
CERL	Spirit/LEED Standard
Southface Energy Institute	Building Energy
SRCC	Contracting
Dept of Energy, ORNL, NREL	Technology

Georgia Tech	Alternative Energy
Environmental Division, DIS	Environmental Issues
Georgia Power	Energy Solutions
PNNL	Technology
SJA	Legal Issues
Local Communities	TBD

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Challenge

Increasingly, the citizens of Georgia are concerned about air quality in the state, specifically the levels of ozone, particulate pollution, and greenhouse gas emissions. Vehicles are a major contributor of these pollutants and the operation of Fort McPherson exacerbates the problem. Further, congestion affects the staff and decreases their quality of life. How can Fort McPherson contribute to overcoming the overall transportation challenges faced by metro Atlanta?

Key Considerations

- **Commuting** – Fort McPherson's Strategic Plan lists the workforce commute as one of the external threats to its mission, due to an overwhelming reliance on private vehicles. However, Fort McPherson is in an ideal location to take advantage of mass transit opportunities, reducing overall vehicle emissions. Increased rider-ship by staff at Fort McPherson in regional/metropolitan transportation alternatives will support regional goals and enhance its mission success.

- **AAFES Distribution Center** – The Army and Air Force Exchange Service (AAFES) operates a major distribution center at Fort Gillem. Goods are shipped throughout the southeast from the center. The additional vehicle emissions partially impact the Atlanta region. Bio-based diesel and alternative shipping options, such as rail, may be viable for AAFES, which will support air quality objectives.

- **Commissary, Post Exchange, and Medical Clinic** – A commissary at Fort McPherson supports its active duty personnel and a large retired military community. Fort McPherson also provides medical services for the active duty personnel and the retired community. Commuting to these services creates an additional traffic burden of an estimated 4,700 privately owned vehicles per day.

- **On-Post Vehicle Use** – Fort McPherson uses a fleet of government vehicles for operations on the installation. These operations include: building maintenance; landscaping; inspections; coordination with other agencies on the installation; errands; transportation of incoming troops; and recreational activities. The use of alternative fuel vehicles or hybrids would help reduce the emissions of vehicle use on-post.

Importance to Fort McPherson

Mission – Reliable transportation to Fort McPherson is critical to its mission. The Fort McPherson Strategic Plan identified commuting as one of the crucial external threats to mission accomplishment because it relies almost exclusively on privately owned vehicles.

Quality of Life – Delays in getting to work and home again add to the stress of commuting and reduce worker satisfaction that can affect long-term productivity and quality of life.

Cost of Operation – Transportation costs increase basic costs for both Fort McPherson operations and for commuters.

Environment and the Community – The emissions associated with the daily commute contribute to Atlanta's air quality problems. In addition, trucks transporting goods for AAFES add to the traffic congestion, and stress local infrastructure. Nitrous oxides emitted from vehicle operation contribute to the high ozone concentration in the Atlanta region, particularly in the summer.

Introduction

Fort McPherson's location inside the Atlanta metro area demands that transportation issues are important to its preservation. Atlanta and the surrounding counties have grown dramatically in the last 20 years. Population has increased from less than 2 million to over 3.5 million. Because of this growth, the number of daily commuter vehicles has doubled. Transportation studies show Atlantans travel over 118 million miles commuting daily, causing heavy congestion and delays. The more serious side effect is the decreased air quality, resulting primarily from those vehicle emissions. Poor air quality does not just pose risks to human health; it can also harm the environment, plants, and the ecosystems on which we depend.

Regulations at a Glance

Executive Order 13149, Greening the Government Through Federal Fleet and Transportation Efficiency – Against a 1999 baseline, increase fleet fuel efficiency by 3 miles per gallon and reduce vehicle petroleum consumption by 20 percent by 2005. Also, ensure that alternative fuels account for 50 percent of fuels used in dual-fuel vehicles by 2005.

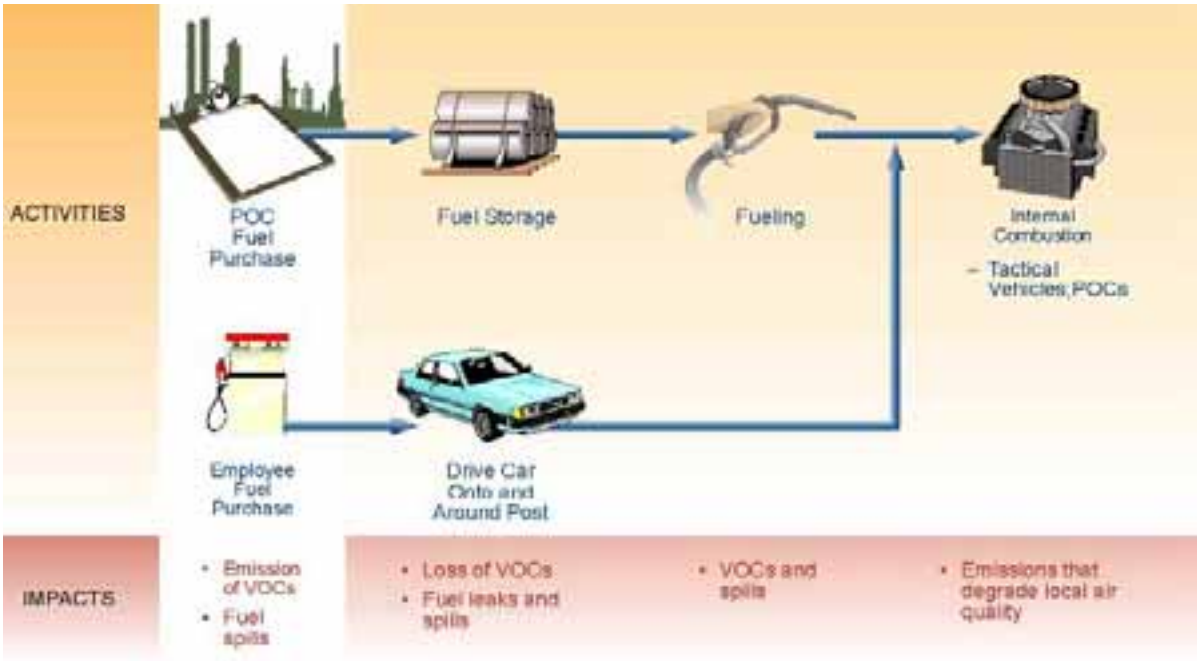
Clean Air Act (CAA) – This legislation sets limits on the amount of certain pollutants that can be in the air in the United States.

The Atlanta region cannot meet the national "ambient air quality standards" for ozone (O_3), primarily due to the emission of nitrous oxides from fuel burning. Atlanta commuters drive 118 million miles each day, equivalent to the annual production of 1.1 million tons of CO, 21.9 million tons of CO_2, and 54,750 tons of NO_2. Every summer, hot days increase the concentration of ozone and put Atlanta in a "non attainment" area. Another direct effect of vehicle use is the addition of massive amounts of carbon dioxide (CO_2) to the atmosphere. Although not regulated per se, CO_2 is a "greenhouse" gas and contributes to long-term global warming.

Activities and Impacts

Fort McPherson's transportation activities include the private workforce commute; the military community vehicle use, the provision of retail and storage space for logistic operations (i.e. AAFES); and the general vehicle use in the day-to-day operations and maintenance of the installation. As such, these activities contribute to traffic congestion and degrade the air quality of the Atlanta area. These activities result in 620,000 miles per day of travel and contribute 4,000 tons of CO, 82,700 tons of CO_2, and 210 tons of NO_X to the air in the metro Atlanta area annually. Contributing transportation patterns are presented below in Figure 2.

Figure 2 – Transportation: Activities and Impacts



Commuting

Recently, Fort McPherson completed a traffic study for both Fort McPherson and Fort Gillem. The study found that installation commuters drive an average of 330,000 miles each day, or roughly 85 million miles per year. This translates to an annual contribution of approximately 2,100 tons of CO, 44,000 tons of CO_2, and 113 tons of NO_X.

AAFES Distribution Center

AAFES operates a major distribution center at Fort Gillem. Trucks haul AAFES goods to and from other distribution centers and deliver them to retail stores throughout the region. Approximately 60 trucks travel a total of 12,000 miles per day carrying these products. This adds 80 tons of CO, 1,600 tons of CO_2, and 4 tons of NO_X annually to emissions within the United States. Further, AAFES operates a fleet of 66 trucks to move the goods between on-post warehouses. This activity logs another 3,300 miles each day, creating 22

tons of CO, 440 tons of CO_2, and 1 ton of NO_X annually. Bio-diesel will be utilized shortly in AAFES trucks resulting in reduced emissions.

Commissary, Post Exchange, and Medical Services

Fort McPherson provides commissary, exchange, and medical services to an estimated 1,325 active duty military, 3,175 reservists, 46,000 retirees, and 70,000 family members. The recent traffic study estimates that such vehicle use amounts to 270,000 miles each day. This translates to 1,700 tons of CO, 36,000 tons of CO_2, and 90 tons of NO_X annually.

On-post General Vehicle Use

Garrison vehicle activities on-post include maintenance of the grounds and facilities, traveling to and from meetings, installation inspections, recreational activities, and general coordination of installation staff actions. Fort McPherson maintains a fleet of 243 vehicles to accomplish these tasks. The majority of the vehicles are sedans and light trucks. These activities account for approximately 4,700 miles per day and contribute 33 tons of CO, 660 tons of CO_2, and 1.5 tons of NO_X annually. Forty-six are compressed natural gas (CNG) vehicles and 26 are ethanol-compatible.

Forecast

Atlanta continues to grow. By the year 2025, the region could have 4.8 million people commuting to 2.8 million jobs each day, which translates to 200 million total vehicle miles traveled per day. These additional vehicles will make it more difficult for Fort McPherson employees to commute to work, family members to drive to the commissary or medical clinic, and the AAFES distribution center to move and store their products. The potential increase in low-level ozone levels will worsen the health risks associated with living and working in the metro Atlanta area. Through this possible increase in the number of vehicles, the air quality of the Atlanta metro region can only decline unless preventative action occurs.

Current Sustainability Activities

- **Clean Air Campaign (CAC)** – Fort McPherson is a partner with the "Clean Air Campaign," a not-for-profit organization that works to reduce traffic congestion and improve air quality through a variety of voluntary programs and services, including free

employer assistance, public information, and children's education. The CAC assists Fort McPherson in proactive ways to reduce the number of single-occupant vehicles on the road. Members of the Fort McPherson staff provide information that helps commuters locate carpools, join vanpools, and get discounts for monthly transit passes.

- **Clean Cities** – In 1993, Atlanta began to help market Alternative Fuel Vehicles (AFVs). By 2001, there were over 3,000 AFVs and 113 stations to service these vehicles. Most of these vehicles use Compressed Natural Gas (CNG), with about an equal number of propane and electric-powered vehicles making up the total. The U.S. Postal Service, Georgia Power, and MARTA use large fleets of AFVs. Fort McPherson operates 46 CNG vehicles and maintains a fleet of 26 vehicles that can burn ethanol.

- **Electric Vehicles** – Fort McPherson has also begun building a fleet of electric cars (basically all-weather golf carts) ideal for on-post transportation. The installation recently acquired 11 of the vehicles to replace gas-powered cars. Eventually these vehicles could become part of an electric transportation system on Fort McPherson and link with a proposed Atlanta program to lease electric vehicles to individuals for local trips.

- **Regional Transportation Plan** – Atlanta has a Regional Transportation Plan 2025 that sets the transportation policy and outlines projects for the long-term improvement of mass transit. This is an excellent opportunity for a Fort McPherson-Atlanta partnership to reduce the single occupancy vehicle (SOV) commute each day. The website is www.atlantaregional.com/mobilityair/plansprograms/RTP/rtp2025update.html.

- **Mass Transit Benefit Program** – Vouchers of up to $100/month are provided to eligible government employees to take mass transit or vanpools to work.

- **Bio-diesel** – Except for NO_x, emissions from the combustion of bio-diesel are less than petroleum-based diesel fuel. The major user of diesel, AAFES at Fort Gillem, will soon be using a mixture of 20 percent bio-diesel. This will reduce the use of fossil fuel in AAFES vehicles that are fueled at Fort Gillem by 20 percent.

The Realm of Possibility

Commuting

Today | 2 Years | 5 Years | 10 Years | 15 Years | 25 Years

- Trees for Travel
- Car Sharing

- **Car Sharing** – Along with 30 other metro areas in the U.S., Atlanta is one of the pioneers in car sharing. Essentially, it is an automobile community cooperative, or a subscription-based transportation service with cars available to its members. The average car-sharer spends only $1900 per year on automobile expenses, as compared to the average individual car owner's costs of $7600 per year. In addition, after one joins a car-sharing operation, they reduce their car use by over 70 percent per year and consume 55 percent less fuel energy. In Atlanta, the car-sharing operation is E-motion Mobility at www.emotionmobility.com.

- **Trees for Travel** – Trees for the Future is a nonprofit organization that will plant trees to offset the pollutants caused by air and vehicle travel. Organizations can keep track of their mileage and send donations to Trees for the Future. Large land-owning organizations, such as Fort McPherson, can start their own program to offset the vehicle emissions caused by transportation activities (http://www.treesftf.org/travel.htm).

Fuel Efficiency

Today | 2 Years | 5 Years | 10 Years | 15 Years | 25 Years

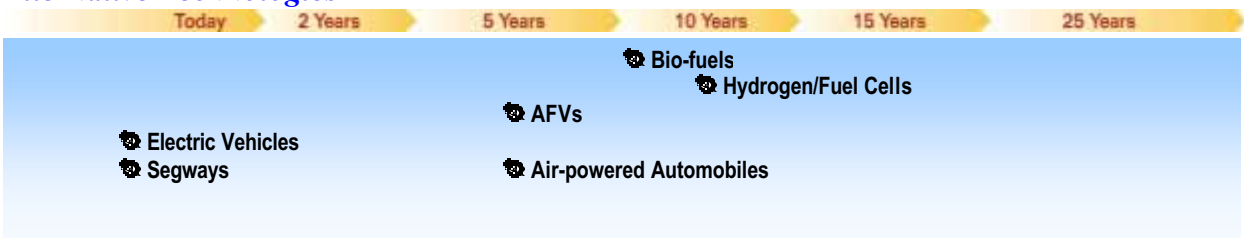
- LEV/SuLEV
- Hybrid Vehicles

- **Hybrid Vehicles** – A hybrid is an automobile that runs on a combination of technologies with the traditional internal combustion engine. The Honda Civic and Toyota Prius are both hybrid electric vehicles and are presently on the market. They normally use half as much gas to the gallon as a conventional automobile.

- In addition, the Department of Energy now offers a $2,000 rebate on their purchase, making them more affordable. This technology does not have the refueling problems that other technologies may have because it fundamentally depends on the same combustion engine mechanism.

- **LEV/SuLEV** – Low-emission vehicles (LEV), super-low emission vehicles (SuLEV), and no-emission vehicles are on the market, in response to new laws in California. Georgia laws encourage the use of LEVs and SuLEVs, through financial incentives.

Alternative Technologies



- **AFVs** – Alternative fuel vehicles (AFVs) are available on a limited basis now, but it will be a few more years before they truly begin to capture market share in the public and private sectors. Honda is working on a zero-emission vehicle that uses fuel cells for power. The state of California will now give up to $9,000 in rebates to people who buy super-low emission vehicles (SuLEVs). With lower per-mile costs associated with fueling larger fleets, city bus fleets and commercial fleets are prime candidates for alternative fuels such as compressed natural gas. Colorado Springs Utilities runs over 90 vehicles on natural gas, reducing carbon monoxide emissions by 75 tons and nitrogen oxide emissions by 2,772 pounds per year. The General Services Administration (GSA) can provide a number of AFV options. For more information, go to the following websites:
  http://www.afdc.doe.gov/afvehicles.html and
  http://www.csu.org/environment/energy/vehicles.html.

- **Air-powered Automobiles** – Based upon isotherm dynamics with a lightweight body and under-belly mounted engine, this vehicle has no harmful emissions and no fuel costs. It is very small and does not go very fast, but is very useful for urban environment and urban fleets, or on a military installation. More information can be found at www.technologyreview.com/articles/print_versioun/wo_harney091202.asp.

- **Bio-fuels** – Bio-fuels are alcohols, ethers, and other chemicals made from renewable resources (e.g., fast-growing trees, grasses, and algae) and waste products (e.g., agricultural and forestry residues, and municipal and industrial wastes). It is estimated that domestically produced biomass resources could eventually provide at least half of the U.S. light duty vehicle (LDV) fuel requirement. In the not-too-distant future, biomass will be consumed in fuel cells in vehicles and stationary equipment to produce heat and electricity very efficiently, with virtually no pollution and no net increase in carbon emissions. Eventually, high-efficiency biomass power plants will allow any facility to generate its electricity on-site.

  According to the Department of Energy, America's fastest growing alternative fuel is bio-diesel. Fuel generated from surplus soybean crops can replace diesel in many applications. Bio-diesel reduces diesel exhaust by 80 to 90 percent. The Defense Energy Support Center recently issued a long-term contract to purchase bio-diesel for fleet vehicles including those of the Marines, Air Force, and Department of the Interior.

- **Electric Vehicles** – The Advance Research Projects Agency established the Hawaii Electric Vehicle Demonstration Project to facilitate further applications of electrical vehicle technologies for commercial and military applications. The potential for creating jobs, broadening the use of electric and other alternatively fueled vehicles, developing infrastructures to support those vehicles, and maximizing the number of alternatively fueled vehicles on the road increases with partnerships of this type.

- **Hydrogen/Fuel Cells** – Hydrogen is not a viable energy source since little free hydrogen is available. Instead, many view it as the ultimate energy storage and transmission medium. It will be extracted from hydrocarbons, bio-fuels, and even water, and shipped/piped to another location where it will be directly burned, or indirectly consumed in a fuel cell, producing only energy and water vapor. Iceland, which has rich geothermal and hydrologic resources to extract hydrogen from seawater, recently set a goal of becoming the first hydrogen economy. Iceland New Energy, a consortium that includes Daimler Chrysler AG, Norsk Hydro AS of Norway, Royal Dutch Shell Group, and a Reykjavik-based venture capital fund, has launched projects aimed at promoting the hydrogen economy in Iceland. Three buses powered by hydrogen fuel cells will be introduced into Reykjavik's city transport fleet by the end of 2002. A second project will begin replacing conventional chemical batteries with fuel cells in stationary power structures that are not currently on the regular electric grid.

Fuel cells convert fuel to power three times more efficiently than internal combustion engines; they also allow for a greater range of travel than electric vehicles and do not pollute at the point of use. Every major automobile manufacturer in the world is investing in fuel cell technology, and the Department of Energy supports fuel cell research and development.

- **Segways** – These machines are self-balancing, personal transportation devices designed to operate in any pedestrian environment. Segways use a process called dynamic stabilization, which works in much the same way your own sense of balance does. This machine can carry heavy loads for localized, on-post transportation without any harmful air emissions. For more information, go to the following website: www.segway.com.

Fort McPherson 25-year Goals for Transportation

Attendees at the Fort McPherson Installation Sustainability Workshop, which convened on 11–13 December 2002, developed the following long-range goals:

Fort McPherson/Gillem will operate all transportation systems on post with renewable energy resources by 2028.

50% of the population working on or served by McPherson/Gillem live within a 5-mile radius by 2028.

The primary issues and goals discussed in the Transportation working group are described below. This information will be helpful in developing the short-term objectives and five-year plans needed to reach the long-range goal.

Breakout Group Membership:

Facilitator: Mr. David Eady
Recorder: Ms. Michelle Hanson

Name	Organization
Carrie Weisse	Ft. McPherson Environmental Division
Bob Malone	Ft. McPherson Installation Transportation Office
Paige Schultz	Fort Rucker
Mark Clements	SERO

Tom Shillock	The Clean Air Campaign
Jeff Basile	Fort Hood
Kelly O'Neill	Fort Carson
Paul Wirt	Fort Bragg
Michael LaDuc	Fort Campbell
Nora David	SERO
Roc Tschirhart	Army Reserve

Desired End States and Baseline Issues:

Desired End States – Headlines

Mass Transit

- Ft. Mac leads the way in mass transit
- IPT – instant personal transport – a success thanks to Ft. McPherson/Gillem
- Fort Mac leads the way in sustainability – no emissions, closing the loop, fossil fuels, mass transit, car pools

Alternative Fuels

- Fort Gillem opens hydrogen fuel pumps to public.
- Ft. Mac purchases largest hybrid engine fleet
- Ft. McPherson passes gas with alternative fuel vehicles
- Ft. Mac's vehicle emissions generate oxygen
- AAFES buys turbine engine trucks
- The Neat Clean fleet at Ft. McPherson – 100% AFV
- Army eliminates fossil fuel use in vehicle fleet.

Reduced Emissions

- Nothing but clean air at Ft. McPherson
- Clean air pocket over Ft. Mac/Gillem spreads to greater Atlanta region.
- Atlanta finally achieves clean air due to Ft. Mac/Gillem leadership
- Zero emissions achieved at Fort McPherson

Reduced Commuting Distance

- Fort McPherson regional leader in telecommuting
- Innovative communications end shuttling between Ft. Mac and Gillem
- Fort McPherson staff bans all TDY travel

- Ft. Mac and AAFES create joint venture to reduce intrapost traffic
- Fort McPherson becomes the first pedestrian-only installation
- Army builds homes near Fort Gillem – a planned community
- Local forts reduce commuting trips by 50%
- Smart commuting at Mac/Gillem demonstrate how it's done!
- SOV commuting eliminated at Ft. McPherson
- Army is the model for sustainable transportation in Atlanta
- Pedestrian tunnel from hartsfield opens for Ft. Mac and Gillem
- AAFES implements program to optimize transportation distances

Other

- Mark Clements wins Governor's race
- Fort McPherson and FORSCOM outsourced – Wal Mart wins contract

Baseline Issues – Headlines

Mass Transit

- MARTA tokens underused
- MARTA station is underused by most of Fort Mac
- City to close MARTA station – lowest usage in city
- MARTA refused to run buses on post
- Mass Transit miserable failure at Ft. Mac, 85M miles commuting/year

Alternative Fuels

- CNG station underused

On post transport

- Personnel at Ft. Mac are not authorized to walk between buildings
- Study shows most vehicle trips on post are less than 0.5 miles

Transport between posts

- Meetings result in millions of commuter miles/year
- Army personnel spend 20% of workday running back and forth between Mac and Gillem – your tax dollars at work
- Wasteful commutes between Ft. Mac and Gillem

Transport to post

- Telecommuting banned by FORSCOM
- Ft Mc/Gillem most miles driven in Atlanta!
- Vehicle miles driven surpass 1 million miles/day at Ft. Mac.
- Local commuters spend an average of 600 hours/year in traffic
- Opportunities for carpooling ignored at Ft. McPherson
- Traffic congestion on Fort McPherson results in 2 hour traffic jam.
- Pile up on Lakewood Freeway kills 15 – Army at fault

Air Emissions

- Fort McPherson regional leader in Nox, Sox, CO2.
- Ft. Gillems lack of eateries increases congestion.
- Ft Mac/Gillem uses 2-stroke engines causing 3 ozone alerts
- Fort McPherson heats things up – 88 million lbs of CO2 emitted annually
- Fort Mac/Gillem personnel all drive SUVs, pollute air.

Health

- respiratory problems increase from poor air quality at Ft. Mac

Compliance

- McPherson's vehicle program fails to meet EPACT mandates
- FORSCOM violates Ft. Mac's air permit
- Ft. Mac Commander fired – installation forced to pay $10M air quality fine

What needs to change and how would you measure it?

- On post vehicle use – more electric vehicles, hydrogen vehicles
- Get people out of POVs - measure total POV miles/year (normalized for base year. Changes needed include convenient commuting alternatives at both posts, workday alternatives.
- Video teleconference hookups in all major facilities – 80% reduction in on-site, face-to-face meetings
- Increase video teleconferencing options to reduce commuting between installations by 95% in 8 years
- 100% convenient shuttle bus or other transport between McPherson and Gillem by 2015.
- Shuttle van between Fort Gillem and McPherson reduce VMT by 275 miles/day.

- Move same functions to same place to reduce travel between posts: USARC-Gillem; 1st Army-MAC;
- Increase in use of alternative fuels
- Eliminate POVs at Ft. McPherson
- Reduce emissions from government vehicles by 75% and reduce the toxicity of emissions by eliminating all human carcinogens
- Revise AAFES procedures to buy more local products for each installation
- Reduce/eliminate need/perceived need for between post commuting: number of in-person meetings called, use alternatives like teleconferencing, email, desktop VTC, delegation and trust
- Incentives and tracking for using mass transit and car pooling –
- Charge $$ for on-post parking
- Reduce use of gas, diesel in fleet by 100% by 2025.
- 100% reduction in POV travel around installations, due to convenient alternatives by 2010.
- Increase/improve air quality
- Increase carpooling, vanpooling, and transit by introducing a daily parking fee.
- No POVs on post.
- Increase carpooling and use of MARTA by Ft. Mac personnel by 75%.
- Minimize miles in distribution system – local purchase.
- Have more VTCs and less travel/tdy.
- Close McPherson, move everything to Gillem, leave golf course and museum at McPherson
- Institute a progressive telecommuting program with 20% of jobs identified for inclusion by 2005.
- Establish incentives to increase the use of MARTA by 75%
- Mass transit and car pool use increase by 75% by 2020.
- Making mass transit a way of life – changing the mindset.
- Increase ridership on MARTA by providing a shuttle from station to installation.
- New technology/hybrid vehicles/fuel cells – use more of them for post travel.
- Implement van pooling – increase by 50 van pools.
- Have more bicycles and electric cars for each building to use on post.
- One-stop facility (food, pharmacy, etc) on Gillem that is open to all on-post personnel.

Initial Goals and Proponents Developed:

Initial Strategic Goal 1:

•**Desired End State:** Eliminate consumption of transportation related non-renewable energy at Ft. McPherson/ Ft. Gillem
•**Metric:** 100% reduction in fossil fuels in GOVs; 75% reduction by POVs
•**Timeframe:** By 2028
•**Proponent Organization:** Directorate of Installation Support – Transportation Division
•**Issue:** Fossil fuel use; Emissions; Energy independence

Initial Strategic Goal 2:

•**Desired End State:** Minimize time spent in transit.
•**Metric:** 50% reduction in personal commuting time; 95% reduction in inter-post commuting.
•**Timeframe:** By 2028
•**Proponent Organization:** Directorate of Installation Support – Transportation Division
•**Issue:** Amount of time spent commuting both to/from work and between posts; Quality of life; Emissions.

Final Goals and Team Members:

FINAL STRATEGIC GOAL #1

50% of the population working on or served by McPherson/Gillem live within a 5 mile radius.

•**Desired End State:** A high quality environment in close proximity to Fort McPherson/Gillem in which to live, work and play.
•**Metric:** 50% of civilian, military, and retiree population; 5-mile radius
•**Timeframe:** By 2028
•**Issue:** Opportunities for housing, education, recreation, vocation, cultural, community revitalization, historical preservation; improved resource use and air quality

Team Member(s):
• **Proponent Organization:** Strategic Planning Office
•**Team Member/Role:** Public Affairs
•**Team Member/Role:** Housing Office
•**Team Member/Role:** Metro Atlanta Chamber of Commerce
•**Team Member/Role:** Cities of East Point/College Park/Forrest Park
•**Team Member/Role:** GA Dept of Community Affairs
•**Team Member/Role:** HUD
•**Team Member/Role:** GA Dept of Transportation
•**Team Member/Role:** Atlanta Regional Commission
•**Team Member/Role:** Local Housing Authorities (City of Atlanta, Fulton County, City of East Point)
•**Team Member/Role:** Local NGOs
•**Team Member/Role:** GA Power Dept of Community Development

FINAL STRATEGIC GOAL #2

Fort McPherson will operate all transportation systems on post with renewable energy resources by 2028.

•**Desired End State:** Eliminate non-renewable source energy (e.g., petroleum, natural gas) use for transportation on post.
•**Metric:** 100%
•**Timeframe:** By 2028
•**Issue:** Fossil Fuel Use, Emissions, and Energy Independence

Team Member(s):
•Proponent Organization: DIS – Transportation Division
•Team Member/Role: Strategic Planning Office
•Team Member/Role: AAFES
•Team Member/Role: FORSCOM, 1st Army, 3rd Army, USARC, and other major tenants
•Team Member/Role: Procurement Office
•Team Member/Role: DOE, Atlanta Regional Office
•Team Member/Role: SERO
•Team Member/Role: Clean Air Campaign

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Challenge

Fort McPherson's Operations and Maintenance (O&M) budget was approximately $58 million in 2001. Approximately 5,900 tons of solid waste, including hazardous waste, is created and then disposed of each year. In addition to the Infrastructure and Transportation challenges, how can Fort McPherson reduce the total resources it uses, increase the efficiency of its resources to eliminate waste, and shift to renewable sources for the resources it does purchase?

Key Considerations

- **Resource Conservation** – By using fewer resources, Fort McPherson can reduce its costs and environmental footprint, associated with the manufacture, use, and disposal of materials and resources.

- **Energy Independence and Green Power Purchasing** – Combined, these two options allow for extensive renewable energy technology promotion, either on- or off-site. Energy independence focuses on generation through renewable technologies like solar panels, fuel cells, or wind turbines. If initiated, green power purchasing will allow Fort McPherson to support renewable energy markets through purchasing power.

- **Landfill Capacity** – The state estimates only 15 years of capacity remains. In 1990, the state legislature passed 25 percent solid waste reduction goal that has not been met. As that capacity becomes scarce, tipping fees will increase.

- **Hazardous Materials** – Hazardous material use and storage threatens the health and safety of the local community, and the environment. For example, ozone-depleting chemicals (ODCs) like freon used in chillers threaten the high-level ozone layer. Fort McPherson's effective management of these materials can greatly reduce the costs from waste and disposal, and adverse effects to the environment.

- **Water** – Continuing population growth will further deplete water resources for future generations. Storm water outfalls, and their corresponding watershed, must be managed to prevent impact on water resources on- and off-post and to ensure a sustainable water resource.

Importance to Fort McPherson

Mission – Reliable and affordable resources are essential to Fort McPherson's sustained operation. Energy security s a growing concern nationwide. The ability to buy the types and quality of materials to accomplish the mission at a reasonable price is also important. Better materials procurement can be an excellent way to decrease costs and promote market change for environmentally friendly technologies.

Quality of Life – Good quality of life depends on clean air and water and on energy availability.

Cost of Operation – Fort McPherson's Operations and Maintenance (O&M) budget was approximately $58 million in 2001. Facilities Maintenance (including labor and contracts) accounts for the majority of this amount, $51 million; and energy costs accounted for about $6 million. Administrative materials were about $1.6 million, and the cost of recycling and disposal is $400,000 annually. Additionally, tenants purchase approximately $10 million of materials. Figure 3 shows the utility costs at Fort McPherson for FY01.

Figure 3 – Resource Costs at Fort McPherson

Type of Utility	Cost in FY01	Consumption in FY01
Water	$175,000	100,000,000 gallons
Electricity	$3.5M	2,286 MBTUs
Natural Gas and Propane	$2M	300,000 BTUs
Total	$6M	N/A

Environment and the Community – Total on-site energy use at Fort McPherson for FY01 resulted in the estimated generation and release of 13 tons of carbon monoxide (CO), 30 tons of nitrogen oxides (NO_x), and 3/4 ton of sulfur oxides (SO_x) into the air. Reduced use of energy or switching to more renewable energy sources will decrease the regional impact to air associated with local energy production. Currently Fort McPherson recycles 5 percent, or 76 tons of its solid waste. Overall, Fort McPherson must find disposal options for 5,860 tons of waste annually.

Transforming the procurement and use program at Fort McPherson to incorporate sustainability concepts will require that everyone—end-users, purchasing officials, waste handlers, and partner manufacturers in the local and regional community—examine the way materials are purchased and used. A sustainable purchase and use system that extracts the maximum amount of value from each material, while causing the minimum amount of undesirable impacts, must be designed if Fort McPherson wants to continue to serve the country in its current capacity and into to the future.

Introduction

Resource consumption and waste disposal are by-products of mission success at Fort McPherson. Both cost money and create impacts to the environment. Conservation of the resources, careful selection of the products and services, and finally finding an end-use will enable Fort McPherson to accomplish its mission and build better community relations in the process.

Energy use to operate the installation is a large part of the budget and contributes to decreased air quality as well as potential ground/surface water contamination. Materials, like paper, computers, furniture, and other non-hazardous products, also account for a significant part of the budget and may have environmental impacts far exceeding their original cost. Finally, the management of hazardous materials is necessary in order to protect human and environmental health.

Finally, the manufacture, transportation, storage, and use of products and materials also cause negative environmental impacts both on- and off-post. The federal government is committed to encouraging markets for recycled products (see "Requirements at a Glance" to the right). To that end, all federal installations are required to purchase environmentally preferable products (EPPs) such as recycled paper, re-refined oil, and retread tires. EPPs are those products that contain or require less hazardous materials to produce or use, have fewer environmental impacts compared to similar products, and/or contain recycled materials.

Requirements at a Glance

Executive Order 13123, Greening the Government through Efficient Energy Management – Reduce energy use by 35 percent by 2010, compared to a 1985 baseline

Executive Order 13148, Greening the Government Through Leadership in Environmental Management – Train procurement officers and integrate affirmative procurement into developing plans, work statements, and specifications.

Resource Conservation and Recovery Act (RCRA) – This legislation's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner. RCRA regulates the management of solid waste (e.g., garbage), hazardous waste, and underground storage tanks holding petroleum products or certain chemicals.

Clean Air Act (CAA) – This legislation sets limits on the amount of certain pollutants that can be in the air in the United States. The CAA requires installations to apply for permits for activities that create air impacts.

Clean Water Act (CWA) – In 1972, the U.S. Congress enacted the first comprehensive legislation to control water pollution. Under the CWA, discharges to surface water must be permitted by the U.S. Environmental Protection Agency (EPA) and monitored by the discharger.

Safe Drinking Water Act (SDWA) – This legislation was developed to protect the public water supply. Source Water Protection emphasizes preventing contamination of drinking water resources and includes wellhead protection and sole source aquifer watershed control plans.

(A list of EPPs can be found at http://www.epa.gov/cpg/products.htm.) The General Service Administration Environmental Products and Services Guide also provides a list of EPPs and can be found by visiting http://www.gsa.gov (click on "Buying Green through GSA" and on "Environmental Products & Services").

Activities and Impacts

Energy Use

Overall energy consumption has increased slightly with the addition of new activities on Fort McPherson to an annual cost of $6 million. The rising price of natural gas has also been a factor in the increase. The Pacific Northwest National Laboratory (PNNL) is currently conducting an extensive audit of the facilities and energy use to determine an accurate measure. Figure 4 on the next page presents the environmental impacts of energy usage.

Georgia Power is the installation's electric utility and provides electricity through Fort McPherson's own distribution system. While electricity makes up only a third of the total energy usage, it accounts for 68 percent of the cost. Part of the reason for the expense is purchasing power during the peak times in the summer during the highest demand. Fortunately, most of the major buildings and housing are individually metered to closely monitor resident consumption and save costs.

Another consideration is the source of the electricity. Georgia Power is a Southern Company that system-wide gets 55 percent of its power from coal, 26 percent from nuclear, 13 percent from gas/oil, 5 percent

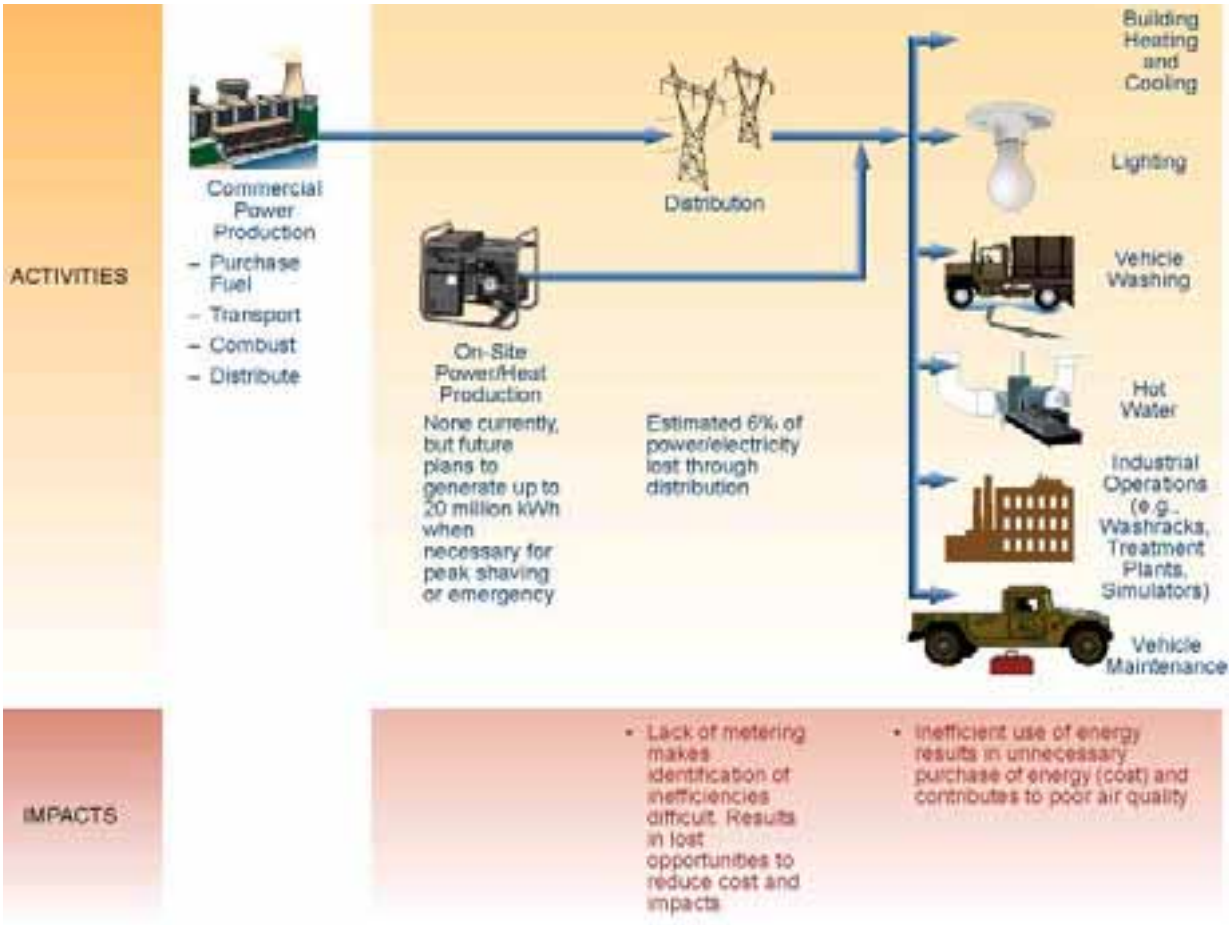
Useful Information

The following information would be useful in determining where Fort McPherson could begin to establish sustainable purchasing and use practices:

- **Sources of materials and products** – Where are the products used at Fort McPherson manufactured? Are local suppliers available?
- **Energy** – At present, electrical usage is not metered at all locations. Usage information would be helpful in understanding how power is consumed to offer the best opportunities for reduction through energy efficient retrofits. Could power needs be reduced through improvements in operational procedures?
- **Quantities** – How many commonly discarded materials/products are used each year?
- **Composition** – What products contain hazardous components? What products contain recycled materials?
- **Releases** – Which products result in the release of chemicals to the environment or generation of hazardous waste?
- **Markets** – Various organizations manage the sale and recycling of materials and wastes. The nature of markets and the value of materials are not easily quantified or tracked.
- **Treatment and disposal** – What is the long-term availability of capacity to dispose of garbage and hazardous waste? What are the projected costs for treatment and disposal in the short-, mid-, and long-term?
- **Water** – Can water use be reduced through efficient irrigation practices and reduced use by residence and employees?

from hydroelectric, and only 1 percent from renewable sources. Southern Company has a 20-year energy plan—called the "Clean Power Plan"—that hopes to increase the amount of power produced by renewable sources to 4 percent by 2010 and 10 percent by 2020. The primary renewable sources will be biomass co-firing, biomass combined heat and power (CHP) and wind turbines. Ideally, Fort McPherson can facilitate the implementation of the "Clean Power Plan" with their large purchasing power.

Figure 4 – Energy Use: Activities and Impacts



Natural gas and propane power the boilers with annual consumption of 470,000 MBTUs and cost about $2 million annually. Of this amount, 75 percent is used during the four coldest months and nearly all (80 percent) is consumed at Fort Gillem. While natural gas and propane

are still relatively inexpensive, deregulation of the gas supply has caused erratic prices and a general upward price trend. Under this trend, winter heating bills will only increase.

Generators supply backup power at several of the large buildings. A total of 4.4MW of power from generators is available at Fort McPherson. These generators may be used to reduce the installation's energy load during the summer months. Operating hours will be limited due to the 49.9 tons per year NO_x emission limit under the Fort McPherson Synthetic Minor Air Permit. FEMA stores and periodically operates their portable emergency generators that are sent to locations of natural disasters.

Materials Use

Fort McPherson purchases approximately $1.6 million worth of administrative supplies annually for garrison use. The major tenants operating on Fort McPherson purchase an additional $10 million annually to supply the major staff activities. Figure 5 shows the activities and impacts associated with material use. Alternatives and better product choice can help Fort McPherson's affirmative procurement goals, such as purchasing materials with recycled content.

Figure 5 – Product Life Cycle: Activities and Impacts

First, each organization maintains property books for the computers and printers allocated to each individual. Excess equipment is identified, and reissued or disposed of. Upgrades occur every three years to take advantage of technological advances. These upgrades result in the purchase of up to 3,000 computers per year across the installation, which generates a significant amount of solid and hazardous waste. The installation initiated a program to donate the old computers to the local schools. This provides a valuable service to the local community and avoids landfilling all those computers every year.

Second, the Army has long stressed the need for reducing the amount of paper used in coordination and information management. Fort McPherson buys in excess of 3,600 boxes of paper each year. This equates to over 36 tons of paper. Fortunately, the affirmative procurement program ensures that "new" paper has a percentage of recycled material and almost 90 percent of the used paper is recycled. While it is unlikely that the Army will become a "paperless" operation, the use of email and electronic signatures has significantly reduced the paper use and we should continue to explore ways to reduce our use of paper. Since Fort McPherson is a large consumer of many of the materials used in administrative work, it can influence suppliers to provide more "green" materials.

Eventually all the equipment, material, and other waste products must be disposed of when its usefulness is gone. Fort McPherson generates approximately 6,160 tons of solid waste annually. About 5 percent of the total solid waste, or 300 tons is diverted from the waste stream and is recycled. See Figure 6 below for a list of recycled products and amounts.

Figure 6 – Annual Fort McPherson Recycling

Glass – 108 tons
Cardboard – 68 tons
Mixed paper – 52 tons
Newspaper – 24 tons
White paper – 32 tons
Plastic – 20 tons

While this recycling effort is a start, the net result is 5,860 tons of solid waste (mostly municipal), and is trucked to the landfill every year at a cost of nearly $400,000.

Landfill Waste

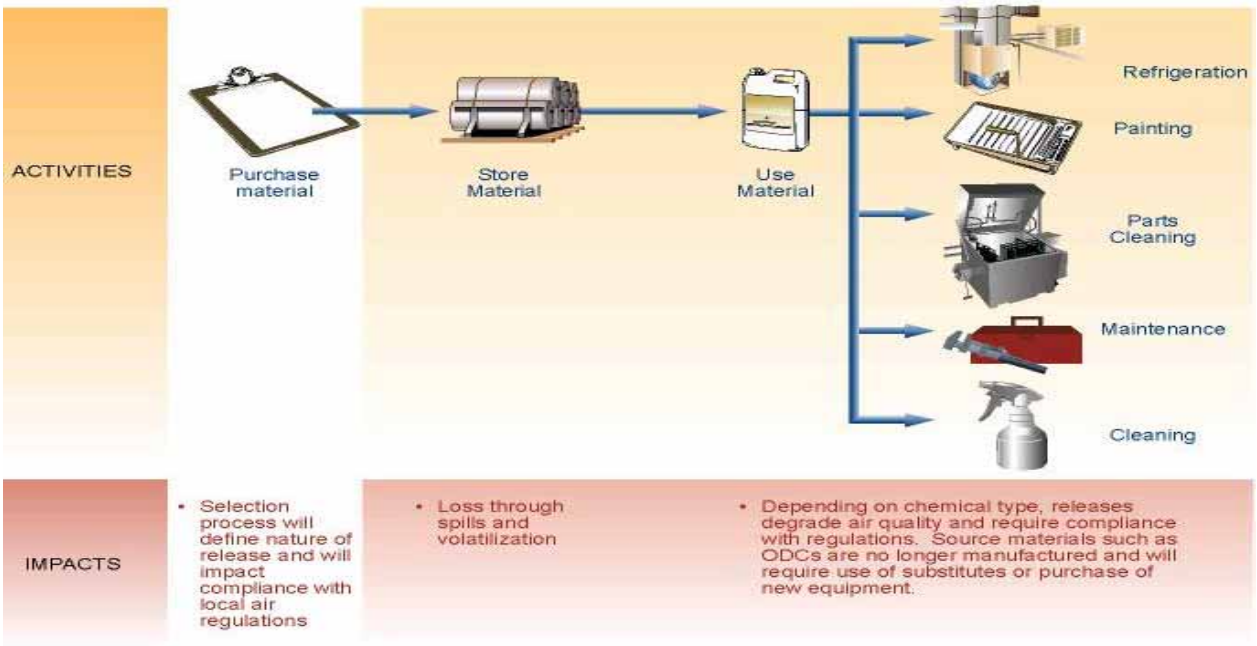
In the early 1990s, Georgia was suffering from a landfill crisis. In response, the State Legislature passed a 25 percent goal reduction of waste. This goal, although never fulfilled, demonstrates that this may be a problem in the future. It is estimated that Georgia has only 15

years of landfill capacity. This may pose a greater issue for Georgia because their solid waste disposal is twice that of the national average, at nine pounds of trash per person per day, or a total of 12.8 million tons in 1999. Part of this waste habit is due to inexpensive tipping fees at an average of $30 per ton. Fort McPherson now pays $50 per ton for waste. The nearby landfill at Live Oaks has a capacity of only 10 years.

Hazardous Material Use

Hazardous material use does not account for a large portion of the materials used on Fort McPherson. However, their use at Fort McPherson is closely monitored. See Figure 7 for the activities and impacts associated with Hazardous Materials.

Figure 7 – Hazardous Material Use: Activities and Impacts



Fort McPherson operates a paint booth that applies Chemical Agent Resistant Covering (CARC) paint to tactical vehicles. The booth generates waste paint and accounts for VOC emissions during its operation.

To gain tighter control on Hazardous Materials, Fort McPherson implemented a program called the Hazardous Material Management Control Center (HMCC) or "Pharmacy" that will

eventually control the purchase, use, and ultimate disposal of most hazardous materials used by all organizations on the installation. The pharmacy is already handling over 100 tons of materials annually and will significantly decrease the hazardous waste disposal costs in the future. Figure 8 presents a list of annual hazardous wastes and amounts:

Figure 8 – Annual Hazardous Waste Disposal

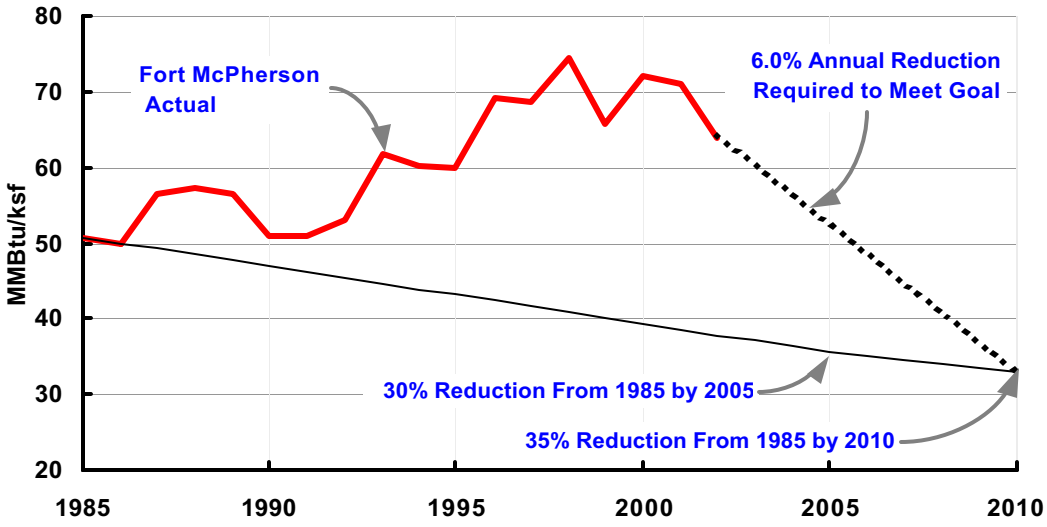
Lithium Batteries – 236 lbs
NiCad Batteries – 141 lbs
Paint related – 9000 lbs
Auto (petroleum) related – 2900 lbs
Florescent Lights – 370 lbs
Lab related (acids, ethers, etc) – 446 lbs
Photo Processing – 2000 lbs

Forecast

Fort McPherson is working with Pacific Northwest National Laboratory (PNNL) to perform detailed energy modeling across the post using the Facility Energy Decision System (FEDS) model. The projections in the following sections are rough numbers developed using FEDS, based upon information in the real property database. A more intensive analysis is underway, based upon detailed audits of 30 representative buildings, that will provide prioritized retrofits and recommended technologies by building type across the post. These analyses will be available this spring to support development of Fort McPherson's 10-year plan. This detailed analysis will facilitate retrofit planning and support Fort McPherson in working with Georgia Power to identify and target energy savings projects. The current use of 65MMBTU/ksf is above the 1985 baseline by 50MMBTU/ksf. Figure 9 presents the actual energy per square foot compared against the "Glide Path" to reach the 35 percent reduction, against a 1985 baseline, required by Executive Order 13123. Fort McPherson has converted unconditioned warehouses into offices and shops or has deconstructed warehouses; thus they will find if difficult, if not impossible, to meet the goals in the EO.

Atlanta is a large market and obtaining environmentally preferable products should be a priority for the installation. As the fifth largest employer in the metro Atlanta area, Fort McPherson can influence the types of materials that are available simply by requesting them. In addition, tipping fees for disposal of solid waste will certainly increase as local landfills reach capacity. Fort McPherson needs to find new markets and implement a robust program to recycle more of its solid waste.

Figure 9 – Energy Reduction Glide Path for Fort McPherson



Fort McPherson Energy Reduction Glide Path

Current Sustainable Activities

- **HazMart** – Hazardous material pharmacies help control the use of environmentally harmful materials by tracking the purchase and disposal of products in one central location. In this system, a worker who needs a certain chemical must "check-out" the substance from the central location and return the unused portion. This ensures that harmful chemicals are properly disposed of, and can save money by making sure that all purchases are of the correct amount for the required use.

- **Flywheel Technology** – In the basement of HQ FORSCOM sat a room full of 12-volt batteries whose only purpose was to provide interim power to critical components of the building while the primary power supply switched to generator power. These batteries required over 2000 square feet of storage space and posed a potential chemical and fire hazard. The installation found a better solution by replacing the batteries with flywheel technology. Two flywheels generate no hazardous fumes and take up much less space.

- **Replacements** – The best available technology will replace aging and failing equipment. Energy efficient equipment will have purchasing priority on a life cycle cost basis. Fort McPherson is considering new technologies for the following equipment: boilers, hot water

heaters, air handling units, heat pumps, compressors, Direct Digital Controls (DDC), motors pumps, and heat exchangers.

- **Upgrades** – Upgrades of boiler plants and other distribution systems will occur, where feasible, using dollars from the Energy Conservation Investment Program (ECIP), Operations, and Maintenance - Army (OMA).

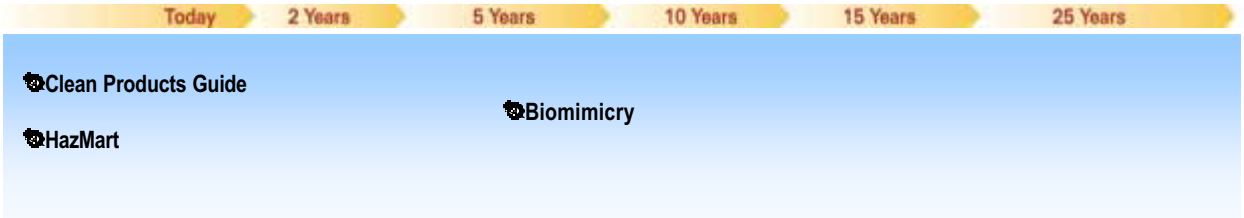
- **Bio-diesel** – Bio-diesel will be burned soon in generators, resulting in reduced emissions. The generation of NO_x will increase very slightly.

- **Infrared Heater** – A direct-fired infrared heater has been installed in one of the larger buildings at Fort Gillem. The heater replaced an inefficient steam boiler used for heating the building. This conversion reduces the use of natural gas during the cold months.

The Realm of Possibility

To become sustainable, Fort McPherson is encouraged to identify and plan for innovations that will support the goals established during the Installation Sustainability Workshop. To do this, participants should review the concepts and technologies that are within the realm of possibility now and in the future. This section provides a glimpse of what can be accomplished with existing technology and what can be expected from developing sustainability approaches.

Clean Products



- **Biomimicry** – Biomimicry stems from the belief that the design of the natural world around us inspired the future of material design and use. Abundant evidence indicates that nature has long ago mastered the problems that we still grapple with today. The silk from a spider's web is ***three times*** stronger than Kevlar, the material used in bulletproof vests. Slug mucous can withstand pressure up to 1500 times its weight without losing any of its fluid or lubricating properties. Termite mounds are marvels of design ingenuity, using passive cooling systems, and venting to maintain constant interior temperatures regardless of exterior temperatures. See this website for more information: http://www.natick.army.mil/warrior/97/nov/silk.htm.

- **Clean Products Guide** – GSA maintains an extensive "Environmental Products and Services Guide" which lists all available "green" products. The guide can be found on the following websites: http://www.gsa.gov/attachments/GSA_PUBLICATIONS/pub/EPSG2001.pdf and http://pub.fss.gsa.gov/environ.

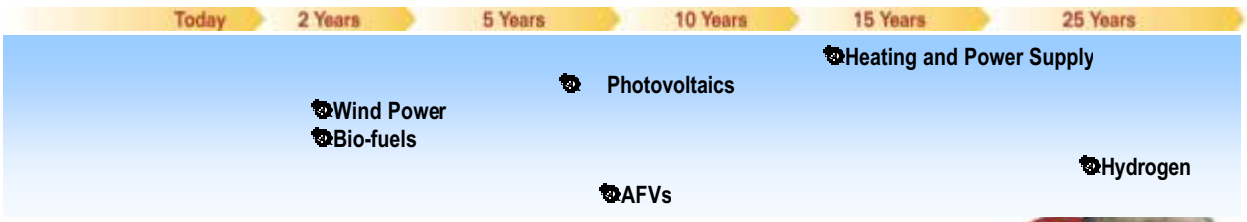
- **HazMart** – The HazMart currently only includes garrison activities. Eventually, all activities on the installations will use the HazMart, including tenants.

Product Leasing

- **Paperboard and Food Composting** – Shredded paperboard can be used as a bulking agent for food composting. A food composting program, which may include pre-consumer (i.e., kitchen waste) and/or post-consumer (e.g., food service waste from lunchrooms) waste, typically needs a bulking agent to absorb the excess water from food waste.

- **Take Back Programs** – One of the new business models taking hold in Europe and Asia is "manufacturer take back" programs. In such a program, the original manufacturer retains ownership and disposal responsibility for products. Examples include recyclable BMWs and Nike Shoes. Interface, Inc., is the American manufacturer pioneering this concept. Interface's "Evergreen Lease" on commercial carpet provides a service in which worn carpet tiles are checked and replaced each month. The worn tiles are recycled 100 percent into new carpet. This business model is not new—think back to when the telephone company owned your old black phone, which never broke or had to be replaced. For more information on efforts worldwide, see Chapter 3, *Waste Not*, and Chapter 4, *Making the World*, in the book Natural Capitalism.

Energy Independence



- **Alternative Fuel Vehicles (AFVs)** – Alternative fuel vehicles (AFVs) are available on a limited basis now, but it will be a few more years before they begin to capture an appreciable market share in the public and private sectors. Honda is working on a zero-emission vehicle that uses fuel cells for power. The state of California will give up to $9,000 in rebates to people who buy super-low-emission vehicles (SuLEVs). Because lower costs per mile are associated with fueling large fleets, buses and other fleet vehicles are prime candidates for alternative fuels such as compressed natural gas (http://www.afdc.doe.gov/afvehicles.html).

- **Bio-fuels** – Bio-fuels are alcohols, ethers, and other chemicals made from renewable resources (e.g., fast-growing trees, grasses, and algae) and waste products (e.g., agricultural and forestry residues, and municipal and industrial wastes). It is estimated that domestically produced biomass resources could eventually provide at least half of the light duty vehicle (LDV) fuel requirement in the United States. Bio-diesel fuels are available today. In the not-too-distant future, biomass will be consumed in fuel cells in vehicles and stationary equipment to produce heat and electricity very efficiently, with virtually no pollution and no net increase in carbon emissions. Eventually, high-efficiency biomass power plants will allow any facility to generate its electricity on-site.
    - The use of methane power will be increased in Georgia and other states. Several Electrical Membership Corporations in Georgia plan to generate power-using methane from four landfills in the state. Nebraska has a 3.2-megawatt landfill methane power plant.
    - Agriculture and wood waste, called biomass when used for electricity generation, is used by the Community Power Corporation of Colorado to generate electricity for single dwellings. For more information, go to http://www.gocpc.com/.

- **Heating and Power Supply** – Today, almost every home and business owns a hot water heater and heating, ventilation, and air conditioning (HVAC) unit. When these units are no longer in service, they are usually disposed of in a local landfill. There is an alternative; Trane is starting to offer full-service leases to commercial clients at competitive monthly rates. In these arrangements, the customer provides the location for installation and Trane takes care of the rest. When the customer desires a new unit, a trade with the manufacturer occurs. In the future, home heating and electricity may be bundled in a fuel cell, further simplifying the process (http://www.trane.com/commercial/financing/leasing.asp).

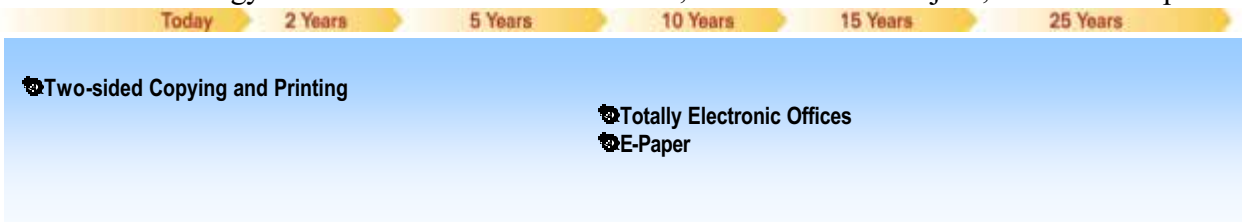
- **Hydrogen** – Hydrogen is not a viable direct energy source since very little free hydrogen is available. Instead, many view hydrogen as the ultimate energy storage and transmission medium. In this context, hydrogen will be extracted from hydrocarbons, bio-fuels, and water

and shipped/piped to another location where it will be burned or consumed in a fuel cell, producing only energy and water vapor. Iceland, which has rich geothermal and hydrologic resources that can be employed to extract hydrogen from seawater, has the goal to become the first hydrogen economy. Iceland New Energy, a consortium that includes Daimler Chrysler AG, Norsk Hydro AS of Norway, Royal Dutch Shell Group, and a Reykjavik-based venture capital fund, has launched projects aimed at promoting the hydrogen economy in Iceland. Three buses powered by hydrogen fuel cells will be introduced into Reykjavik's city transport fleet by the end of 2002. A second project will begin replacing conventional chemical batteries with fuel cells in stationary power structures that are not currently on the regular electric grid.

- **Photovoltaics** – Photovoltaics (PV) have the potential to provide a significant amount of the nation's electricity supply. *The theoretical potential of PV on rooftops alone could satisfy up to one-third of world electricity demand.* However, they are expensive to manufacture, have not yet realized their efficiency potential, and require lots of space. This situation is starting to change. Overall system efficiency is improving. New products that integrate photovoltaic cells into building materials are now coming on the market. Skylights, awnings, wall panels, and roof shingles now incorporate PV, generating electricity while serving a second structural function. This integrated approach obviates the need for additional land use, reduces total system costs, and makes available thermal energy dissipated by the PV panels for space heating and/or water preheating.
    - The total average power available from solar radiation exceeds current human consumption by 1500 times (Source: World Energy Assessment: Energy and the Challenge of Sustainability; United Nations Development Programme, UN Department of Economic and Social Affairs and World Energy Council: New York, 2001).
    - Fort Huachuca, Arizona, uses conventional solar hot water heaters, photovoltaics, day lighting systems, and solar walls on hangars.
    - Japan's National Space Development Agency commissioned construction of a space solar power satellite. This technology originated in 1899 with Nikola Tesla, who tried to light homes in Colorado Springs by beaming energy from a tower. The experiment was unsuccessful, but its principles led to the current attempts to capture solar energy. The advantage of a space-based solar array is that it would work even on overcast days.

- **Wind Power** – Through the 1990s, wind was the fastest growing source of electricity generation in the world. However, the majority of this growth occurred in Europe, where conventional energy costs are higher than those in the United States. With large, untapped, wind energy resources throughout the country and declining wind energy costs, the United States is now moving forward with an aggressive initiative to accelerate the progress of

wind technology and further reduce its costs, to create new jobs, and to improve



environmental quality. Wind Powering America, an initiative led by the Department of Energy to increase the use of wind power, will expedite the movement of wind technology into the mainstream of the U.S. electricity supply sector. For more information on how to establish a wind farm at your installation, go to http://www.nrel.gov/wind.

- Developments in wind technology include larger, more controllable and grid-compatible turbines; hybrid systems; and stand-alone systems for small, localized uses.

Local Manufacture

- **Locally Manufactured Products** – The use of locally manufactured products reduces harmful air emissions by reducing the transportation distance to their final destination. In addition, the purchase of these products stimulates the local economies of the communities around the installation.

Use Reduction

- **E-paper** – Lucent Technologies and E Ink Corp of Cambridge, Massachusetts, are developing e-paper. This paper may be used repeatedly to download daily newspapers and books.

- **Totally Electronic Offices** – In the next 10 years, offices will use less and less paper as workers become more dependent upon email, web pages, and other electronic means of

doing business. This will reduce the overall flow of material into an office, and there will be fewer pens, staplers, tape, and plastic binders as well.

- **Two-sided Copying and Printing** – Printing and copying on both sides of a sheet of paper is a fast and easy way to immediately reduce paper use by 50 percent. Printers can be used with little or no modification and overall printing speed is preserved.

Reuse and Recycling

- **Recycled Asphalt** – DOD and the U.S. Environmental Protection Agency (USEPA) conducted a joint parking lot repaving project for the Pentagon. The $1M project used 25 percent recycled asphalt.

- **Team Tire** – Several Department of Defense (DOD) and Army agencies and installations participate in the Army Tank-automotive and Armaments Command's (TACOM) "Team Tire" Program, in which vendors provide motor pools with re-treaded tires in exchange for used tires. The used tires are retread by the vendor for reuse elsewhere. The cost of retread tires is significantly less than that of new tires—up to $200 less for some tires.

Waste

- **Innovative Deconstruction** – Fort Knox sells the salvage rights to buildings that are on the demolition schedule. The purchaser of the rights can remove windows, doors, flooring, siding, plumbing, and copper wire, but must remove at least 50 percent of the volume of the building. The installation makes about $100K/year on the sale of the salvage rights, but

saves hundreds of thousands of dollars on reduced demolition and disposal costs. Fort McCoy has a similar program.

Redstone Arsenal has paid a local house mover and developer to move 89 two-story brick duplexes off the installation and into the local community. The cost was about $9,000/house versus the $12,000 it would have cost to demolish them—a total cost savings of $267,000.

The Army has signed a Memorandum of Agreement with Habitat for Humanity to allow Habitat to deconstruct buildings on the demolition schedule and sell the salvaged items to support Habitat home-building activities. Fort Hood is developing a pilot project with the Austin, Texas Habitat affiliate.

Researchers at the Georgia Institute of Technology are studying how to construct buildings so that they can be easily deconstructed and the building materials reused.

- **Landfill Fluff** – Fort Campbell and the Army's Construction Engineering Research Lab are testing a new waste-reduction technology in partnership with its inventor, Bouldin-Lawson, Inc. Unsorted household garbage is fed into a grinder, hydrolyzed, and then flash-heated to kill germs. The resulting dry "fluff," which looks like cellulose insulation, passes all toxicity tests and appears to pose no environmental hazard. The process reduces waste volume and weight by 90 percent. The entire process costs $30/ton—comparable to landfill disposal fees in most areas of the country. Testing at Fort Campbell will determine if the "fluff" is useful as a soil amendment and with building materials (i.e., plastic lumber). This technology has the potential to eliminate the need for landfilling household garbage.

- **Zero Footprint Camp** – The U.S. Army Materiel Command (AMC) recognizes that traditional waste management methods used for base camp operations are resource-intensive and create a substantial burden on the camps. These traditional methods also depend on contracted civilian waste management services, posing potential risk to the physical security of the area from terrorist activities. In response to these concerns, AMC developed the Zero Footprint Camp (ZFC) initiative to reduce the logistics footprint, operations and support costs, and environmental impacts of base camp operations. This initiative minimizes waste by applying "whole-systems" approaches to resource management, thereby finding cost-effective and technically feasible ways to reprocess and/or reutilize trash, grey water, black water, and food garbage within the camp. While the current ZFC initiative focuses primarily on solid waste and wastewater management, it will be expanded to cover other aspects of base camp operations. For more information, go to http://www.haifire.com/download/zfc.pdf.

Fort McPherson 25-year Goals for Resources

Attendees of the Fort McPherson Installation Sustainability Workshop, which convened on 11-13 December 02, developed the following long-range goals:

Water: Reduce stormwater discharges to zero by 2027; potable water consumption reduced by 75% by 2027; eliminate use of potable water for non-potable water uses by 2027.

Procurement: Procurement of 95% Environmentally Preferable Products and Resources by 2027.

Materials: Zero Solid Waste Landfilled by 2027.

The primary issues and goals discussed in the Resources working group are described below. This information will be helpful in developing the short-term objectives and five-year plans needed to reach the long-range goals.

Breakout Group Membership

Facilitator: Mr. Rick Sinclair
Recorder: Ms. Kristen Walden

Rank	Name	Organization
Mrs.	Ann Gabriel	IMA, Southeast Region Office
Mr.	Wayman Benford	IMA, Southeast Region Office
Mr.	Owen Nuttall	Fort McPherson Directorate of Installation Support
Mr.	John Wuichet	Army Environmental Policy Institute
Mrs.	Elizabeth Keysar	Army Environmental Policy Institute
Mrs.	Gerri Nichols	
Mr.	Michael Morrison	
Mr.	John Esson	
Mr.	Dan Worth	
Mr.	Rich LeClerc	Fort Drum
Ms.	Yvette Green	

List of Issues and Potential Responses to Issues

Water:

- Potable water used for non-potable uses
- Contamination
- Waste
- Increasing demand
- Decreasing quality of life and resources
- Life-cycle costs
- Swimming pool still leaking at Fort Gillem after 25 years of use
- Costs – how to pay for capital investment needed
- Atlanta's growth exceeding water supply
- Lack of recognition of water issues due to no wastewater or drinking water systems on Fort McPherson and Fort Gillem
- Water supply not seen as an crucial issue
- Fort McPherson water consumption 5 times higher than 10 years ago
- Not much emphasis on water conservation because end-users do not pay the bill
- Lack of funding for infrastructure
- High cost of infrastructure investment on small installation

Energy:

- High cost of non-renewable energy
- Energy cost over half of Fort McPherson budget
- Waste
- No competition between providers
- Energy consumption increasing
- Local power provider uses increasing percentages of coal, gas, oil, and nuclear sources
- Renewable energy sources too small; Southern Solar Source ignored
- Utilities privatization does not consider sustainability
- Most people who work at Fort McPherson do not live near the installation
- Privately-owned vehicles and commuting are not counted as part of the installation's total energy consumption
- With a MARTA station right outside Fort McPherson's gates, parking facilities should be used less or not at all
- Old buildings are energy inefficient and difficult and expensive to modify
- Buying energy from coal-fired power plants
- Dependence upon a centralized power generation infrastructure

Materials:

- Enforcement of recycling
- Decentralized purchasing obstacle to affirmative procurement
- Adaptability – the use of snap-to-building/structures
- Data not collected on rate of double-sided paper printing and copying or point of origin of manufactured goods
- Georgia's solid waste disposal rate twice national average
- Only 5% of Fort McPherson's waste is currently recycled
- Too much solid waste, too little capacity in landfills remaining
- Those who buy materials do not necessarily pay for the disposal costs – lack of accountability
- Products used by Fort McPherson are not made locally
- Why does Fort McPherson and Fort Gillem have use Carc paint if vehicles are not deployed?
- Awareness and buy-in
- Sale-ability versus consume-ability
- Lack of education for employees on proper disposal techniques

Initial Goals and Proponents Developed

Initial Strategic Goal 1

- **Issue:** High cost of infrastructure and water resources wasted
- **Desired End State:** Reduce stormwater discharges to zero
- **Metric:** Zero stormwater discharge
- **Timeframe:** 2027
- **Proponent Organizations:** Directorate of Installation Support

Initial Strategic Goal 2

- **Issue:** Potable water used for non-potable uses
- **Desired End State:** Eliminate use of potable water for non-potable uses
- **Metric:** Gallons
- **Timeframe:** 2027
- **Proponent Organization:** Directorate of Installation Support

Initial Strategic Goal 3

- **Issue:** Lack of regional water resources
- **Desired End State:** Potable water consumption reduced by 75%

- **Metric:** 75% reduction
- **Timeframe:** 2027
- **Proponent Organizations:** Directorate of Installation Support

Initial Strategic Goal 4

- **Issue:** Organizational cultures resist change
- **Desired End State:** All post occupants aware of sustainability principles and implications to post operations
- **Metric:** Number of post occupants trained
- **Timeframe:** 2012
- **Proponent Organizations:** Public Affairs Office

Initial Strategic Goal 5

- **Issue:** High cost of energy and dwindling fossil fuels
- **Desired End State:** Reduce energy usage by 35%
- **Metric:** BTUs per building space
- **Timeframe:** 2010
- **Proponent Organizations:** Directorate of Installation Support

Initial Strategic Goal 6

- **Issue:** pollution from fossil fuels
- **Desired End State:** Use of renewable energy for 50% of total requirements
- **Metric:** % total requirements
- **Timeframe:** 2010
- **Proponent Organization:** Directorate of Installation Support

Initial Strategic Goal 7

- **Issue:** "Throw away" society
- **Desired End State:** Procurement of 95% Environmentally Preferable Products and Resources
- **Metric:** 95% of new purchases are environmentally preferable products and/or resources
- **Timeframe:** 2027
- **Proponent Organization:** Army Contracting Agency

Initial Strategic Goal 8

- **Issue:** High cost of landfilling waste and lack of landfill capacity
- **Desired End State:** Zero solid waste landfilled
- **Metric:** Tons of solid waste landfilled
- **Timeframe:** 2027
- **Proponent Organization:** Directorate of Installation Support

Final Goals and Team Members

Final Resources Goal #1

Reduce stormwater discharges to zero by 2027; potable water consumption reduced by 75% by 2027; eliminate use of potable water for non-potable water used by 2027.

- **Issue:** Pesticides in landscaping, siltation, excessive use, using potable water for non-potable water uses, limited regional resources, water quality, rationing water, impervious surfaces.
- **Desired End State:** Do not exceed water consumption needs and limit release of contaminated water. Take only the water we need and do no harm to the regional ecosystem.
- **Metric:** Reuse of water, gallons/capita, total water used, water discharge, gray water, stormwater, runoff, fixture efficiency
- **Timeframe:** 2027
- **Proponent Organization:** Directorate of Installation Support
- **Team Members:**
  - Army Contracting Agency
  - Safety Office
  - Staff Judge Advocate
  - Major Tenants
  - AAFES / Defense Commissary Agency
  - Georgia Environmental Protection Division
  - Municipalities

Final Resources Goal #2

Procurement of 95% Environmentally Preferable Products and Resources by 2027.

- **Issue:** Life-cycle costs of materials are not evaluated; Availability of green spec products; limited amount of money for initial purchases; perception that green products cost more.
- **Desired End State:** Procurement and use of 95% Environmentally Preferable Products and Resources
- **Metric:** Contracts, IMPAC Cards, DLA / AMC Purchasing Tracking Databases, consumer purchases
- **Timeframe:** 2027
- **Proponent Organization:** Army Contracting Agency
- **Team Members:**
  - Directorate of Installation Support
  - Military Police
  - Staff Judge Advocate
  - Major Tenants
  - AAFES
  - Defense Commissary Agency
  - Georgia Environmental Protection Division
  - Georgia Pollution Prevention Assistance Division

Final Resources Goal #3

Zero Solid Waste Landfilled by 2027.

- **Issue:** Education and enforcement of recycling; No incentives to incentives to recycle; Decreasing landfill capacity; No benefits from savings.
- **Desired End State:** Zero Solid Waste Landfilled
- **Metric:** Construction and Demolition Waste, Cardboard, White Paper, Yard Waste, Food Waste, Packaging, Carpet, Metals, #1-2 Plastics
- **Timeframe:** 2027
- **Proponent Organization:** Directorate of Installation Support
- **Team Members:**
  - Army Contracting Agency
  - Military Police
  - Staff Judge Advocate
  - Major Tenants
  - AAFES / Defense Commissary Agency
  - Georgia Pollution Prevention Assistance Division
  - Service Providers
  - Corps of Engineers

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Appendix A
Acronyms and Abbreviations

AAFES	Army and Air Force Exchange Service
AFVs	Alternative Fuel Vehicles
AMC	Army Materiel Command (U.S. Army)
BTU	British Thermal Units
CAA	Clean Air Act
CAC	Clean Air Campaign
C&D	Construction and demolition
CARC	Chemical agent resistant coating
CEMML	Center for Ecological Management of Military Lands
CFLs	Compact fluorescent lights
CHP	Combined Heat and Power
CID	Criminal Investigation Forensic Laboratory
CNG	Compressed Natural Gas
CO	Carbon monoxide
CO_2	Carbon dioxide
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
DIS	Directorate of Installation Support
DDC	Direct Digital Controls
DOD	Department of Defense
DOE	Department of Energy
ECIP	Energy Conservation Investment Programs
EOD	Explosive Ordnance Detonation
EPA	Environmental Protection Agency (U.S.)
EPPs	Environmentally preferable products
FEDS	Facility Energy Decision System
FEMA	Federal Emergency Management Agency
FORSCOM	U.S. Army Forces Command
FY	Fiscal year
GSA	General Services Administration
HAZMAT	Hazardous material
HMCC	Hazardous Materials Control Center
HVAC	Heating, ventilation, and air conditioning
HQ FORSCOM	Forces Command Headquarters
IDG	Installation Design Guide
IMA	Installation Management Agency
ISP	Installation Sustainability Program
LDVs	Light Duty Vehicles
LEED	Leadership in Energy and Environmental Design (USGBC)
LEVs	Low-Emission Vehicles
M	Million
MBTUs	Million British Thermal Units
MCA	Military Construction, Army
Mgal	Million gallons
NEPA	National Environmental Policy Act

NO_X	Nitrogen oxides
O_3	Ozone
ODCs	Ozone-depleting chemicals
O&M	Operations and Maintenance
OMA	Operations and Maintenance – Army
PNNL	Pacific Northwest National Laboratory
PV	Photovoltaic
RCRA	Resource Conservation and Recovery Act
RPMP	Real Property Master Plan
SDWA	Safe Drinking Water Act
SERO	Southeast Region Office
SOV	Single Occupant Vehicle
SO_X	Sulfur oxides
SPiRiT	Sustainable Project Rating Tool (military adaptation of USGBC's LEED)
SuLEVs	Super-low emission vehicles
TACOM	Tank-automotive and Armaments Command (U.S. Army)
TNS	The Natural Step Program
USACE	U.S. Army Corps of Engineers
USARC	U.S. Army Reserves Command
USEPA	U.S. Environmental Protection Agency
USGBC	U.S. Green Building Council
VOCs	Volatile organic compounds
ZFC	Zero Footprint Camp