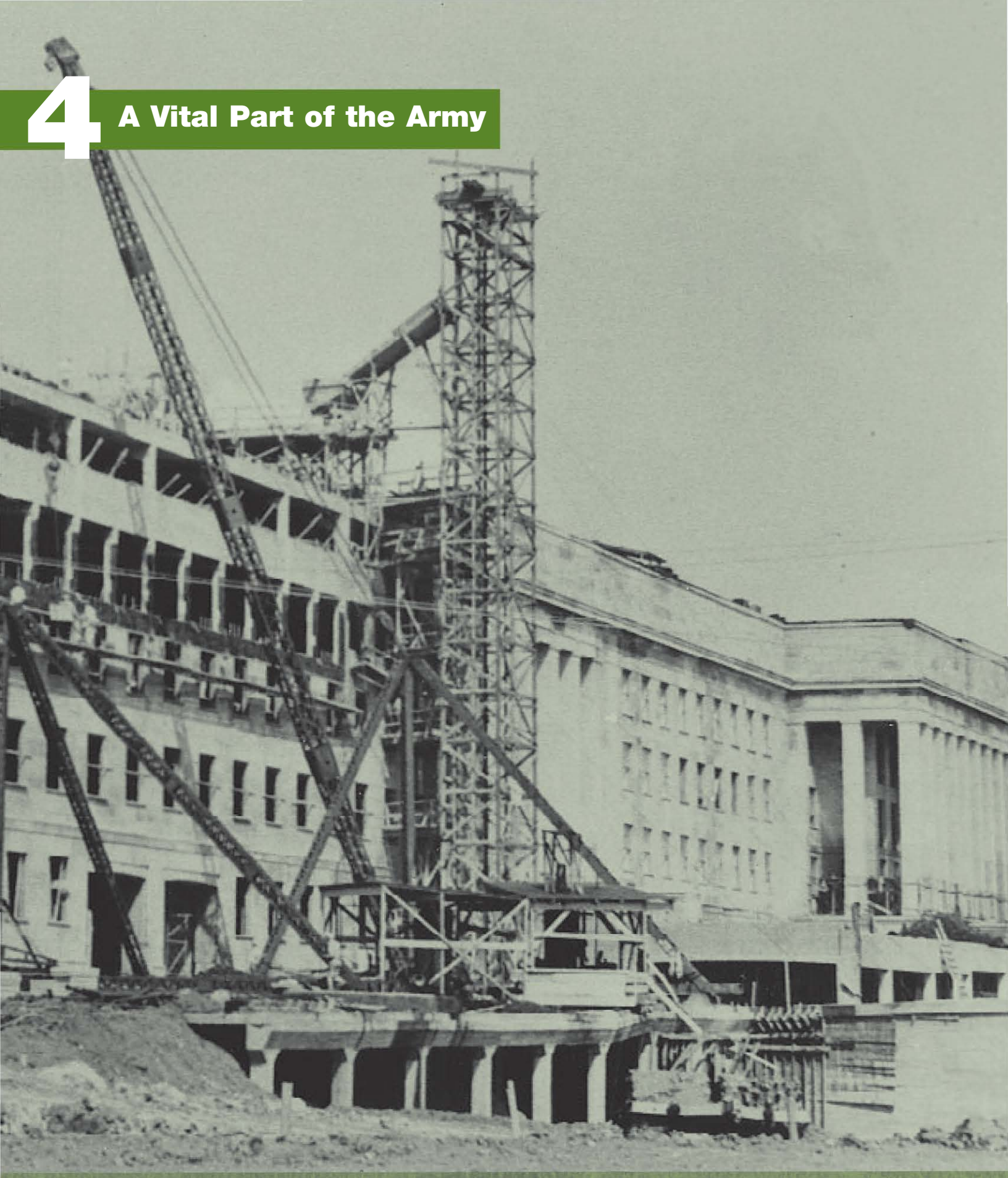
4 A Vital Part of the Army



The Pentagon under construction, 1942

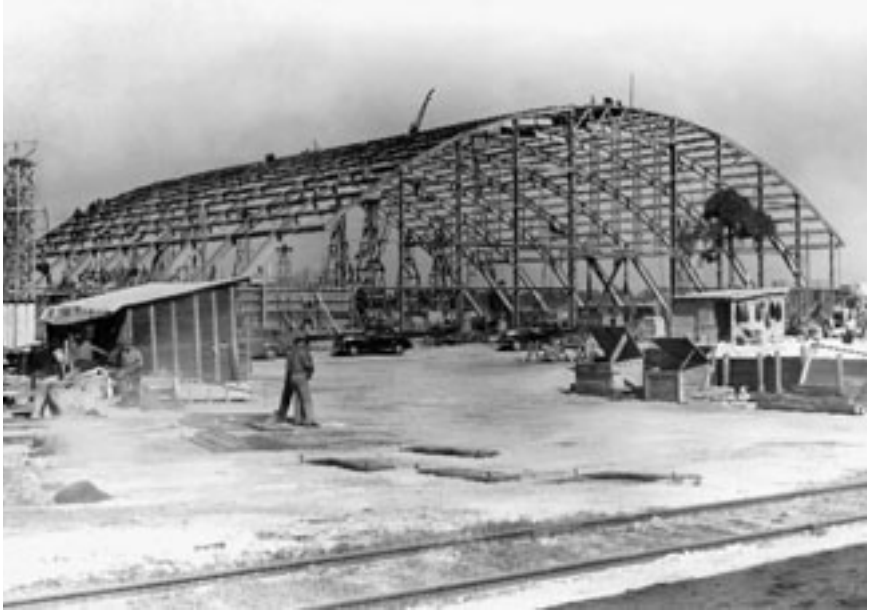
Military Construction

The military construction mission of the U.S. Army Corps of Engineers dates from just prior to World War II. Until that time, the Quartermaster Department built almost all facilities for the U.S. Army. By 1940, it was clear that this arrangement could not continue. Quartermaster resources were inadequate for the large mobilization job ahead. Furthermore, the engineers' civil works organization and experience provided the basis for absorption of the new assignment. So in November 1940, the War Department chose the Corps to build facilities for the Army Air Corps. Thirteen months later, the Corps of Engineers undertook all construction for the U.S. Army's war effort.

This massive enterprise involved military and industrial projects. The Corps managed construction of a wide range of factories, most notably for the assembly of aircraft and tanks and the production of ammunition. Corps-built military installations included camps for 5.3 million Soldiers, depots, ports, and the Pentagon. Each of these tasks included planning, site selection, land acquisition, design, contract negotiations, procurement, labor relations, and the construction itself. All told, the wartime mobilization program involved more than 27,000 projects and cost $15.3 billion. Major General Leslie R. Groves, head of the Manhattan Project, summed up the significance of this work for the successful conduct of the war: "Mobilization was decisive and construction generally controlled mobilization."

Yet there was more to U.S. Army engineer construction during the war than the stateside program. Work in

Hangar under construction by the Jacksonville District at MacDill Field, Tampa, Fla., for Army Air Corps, January 1942



Soldiers of the 95th Engineer General Service Regiment, an African-American unit, building a bridge on the Alaska-Canada (ALCAN) Highway.

Steel barge bridge along the Ledo Road

support of the war against Japan ranged over a vast portion of the world, from Panama to India and from Alaska to Australia. A huge organization—which grew to include 236,000 engineer troops in an Army of 1,455,000—built pipelines, dredged harbors, and built and repaired ports throughout the Pacific Theater.

The accomplishments in the Pacific rivaled those of the Corps on the home front. Among the major projects in the Pacific area was the air ferry route to the Philippines. To move heavy bombers west across the ocean, the Corps built airfields on a host of Pacific islands. U.S. Army engineers developed these bases in a matter of a few months.

Two land routes also merit special notice. The ALCAN Highway, from Dawson Creek, British Columbia, to Fairbanks, Alaska, prompted by the threat of a Japanese invasion and the closure of Alaskan sea routes, ran through nearly 1,600 miles of muskeg and mountains. The project, begun in 1942, involved 133 major bridges and, at the peak of construction, employed eighty-one contractors and 14,000 men. Closer to hostilities, the Ledo Road from northeastern India to Burma crossed 430 miles of jungle, mountains, and rivers. Paralleling the road was the longest invasion pipeline ever built. Construction began under difficult conditions in

Fitzsimmons Army Hospital, Denver, Colo., 1952

late 1942 and was completed when a convoy from India reached China in early 1945.

The war against Germany also demanded massive construction support. After building bases in Greenland and Iceland to protect Atlantic shipping, the Corps moved to England, where as many as 61,000 U.S. Army engineers created the ground and air facilities required to support the strategic bombing of Germany and the invasion of France. During the same period, in North Africa the Corps built many airfields for British and American air forces and provided ports and depots to support the invasion of Italy.

In June 1944, engineers moved into Europe with the Allied invasion. Operations included the rehabilitation of ports and railroads as well as airfield and depot construction. For example, engineers cleared and reconstructed the port of Le Havre using plans developed well before the advance into France. Large construction projects also included a camp and depot at Valognes, France, that served as headquarters for logistical forces of the Communications Zone. The post included tents for 11,000 Soldiers and provided 560,000 square feet of hutted office space.

After the war, the Corps maintained a large presence in Europe. Engineers restored transportation networks and other public services in Germany and Austria. In France during the early 1950s, the Corps performed a wide array of line-of-communications construction, from pipelines to supply depots, in anticipation of the need to reinforce units in Germany. Additionally, U.S. Army engineer construction fulfilled the needs of the large numbers of

American troops stationed in Germany through the end of the Cold War by building housing, hospitals, depots, and offices.

The U.S. Army Corps of Engineers also remained with the occupation forces in Japan and met all of their building requirements. When war broke out in Korea in 1950, bases in Japan provided the springboard for the movement and supply of forces deployed against the North Koreans and Chinese. In Korea itself, engineers performed remarkable feats of road and bridge construction over extremely difficult terrain and provided ports and airfields for friendly forces. They rehabilitated water supply and sanitation systems that remained in use by the Republic of Korea for many years, and they still provide construction support for American units stationed there.

Military construction after the Korean War expanded into numerous countries. Work continued in Europe and the Far East, but increasing Cold War tensions led to the establishment of bases elsewhere. Through the 1950s and into the 1960s, the Corps built early warning facilities and airbases in diverse locales, including Greenland, Morocco, and

Buildings constructed by the Corps on Greenland to support Project Blue-Jay, October 1951. Project Blue-Jay involved the construction of Thule Air Force Base.

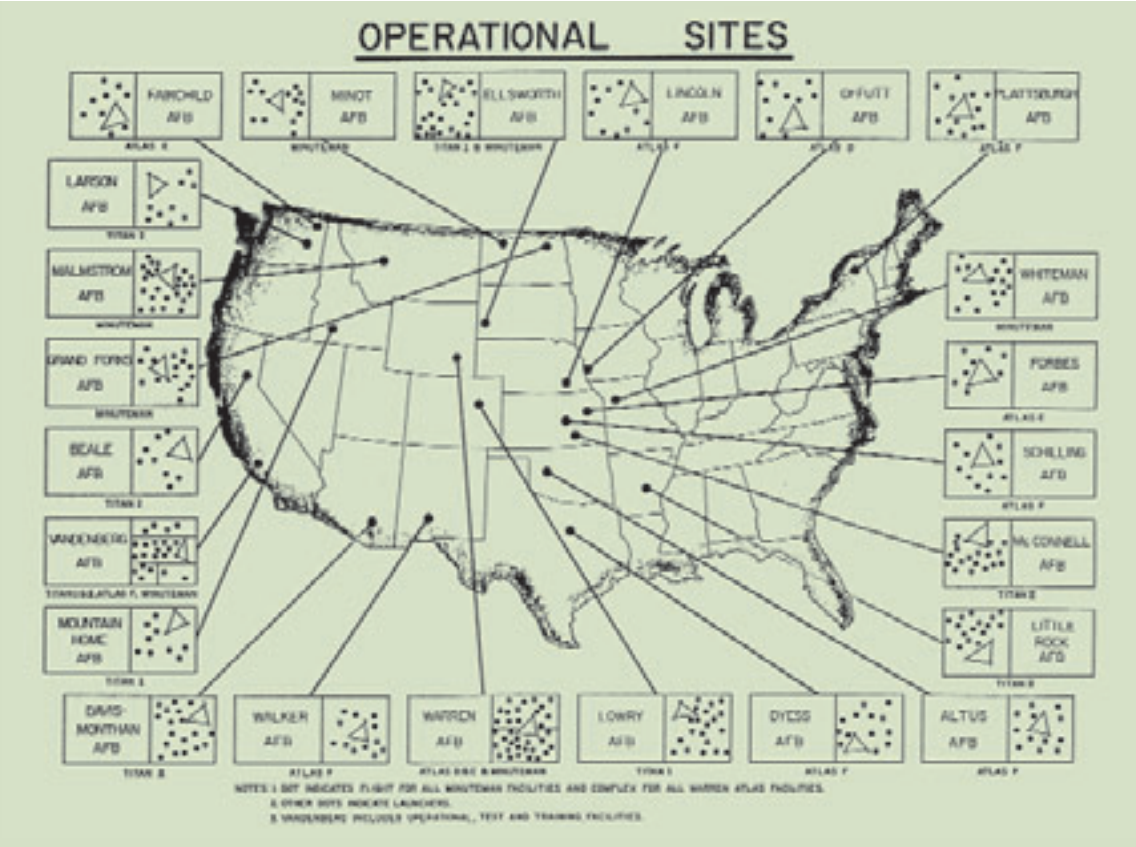
Air Force Dormitory, Brindisi, Italy, 1965

Libya. These forward bases brought Strategic Air Command bombers within striking range of the Soviet Union.

After the Soviet Union tested its first atomic bomb in August 1949, the United States began looking for ways to protect its vital military installations and major urban areas from Soviet air attack. The answer was the U.S. Army's Nike antiaircraft missile system, and in 1952 the U.S. Army Corps of Engineers began purchasing land and building Nike missile batteries at sites around the country. Each site encompassed approximately forty acres, and between 1954 and 1958 the Corps built nearly two hundred Nike Ajax missile batteries. In 1958 the Army began replacing the liquid-fuel Ajax missiles with the longer-range, solid-fuel Nike Hercules equipped with nuclear warheads. To house the new missiles the Corps of Engineers either modified the existing Ajax facilities or built new Nike Hercules missile batteries. Ultimately the Corps of Engineers constructed a total of 265 Nike Ajax and Hercules launch facilities. The last Ajax battery was decommissioned in 1963 and the final Hercules missile site was closed in 1979.

Even as the United States was building an air defense network, the evolution of a new technology—long-range intercontinental ballistic missiles (ICBM) armed with nuclear weapons—opened a new chapter in the arms race with the Soviet Union. While the United States Air Force raced to develop an operational ICBM, in 1957 it turned to the U.S. Army Corps of Engineers to begin building the research, test, and training facilities to support the development effort, as well as the operational launch sites to deploy the ICBMs. In 1960 the Corps established the Corps of

The ICBM site construction program spanned the country and encompassed facilities from New York to California.



A Nike Ajax missile battery in 1959. The heavy earthen berm on the right surrounded the refueling area.

National Air and Space Museum

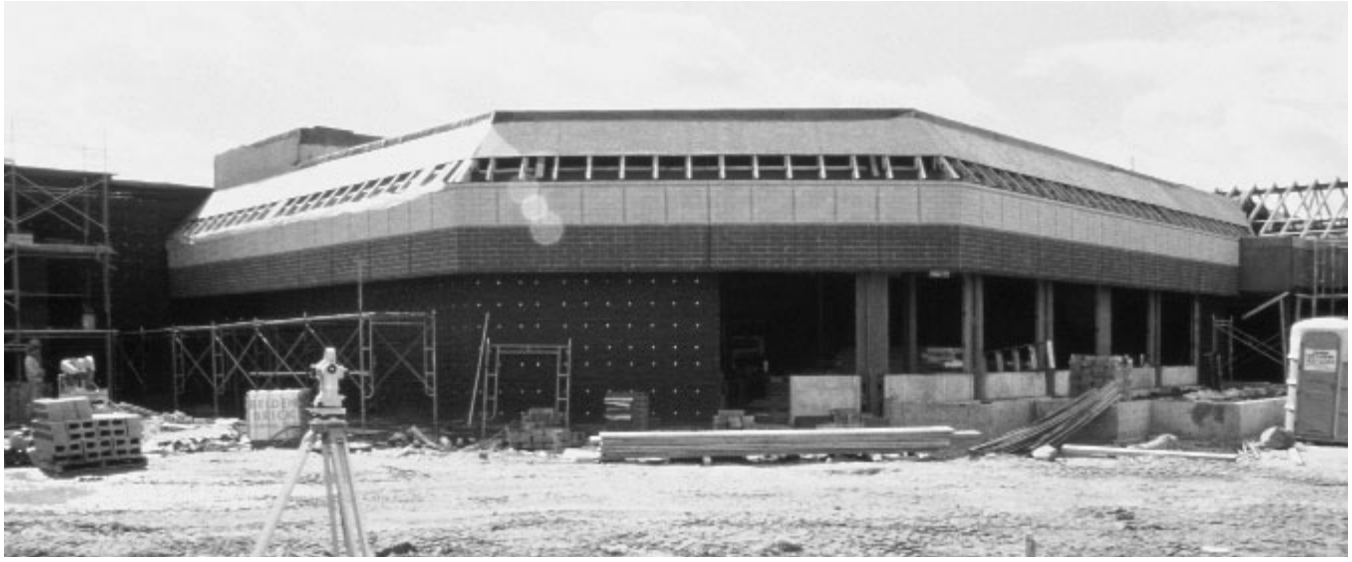
Engineers Ballistic Missile Construction Office (CEBMCO) to manage the project. By 1966 CEBMCO had a staff of three thousand people managing twenty-two construction projects spread over seventeen states. Construction of the missile facilities went on around the clock, and by 1961 more than twenty-one thousand construction workers were building missile facilities. Construction of the Atlas, Titan, and Minuteman missile silos, most of which were built deep underground and hardened to survive a preemptive first strike, was particularly challenging and required the Corps to develop new construction techniques and management procedures to support the effort. By the late 1960s, the Corps had completed 1,200 ICBM launch sites.

In the 1970s the Corps provided construction support for the Sentinel and Safeguard antiballistic missile (ABM) programs. The ABM construction program culminated in the completion of the Stanley R. Mickelsen Safeguard Complex in North Dakota in 1972.

During the military buildup of the 1980s, the U.S. Army Corps of Engineers conducted large construction programs for the U.S. Army and the U.S. Air Force. During the first half of the decade, the construction effort reached approximately $1 billion a year for each service. In the largest U.S. Army installation construction

The main tunnel of a Titan I launch complex nearing completion, 1960

Activation of the first Titan I squadron at Lowry AFB, Colo., April 1962
U.S. Strategic Command History Office



Shopping center under construction at Fort Drum, N.Y.

program since World War II, the Corps built an almost completely new base at Fort Drum, New York, for a newly organized light infantry division, the 10th Mountain. Although the division used some of the existing buildings, the Corps constructed almost an entirely new post, including infrastructure, barracks, family housing, dining facilities, headquarters buildings, a large physical fitness complex, medical clinics, and an airfield. Built on a tight schedule, the almost $1 billion construction program produced a modern, well-planned installation adapted to its environment and incorporating lessons learned at other U.S. Army installations. With its enclosed shopping mall, child care center,

Barracks under construction, Vilseck, West Germany, 1983

and recreational and entertainment facilities, the installation reflected the U.S. Army's growing concern about the quality of life of its Soldiers and their families. Although unique in its scope and complexity, the Fort Drum program was only one portion of the busy Army and Air Force construction programs of the Reagan administration.

With the collapse of the Soviet Union and the end of the Cold War, the future of military construction was uncertain. Many military construction projects were temporarily frozen as the Nation's leaders discussed the possibility of a "peace dividend." As the military services struggled to redefine themselves in the post-Cold War world, the Army began to consolidate installations and dispose of unneeded property. The Base Realignment and Closure (BRAC) program was an attempt to save money and adapt the installation structure to the expected decline in the services' size. BRAC, however, generated its own demand for construction, as units moved to new installations that required new facilities.

The U.S. Army Corps of Engineers was also active in the effort mandated by international convention to dispose of chemical weapons that were outdated or no longer needed in the Nation's arsenal of weapons. The Chemical Demilitarization Program involved the construction of complex and expensive facilities that, although at times controversial, were designed to dispose of the chemical weapons located at eight sites within the Continental United States and one on Johnston Atoll in the Pacific Ocean.

The Department of Defense began an ambitious environmental cleanup program in 1984. At former and current sites, the services worked to locate and remove old contaminants and operate active installations in an environmentally responsible manner. Much of the work associated with these programs fell to the U.S. Army Corps of Engineers. In 1997, the Corps' environmental cleanup duties expanded when the Formerly Utilized Sites Remedial Action Program (FUSRAP) was transferred from the Department of Energy to

Preparing to remove underground storage tank at the former Kincheloe Air Force Base, Kinross, Mich., 1994

Barracks at Fort Bragg, N.C., 2003

the Corps. FUSRAP removed radioactive materials from sites formerly used by the Manhattan Engineer District, which built the Nation's first nuclear weapons during World War II, and its successor, the Atomic Energy Commission.

As part of its military construction mission, the Corps continued to have responsibility for the renovation of the Pentagon, a structure that it had built during World War II. Nearly six decades later, the Pentagon badly needed repair and updating. The Corps completed the first segment of the renovation before responsibility for the massive renovation project was transferred to another agency in 2000. The Corps' work proved its durability when it resisted the impact of the September 11, 2001, terrorist airliner attack much better than the adjacent, unrenovated segment of the building.

Other military construction programs aimed to improve the quality of life for Soldiers. A major barracks renovation program provided better facilities with more amenities and privacy to enlisted Soldiers, and a massive new housing privatization program began placing large proportions of U.S. Army family housing in the hands of private companies. Under the Residential Communities Initiative, contractors began renovating and improving existing family housing and building large tracts of new housing. The Nation's reliance on an all-volunteer Army meant that the quality of life for Soldiers—who were increasingly deployed in combat abroad—and their families at home was an important priority.

Even before the terrorist attacks of 2001, it had become apparent that the post-Cold War world would not be a peaceful one. After years of research and development, the United States began acquiring weapons and building facilities to provide a defense against a limited ballistic missile attack, and the U.S. Army Corps of Engineers played an important role in providing the ground-based facilities in Alaska. But increasingly, the country found itself drawn into smaller conflicts like the civil strife that plagued Somalia, Rwanda, and the collapsing Yugoslavia. Large and rigid Cold War-era U.S. Army units were difficult to use in this new combat environment, and in 1999 Chief of Staff of the Army General Eric Shinseki began a massive reorganization of combat units to make them smaller, lighter, and more flexible. The Corps helped to design and build the new bases that would train and support these new units.

U.S. Army transformation led to "Milcon Transformation" with the objective of providing these new facilities faster, better, and cheaper in close cooperation with private industry. One of the early challenges was to provide modular facilities quickly for troops who were moving back to the United States from Iraq and other parts of the world and preparing for transformation.

In the early years of the twenty-first century, the Corps confronted challenges inherent in executing its normal military construction mission for the Army, the Air Force, and other Department of Defense agencies;

Exterior view of Camp Zama, Japan, high rise family housing, 1999

supporting the massive spending on the Global War on Terrorism in Iraq and Afghanistan; supporting Army Transformation; and preparing for an additional round of BRAC requirements. Although the Cold War with its large demands on the Corps had ended, the post-Cold War world offered a new and daunting set of challenges that were scarcely imagined just a decade earlier.

The U.S. Army Corps of Engineers Responded to President Kennedy's Call for National Preparedness

"We are not against any man or any nation or any system except as it is hostile to freedom. So stated President John F. Kennedy in a May 25, 1961, special address to Congress on urgent national needs in response to crises in Berlin, Germany, and Cuba. In the address, President Kennedy spoke at length on civil defense, which he characterized as insurance for the civilian population in case of an enemy miscalculation. To overcome years of neglect, he assigned responsibility for civil defense to Secretary of Defense Robert McNamara and established a National Fallout Shelter Program.

Secretary McNamara proceeded to create an Office of Civil Defense within the Department of Defense and tapped the U.S. Army Corps of Engineers and the Navy s Bureau of Yards and Docks to conduct a fallout shelter survey and other civil defense tasks. The initial mission was to identify structures, determine their ability to block a massive dosage of radiation resulting from a nuclear attack by a factor of twenty, and mark them as public shelters. The goal was to find shelter for up to 50 million Americans.

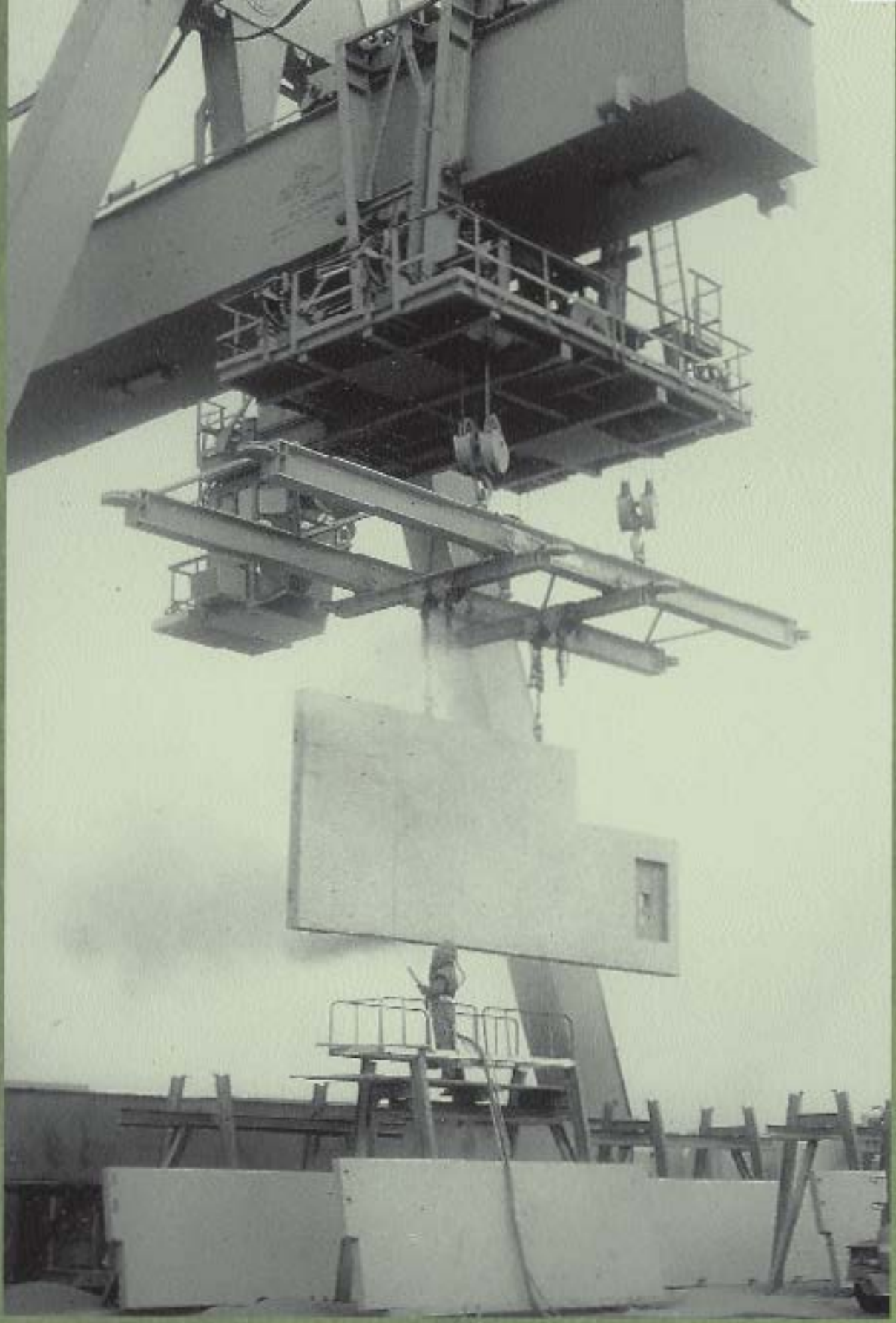
The Corps responded by creating a Joint Civil Defense Support Group in the Chief s office with a colonel in charge. The Corps staffed the new headquarters organization and similar offices with division and district personnel. Most of these personnel were diverted from civil works assignments.

Within a short time, the National Fallout Shelter Survey achieved impressive results. The Corps developed specialized techniques for computer processing of survey data, developed scientific methods to evaluate potential shelters, trained nearly 1,500 architect-engineers and Corps employees, and negotiated and supervised more than 500 architectural and engineering contracts to conduct the nationwide survey. The fallout shelters thus established were stocked with federally procured water, food, medical, and sanitation supplies, as well as radiation monitoring kits.

Additional civil defense tasks included preparing the following: engineering and cost studies of standard structures for emergency operating headquarters, pilot feasibility studies to determine local capabilities to quickly increase the number of public shelters, technical civil defense publications, a nationwide survey of construction and engineering equipment and inventory of potential contractors, and a survey of fallout shelters for selected radio and television stations in the National Emergency Broadcast Network.

The program continued throughout the 1960s, and by 1970 it was consolidated at the Corps division level. Overall management passed to the Defense Civil Preparedness Agency in 1972. This organization was subsumed into the Federal Emergency Management Agency in 1979.

The Corps response to President Kennedy s call for national preparedness was another example of the agency s ability to quickly and efficiently respond to new missions using its decentralized organization and established contracting expertise.



Precast concrete plant,
King Khalid Military City,
Saudi Arabia

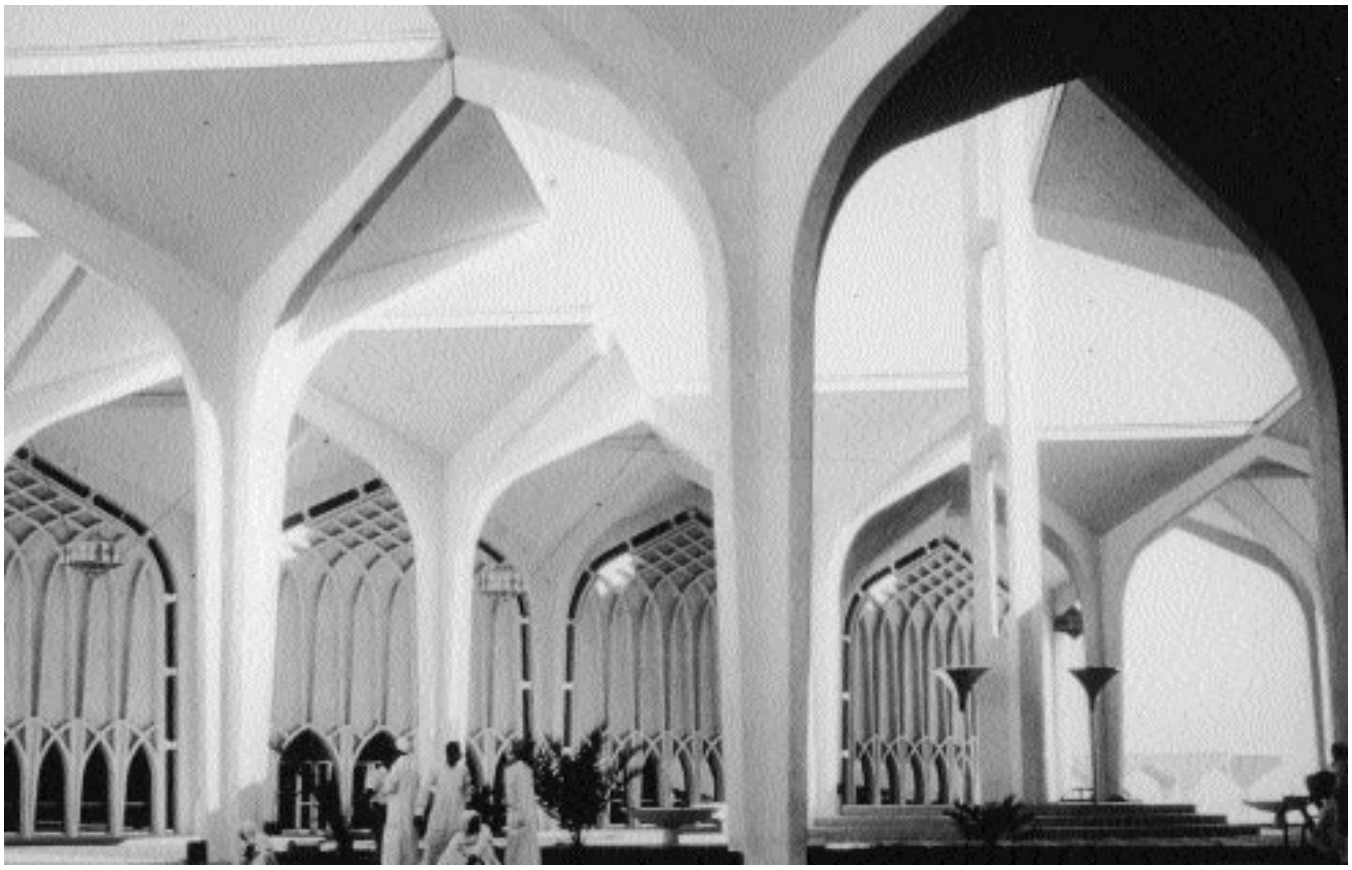
Work for Other Nations

Shortly after World War II, the U.S. Army Corps of Engineers became involved in massive foreign assistance programs sponsored by the United States government in response to the devastating impacts of that global conflict. Much of Europe was a shambles, suffering in many instances from physical devastation and political instability. These conditions made the continent vulnerable to the expansion goals of the Soviet Union. As a result, in 1948 the U.S. Congress approved Secretary of State George C. Marshall's plan to provide financial support for reconstruction programs developed by participating European nations. This ambitious plan followed separate congressional aid packages to Greece and Turkey, nations that were particularly vulnerable to subversion or aggression.

The 1951 Mutual Security Act extended the U.S. foreign assistance program to other portions of the globe. This law was passed in a period of growing international tensions marked by the advent of the Iron Curtain, the Berlin Blockade, the communist success in China, and the outbreak of the Korean War. The purpose of the legislation was maintenance of national security and promotion of U.S. foreign policy through military, economic, and technical assistance to strengthen friendly nations. The act consolidated or built upon a variety of efforts, including the Military Assistance Program authorized in 1949 by the Mutual Defense Assistance Act, through which the United States offered help to allies in establishing defenses against external aggression and internal violence. The Mutual Security Act also included the program of technical assistance first articulated in President Harry S. Truman's 1949 inaugural address. Finally, the new law replaced the various economic aid programs with comprehensive loan and grant provisions.

Foreign assistance programs continued to evolve in response to changing perceptions of the world situation and American interests. In the first years of the Cold War, economic aid predominated. During the Eisenhower years, from 1953 through 1961, most of the assistance

Gen. George C. Marshall



Interior of Dhahran Airport, Saudi Arabia, completed by the Corps in 1961

from the United States was military. Then, in the decade that followed, an equilibrium was reached between economic assistance and military programs, including sales. The Foreign Assistance Act of 1961 established the U.S. Agency for International Development (AID) to administer the major economic aid programs. More significantly for later U.S. Army Corps of Engineers activities, Section 607 of this act provided for furnishing services and commodities to foreign countries on a reimbursable basis. Starting in the mid-1960s, this became the basis for a number of major engineering programs.

Other important trends shaped the role of the U.S. Army Corps of Engineers abroad. As bipolar hostilities appeared outside of Europe, base construction spread from Middle Eastern and North African countries to the Far East and South Asia. This trend coincided with the advent of a different form for transferring aid to recipient nations. During the early years of the Cold War, most aid was in the form of grants—90 percent of American help was outright gifts. By the mid-1960s, 60 percent of economic aid was loans.

The U.S. Army Corps of Engineers' contributions to these foreign

programs took place in this context of evolving emphasis. Thus, during the immediate postwar years, when American foreign policy and assistance programs emphasized Europe and particularly Greece and Turkey, the Corps was extremely active in these two nations. In Turkey, the Corps concentrated on construction of military facilities for Turkish and American armed forces. In Greece, after the State Department came to the Corps for technical expertise, the Corps restored a badly mauled transportation and communication network. The Grecian District, which was established in Athens in July 1947, cleared the Corinth Canal, restored the Port of Piraeus, and built or repaired more than 3,000 kilometers of roads.

Corps operations in Greece established several major precedents. First was the organization of an engineer district to administer and supervise large-scale infrastructure programs in a foreign country. Second was the provision of technical assistance in conjunction with economic aid. Third, the practice of training local contractors and artisans to perform as much of the actual work as possible became an integral part of reconstruction and economic development. Fourth, the commitment to helping a friendly nation to help itself, which was manifested in projects aimed at restoring the Greek economy, became a standard feature of Corps projects.

Reconstruction of the port of Piraeus, Greece, February 1948

During the 1950s, the Military Assistance Program dominated American overseas efforts. This program was one of two major Department of Defense foreign activities in which the Corps participated. First and most important was the maintenance and support of American forces in other lands. The other, the Military Assistance Program through which the United States aided the military forces of other nations, was directed largely toward supporting allies on the periphery of the Soviet Union and near the People's Republic of China.

In the period 1950–1964, this program dispensed assistance valued at more than $350 million. Iran, which was the largest single recipient,

The Corps built a cantonment for the Pakistani army at Multan to accommodate 8,500 troops. The barracks above were two structures of the 310 built on the post. Construction at Multan began in 1959 and was complete two years later.

and four other nations—Pakistan, Turkey, Taiwan, and South Korea—received nearly all of the military assistance money. The projects carried out in Pakistan by the Trans-East District of the Mediterranean Division illustrate the nature of the work performed. In a massive modernization program for the Pakistani armed forces, the Corps built cantonments, airfields, wharves, and marine railways.

While heavily involved in these efforts, the U.S. Army Corps of Engineers also worked in programs of economic assistance. Projects intended to buttress a recipient nation's economy were administered by AID and its predecessor agencies. Corps participation in economic development programs actually predated the establishment of any of these agencies. As early as 1946, the Corps of Engineers worked with numerous Latin American governments to establish national cartographic programs. These efforts were ultimately intended to provide the basis for resource inventories of participating nations. After 1953, when the Department of State took over this program, the Corps continued to contribute to its success. Engineer personnel worked in twenty-two countries developing programs, rendering procurement assistance, and administering contracts.

The Corps of Engineers' Peshawar, Pakistan, resident office opened in 1956 in this remote city near the Khyber Pass. The resident office first supervised construction for the Pakistani air force, and then in 1958 worked on highly classified projects for the U.S. Air Force. Shortly after war broke out between India and Pakistan in 1965, Air Force work ended and the office closed.

In the late 1950s, the Corps began undertaking large projects within the economic assistance program. Between 1950 and 1964, the

Corps produced major engineering studies for seventeen different countries. These surveys dealt with beach erosion problems, river hydraulics, transportation networks, and entire public works programs. Corps personnel examined the feasibility of various port and highway projects. Engineers also became involved in actual construction in eight countries. The major construction projects included airports, highway systems, and ports, and the Corps spent $109.5 million on them between 1959 and 1964.

The Corps' work on these studies and construction projects reflected new directions in the overall program administered by AID. In the years just prior to 1965, the focus was on long-term projects that supported broad economic development. In this framework, engineering and construction loomed large, and the Corps, with its unique capability to plan, organize, and execute major building programs, made major contributions.

During the mid-1960s, several developments led to changes in the Corps' role in foreign programs. AID changed its emphasis from major construction efforts aimed at improving economic infrastructures to more immediate needs for the improvement of food supplies, public health, and education. Moreover, AID turned more to private engineering and architectural firms for support in this area. In so doing, the agency cited the provisions of Section 601 of the Foreign Assistance Act of 1961, which encouraged maximum utilization of private resources instead of other government agencies.

The buildup of American armed forces in Vietnam also redirected the foreign operations of the U.S. Army Corps of Engineers. The maintenance and support of American forces in Southeast Asia took an ever-increasing portion of the Corps' resources. Moreover, Vietnam absorbed a growing percentage of the foreign aid budget, leaving less money for major projects in other parts of the world. As AID turned its attention to Vietnam and Southeast Asia, the agency became involved in major geodetic and cartographic enterprises. The U.S. Army Corps of

Housing courtyard, King Abdul Aziz Military Academy, Saudi Arabia

Saudi Arabian National Guard headquarters building

Engineers, with expertise already employed in a number of other nations, contributed again to resource inventory projects and the production of maps required for the land reform program of the government of South Vietnam. Thus, while the Corps' involvement in major construction projects dropped off, it still participated in other aspects of AID's work.

Even before international developments had changed the character of U.S. Army Corps of Engineers' overseas projects, another major factor had entered the picture. This was the beginning of Corps involvement in reimbursable programs funded by recipient nations instead of by U.S. loans and grants. Authorized by Section 607 of the Foreign Assistance Act, these projects were based on bilateral agreements between the United States and nations that sought the Corps' technical expertise in development programs. The first of these was funded by the government of Saudi Arabia in 1963. There the Corps engaged in a large number of construction projects—including a variety of facilities for the Saudi Arabian armed forces and civil projects such as construction of radio and television communications installations—that eventually totaled $5 billion when it ended in the late 1980s.

By the late 1960s and early 1970s, the number of reimbursable programs had grown. In addition to the work in Saudi Arabia, projects started in Iran, Jordan, Kuwait, and Libya. The Corps' effort in these nations improved the American balance of payments and provided valuable experience for U.S. Army engineering personnel while sharing the Corps' technical and professional expertise.

The U.S. Army Corps of Engineers met more pressing requirements in the Middle East while managing its long-term reimbursable projects. In accordance with the 1978 Camp David Agreements, the Corps built two airbases for Israel as replacements for those evacuated during the withdrawal from the Sinai. Completed in 1982, only three years after the start of construction, the bases cost about $1 billion, more than three-fourths of which was an American grant. Meanwhile, the Corps also constructed Sinai base

camps for the multinational force and observers who patrolled the demilitarized zone between Egypt and Israel.

Egypt also received considerations as a result of the Camp David Agreement. In addition to the opportunity to obtain F-16 jets through the Peace Vector program, the Egyptian air force received improvements to airbases to accommodate these new aircraft. An example of the base improvement effort was the large Gianaklis airbase in the Nile delta, a $250 million project awarded in 1992 and substantially completed by 1996.

After the Wye River memorandum of 1998, the Corps again participated in attempts to maintain peace in the Middle East. In exchange for moving bases from the West Bank and thereby freeing land for possible transfer to the Palestinians in accordance with the Wye River memorandum, the Israelis received two infantry training bases and other facilities paid for by the United States and constructed by the Corps. Although the reimbursable programs of recent years have been less extensive than the massive Saudi Arabian and Israeli airbase projects, reimbursable work continued to be an important Corps mission.

The U.S. Army Corps of Engineers has consistently played a major supporting role in "nation building" around the world. The

Construction of enlisted quarters, King Khalid Military City, Saudi Arabia

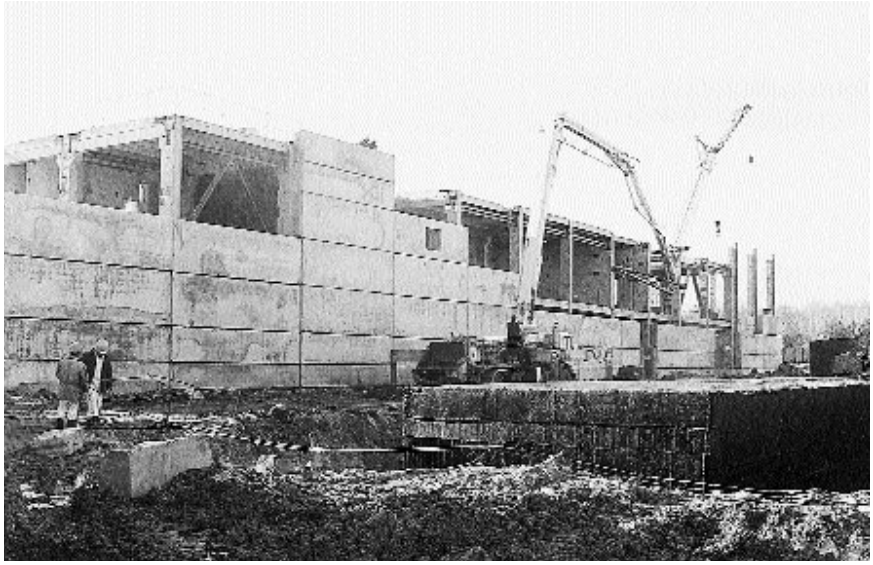
Hardened aircraft shelter with an F-16D completed by the Transatlantic Programs Center at Gianaklis Airbase, Egypt, 1996.

Port of Owendo, Gabon, site of Corps studies undertaken for the Agency for International Development

wide variety of projects to help other nations has included technical assistance to the African nation of Gabon to improve its ports, geological and hydrological studies of the Niger River Basin in Africa, technical advice on water resources development to the People's Republic of China, disaster relief in Bangladesh after devastating floods in 1991, and construction of hydropower facilities in the Federated States of Micronesia.

The collapse of the Soviet Union and the end of the Cold War in the 1990s produced large construction programs in the former Soviet Union. Although financed by the United States, these programs responded to and reflected the new geopolitical realities in the world. The breakup of the Union of Soviet Socialist Republics led to the creation of a number of new nations that needed U.S. embassies, which the Corps helped construct or renovate. A large program began in 1997 as a result of concern about the handling of nuclear weapons in the former Soviet republics. The Cooperative Threat Reduction Program funded a variety of cooperative construction projects, ranging from the building of a Russian facility to store fissile materials from dismantled nuclear

Holding area for fissile material in Russia



weapons to the construction of apartment buildings in the Ukraine for former soldiers of the Soviet Strategic Rocket Forces who required housing. In another program in the former Soviet Union, the Corps, in cooperation with the U.S. Customs Service and the Republic of Georgia, built facilities to help the Georgian government secure its borders to inhibit the movement of dangerous cargo such as drugs or nuclear weapons and increase its customs revenues. All of these programs sought to bring some stability to a vast area undergoing the difficult transition to new political and economic systems.

Often overshadowed by such large programs are a variety of small projects that affect the lives of perhaps only a few, but with possible implications for many. The Corps has worked in more than 30 African nations on numerous small infrastructure projects like roads, bridges, schools, water wells, low-cost housing, health clinics, sanitation facilities, and biodiversity promotion. Working with U.S. embassies and local military forces, the Corps has built facilities such as a community training and counseling center for the Kenyan Red Cross to assist in its struggle with the devastating effect of HIV/AIDS and drug abuse. In addition, the Corps provided assistance to AID in the wake of the 1998 embassy bombings in Kenya and Tanzania to help mitigate damage to surrounding buildings, and a myriad of reconstruction projects following the wars in Afghanistan and Iraq.

A Corps-built clinic, Rwanda

Whatever the scope of the project, the U.S. Army Corps of Engineers has sought since the end of World War II to assist other nations in improving their infrastructures, to share American technical know-how, and to help other countries cultivate their own capabilities for self-development. From large-scale construction programs like the massive Saudi Arabian effort to smaller feasibility studies in the 1980s such as the harbor improvements at the Port of Asau in Western Samoa, the U.S. Army Corps of Engineers has developed the ability to assist other nations in vital engineering and construction management activities, both large and small.

Strengthening the Free World: Rehabilitating Postwar Greece

The advantages of having a military-civilian engineer organization were demonstrated when the United States decided to help Greece recover from the devastation of war. Soon after the end of World War II, Greece was torn by a civil war. President Truman and congressional leaders believed it was in America s interest to prevent the sitting Greek government s collapse by assisting the nation to get on a path toward economic recovery. To strengthen the anticommunist monarchy, a program of economic aid to Greece was developed under the auspices of the U.S. Department of State.

President Truman appointed Dwight P. Griswold, a former governor of Nebraska, as the administrator of the recovery program. Soon after his arrival in Greece in July 1947, Griswold reported on the extensive devastation

The dredge Poseidon *clearing the Corinth Canal, 1947*

he found. The State Department decided that the reconstruction and rehabilitation of roads, railroads, bridges, ports, and the Corinth Canal, one of the main Greek waterways, were of primary importance. Once the country s transportation system was restored and the ports were in operable condition, economic recovery would be more rapid.

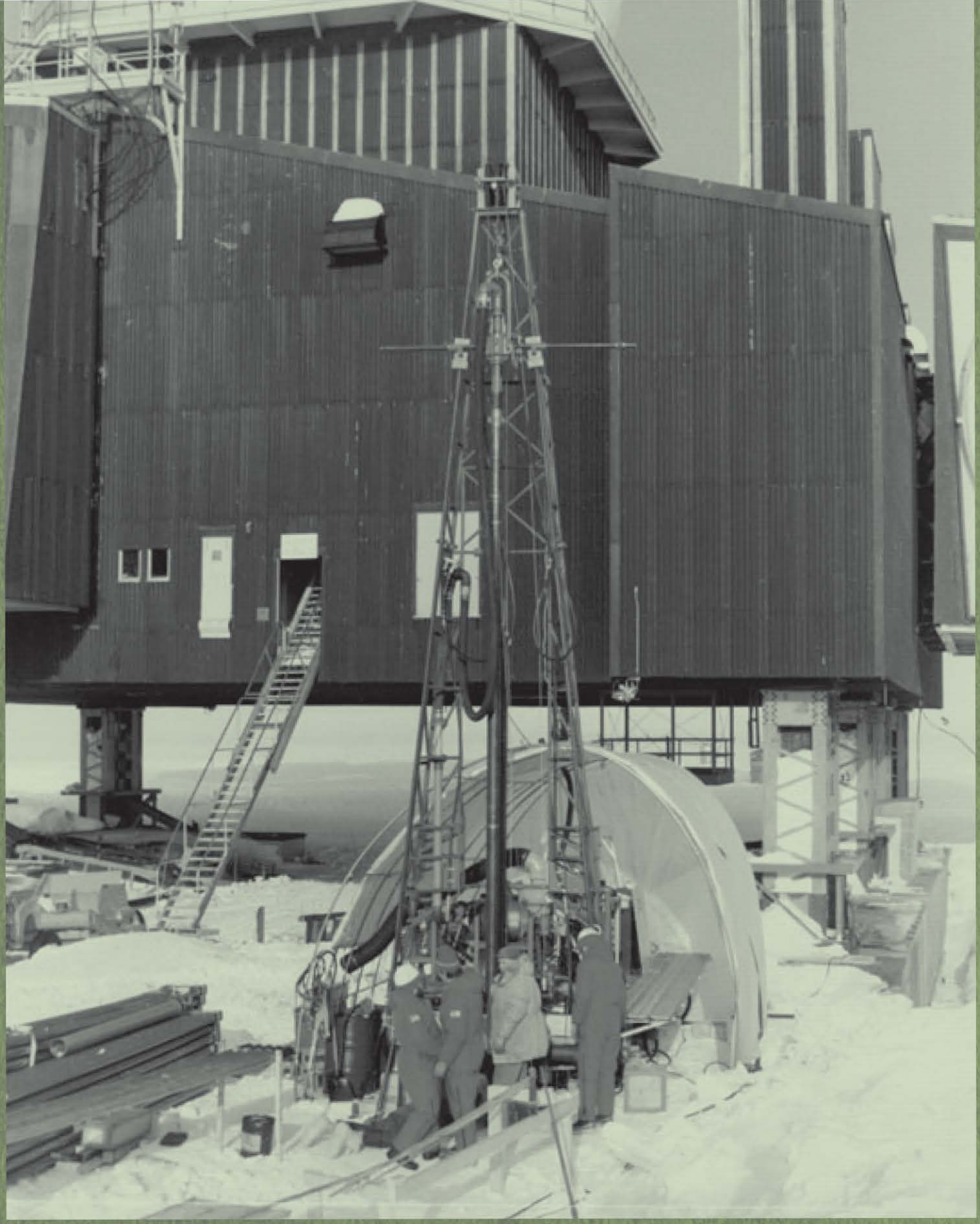
Although it received some 100 letters from construction firms interested in doing the work, the State Department was unfamiliar with doing construction and letting contracts; it had no organization to do the job. It repeatedly sent representatives to the Office of the Chief of Engineers to get information regarding such matters as the selection of contractors, the types of contracts that could be used, and the amount of the fee to be paid. The State Department concluded it would be unable to do the work itself and asked the U.S. Army Corps of Engineers, which had a capable civil works construction organization, to undertake the work on its behalf. Assigned to the Corps in late July 1947, the program was scheduled to be completed within a year.

The Corps of Engineers subsequently set up the Grecian District, headquartered in Athens, to manage the program. Its personnel were largely drawn from divisions and districts throughout the Corps. The new district entered into agreements with a number of contractors that formed joint ventures. By mid-August 1947, Colonel David W. Griffiths, the new District Engineer, some of his civilian employees, and some of the contractors employees arrived in Athens.

Actual reconstruction began in mid-September with the clearing of debris from the port of Piraeus. Soon work was under way on the reconstruction of other ports, the repair of wrecked railroad bridges and tunnels, and the upgrading of highways, all of which had deteriorated badly. Debris-clearing operations began on the Corinth Canal. Soon after arriving in Greece, Colonel Griffiths was given the additional duty of upgrading a number of airfields.

All of this work had to be done rapidly and efficiently. Secretary of War Kenneth Royall had admonished that the War Department is on continual exhibition to the President, the Congress, the State Department, and to Greece ... and other interested nations. Colonel George W. Marvin, the chief engineer of the American military assistance group advising the Greek Army in its fight against the guerrillas, helped Colonel Griffiths by obtaining Greek Army units to provide security for men working on District projects.

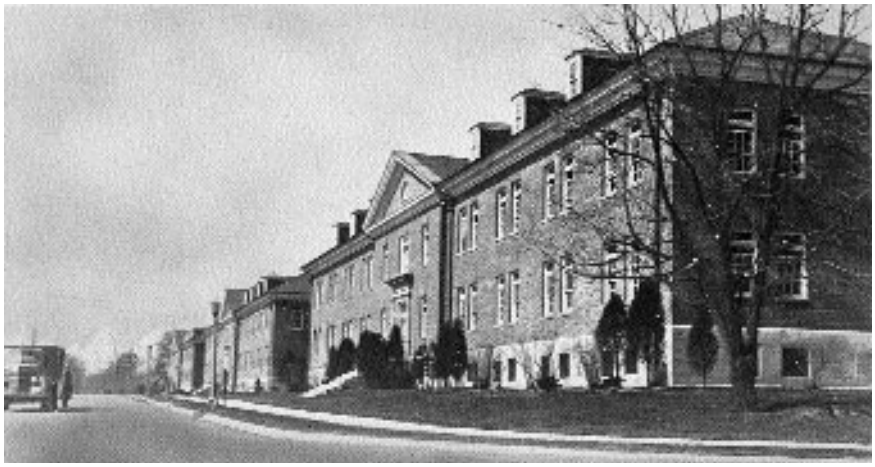
The U.S. Army Corps of Engineers reconstructed about 900 miles of highway, rebuilt three major ports, restored railroad bridges and tunnels totaling some two miles, and upgraded ten airfields. The Corinth Canal was reopened after about one million cubic yards of earth and debris had been removed. Actual construction time was about a year and a half. The schedule overrun resulted mainly from guerrilla attacks, unusually severe winter weather, and unexpected delays in getting supplies. Once again, the dual military and civilian organization of the U.S. Army Corps of Engineers made possible the efficient accomplishment of an important strategic mission.



Greenland Ice Sheet Project (GISP), Deep Drilling Operation by the Corps' Cold Regions Research and Engineering Laboratory, 1975. Cold War strategic interest in cold regions prompted extensive research.

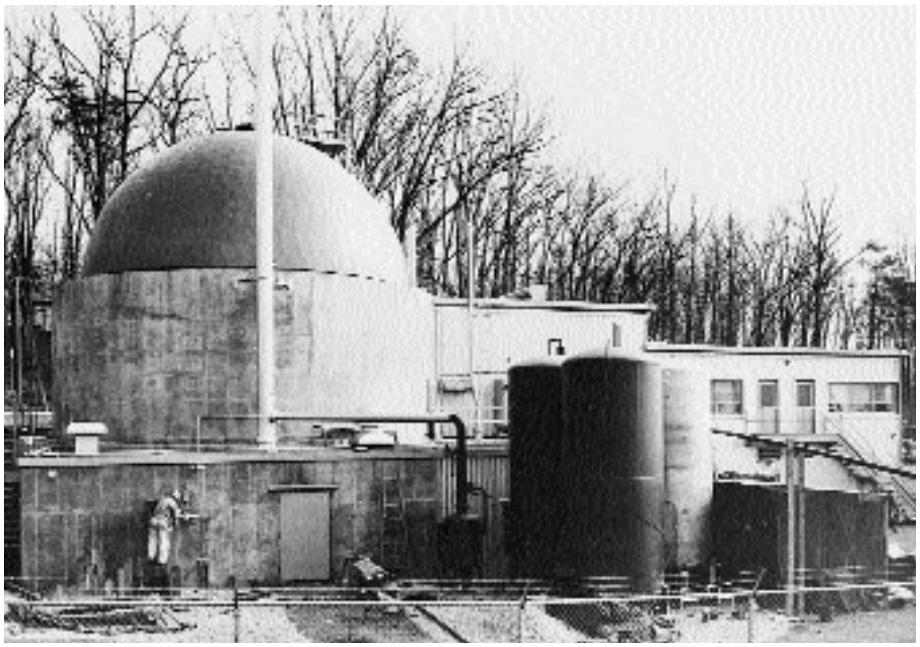
Changing Military Responsibilities and Relationships

During World War II, the Office of the Chief of Engineers and its subordinate activities exercised a broad range of military responsibilities. The Corps trained engineer officers and enlisted men, primarily at Fort Belvoir, Virginia, home of the U.S. Army's Engineer School since 1919, and at Fort Leonard Wood, Missouri, where an Engineer Replacement Training Center opened in 1941. The Corps developed the Tables of Organization and Equipment that structured U.S. Army engineer units, wrote the technical manuals that explained the use of engineer equipment, and prepared the field manuals that detailed military engineering tactics and doctrine. The Corps determined the U.S. Army's engineer equipment requirements, purchased the items needed and distributed them, while supervising the efforts of the Engineer Board to develop new and improved equipment. It



Company barracks, Fort Belvoir, Va., home of the U.S. Army Engineer School until 1988.

Engineer Replacement Training Center, Fort Belvoir, Va., which also trained enlisted personnel during World War II.



Nuclear reactor built at Fort Belvoir, Va., in 1955–57 by the Army Engineers Reactors Group and the Atomic Energy Commission. The Army's first nuclear reactor, this facility was decommissioned in 1973.

selected engineer officers for assignment to troop units, schools, and civil works. The Corps supervised all U.S. Army mapmaking. Finally, the engineers met the huge military construction and real estate needs of a rapidly expanding U.S. Army.

These functions, with the exception of general military construction and Army real estate, transferred to the Corps in December 1941, were traditional Corps missions that the engineers pursued during the war on a vastly expanded scale. Three months after the attack on Pearl Harbor, however, its position within the War Department changed, as the Corps of Engineers and other technical and administrative services of the U.S. Army were placed under the Services of Supply, one of three major components into which the War Department was then divided. General Brehon Somervell, himself an engineer officer, commanded this organization throughout the war, although its title changed in 1943 to Army Service Forces.

When the Army Service Forces headquarters was dissolved in 1946, the Chief of Engineers and the chiefs of the U.S. Army's other technical services returned briefly to the direct supervision of the Army chief of staff. The director of Logistics, however, inherited the general supervision of the technical services in 1948, and the deputy chief of staff for Logistics obtained more effective oversight of their work in 1954. The Under Secretary of the Army (during 1950–1953) and Assistant Secretaries of the Army for Materiel; Financial Management; Civil-Military Affairs; and Manpower, Personnel, and Reserve

Forces (during the Eisenhower administration) successively provided civilian direction for the Corps' military construction, housing, and real property functions.

For a decade and a half after World War II, the U.S. Army Corps of Engineers undertook the same broad range of functions it had exercised during the war. It even retained its role as engineering and construction agent for the U.S. Air Force after that service became independent of the U.S. Army in 1947. In 1954, the Corps became responsible for the Army's nuclear reactor program. It created the Army Engineer Reactors Group, which, in conjunction with the Atomic Energy Commission, completed in 1957 the Nation's first military nuclear power plant built primarily to generate electricity. Other nuclear plants followed, including a floating power plant and field reactors producing both steam heat and electricity.

Research Laboratories

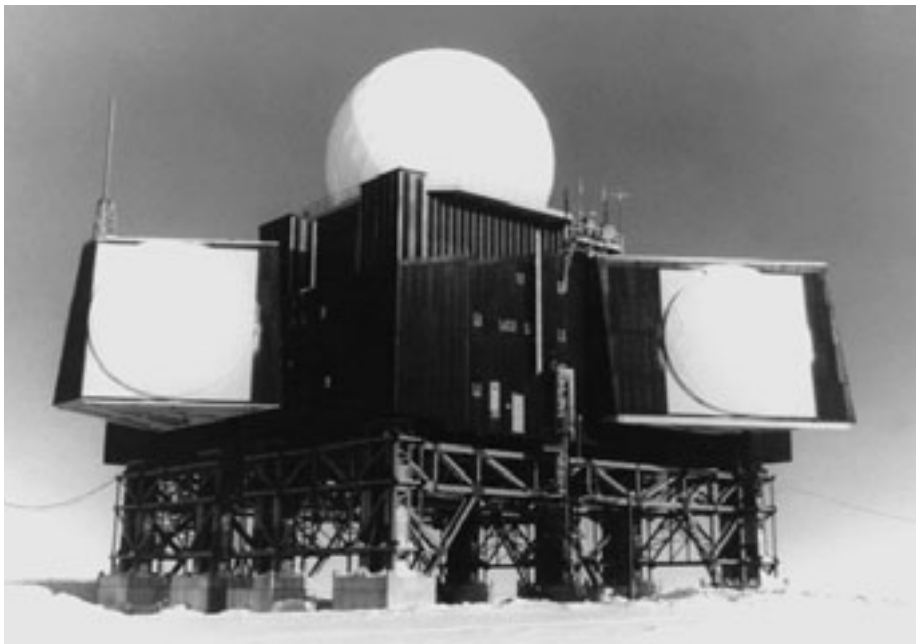
The Corps' laboratories prospered in the postwar years. The Engineer Research and Development Laboratories at Fort Belvoir, successor to the Engineer Board, continued its work in developing new and improved bridging, road construction, camouflage, demolition, mapping, and mechanical equipment. A Nuclear Power Branch was added to the laboratory to engage in research and development in the nuclear power field.

Before computer modeling, the Waterways Experiment Station in Vicksburg, Miss., used physical models to study waterways problems. This model of the Mississippi River at St. Louis, Mo., tested various measures to reduce siltation in the harbor.

A joint logistics over-the-shore sand grid demonstration test, Fort Story, Va.

The Waterways Experiment Station, established by the Corps and its Mississippi River Commission in 1929 at Vicksburg, Mississippi, as a hydraulics laboratory, had entered the field of military research and development during World War II. Soon after it developed the pierced-steel plank and prefabricated bituminous surface used in U.S. Army airfield construction. Placed under the direct supervision of the Chief of Engineers in 1949, during the Cold War the Waterways Experiment Station developed flexible pavements for runways designed for heavy B-52 bombers, and it examined, through chemical simulation, the blast effects of nuclear detonations in an effort to produce hardened

The Cold Regions Research and Engineering Laboratory, Hanover, N.H.



A Distant Early Warning (DEW) Line station on the Greenland icecap

structures capable of withstanding such attack.

Responding to increased U.S. Army emphasis on Arctic defenses, during and after World War II, the U.S. Army Corps of Engineers established laboratories at Wilmette, Illinois, and Boston, Massachusetts, to study the impact of cold climates on military operations. These Corps laboratories conducted research and experimentation on materials and techniques suitable for construction in areas of snow, ice, and permafrost. Their efforts aided the development of the Distant Early Warning (DEW) Line Radar System that stretched across Greenland, northern Canada, and Alaska, as well as the construction of American airfields and bases in those regions. The laboratories consolidated in 1961 to form the Cold Regions Research and Engineering Laboratory at Hanover, New Hampshire.

U.S. Army Reorganization

In 1962 seeking to streamline the U.S. Army's structure, Secretary of Defense Robert McNamara implemented the most substantial reorganization of the Army in the post-World War II era. The positions of all of the technical service chiefs, except for the Chief of Engineers and the Surgeon General, were abolished, and three newly created functional commands took important responsibilities from the Chief of Engineers. The Army Combat Developments Command assumed responsibility for engineer training and military doctrine. The Office of Personnel

Operations took over the career management of engineer officers and the Army Materiel Command assumed engineer supply and equipment development functions.

Overseeing the development, purchase, and supply of a wide range of U.S. Army weapons and equipment, the Army Materiel Command created a number of major subordinate commands to which it assigned responsibility for specific types of items. The Army Mobility Command (1962–1967) and its successor, the Army Mobility Equipment Command, took over the supply of most military engineering equipment and the supervision of the Engineering Research and Development Laboratories at Fort Belvoir, which became the Army Mobility Equipment Research and Development Center. The two commanders of the Army Mobility Command, Major Generals Alden Sibley and William Lapsley, were both engineer officers, and Sibley moved to the Mobility Command directly from his duties as the last Deputy Chief of Engineers for Military Operations. This eased the transition in engineer supply matters.

Major General William Gribble, later Chief of Engineers, served as the Army Materiel Command's Director of Research and Development in 1964–1966, and Major General Richard Free, another engineer officer, held that position from 1967–1969. These were important years for the development of new engineer materiel used to support American forces in Vietnam. Aided by renewed experimentation in airfield mats and membranes at the Waterways Experiment Station, the Materiel Command developed the prefabricated neoprene-coated nylon membrane, known as the T-17 membrane, used on airfields in Vietnam; new aluminum and steel landing mats; and peneprime, a high-penetration asphalt that met dust-control needs in Vietnam. The Chief of Engineers remained the senior engineer advisor to the Army Chief of Staff; his advice was sought and implemented on such decisions as the selection of the D-7 dozer as the standard bulldozer in Vietnam rather than the newer but less easily transported D-8 model.

Despite its loss of important training, personnel, and materiel supply responsibilities in 1962, the Office of the Chief of Engineers continued to supervise the engineering, construction, and real estate services required by the U.S. Army, U.S. Air Force, and National Aeronautics and Space Administration. The Chief's office also continued to formulate policies governing the maintenance and repair of U.S. Army housing and other real property and the operation of the utilities on Army installations, as it had since World War II. U.S. Army facilities engineers implemented

Family housing constructed at Ben Guerin, Morocco, in the late 1950s as the Corps built airfields to allow Air Force heavy bombers to reach the Soviet Union.

these policies under the supervision of installation commanders. The Chief of Engineers, however, lost control of funding in the repairs and utilities sphere in 1958. The Chief of Engineers' work in all of these fields remained under the general staff supervision of the Deputy Chief of Staff for Logistics, while the Assistant Secretary of the Army for Installations and Logistics in 1961 assumed civilian oversight of all of these functions.

In addition, the Office of the Chief of Engineers continued to supervise U.S. Army mapping, geodesy, and military geographic intelligence services, maintaining the Defense Department's worldwide map library, as it had since 1939. Beginning in 1963 and 1964, the office exercised its topographic responsibilities under the program direction of the Assistant Secretary of the Army for Research and Development, with policy guidance from the Army's Assistant Chief of Staff for Intelligence.

While the Engineer Research and Development Laboratories were placed under the Army Materiel Command in 1962, its former topographic and nuclear power development functions remained the responsibility of the Corps of Engineers. With the field of military mapping research expanding rapidly at the dawn of the satellite era, the Chief of Engineers in 1960 transferred this function from the Engineer Research and Development Laboratories to the newly created Engineer Geodesy, Intelligence, and Mapping Research and Development Agency. The reorganization of 1962 left the military mapping agency part of the U.S. Army Corps of Engineers. The

Autonomous land vehicle, a test robotic vehicle developed by the Engineer Topographic Laboratories, now the Topographic Engineering Center

agency was renamed the Engineer Topographic Laboratories in 1967.

The Department of Defense consolidated the topographic work of the different military services in 1972, however, and the U.S. Army Topographic Command, whose director had reported to the Chief of Engineers, was absorbed into the new Defense Mapping Agency. The Chief of Engineers again retained responsibility for U.S. Army topographic research and development. The Engineer Topographic Laboratories, located at Fort Belvoir, Virginia, developed during the 1960s and 1970s automated equipment for producing topographic maps from aerial photographs and improved systems of Army field map production. In the 1980s, they developed systems to convert terrain data into digital form and used computer graphics to offer commanders access to this data in a variety of easily interpreted formats. The Corps renamed the Engineer Topographic Laboratories the Topographic Engineering Center in 1991.

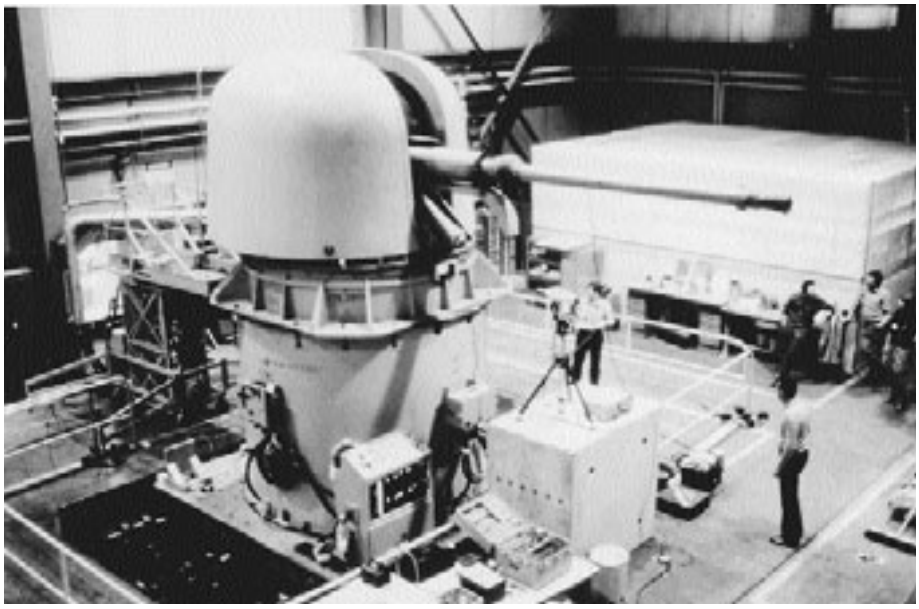
The Army Engineer Reactors Group, renamed in 1971 the Army Engineer Power Group, retained the Corps' responsibility for U.S. Army nuclear power development after the 1962 reorganization. In May 1962, the Corps created the Army Engineer Nuclear Cratering Group at Livermore, California, to study, in cooperation with the Atomic Energy Commission, the feasibility of nuclear methods of excavation. Although officials considered using nuclear devices in the construction of a proposed sea-level canal across Central America and in several civil works projects in the United States, no feasible use of this concept was found. The Corps disbanded the Nuclear Cratering Group in 1971.

The Cold Regions Research and Engineering Laboratory was transferred to the Army Materiel Command in 1962, but because of continuing Corps of Engineers requirements for Arctic construction research, the Materiel Command approved its return to the Corps of Engineers in 1969.

After the transfer of the Engineer Research and Development Laboratories to the Army Materiel Command, the Chief of Engineers sought to create a new facility to conduct basic research into construction materials and design, housing habitability and maintenance, and energy and utility systems. As the Ohio River Division's Construction Engineering Laboratory at Cincinnati had begun significant work in this sphere, the Corps, with the approval of the U.S. Army Secretariat, expanded that facility into a new Construction Engineering Research Laboratory. The new laboratory opened in Cincinnati in

1968 and moved the following year to its present location at Champaign, Illinois, where it occupies facilities leased from the University of Illinois. This newest Corps laboratory developed a fibrous reinforced concrete used both in airfield runways and in some civil works projects, a portable instrument to test welding quality, and a centralized facility to control pollutants where U.S. Army vehicles are washed.

In order to streamline its business practices and provide better service to its customers, many of whom were outside organizations, the Corps of Engineers reorganized its research and development laboratories



Biaxial shock test machine designed by the Construction Engineering Research Laboratory to test both horizontal and vertical structural strength.

Construction of "the Pier" in the late 1970s at the Field Research Facility, located near Duck on the Outer Banks, N.C. The facility was part of the Coastal Engineering Research Center, established in 1963 to study coastal engineering problems. After several moves and reorganizations, the center became part of the Coastal and Hydraulics Laboratory of the Engineer Research and Development Center.

A USACE officer at ERDC using a battlefield computer simulation

into the U.S. Army Engineer Research and Development Center (ERDC) in 1999. The seven component laboratories in ERDC were the Coastal and Hydraulics, Environmental, Geotechnical and Structures, and Information Technology laboratories in Vicksburg, Mississippi (formerly parts of the Waterways Experiment Station); the Construction Engineering Research Laboratory in Champaign, Illinois; the Cold Regions Research and Engineering Laboratory in Hanover, New Hampshire; and the Topographic Engineering Center in Alexandria, Virginia. In the summer of 2006 the Corps continued this process of streamlining and consolidating by combining the positions of Director of the Engineer Research and Development Center and Director of Research and Development in engineer headquarters.

A researcher at ERDC's Environmental Laboratory carrying out experiments in environmental chemistry

Engineer Troop Units

After World War II, U.S. Army engineer troops were organized primarily into engineer combat and construction battalions, supplemented by topographic battalions and various specialized engineer companies. The combat battalions were designed to provide the engineering capabilities required by front-line forces, and their men were trained and equipped to fight as infantry if necessary. Engineer construction battalions had heavier equipment suited for the more permanent construction typically required to the rear of combat zones, and their members were not expected to fight as infantry. Lieutenant General Walter Wilson, the Chief of Engineers, proposed in 1962 to eliminate the engineer construction battalion and create a

single, standardized engineer combat battalion that could be aided, when required for heavier work, by a construction equipment company. The Combat Developments Command studied Wilson's proposal but concluded that the construction battalion would be essential in the event of a lengthy war. Subsequent events in Vietnam supported this conclusion, for engineer construction battalions there played a leading role in building U.S. Army installations and an ambitious highway development program.

The Chief of Engineers regained staff responsibility for the development of Army engineer units in 1969, and a reevaluation of the proper role of the engineer construction battalion soon ensued. The Engineer Strategic Studies Group, a broadly chartered studies and analysis activity reporting to the Chief of Engineers, proposed in 1974 that the engineer construction battalion be reorganized and its firepower augmented so that it, too, would be prepared to assume a full combat role. In the contemporary climate of congressional concern over the military's proportion of combat and support forces, frequently termed the "tooth-to-tail ratio," the U.S. Army then accepted this proposal. Engineer construction battalions at home and abroad were reorganized in 1975 as engineer combat (heavy) battalions. As part of the reorganization, the units were provided additional antitank weapons, grenade launchers, radios, and demolition equipment, and their men were given additional combat training. The conversion of the engineer construction battalions in Europe contributed significantly to the reduction of the U.S. Army's support forces there, as mandated by the Defense Appropriation Act for 1975. In that same year, the U.S. Army again included the U.S. Army Corps of Engineers among its combat arms branches, while also retaining it among its combat support arms and its services.

Army Facilities Programs

The U.S. Army Corps of Engineers substantially increased its responsibility over the U.S. Army's military construction and family housing programs in 1974. Prior to that time, the Deputy Chief of Staff for Logistics formulated Army budget planning and set basic policies for these facilities programs, which the Corps then executed. The Deputy Chief of Staff for Logistics exercised these functions through his director of installations, as he and his predecessors had done since 1954. As part of a larger transfer of Army staff responsibilities to operating elements, the U.S. Army in 1974 placed the director of

installations, Major General Kenneth Cooper, together with his staff and his program development responsibilities, under the Chief of Engineers. General Cooper became Assistant Chief of Engineers. In the same year, the Corps added facilities engineering technical assistance and fossil-fuel energy consulting to the then-dwindling responsibilities of the Army Engineer Power Group, which it renamed the Facilities Engineering Support Agency.

Environmental Responsibilities

In 1966 the U.S. Army Chief of Staff assigned the Chief of Engineers supervision over the engineering aspects of the Army's emerging program to protect the environment and abate pollution in the construction and operation of its military facilities. He also instructed the Surgeon General and the Chief of Engineers to work together to develop pollution abatement programs for the U.S. Army. In 1971, the deputy chief of staff for logistics assumed primary staff responsibility for directing the Army's environmental preservation and improvement activities, exclusive of the civil works arena. His director of installations created an Environmental Office in that year to undertake this responsibility. The Chief of Engineers continued to supervise the engineering portion of the program.

When the director of installations became the Assistant Chief of Engineers in 1974, the Corps added the direction of U.S. Army environmental efforts related to military sites to those involving civil works projects. This mission came to include supervising the Army's water pollution abatement and solid waste management programs; issuing policies for monitoring and controlling air pollutants emitted by Army facilities and vehicles; and drafting regulations to govern the Army's management of hazardous and toxic materials, its noise abatement efforts, and its responses to any Army-caused oil spills. The Corps also assumed responsibility in 1974 for a U.S. Army program to preserve buildings of historic or architectural significance and noteworthy archaeological sites on Army properties. The Office of the Assistant Secretary of

The volatilization system that removed dangerous organic compounds that contaminated ground water around the Twin Cities Ammunition Plant, Minn.

the Army for Civil Works assumed civilian direction of the Army's military environmental program upon the office's establishment in 1975. The Army shifted this oversight function to the office of the Assistant Secretary of the Army responsible for installations and logistics in 1978.

The creation of the Defense Environmental Restoration Program, first funded by a 1983 law, led to a noteworthy enlargement of the Corps' environmental work relating to military installations. The military services had earlier initiated efforts to remove hazardous materials from their active installations. The new program added hazardous waste disposal from former military sites and the removal of unsafe buildings, ordnance, and other debris from both active and former military sites. The U.S. Army Corps of Engineers, which had already begun providing engineering assistance to the Environmental Protection Agency in

Officers Club at Fort Totten, N.Y., built in the shape of the Corps Castle and placed on the National Register of Historic Places

Geo membrane and gas vent layers covering a landfill at K. I. Sawyer Air Force Base, Mich., 1996

Removal of contaminated soil, Rocky Mountain Arsenal, near Denver, Colo.

its direction of civilian toxic waste removal under the Superfund Program enacted in 1980, assumed program management in 1984 of the environmental restoration program for all former military sites, for all services. The deputy for Environmental Policy in the Office of the Deputy Assistant Secretary of Defense for Installations selected sites for cleanup after considering the recommendations of the Office of the Chief of Engineers. This position was raised to Deputy Assistant Secretary of Defense, Environment in 1986.

The U.S. Army Toxic and Hazardous Materials Agency, created in 1978 at Aberdeen, Maryland, as a subordinate activity of the Army Materiel Command, maintained operational control of the expanded environmental restoration program on active U.S. Army installations. It also relied on the U.S. Army Corps of Engineers for most of its design and construction work. The Corps had provided similar assistance in the cleanup of many active U.S. Air Force installations. In 1988, the Army placed the Toxic and Hazardous Materials Agency under the Chief of Engineers, consolidating Army environmental responsibilities under a single head.

Demolition of a smokestack at a Bunker Hill, Idaho, Superfund site, 1995

Army Facilities Maintenance

The U.S. Army Corps of Engineers increased its involvement in maintaining and repairing Army housing and other facilities at the same time it broadened its environmental responsibilities. A study panel headed by engineer Lieutenant General Lawrence Lincoln in 1968 urged the U.S. Army to encourage installation facilities engineers to turn to Corps districts and divisions for engineering support by funding a portion of that work. The U.S. Army agreed to set aside a modest fund for Corps installation support, invited installation commanders to turn to the Corps for additional maintenance and repair work on a reimbursable basis, and took other actions recommended by the Lincoln Panel to strengthen facilities engineering.

When the administration of President Jimmy Carter proposed management consolidation and increased reliance on private-sector contracting in the maintenance of U.S. Army facilities, the U.S. Army Corps of Engineers undertook several new studies in this sphere. A panel headed by Brigadier General Donald Weinert reviewed Army facilities engineering in the context of the era's heightened emphasis on master planning, energy conservation, worker safety, and environmental protection. The group observed in 1978 that the Corps' resources were still often neglected in the facilities maintenance sphere, despite the U.S. Army's implementation of most of the Lincoln Panel's recommendations. A subsequent engineer planning group headed by Colonel Charles Blalock proposed incorporating installation facilities engineers into the Corps' district organization, aiding them with the Corps' substantial experience in contracting, and giving them a full range of local engineering responsibilities.

Although the U.S. Army did not accept the offer of Lieutenant General John W. Morris, Chief of Engineers, to assume such broad installation engineering responsibilities, it did approve the plan, elaborated by the Engineer Studies Center (formerly the Engineer Strategic Studies Group), to centralize Army facilities maintenance work in the Military District of Washington under a single engineer manager. The U.S. Army Corps of Engineers in 1980 created the Engineer Activity, Capital Area, at Fort Myer, Virginia, to exercise that function.

Although installation commanders retained responsibility for maintenance work on U.S. Army posts, their facilities engineers turned increasingly to Corps districts and divisions for assistance in prosecuting the Reagan administration's substantial

effort to reduce the backlog of Army repair and maintenance work. Streamlining its procedures in this sphere, the U.S. Army Corps of Engineers saw its reimbursable installation support work grow from $130 million in 1980 to $620 million in 1986. Effective Corps support in this work was enhanced by new administrative reforms proposed by internal reviews made in 1985 and 1988, the former by a panel headed by North Central Division Engineer Brigadier General Jerome Hilmes, and the latter by the Office of the Engineer Inspector General, Colonel Dennis Bulger.

A Major Command

Witnessing a decline in support for large, new water resources projects in the later 1970s, Chief of Engineers Morris attempted to strengthen his office's ties to the U.S. Army as a whole. Consequently, in 1979 the U.S. Army Corps of Engineers—comprising the Office of the Chief of Engineers and the divisions, districts, laboratories, and other agencies subordinate to the Chief of Engineers—was designated an Army major command. This status gave the Corps a position comparable to other leading specialized Army commands such as the Training and Doctrine Command, Materiel Command, Communications Command, and Health Services Command, and the Army components of unified commands, such as U.S. Army, Europe, and the Eighth Army in South Korea.

The Chief of Engineers' ties to the U.S. Army were strengthened further in 1986 when he was named Chief of the Corps of Engineers Regiment, a ceremonial institution through which all engineer Soldiers, officers, and units would participate in the new U.S. Army Regimental System. The Chief of Engineers' assumption of this position gave symbolic recognition to his office's long history of leadership among the U.S. Army's military engineers.

The Goldwater-Nichols Department of Defense Reorganization Act of 1986 obliged the U.S. Army to distinguish clearly between the small group of personnel who continued to serve the Chief of Engineers in his capacity as an Army staff officer, and the larger number who worked for him as commander of the U.S. Army Corps of Engineers, the engineering and construction organization. The act also mandated personnel reductions that had an impact on the Office of the Chief of Engineers as an Army staff office. Responding to both the Army staff personnel limitations and his own view of current management requirements, the Chief of Engineers, Lieutenant General E. R. Heiberg III, ordered the consolidation of the Facilities Engineering Support Agency and the technical support activities of the Assistant

Distinctive Unit Insignia of the U.S. Army Corps of Engineers as a major Army command

Chief of Engineers in the fields of facilities engineering and housing management. The new organization resulting from the consolidation, called the U.S. Army Engineering and Housing Support Center, was established in 1987 at Fort Belvoir, Virginia. Its creation left U.S. Army program development responsibilities in the facilities and housing spheres in a leaner Office of the Assistant Chief of Engineers, now distinctly an Army staff organization. The Army Environmental Office became an Army staff support agency, which also reported to the Assistant Chief of Engineers. The new Engineering and Housing Support Center assumed responsibility for providing engineering support and technical policy interpretation for facilities and housing to U.S. Army forces worldwide.

In addition to supporting U.S. Army installations at home and abroad, the Corps undertook a major new responsibility for supporting the Army with facilities and services during military operations. After the Cold War ended and the U.S. Army demonstrated its clear military superiority on the conventional battlefield during the Gulf War of 1990–1991, it was not clear what military challenges the new era would bring. However, with pressure to reduce the size of the military, the U.S. Army's leaders emphasized moving uniformed personnel to combat positions and relying on civilian contractors to perform more support services.

Family housing, Fort Belvoir, Va.

Dormitory, Fort Huachuca, Ariz.

The U.S. Army Corps of Engineers, in cooperation with the Department of the Army's Deputy Chief of Staff for Logistics, developed a contract that would use a civilian contractor to prepare plans and perform selected services to augment

U.S. forces during military contingency operations overseas. Based on the Army's newly created Logistics Civil Augmentation Program (LOGCAP), which had been conceived in the 1980s, the contract was broadly structured to cover a number of scenarios worldwide requiring varying levels of support to U.S. military forces based on the theater commander's needs. The Army set up the contract to provide basic life support, maintenance, and transportation services. The Corps' Transatlantic Division awarded the first LOGCAP contract (LOGCAP I) in August 1992, and it was used to support U.S. and United Nations forces sent to Somalia in December 1992.

In total, U.S. forces used LOGCAP I to support six contingency operations from 1992 through 1997, including the largest operation, which was in Bosnia. In 1995 North Atlantic Treaty Organization forces, including American troops, entered Bosnia on a peacekeeping mission. LOGCAP I was used in the Balkans from December 1995 through May 1997.

During this time, the U.S. Army transferred official responsibility for LOGCAP program management to the Army Materiel Command, effective October 1996. Because the U.S. Army Corps of Engineers remained responsible for the first five-year contract, and since the peacekeeping operations had been extended in Bosnia, U.S. Army Europe (USAREUR) asked the Transatlantic Division, now known as the Transatlantic Programs Center (TAC), to award a follow-on logistics services contract. From May 1997 through May 1999, logistics services were provided under a sole source contract to avoid any disruption of services to U.S. forces in the Balkans.

With the commitment of U.S. forces for an indefinite period, USAREUR asked TAC to competitively award the Balkans Support Contract with a contract period of May 1999 through May 2004. Meanwhile U.S. troops entered Kosovo in 1999, and the new Balkans Support Contract, which was separate from LOGCAP, provided logistics support services for operations in both Bosnia and Kosovo. Subsequently, the Balkans Support Contract was extended to accommodate a protracted evaluation period. Ultimately TAC awarded the follow-on Balkans Support Contract in June 2005. While the Corps continued to support USAREUR with managing its logistical services contract requirements, USACE did not have official responsibility for LOGCAP after the Army transferred the program to the Army Materiel Command in 1996.

Restructuring of Installation Support

As the U.S. Army turned more of its attention to its domestic installations in the aftermath of the Cold War, Acting Secretary of the Army John Shannon in 1993 gave broad authority over planning, programming, and general support for Army bases, facilities, and environmental restoration efforts to a new assistant chief of staff for installation management. This new Army staff officer assumed most of the responsibilities of the Assistant Chief of Engineers, whose office was abolished. The Army Environmental Office, the Army Environmental Center (as the U.S. Army Toxic and Hazardous Materials Agency had been renamed), and elements of the Engineering and Housing Support Center involved in policy were also placed under the new Assistant Chief of Staff. General officers, who had previously reported to the Chief of Engineers, became the first directors of Environmental Programs and of Facilities and Housing for the Assistant Chief of Staff for Installation management. The military engineering and topography functions that had been overseen by the Assistant Chief of Engineers, however, remained Army staff responsibilities of the Chief of Engineers. They were henceforth exercised by the newly established Office of the Chief of Engineers (Pentagon). The Engineering and Housing Support Center was renamed the U.S. Army Center for Public Works. Remaining under the Chief of Engineers, it has continued to provide technical support to installation commanders. Overall, the U.S. Army Corps of Engineers retained its design and construction missions, including the execution of a large and expanding program for the cleanup of hazardous materials at current U.S. Army and U.S. Air Force installations and former defense sites.

In 1998 the headquarters of the U.S. Army Corps of Engineers began its own major restructuring of the installation support mission. The Center of Public Works became the Installation Support Center in preparation for abolishing the organization and establishing two elements in its place. In 1999 the Corps established an Installation Support Division as one of four major divisions in the Directorate of Military Programs. The new division oversaw real property facilities management and installation support activities for the Directorate of Military Programs and provided related services for the Assistant Chief of Staff for Installation management and the U.S. Army. Other members of the Installation Support Center were sent forward to engineer divisions, where they would

be located closer to their customers and could provide more effective installation support.

Customer support became even more important in 2002, when the U.S. Army instituted one of the most fundamental changes in the management of installations in its history. In spite of attempts to centralize installation management, including one by the powerful Army Service Forces during World War II, the U.S. Army persisted in the policy of assigning the senior combat commander on an installation the additional duty of installation commander. With the establishment of the Installation Management Agency as a field operating agency of the Assistant Chief of Staff for Installation Management, the Army split the two functions, establishing a separate garrison commander responsible to the Installation Management Agency. The combat unit commander could concentrate on his military mission, leaving the Installation Management Agency responsible for establishing the standards and providing the resources to ensure equitable services and quality of life on all U.S. Army installations. The U.S. Army Corps of Engineers now works closely with the Assistant Chief of Staff for Installation Management and the Installation Management Agency to perform its military construction responsibilities for the U.S. Army, one of the Corps' key missions since the beginning of World War II.

Corps and Army Restructuring

In 2006 the U.S. Army Corps of Engineers (USACE) was undergoing an organizational transformation from a major U.S. Army command, which it had become in 1979, to a direct reporting unit (DRU). In a major restructuring that went into effect in the summer of 2006, the Army abolished the major Army command (MACOM) as an organizational element and transferred all old MACOMs and several new organizations to one of three categories: Army Commands, Army Service Component Commands, and Direct Report Units (DRUs).

Three former MACOMs—Training and Doctrine Command, Forces Command, and Army Materiel Command—became Army Commands. Nine Army component commands, such as U.S. Army Europe, U.S. Army Pacific, U.S. Army Central, and Eighth U.S. Army, became Army Service Component Commands. Eleven Army organizations, including several of the remaining former MACOMs, such as USACE, and a number of other organizations, such as the Installation Management Agency and the Acquisition Support Center, became DRUs.

DRUs are Army organizations with institutional or operating functions that provide broad general support to the Army, usually in a single, unique discipline. DRUs report to a member of the Army staff, but since the Chief of Engineers was both an Army staff officer and the USACE commander, his status in this regard remained unchanged. USACE's lineage and heraldic honors and insignia also were preserved. An implementing Army general order was expected by the end of 2006.

According to the Army announcement issued on June 6, 2006, the restructuring was intended to contribute to the process of Army transformation and increase the Army's responsiveness at home and abroad. By summer 2006 the Corps of Engineers was undertaking a huge, multi-year military construction and base realignment and closure workload for the Army and the Air Force and providing major support to the effort to rebuild Iraq and Afghanistan. The engineers' domestic and global responsibilities remained large and diverse as it supported the U.S. Army and the Nation.

Constructing Camp Bondsteel

Following the successful bombing campaign launched by nations of the North Atlantic Treaty Organization to induce Serbia to cease ethnic cleansing operations in Kosovo, during the summer of 1999 U.S. military forces entered the province to provide security and protect Kosovar refugees. Called Task Force Falcon, this force required extensive headquarters, logistical, operational, and housing facilities, which U.S. Army engineers provided.

The commander of the engineer brigade, 1st Infantry Division, Colonel Joseph Schroedel, who later became commander of the South Pacific and South Atlantic divisions, oversaw the initial construction effort to support the deployment of Task Force Falcon. Building the Kosovo base camps involved some 1,700 military engineers augmented by 1,000 employees of Brown and Root Services under a logistics support contract managed by the Corps of Engineers. The Waterways Experiment Station provided data for locating water sources. A team from the Baltimore District advised on environmental engineering and demining. Nearly 7,000 local skilled and unskilled laborers assisted the U.S. Army engineers in base construction.

These engineer troops constructed four base camps in the region and two large ones in Kosovo. The latter were Camp Bondsteel and a smaller base camp nearby. Staff Sergeant James L. Bondsteel received the Medal of Honor during the Vietnam conflict. The majority of the construction at Camp Bondsteel, built from the ground up on a former farm field, occurred in just three months. Con-

Soldiers of the 320th Engineer Company set up a positioning receiver to survey the airfield, Camp Bondsteel, Kosovo. The low building in the left, center, is a SEA hut.

Department of Defense

struction proceeded twenty-four hours a day during that time.

The U.S. Army decided to utilize rapidly constructed, semipermanent Southeast Asia (SEA) huts to provide troop housing quickly. The SEA huts, which got their name from previous wartime employment in Southeast Asia, were modified for use in the Balkans. Each SEA hut was ninety-two feet long by thirty-two feet wide and included five sleeping rooms plus a combination shower and latrine. The temporary units were made of plywood with metal roofs. Rooms had wall-mounted heating/cooling systems, electricity, and a drywall finish.

Although the engineer brigade returned to the United States in 2000, the support of the U.S. Army Corps of Engineers continued thereafter. Camp Bondsteel, near Urosevac, Kosovo, subsequently served as headquarters for the Multi-National Brigade (East). Over time Camp Bondsteel has evolved into what is by any measure an immense post. Its perimeter measures 7 miles and encloses an area of 955 acres. In the construction of the base, 20 miles of roads were built, 100 miles of electrical cable were laid, and a half-million cubic yards of earth were moved. The post is divided into two sections: North Town and South Town. Approximately 5,000 Soldiers live in more than 250 SEA huts. Also on post are a 30,000-square-foot headquarters building, an ammunition dump, motor pools, chapels, recreation and dining facilities, an operations center, two post exchanges, a wastewater treatment plant, and a heliport. The U.S. Army Corps of Engineers also helped design force protection structures for the base.

Camp Bondsteel, Kosovo

Idealized view of water management

President's Water Resource Policy Commission

Civil Works, Congress, and the Executive Branch

Early Civil Works Oversight

From the earliest beginnings of the U.S. Army Corps of Engineers, both Congress and the cabinet official overseeing the U.S. Army carefully monitored and guided the involvement of the Corps in civil works projects. In fact, in 1800, it was Secretary of War James McHenry who suggested that engineer officers possess talents that serve the country not only in war, but also in peacetime "works of a civil nature."

Once the Corps was permanently established in 1802, few operational and organizational changes were made without the explicit authorization of the Secretary of War. Indeed, the Chief of the Engineer Department, along with the chiefs of other War Department bureaus, enjoyed direct access to the Secretary of War and protested vehemently whenever the U.S. Army's commanding general attempted to interfere with that access. Even the correspondence procedures reflected this close relationship. Mail intended for the Chief Engineer was sent under cover to the Secretary of War with the words "Engineer Department" written on the lower left-hand corner of the envelope. Conversely, reports from the U.S. Army engineers intended for Congress were transmitted through the Secretary of War. The precise role of the U.S. Army commanding general was not clarified until Congress abolished that position and created the position of chief of the general staff at the beginning of the twentieth century.

Examples of early oversight activities of the Secretaries of War are numerous. John C. Calhoun did not hesitate giving guidance to the Board for Internal Improvements, organized in 1824 to administer the responsibilities imposed by the General Survey Act. Charles M. Conrad transferred certain civil works responsibilities from the Topographical Engineers to the Corps of Engineers following passage of the 1852 Rivers and Harbors Act. His successor, Jefferson Davis, allowed the use of local funds to continue projects that had already received some congressional appropriations. In these and other ways, the Secretaries of

James McHenry, Secretary of War, 1796–1800

Charles M. Conrad, Secretary of War, 1850–1853

U.S. Army Center of Military History

War profoundly influenced the organization and direction of the U.S. Army engineers.

Meanwhile, Congress also helped mold the operations and policies of the U.S. Army Corps of Engineers. Congress not only appropriated funds and authorized civil works projects, it also specified how many officers the Corps was to have, conditions for their promotion, and even how much per diem (if any) they should earn while assigned to a project. Congress authorized oversight boards of engineer officers and determined what precise responsibilities the boards were to discharge. It requested surveys and reports, and congressional committees carefully reviewed the Corps' progress on its civil works assignments, rarely failing to call attention to a real or imagined defect in the Corps' management. The responsibility of the Engineer Department to carry out the wishes of Congress, including the development of "internal improvements," was explicitly noted in the General Regulations of the Army as published in 1825.

After the Civil War, the congressional role in Corps affairs became even more evident. While not appreciably increasing the number of officers assigned to the Corps, Congress substantially increased the Corps' work on rivers and harbors. Consequently, the Corps was forced to depend on help from the civilian engineer community. This dependence worked to the Corps' disadvantage. Most of the civilian engineers did not become career employees of the Corps, but the very fact of their employment helped give credibility to the charge that the Corps was unable to fulfill its civil works functions. Civilian engineers maintained that they, not military engineers, should be in charge of civil works. They lobbied Congress, and their congressional sympathizers introduced numerous bills beginning in the 1870s to transfer civil works functions from the U.S. Army Corps of Engineers to some other part of government; often, the preferred solution was to create a new Department of Public Works. Railroad interests, which perceived the Corps as an unfair competitor in the development of national transportation systems, wished to have the private sector do all river and harbor work. Pummeled from many quarters, the Corps saw its relationship with Congress become more dependent and more fractious.

Authorizations and appropriations during this period reflected some of the worst evils of pork-barrel legislation. Projects were poorly chosen, piecemeal appropriations were commonplace, and the U.S. Army Corps of Engineers often gave unreliable estimates. Around the turn

of the century, relations improved, mainly as a result of the work of Ohio Representative Theodore E. Burton. As chairman of the Rivers and Harbors Committee, he shepherded through Congress a bill establishing the Board of Engineers for Rivers and Harbors within the U.S. Army Corps of Engineers to examine costs, benefits, and necessity of river and harbor improvements. In the 1907 Rivers and Harbors Act, Burton did not allow one new project to be added unless the entire cost of the project was appropriated and it had the express approval of the Chief of Engineers. Burton's efforts briefly curtailed pork-barrel legislation, but when he left the House of Representatives for the Senate in 1909, Congress quickly reverted to its old ways. The 1910 Rivers and Harbors Act appropriated funds for projects in 226 of the 391 congressional districts.

Secretary of War's Role

While Congress busily gave the Corps work, the Secretaries of War attempted to oversee the Corps' execution of its civil works projects. This attention to Corps operations may have been a matter of choice with some Secretaries, but several rivers and harbors acts passed in the 1880s explicitly mandated that the Secretary of War supervise the expenditure of appropriated funds to, in the words of the 1884 act, "secure a judicious and economical expenditure of said sums." The Secretary was directed furthermore to submit to Congress annual reports of work done, contracts made, and funds expended.

Pursuant to these acts, the Secretary of War issued new regulations in 1887 that specifically delegated to the Chief of Engineers the responsibility to supervise "all disbursements by officers of the Corps." Slightly modified in 1889, these regulations also charged the Chief of Engineers to present to the Secretary of War an annual report of Engineer Department operations and, "with the approbation of the Secretary of War," to determine the quality, number, and physical characteristics of equipment needed by the U.S. Army engineers. The Secretary of War approved the assignment of division engineers as well as officers to serve on the board that oversaw fortifications and river and harbor improvements. He approved the initiation of new projects and specified the forms to be used to contract work. Moreover, he approved any modifications of the original contract. Finally, it should be noted that it was the Secretary of War, not the Chief of Engineers, who Congress charged to have surveys done, civil works projects constructed, and rules issued to regulate federally operated

Theodore E. Burton, Congressman and Senator from Ohio

Senate Historical Office

Francis G. Newlands, Senator from Nevada

canals and waterways. The work, of course, was then assigned to the U.S. Army Corps of Engineers.

Multipurpose Water Management

In the Progressive Era at the beginning of the twentieth century, the Secretary of War's office became embroiled in the controversy over the development of multipurpose water projects. Multipurpose planners sought to develop coordinated river basin programs that responded to a wide variety of needs, including navigation, flood control, irrigation, water supply, and hydropower. The U.S. Army Corps of Engineers generally opposed the concept, arguing that other purposes should always be subordinated to navigation in federal projects, that multipurpose dams would be difficult to operate, and that greater coordination was not needed; existing government agencies could provide whatever coordination was required.

However, multipurpose development supporters had powerful friends in Congress, especially Senator Francis G. Newlands of Nevada, who introduced legislation to establish a multipurpose water resources coordinating commission. Henry L. Stimson, President William H. Taft's Secretary of War, was an avid conservationist and a former member of the board of directors of the National Conservation Association. He wholeheartedly supported the Newlands measure. So did Newton D. Baker, who served as Secretary of War under President Woodrow Wilson. Other Secretaries, such as Taft himself, who headed the War Department before he succeeded Theodore Roosevelt as president, and Lindley M. Garrison, who served in Wilson's first administration, were more sympathetic toward the Corps.

Secretary of War Stimson complained about his relationship with the Chief of Engineers. Stimson asked the Chief whether an improvement should be made in light of other demands on the budget. Without answering the question, the Chief of Engineers, Brigadier General William H. Bixby, simply responded that the project was good for the country without comparing it with other projects or budgetary demands. Stimson pursued his point. He wanted to use a comparative approach. However, Bixby objected, "I have nothing to do with that. I cannot have anything to do with it. Congress will not listen to me on that. They reserve the judgment to do that themselves." Stimson thought the Corps was uncooperative and unresponsive, but there was some merit in the argument of the Chief of Engineers.

As Newlands himself pointed out, numerous rivers and harbors

acts had indeed constrained the Corps' flexibility. Although the Corps had authority only to recommend a project based on its own merits, it did seem to support projects that were politically feasible and not necessarily urgently required. Also, the Corps' opposition to a more constructive, integrated approach to water resources management reflected a predictable bureaucratic concern for maintaining maximum administrative independence. Despite some initial legislative success, Newlands saw his plans for a great waterways commission unravel when the U.S. declared war on Germany in April 1917.

The 1925 Rivers and Harbors Act accelerated the movement toward multipurpose water management. It authorized the Corps and the Federal Power Commission to prepare cost estimates for surveys of navigable streams and tributaries "whereon power development appears feasible and practicable." The aim was to develop plans to improve stream navigation "in combination with the most efficient development of the potential water power, the control of floods, and the needs of irrigation." The Corps responded with a recommendation for 24 surveys at an estimated cost of $7.3 million.

In 1927 Congress appropriated the necessary funds, whereupon the Corps launched a series of comprehensive river surveys. The resulting reports, known as the "308 Reports" after the House document in which the survey estimates had first appeared, became basic planning documents for many of the multipurpose projects later undertaken by the federal government. During the depths of the Great Depression, Congress authorized the Corps to supplement the 308 Reports with studies "to take into account important changes in economic factors as they occur and additional streamflow records or other factual data." This authority charged the Corps with a broad responsibility to undertake continuing river basin planning, with an emphasis on navigation and flood control.

Relationship with Congress

From about 1885 to 1925, Americans' daily lives were more and more affected by the federal government. Working with the executive branch, Congress attempted to control abuses that could threaten the liberty, livelihood, or health of the citizenry. To do so, it was necessary to increase the regulatory authority of various federal agencies, including the War Department. In 1886, Congress gave the Secretary authority to regulate harbor lines. The 1890 Rivers and Harbors Act expanded the Secretary's authority to regulate and remove any

Henry L. Stimson, Secretary of War, 1911–1913; 1940–1945 and Secretary of State, 1929–1933
U.S. Army Center of Military History

George H. Dern, Secretary of War, 1933–1936
U.S. Army Center of Military History

navigation obstructions, including bridges, waste material, and structures such as dams and piers built outside of established harbor lines. In 1894, Congress authorized the War Department to regulate navigation in all federally owned canals, whether or not the Corps had built them. The 1899 Rivers and Harbors Act gave the Secretary added authority to regulate the dumping of waste material into navigable streams and the construction of any structures that might impede navigation. The 1906 General Dam Act authorized the Secretary of War to review and approve plans and specifications for all dams to be constructed across navigable waters. While, of course, most of these new responsibilities were delegated to the Corps of Engineers, in no case did Congress bypass the Secretary and grant power directly to the Chief of Engineers.

The Corps' relationship with Congress in the interwar period was extremely close. Indeed, Secretary of War George H. Dern called the Corps "an agency of the legislative branch" in a 1934 report to the president. Congress did not just establish overall water resources policy, but congressional committees also determined which projects should be funded and the extent and timing of the funding. One procedure that was used extensively was the committee review resolution, which required the Corps to reconsider reports in which it had recommended against project construction. This was a particularly popular device during the New Deal, when projects were needed for work relief as well as for navigation or flood control. For instance, only about one-third of the projects authorized in the 1935 Rivers and Harbors Act originated as favorable reports. Reports on most of the others had been modified in response to a committee review resolution. The procedure constituted a kind of quasi-legislative process that circumvented both the rest of Congress and the executive branch.

Corps orders and regulations directed district engineers to contact each member of Congress within their districts to solicit the congressman's wishes about river and harbor improvements. The congressman was also invited to testify at a public hearing dealing with the project and to present written arguments to the Board of Engineers for Rivers and Harbors, which reviewed the project report. If the congressman was still dissatisfied, then he always had recourse to the committee review resolution. Although this kind of relationship could have led to tension, such was not the case. Congressmen protected the Corps at the same time they pressured it. All efforts by President Franklin D. Roosevelt to

centralize water resources planning and institute some Progressive Era ideas met immovable congressional (and War Department) opposition; the Corps remained the water resources agency of choice in both wings of the Capitol.

The passage of the 1936 Flood Control Act, which officially recognizing a federal obligation in flood control activity, greatly expanded the responsibilities of the U.S. Army Corps of Engineers. The law authorized the expenditure of $320 million for about 250 projects and a number of examinations and surveys. Since 1936, the Corps has built, pursuant to congressional authorizations and appropriations, more than 300 reservoirs whose primary benefit is flood control.

Policy Coordination Efforts

More so than any of his predecessors, President Roosevelt attempted to ensure interagency coordination of federal water projects. In 1939, he instructed the departments of War, Interior, and Agriculture to cooperate with his National Resources Planning Board in drawing up a memorandum that would ensure consultation among all federal water agencies during project planning. The subsequent tripartite agreement resulted in a better and more efficient exchange of information among the agencies; however, it failed to eliminate bureaucratic rivalries.

Roosevelt finally gave up on developing a centralized natural resources planning organization in 1943 when Congress refused to appropriate money to keep the National Resources Planning Board in existence. However, the president continued to press one of the board's chief ideas, basinwide planning commissions such as the Tennessee Valley Authority established ten years earlier. His support of the

President Franklin D. Roosevelt
National Archives

Harry S. Truman

Missouri Valley Authority reflected this commitment. A similar authority for the Columbia River Basin was discussed, and Roosevelt's successor, Harry S. Truman, embraced the idea. Nevertheless, continued congressional skepticism assured that river basin commissions would never obtain the authority that Roosevelt and Truman envisioned.

Although Congress effectively destroyed the National Resources Planning Board during the war, federal agencies continued to coordinate their various responsibilities. The Departments of War, Agriculture, and Interior established the Federal Interagency River Basin Committee (FIARBC), commonly called "Firebrick." Later, the Departments of Labor and Commerce and the Federal Security Agency (which supervised the U.S. Public Health Service) joined. Various technical subcommittees attempted to coordinate water development in specific river basins, usually meeting limited success. In 1954, President Eisenhower replaced the commission with the new Interagency Committee on Water Resources (IACWR). "Icewater," as this agency became known, had minimal impact because its objective of strengthening executive authority elicited little interest in Congress.

The various official committees and study commissions, like the first and second Hoover Commissions of the post-World War II period, mirrored an emerging consensus that rational water resources development required uniform procedures and ongoing coordination. However, executive branch committees such as Firebrick lacked the clout to be effective interagency vehicles. The organization in the executive branch that did seem to have the necessary visibility and bureaucratic authority was the Bureau of the Budget, later renamed the Office of Management and Budget. Upon the dissolution of the National Resources Planning Board in 1943, President Roosevelt issued Executive Order 9384, which directed all federal public works agencies to submit their updated long-range programs directly to the Bureau of the Budget. The major goal seemed to be to ensure that the bureau had the opportunity to see how well agency long-range plans fit

into the overall administration program. Although the budget bureau attempted to create a new division to handle the review of agency programs, Congress refused to appropriate funds to hire personnel. Therefore, the bureau was forced to review the programs with existing personnel, and the result was a limited review that ignored such issues as the conformance of agency water project plans with regional plans, social utility, or reliability of the cost/benefit analysis.

Nevertheless, in December 1952, the Bureau of the Budget drafted a far-reaching directive pertaining to the planning of water projects. Known simply as Circular A-47, the document stipulated that the benefits of each element in a multipurpose project must exceed the costs; it would no longer suffice for the total benefits to exceed total costs. Circular A-47 also directed that 50 years would be the maximum allowable time for the repayment of a federal investment. Although criticized in Congress, the guidance remained the basic planning document for the next decade and placed the Bureau of the Budget in the middle of the ongoing debate over water resources planning.

The Eisenhower administration attempted to place individual projects in the context of other national priorities and was skeptical of massive dam-building projects. The Bureau of the Budget generally looked far more favorably at smaller urban flood control projects. Moreover, budget personnel advocated reducing the planning period, if at all possible, to move ahead with actual construction. Of course, Congress could and often did insert projects into bills that not only had not received bureau approval, but had not even been recommended by the Corps of Engineers. For instance, a 1956 bill vetoed by Eisenhower would have authorized thirty-two projects that had not been reviewed by the Corps. A 1958 bill, also vetoed, would have authorized four projects, costing $27 million, that had no project reports, and another three projects, costing $115 million, that had a negative cost/benefit ratio. In 1959, Congress passed a bill over a presidential veto. Eisenhower had disapproved the bill because of the expense involved, some $800 million.

Dwight D. Eisenhower

Budgetary Oversight

The history of federal water resources development in the third quarter of the twentieth century has two general themes: the growing influence of the Bureau of the Budget over water policy, and the continuation of pork-barrel politics to determine actual project authorizations. Despite the Bureau of the Budget's occasionally successful efforts to convince the president to veto a "budget-busting" bill, Congress generally got its way. The bureau could delay projects by not including them in the budget submissions to Congress or by impounding funds for congressional new starts; however, the funds would often be made available in short order and Congress would insert its pet projects when it rewrote the administration budget proposal. Rarely were projects fully funded at the beginning.

The Bureau of the Budget's growing involvement in water resources policy, coupled with a number of highly publicized attacks on the Corps' civil works program in the decade after World War II, weakened the Corps' ability to influence policy, even though the agency continued to administer the largest water resources program. A lack of strong leadership in this area at the secretarial level complicated the problem. In the immediate post-World War II period, first the War Department and then (after July 1947) the Department of the Army considered civil works as somewhat of an orphan within the country's military structure. In fact, the Secretaries of the Army were quite content to leave such matters as dams, floodwalls, and levees to the Corps and its friends on Capitol Hill. Within the U.S. Army's senior bureaucracy, civil functions were bounced from office to office.

Gordon Gray

Civil Works in the Army Secretariat

In 1950, Secretary of the Army Gordon Gray placed civil works under the newly created Assistant Secretary of the Army, General Management. When the holder of that position, Karl Bendetsen, became the Under Secretary of the Army in May 1952, the civil works responsibility moved with him. Two years later, Congress raised the number of Assistant Secretaries in the military departments from two to four, and attached civil works to the new Office of the Assistant Secretary of the Army, Civil-Military Affairs; however, that office was eliminated in 1958, and civil works landed in the Office of the Assistant Secretary of the Army, Manpower and Reserve Affairs. This change reflected the clout of Dewey Short—who had moved from Assistant Secretary for

Civil-Military Affairs to Assistant Secretary for Manpower and Reserve—rather than any sound administrative policy.

Civil functions continued to be shuttled around the hallways of the Pentagon in succeeding years. During the Kennedy administration, these functions found a home in the office of the general counsel, who obtained a second title, special assistant to the Assistant Secretary for Civil Functions. For a while, too, the title of special assistant to the Assistant Secretary for Civil Functions passed to the Deputy Under Secretary of the Army for International Affairs, Harry McPherson. McPherson observed that overseeing the Corps of Engineers "was an exercise in amiable futility." Although, like other military organizations in the United States, the Corps fell under civilian control, McPherson continued, "in its case the controlling civilians were on the Hill" rather than in the Pentagon. Nevertheless, when Alfred B. Fitt became the general counsel in 1964, he decided to be the special assistant in fact as well as name.

Creating an Assistant Secretary for Civil Works

At about the same time that Fitt became general counsel, Secretary of the Army Cyrus Vance established a small, three-man board to review the entire civil works program. One of the board's major findings was that the Secretary of the Army should "participate personally and through his Secretariat" in water resources matters that involved participation by secretaries in other agencies of the executive branch. Board members specifically called for the creation of an Assistant Secretary of the Army "with responsibilities primarily for the civil works mission." Clearly, the board believed that interagency coordination and the growth of the civil works budget relative to the national budget required secretarial-level overview. Since the Secretary of the Army needed to give priority to more traditional military responsibilities, the obvious solution was to create an additional Assistant Secretary position. Of course, this required legislative authorization, but it appears that the board felt reasonably confident such authorization could be obtained. They suggested in their report that "sources outside the Army" had advocated the creation of a new Assistant Secretary for Civil Works position, and it seems likely that at least some of these sources were representatives and senators.

Another factor that contributed to the momentum to establish the position of Assistant Secretary for Civil Works was the 1965 decision of President Lyndon B. Johnson to initiate the Planning, Programming,

Eugene Weber, Deputy Director of Civil Works for Policy, chaired the board that reviewed the entire civil works program.

Budgeting (PPB) System throughout the federal agencies. First advanced by Secretary of Defense Robert McNamara in the Pentagon, the program was designed to allow for closer oversight of executive programs.

Although few federal agencies reacted enthusiastically to the presidential order, one that did was the Army's Office of Civil Functions. In 1965, Fitt established a Systems Analysis Group to develop new procedures for preparing the civil works budget and to draft a long-range water investment program for the Nation. Group members proposed to shift emphasis from individual projects—the details of which were familiar only to the members of Congress directly concerned—to water resources problems in the various regions of the Nation. Under Robert E. Jordan III, U.S. Army general counsel and special assistant to the Assistant Secretary for Civil Functions, the Systems Analysis Group perfected a budgeting system and a five-year investment program based on regional allocations. This new approach was firmly installed in the Corps.

Ultimately, however, neither the Bureau of the Budget nor Congress proved capable of shedding the project-by-project orientation in favor of a more programmatic approach to civil works budgeting. Still, the creation by Fitt and the use by Jordan of the Systems Analysis Group initiated an oversight and broadening of the Corps' civil works program that was far removed from the benign neglect of the preceding decade, and it presaged the establishment of the position of Assistant Secretary for Civil Works.

Utah Senator Frank E. Moss's attempt to establish a Department of Natural Resources, which would have included the Corps' civil works functions, and the nearly successful attempt in 1968 to put a congressional moratorium on public works projects signified the gradual dissolution of the Corps' traditionally strong water resources constituency in Congress. Under Jordan, and with the powerful support of Jordan's capable successor, Under Secretary of the Army Thaddeus Beal, the Systems Analysis Group pressed for new Corps missions: wastewater management and urban studies. Although these initiatives failed to produce new construction responsibilities for the Corps, the experience showed that a secretarial-level political appointee, who focused on civil works, would be of enormous benefit. That appointee could help strengthen planning and review functions within the Corps, and concurrently, give the Corps more clout within the executive branch, such as in the interdepartmental Water Resources Council, established in 1965.

Mainly through the efforts of California Representative Don

Clausen, Congress inserted a section in the 1970 Flood Control Act that authorized the position of Assistant Secretary of the Army, Civil Works; however, it was to be another five years before the executive branch appointed the first Assistant Secretary. This was largely because President Richard Nixon supported the creation of a new Department of Environment and Natural Resources and did not wish to do anything that appeared to strengthen the Corps' civil works mission. Finally, on March 20, 1975, Victor V. Veysey, a former representative from California, was sworn in as the first Assistant Secretary of the Army for Civil Works. He served until January 1977.

Victor V. Veysey
Department of Defense

Role of the Assistant Secretaries

Veysey had the difficult task of defining both his mission and his relationship with the U.S. Army Corps of Engineers. His approach was to act the "honest broker" between the Corps and other organizations involved with water resources; it was an approach that succeeding Secretaries emulated. While working as a conduit between the Corps and its environmental opponents, Veysey never lost the high respect he held for the Corps. He acted forcefully on certain issues, but he looked upon his role primarily as an advisory one. "I wasn't about to order the Chief of Engineers to do anything because I couldn't; that wasn't my role. He takes his orders from the Army chief of staff. But influence, yes. We could try to influence him in directions and in policy, procedure, and so forth…. But from the post of Assistant Secretary you don't order the Chief of Engineers to do anything."

President Jimmy Carter, who questioned the necessity of many water projects and emphasized environmental concerns, did not appoint an Assistant Secretary until April 1978. He chose Michael Blumenfeld, who also served as Deputy Under Secretary of the Army. The Senate failed to confirm Blumenfeld as Assistant Secretary until April 1979. Working through the Water Resources Council, he exerted strong leadership to develop new, environmentally

Michael Blumenfeld
Department of Defense

William R. Gianelli
Department of Defense

Robert K. Dawson
Department of Defense

Robert W. Page
Department of Defense

sensitive principles and standards to guide the planning of water projects.

With the transfer of power from a Democratic to a Republican administration in 1981 came new water resources priorities. The new Assistant Secretary for Civil Works, William R. Gianelli, had formerly headed California's Department of Water Resources under then-Governor Ronald Reagan. His objectives were to reform the regulatory program and to develop new ways to fund the Corps' water resources projects. Both objectives reflected political and philosophical shifts. Gianelli considered the Corps' responsibility to regulate the dredging and filling of wetlands a water quality issue and not a mandate to protect wetlands. He changed regulatory procedures to shorten the processing time, partly by limiting the traditional way of appealing permit decisions. He also led early Reagan administration efforts to reduce the federal financial burden in activities that he believed nonfederal interests could and should fund.

Gianelli's work, together with an unexpected positive response by project sponsors, helped convince Congress that some sort of cost-sharing was necessary if sound water projects were to proceed. It fell to Gianelli's successor, Robert K. Dawson (appointed Acting Assistant Secretary in May 1985), working with Congress, to bring the process to a successful conclusion. The Water Resources Development Act of 1986, signed into law on November 17, 1986, signaled a major historical change in the financing of water projects by requiring cost-sharing for most projects. At the same time, the act authorized about 300 new

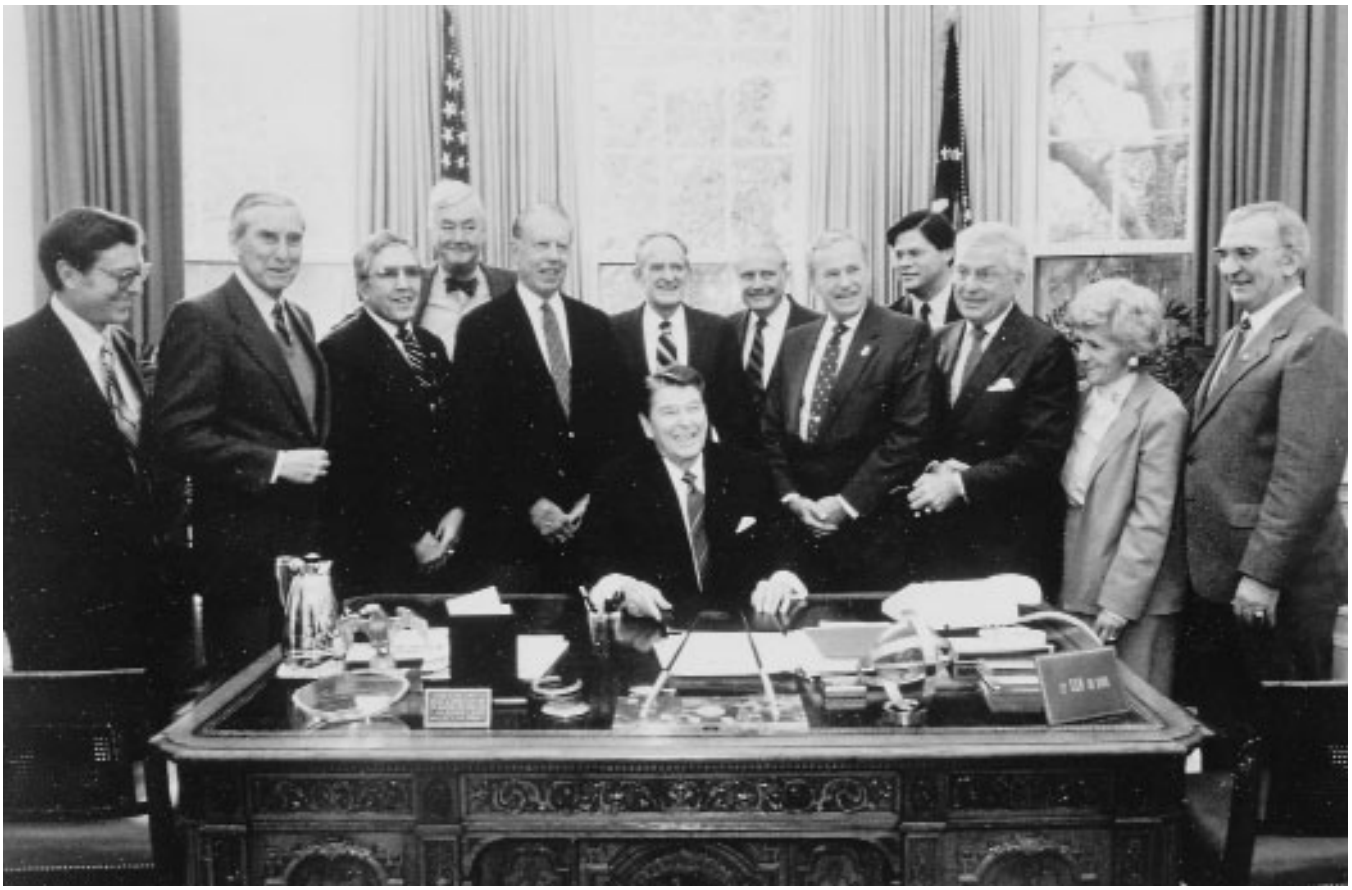
water projects and numerous studies at an estimated cost of more than $15 billion.

Under Dawson's successor, Robert W. Page, the Corps addressed a wide range of subjects to make project development—from planning through construction—more efficient, faster, and cheaper, without sacrificing quality. The Corps rewrote planning procedures to ensure that nonfederal project sponsors, principally states and local communities, were full partners in project development. After Page left office in October 1990, the position remained vacant until July 1991, when Nancy Dorn became the first female Assistant Secretary of the Army for Civil Works. Perhaps more than her predecessors, Dorn was conservative about seeking new missions. She emphasized instead effective management of the Corps' existing missions during her tenure, which lasted until January 1993.

Under Assistant Secretaries Dorn and Page, the Corps undertook major reforms of the wetlands regulatory program. Policy guidance and

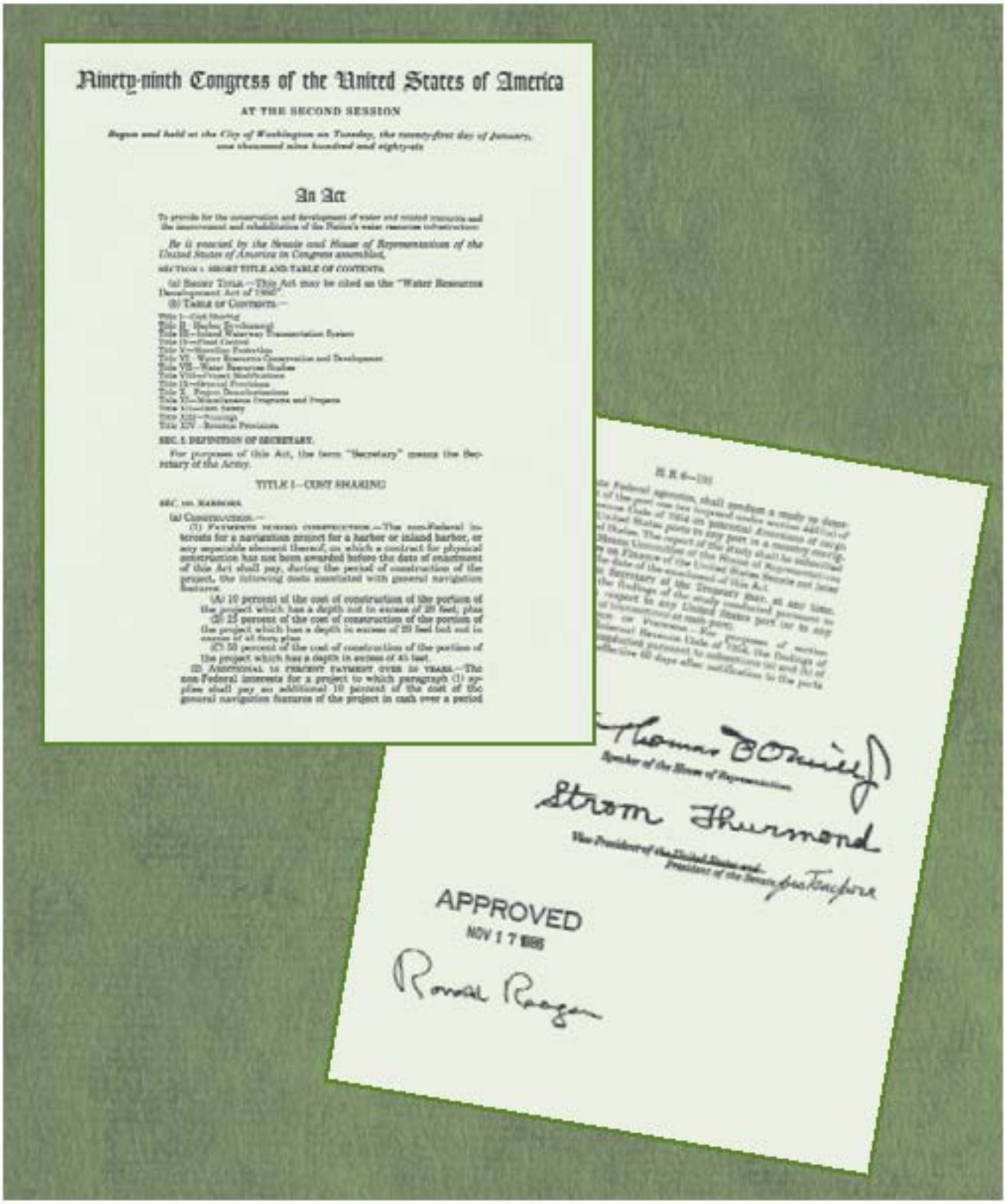
Nancy P. Dorn

Department of Defense



President Ronald Reagan signs the Water Resources Development Act of 1986.

National Archives



Ninety-ninth Congress of the United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Tuesday, the twenty-first day of January, one thousand nine hundred and eighty-six

An Act

To provide for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE AND TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Water Resources Development Act of 1986".

(b) TABLE OF CONTENTS.—

Title I—Cost Sharing
Title II—Harbor Dredging
Title III—Inland Waterway Transportation System
Title IV—Flood Control
Title V—Shoreline Protection
Title VI—Water Resources Conservation and Development
Title VII—Water Resources Studies
Title VIII—Project Modifications
Title IX—General Provisions
Title X—Project Deauthorizations
Title XI—Miscellaneous Programs and Projects
Title XII—Dam Safety
Title XIII—Navigation
Title XIV—Revenue Provisions

SEC. 2. DEFINITION OF SECRETARY.

For purposes of this Act, the term "Secretary" means the Secretary of the Army.

TITLE I—COST SHARING

SEC. 101. HARBORS.

(a) CONSTRUCTION.—

(1) PAYMENTS DURING CONSTRUCTION.—The non-Federal interests for a navigation project for a harbor or inland harbor, or any separable element thereof, on which a contract for physical construction has not been awarded before the date of enactment of this Act shall pay, during the period of construction of the project, the following costs associated with general navigation features:

(A) 10 percent of the cost of construction of the portion of the project which has a depth not in excess of 20 feet; plus

(B) 25 percent of the cost of construction of the portion of the project which has a depth in excess of 20 feet but not in excess of 45 feet; plus

(C) 50 percent of the cost of construction of the portion of the project which has a depth in excess of 45 feet.

(2) ADDITIONAL 10 PERCENT PAYMENT OVER 10 YEARS.—The non-Federal interests for a project to which paragraph (1) applies shall pay an additional 10 percent of the cost of the general navigation features of the project in cash over a period

Thomas P. O'Neill Jr.
Speaker of the House of Representatives

Strom Thurmond
Vice President of the United States and President of the Senate pro tempore

APPROVED
NOV 17 1986

Ronald Reagan

H. Martin Lancaster
Department of Defense

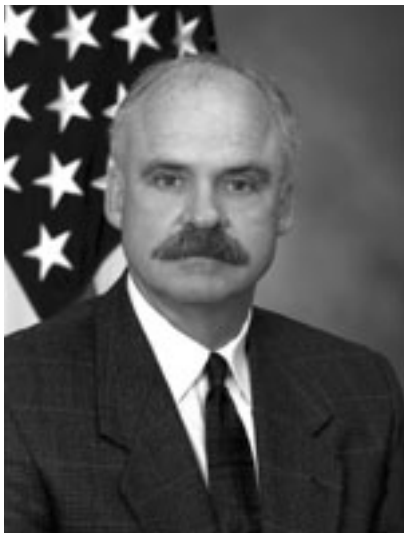
John J. Westphal

changes in interagency agreements gave the Corps more authority in regulating the dredge-and-fill program assigned to the agency in the 1972 Clean Water Act. The Corps also adopted strict time frames and guidelines governing other agencies' input to permit actions and also ensured that the agencies used the same definitions and standards to determine wetland jurisdictions.

With the change in administrations in January 1993, Dorn left office. After a prolonged period in which Acting Assistant Secretaries served, H. Martin Lancaster became the first Assistant Secretary of the Army, Civil Works in the Clinton administration. Lancaster sought to reduce the time and cost of Corps studies and expand engineering and construction management opportunities for the Corps through its reimbursable Support for Others Program. Lancaster, himself a former member of Congress from North Carolina, improved communications with Congress and provided consistent support for the administration's environmental initiatives, especially the restoration of the Everglades and south Florida ecosystem.

Joseph W. Westphal served as the next confirmed Assistant Secretary of the Army, Civil Works from June 1998 to March 2001. He brought a wealth of academic, legislative staff, and executive branch experience to the position. Westphal was a major driving force behind more comprehensive basinwide planning efforts, a revitalization of the

◀ *Water Resources Development Act of 1986*



Mike Parker

John Paul Woodley, Jr.

Corps' recreation facilities, and an expansion of the Corps' ability to serve the Nation in public infrastructure and environmental restoration needs. His eventual successor, Mike Parker, a former representative from Louisiana, was a strong advocate for maintaining funding levels for Corps programs, but he remained in office for only six months before resigning.

Under Secretary of the Army Les Brownlee subsequently also served as the Acting Assistant Secretary of the Army, Civil Works and then as Acting Secretary of the Army. In 2003 President George W. Bush nominated John Paul Woodley, Jr., as the next Assistant Secretary. Woodley previously held the office of the Assistant Deputy Under Secretary of Defense (Environment), and was principal advisor to the Secretary of Defense on environmental, safety, and occupational health policy and programs. Woodley served in a recess appointment as Assistant Secretary of the Army, Civil Works from August 2003 to December 2004. In May 2005 the Senate confirmed his nomination as assistant secretary. Woodley focused

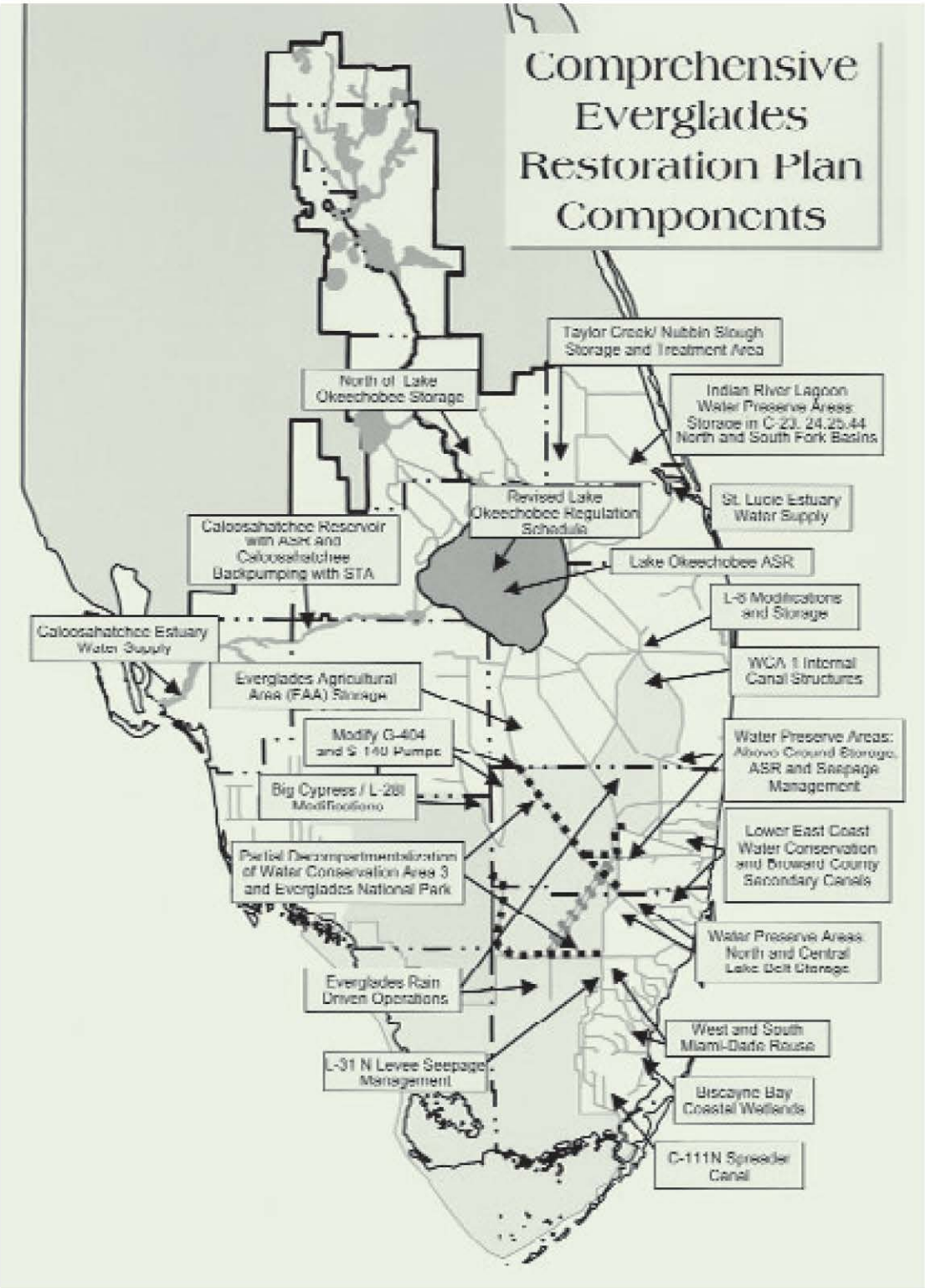
Acting Secretary of the Army Les Brownlee meeting with Brig. Gen. Robert Crear, Iraq, September 2003

the Corps on enhancing performance measurements, streamlining the regulatory process, building planning capabilities, and improving strategic communications.

Civil Works and the Nation

U.S. Army policy on civil works has continued to stress the need for maximizing the benefits of Corps project investments for the Nation. A notable achievement in this regard was the release by the Corps of its final environmental impact statement on the operation of the Missouri River dams and reservoirs, the *Master Water Control Manual,* after nearly a decade and a half of study. Furthermore, the Corps' plan for restoration along Louisiana's coastal areas also was designed to prioritize the most promising and beneficial remedial activities. The Comprehensive Everglades Restoration Plan to capture, store, and redistribute fresh water previously lost to tides and to regulate the quality, quantity, timing, and distribution of water flows throughout south and central Florida, devised by the Corps and its partners and approved in the Water Resources Development Act of 2000, resulted in a massive ongoing effort to restore the Florida ecosystem. Most recently, the water resources, environmental, regulatory, and emergency response expertise developed through the civil works program has been called upon to support reconstruction efforts in Afghanistan and Iraq.

Acting through the Assistant Secretary's office, the Secretary of the Army has assumed leadership of the Corps' civil works program. The principal responsibility of this position remains overall supervision of the functions of the Department of the Army relating to all aspects of the civil works program, and in specific terms to see that the ongoing and future efforts of the Corps are environmentally sustainable, economically responsible, and fiscally sound. Although form and style have varied according to the political orientation of any given administration, the policies of the Assistant Secretaries of the Army, Civil Works have ensured that the Corps remains the flexible, competent engineering organization that has continuously served the country for two centuries in peace and war.



Comprehensive Everglades Restoration Plan

This Chief of Engineers Established the U.S. Army Corps of Engineers as a Partner in the Conservation Movement

More than a decade before the environmental movement took hold, Lieutenant General Samuel D. Sturgis, Jr., Chief of Engineers from 1953 to 1956, envisioned the U.S. Army Corps of Engineers as a partner in the fight for conservation. In a hallmark address to the International Association of Game, Fish, and Conservation Commissioners in September 1953, Sturgis set Corps policy firmly down a path from which it has yet to retreat.

We must obey the laws of nature and work in harmony with natural forces rather than against them, Sturgis declared in the speech. Man cannot dominate these forces; but, by working in harmony with them, he can preserve the heritage of future generations. Sturgis traced his own love of nature to his boyhood. All forms of conservation interested him, from soil to wildlife. The destruction of forests filled him with real pain, and he regretted that in the march of what we often inaccurately term civilization, some values are likely to be lost.

But General Sturgis believed that the U.S. Army Corps of Engineers could help. The Corps could provide shelter for wildlife on coastal and inland waters, for instance. In fact, Corps projects already furnished more than 3.5 million acres of land for some form of wildlife management, and recreation. And Sturgis had a vision namely, to see resting grounds for migratory game, refuges, managed public hunting, fish culture, game management, research laboratories, field headquarters for wildlife research and administration, arboretums, all aimed at public use and enjoyment of wildlife resources. Sturgis proclaimed the support of his command toward this cause: The Corps stands ready and willing to join with each of you and give you every possible assistance that our authorized functions permit to obtain the greatest practicable benefits for wildlife from our projects.

Lt. Gen. Samuel D. Sturgis, Jr., 1953–56, as Chief of Engineers

Pelicans on Gaillard Disposal Island, Mobile Bay, Ala.

Damage assessment following the Loma Prieta earthquake, Oakland, Calif., October 1989

Emergency Operations

The U.S. Army Corps of Engineers received its first formal federal relief assignment in the winter of 1882 when Mississippi River floods forced thousands of people from their homes. When the Army Quartermaster Department was unable to deliver relief supplies to the shivering refugees, Congress turned to the Corps of Engineers and soon engineer vessels were steaming up and down the river dispensing hundreds of tons of supplies and plucking survivors off rooftops and levees.

In the first half of the twentieth century the Corps' role in providing disaster relief stemmed largely from its flood control responsibilities. The Flood Control Act of 1917 established that flood control was a responsibility of the federal government and placed it under the jurisdiction of the Corps of Engineers. A decade later, during the Mississippi River floods of 1927, the Corps of Engineers organized a massive effort to reinforce the levees to hold back the raging water, but eventually the levees failed, killing hundreds of people and leaving hundreds of thousands homeless. With much of the countryside under water the Corps quickly transitioned its efforts from fighting the flood to helping the communities affected by the disaster. The engineers' relief operations included ferrying supplies to the communities cut off by the rising water and rescuing thousands of beleaguered refugees.

The Corps of Engineers' role in providing disaster relief broadened considerably when Congress passed the landmark Federal Disaster Relief Act of 1950. The act provided a

Residents of Hickman, Ky., find refuge on levees and rooftops, 1912

mechanism for local and state governments to request federal assistance, and after determining that a major disaster had indeed occurred, the president could authorize federal agencies to provide "equipment, supplies, facilities, personnel, and other resources" for the preservation of life and property. Additional congressional action followed a series of hurricanes that buffeted the East Coast beginning in 1954. Under PL 84-99 (1955), Congress authorized the Chief of Engineers to undertake activities including disaster preparedness, emergency operations, rehabilitation of flood control works threatened or destroyed by flood, and protection or repair of federally authorized shore protective works threatened or damaged by coastal storms.

A Corps of Engineers disaster survey team inspects damaged homes following Tropical Storm Agnes.

Under the provisions of the expanded legislation the Corps was well positioned to lend a helping hand when a string of devastating hurricanes struck the Gulf Coast in the 1960s. In 1965 Hurricane Betsy inundated much of the city of New Orleans, and in 1969 Hurricane Camille came ashore in Mississippi accompanied by a twenty-four-foot storm surge that killed hundreds. In the wake of Hurricane Betsy the Corps helped pump flood waters out of the city, repaired levees, and removed debris. After Hurricane Camille the Corps of Engineers helped clear roads and conducted extensive dredging operations to clear harbors blocked by the storm. In 1972 Tropical Storm Agnes buried much of the east coast under torrential rains that killed more than 100 people and caused more than $3 billion in damage. To cope with the devastation along the eastern seaboard brought on by the storm, the Corps established the Susquehanna District to help house the displaced residents, clear debris, and help make the battered communities livable once again.

The federal government's disaster policy changed again in the 1980s when Congress passed the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The new law tasked the Corps to provide disaster relief support to the

newly created Federal Emergency Management Agency (FEMA). That support arrangement was tested in 1992 when Hurricane Andrew roared ashore in South Florida, cutting a twenty-two mile path of devastation from Biscayne Bay to the Everglades. Relief operations in south Florida demonstrated a new level of federal commitment to disaster response: In the months following the disaster, the Corps of Engineers spent nearly $400 million in federal funds installing temporary roofs on some 22,500 homes, removing millions of cubic yards of debris, installing emergency generators and pumps, distributing water, installing temporary housing, and helping rehabilitate nearly 270 schools.

The litany of hurricanes continued —following Hurricane Isabel in 2003, nearly 300 Corps of Engineers personnel deployed to the mid-Atlantic region to distribute water and ice, install generators, and erect more than 100 trailers for temporary housing. In 2004 several hurricanes struck the Gulf Coast and in their wake the Corps' "blue roof program," so named for the color of its distinctive blue plastic coverings, installed 135,000 temporary roofs on homes and businesses across the Gulf region.

In 2005 two powerful hurricanes, Katrina and Rita, struck the Gulf Coast within weeks of one another. High winds and a powerful storm surge inundated much of the city of New Orleans and caused widespread damage across large portions of Louisiana and Mississippi. The Corps' response to the powerful storms was unprecedented; during the relief and recovery efforts more than 3,000 personnel were deployed to the battered communities along the Gulf Coast to assist with relief and recovery operations. Working

Corps of Engineers contractors install a temporary roof on a home damaged by Hurricane Andrew.

Military personnel repair the roof of a school damaged by Hurricane Andrew's strong winds.

At a collection point outside of New Orleans, contractors process debris from Hurricane Katrina, October 2005.

under the auspices of FEMA and the National Response Plan, the Corps of Engineers mobilized thousands of contractors who removed approximately fifty million cubic yards of debris, installed 193,000 temporary roofs and 914 generators, and repaired more than 1,000 critical public buildings including schools and hospitals.

Corps of Engineers personnel supervising the placement of a community health facility in Chalmette, La., October 2005.

Operations in and around the city of New Orleans posed special challenges. First, engineers assisted in removing the flood waters from the city. The Corps then launched a crash program to rebuild the city's shattered hurricane protection system to be operational by the start of the 2006 hurricane season.

In addition to hurricanes, during the past century the Corps of Engineers has responded to a variety of other natural disasters including earthquakes and tornados. Following the San Francisco earthquake in 1906, soldiers of the First Battalion of Engineers were the first federal troops to enter the city, and in the weeks that followed they helped feed and house the city's stricken populace and bring raging wildfires under control. When a powerful earthquake rocked south-central Alaska in 1964, the Corps helped remove debris and restore critical municipal services. Following the Loma Prieta, California, earthquake in 1989, and the Northridge, California, earthquake five years later, the Corps provided similar services.

A very different calamity occurred in 1953 when a powerful tornado struck Waco, Texas, killing 114 people and devastating much of the city. Soon after the storm, response personnel from the Fort

San Francisco, Calif., following the April 1906 earthquake and fire

Worth District arrived, set up portable generators, established communications, and within thirty-six hours completed structural assessments of more than 2,000 homes and businesses.

The Corps also has responded to man-made disasters. In 1947 the Galveston District helped evacuate the dead and injured when a devastating explosion destroyed much of Texas City, Texas, killing 500 people and injuring thousands more. In 1989 the tanker *Exxon Valdez* ran aground in Alaska's Prince William Sound, releasing a massive oil spill that threatened large portions of the Alaskan coastline. As government and industry searched for a way to clean up the spill, the Corps modified two of its dredges to vacuum the oil from the water's surface.

Despite more than a century of experience in dealing with disasters and their aftermath, the Nation recoiled in horror when terrorists attacked the World Trade Center and the Pentagon on the morning of September 11, 2001. Soon after the attack in New York, harbor maintenance and survey vessels from the New York District began evacuating 3,000 stranded New Yorkers from lower Manhattan. After discharging

Corps of Engineers personnel confer with a member of the New York City Fire Department at the World Trade Center, September 2001.

their passengers in New Jersey, Corps workboats carried emergency personnel, relief supplies, and fuel back to the city to sustain rescue operations at the World Trade Center. In support of the City of New York and FEMA, the Corps of Engineers brought in mobile command and communication centers to aid emergency operations at the site of the collapsed Trade Center towers. At the same time Corps search and rescue teams searched for survivors while structural engineers assessed the extent of the damage and monitored the condition of the buildings around the World Trade Center complex. The 249th Engineer Battalion also deployed to New York City to help restore power to lower Manhattan and conduct site assessments in and around Wall Street.

The Corps sent its Deployable Tactical Operations System (DTOS) to the World Trade Center to provide communications for rescue workers.

The Corps of Engineers was also instrumental in removing and inspecting the nearly 1.6 million tons of debris that resulted from the collapse of the World Trade Center. The Corps and its contractors moved the debris from Manhattan by barge and transported it to the Fresh Kills Landfill on nearby Staten Island. At the landfill the debris was carefully inspected to identify human remains and recover evidence related to the attack and the collapse of the towers. Scores of victims who perished at the World Trade Center were identified on the basis of material recovered during the inspection process.

The terrorist attacks of September 11th placed new emphasis on domestic security, and in December 2002, the Headquarters, U.S. Army Corps of Engineers, established the Homeland Security

Office within the Civil Works directorate. The new office oversaw the Corps' emergency management program, has played a leading role in assessing the Nation's critical infrastructure, completed numerous facility protection projects, and developed a new risk assessment methodology for dams.

The Corps of Engineers emergency operations function has evolved significantly since 1882 when engineer workboats first carried supplies to flood victims along the Mississippi. Over the course of the last century the federal government has played a progressively larger role in assisting states and municipalities responding to natural and man-made disasters, and the Corps of Engineers' role in providing relief and recovery support has expanded apace. But even as the Corps' mission has expanded into new areas, the foundation of the Corps' value to the Nation—maintaining a nationwide network of engineer districts and divisions with the ability to rapidly mobilize highly skilled and experienced personnel with long-standing relationships with the Nation's construction industry—has remained unchanged.

(above and below) Government and contractor personnel used mechanized shakers at the Fresh Kills Landfill, N.Y., to screen the debris from the World Trade Center.

The U.S. Army Corps of Engineers' Response to Hurricane Andrew

In the early morning hours of August 24, 1992, Hurricane Andrew roared ashore twenty-five miles south of Miami, Florida, hitting Homestead and other south Dade County communities. The hurricane, which possessed one of the highest wind speeds (reported to be 165 mph, with gusts to 185-190 mph), largest storm surges, and lowest barometric pressures ever recorded in the United States during a hurricane, cut a path of destruction twenty-two miles wide and devastated the area from Biscayne Bay to the Everglades. It leveled thousands of homes and other buildings, destroyed public utilities, ripped up trees, and left millions of cubic yards of debris. Its fierce winds tore down most of south Florida s power lines, leaving 1.4 million customers without electricity. After crossing the Florida peninsula and the Gulf of Mexico, it hit southern Louisiana the next day.

The South Atlantic Division and the Jacksonville District of the U.S. Army Corps of Engineers responded immediately, under the overall guidance of the Federal Emergency Management Agency (FEMA). During the next several months the Corps would use almost $400 million in federal funds to help south Florida recover from the devastation.

The Corps provided for immediate human needs. It supplied 5,400 portable toilets to the area and provided hundreds of shower facilities and washers and dryers. Left without a safe water supply, south Floridians relied on the Corps for thousands of gallons of water a day until local water supplies were repaired. With thousands of people homeless, FEMA tasked the Corps to acquire property, clear debris, provide utilities, and put trailers in two large mobile home parks. Corps contractors spent $20 million establishing the parks with more than 250 travel trailers to provide temporary housing.

The Corps also helped to restore vital services to the affected areas. It

(right) Unloading roofing material, Cutler Ridge, Fla.

(below) Temporary housing, Gould, Fla.

turned to its Prime Power units, later organized into the 249th Engineer Battalion, to provide emergency power. In addition to installing twelve of its own 750-kW generators, the Army engineer units supervised the installation of generators and pumps by commercial firms. Prime Power specialists also spearheaded the repair of the Dade County telephone, water, and wastewater treatment systems. Damaged homes needed temporary roof repairs. The Corps and its contractors ultimately supplied 55 million square feet of roofing material and installed it on 22,000 homes. Furthermore, what amounted to a collection of thirty years worth of debris and refuse littered south Florida in the aftermath of Andrew. Massive amounts of debris blocked roads and posed health problems. The Corps began debris removal quickly. At the peak of debris removal efforts, Corps contractors and troops from the 20th Engineer Brigade operated 2,000 trucks a day. One important mission that involved a remarkable degree of cooperation among agencies was the refurbishment of schools in the devastated areas. A team of Corps personnel, contractors, Navy Seabees, Canadian military personnel, and others opened 268 of Dade County s 278 schools on September 14, only three weeks after Andrew had ripped through the area.

Corps and contractor personnel install temporary roofing, Perrine, Fla.

In human terms, Hurricane Andrew was one of the Nation s most debilitating natural disasters, killing twenty people and leaving a quarter of a million homeless. In economic terms, it was one of America s most costly hurricanes, resulting in $26.5 billion in damages. Although the U.S. Army Corps of Engineers was only one actor in the complex drama of south Florida s recovery, the Corps wealth of experience and its prompt response gave it a leading role in helping the people of the region recover from Andrew s wrath.