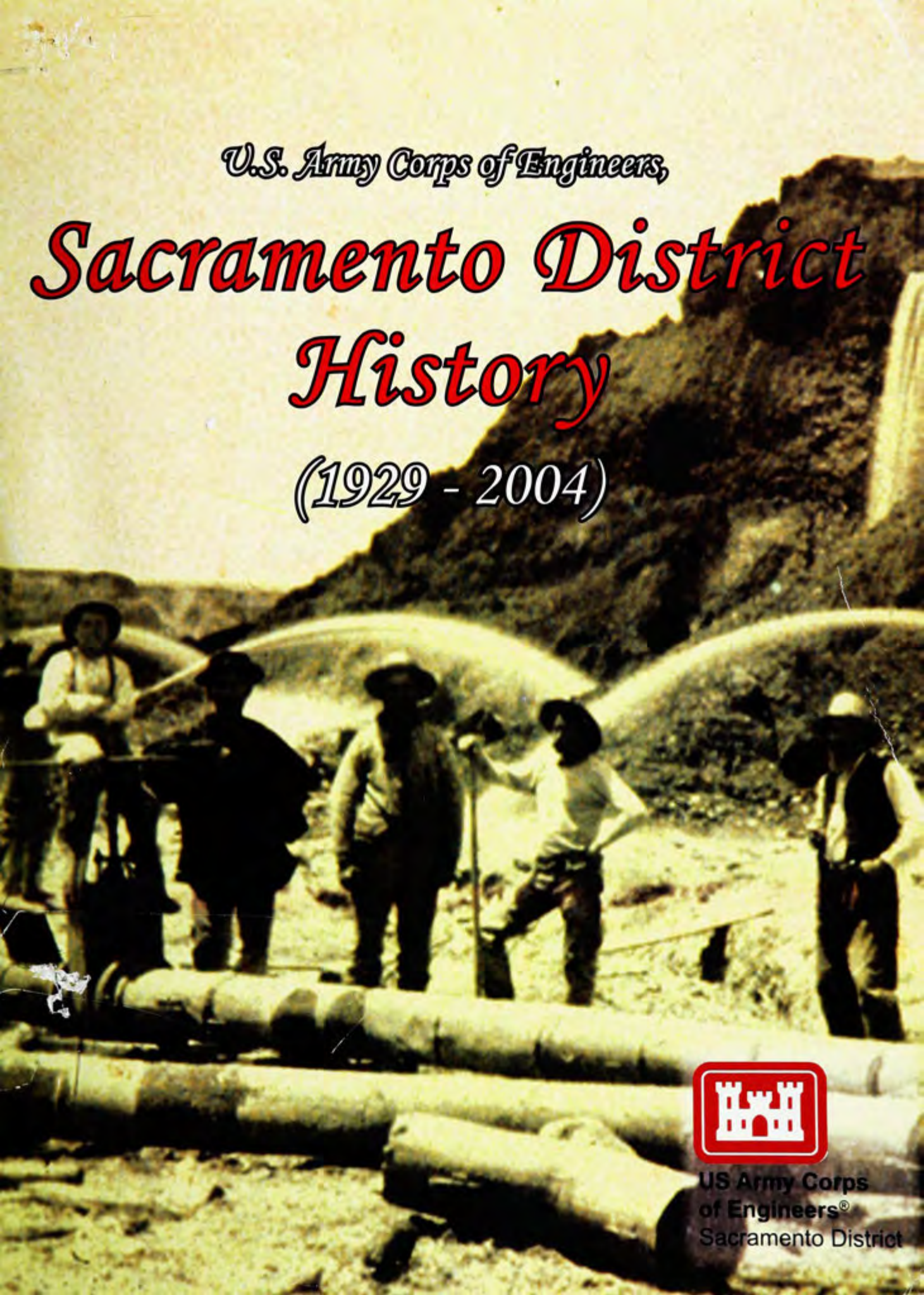
U.S. Army Corps of Engineers,

Sacramento District History

(1929 - 2004)



US Army Corps of Engineers®
Sacramento District

Sacramento District History

(1929 - 2004)

U.S. Army Corps of Engineers, Sacramento District

By Dr. Willie Collins;

with

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A look back at the last 75 years of the Sacramento District

US Army Corps of Engineers®

Sacramento District

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Preface

Although the Sacramento District was established in 1929, this document recaptures the legendary history from the mid-1800's and the repercussions the Central Valley endured regarding the navigation of the rivers and streams, which, at that time, were clogged with sediment from the activities of mining. This volume is the second of its kind for the Sacramento District. The first historical account covers the time period from 1929 through 1973 and was published in 1976. While this book provides an historical perspective of the Sacramento District in the beginning chapter, it is the specific activities during the period from 1973 to 2003 that are described in detail in the remaining chapters. This description reveals the evolutionary growth of the Sacramento District, which has persevered amid a sea of changes brought about by Federal and state regulatory agencies and a most sensitive California constituency.

The comprehensive research involved obtaining more than 33 personal oral history interviews with the District's clients, District employees, and past District Commanders. In addition, 25 transcribed archived oral history interviews were completed, which assisted in providing the intimate details for recounting specific projects the District had been involved with. Other key documents that were consulted included U.S. Army Corps of Engineers' reports, press releases, the District's Public Affairs Reports, newspaper articles, as well as internal correspondence. Specific sources are provided via numerous endnotes.

A handful of individuals and organizations also assisted in the preparation of this history document for the Sacramento District. Without their assistance this document would have not been possible. Special thanks to Mr. James H. Taylor, the former Chief of the Sacramento District's Public Affairs Office, whose dedication brought the right people together to move this document forward – they included individuals who are now retired and those who are still currently with the District. Some individuals volunteered their personal time to be interviewed, which added a personal perspective to the many projects that the Sacramento District has been involved with. Lastly, thanks to Dr. Willie Collins and the team members of his firm, the Consortium for California Cultural and the Water Resources Center Archives at UC Berkeley, for providing the many hours of research, which created the foundation for the document.

This document eloquently describes how the U.S. Army Corps of Engineers' Sacramento District has fostered commerce within its steadily expanding boundaries while safeguarding the millions who live and work within its borders. The District has responded admirably to the demands of a growing region and the needs in both civil and military work. In peacetime and in wartime, the Corps has proven an invaluable force whose skill, imagination, and persistence have shaped the District that we are familiar with today – we hope you enjoy reading this updated historical account of the Sacramento District as much as we have enjoyed researching the history. Essayons!

Col. Ronald N. Light
District Engineer

Foreword

Sacramento District

Chapter 1 summarizes the District's first history, entitled *Commitment to Excellence: A History of the Sacramento District US Army Corps of Engineers, 1929-1973*, written by Joseph J. Hagwood Jr.

From a workforce of a few men assembled in a hotel in 1914 to a staff that increased to nearly 2,000 during the military buildup in the mid-1940's to a stabilized staff of more than 1,000 in 1973 through 2003, the Sacramento District boasts a history as colorful as the land it has helped to develop.

The District's early mission of improving navigation on the Sacramento and San Joaquin Rivers evolved into a flood control effort by creating bypass channels and establishing levees. While the Civil Works occupied the District in the early years, the growth in its military work was in response to military needs. The war years from 1940 to 1945 brought new mobilization projects, such as arsenal production plants, hospitals, and Japanese-American relocation centers. The District continued to expand its boundaries through the Korean War. By the late 1960's, the Sacramento District was the second largest district in the Corps. The 1970's brought many changes as career employees reached retirement age and new wave of employees came aboard. This was the time of the environmental movement, and the District met the demands of the regulatory requirements by adopting a pro-environmentalist agenda. The first step was to acknowledge what effects the District projects had on the environment.

Chapter 2 traces the evolution of the Sacramento District's most controversial water storage project—the New Melones Dam. New Melones Dam became one of the first water projects to fall under contentious public scrutiny. It galvanized environmental and commercial interests. Ten years prior to the New Melones Dam breaking ground in 1966, the project was involved in numerous environmental studies, lawsuits, and hearings. In the spring of 1979, the Corps began filling the reservoir to test the power plant's new turbines. This began a protest by Mark Dubois, a leader from the Friends of the River, an environmental group, which received National attention and influenced the Corps' response to stop the filling of the reservoir. Finally, in 1982, the New Melones Lake reached and exceeded the storage level capacity and subsequently prevented an estimated $357 million (2000 price level) in flood damages from major storms, which occurred from 1983 to 1997. New Melones is an example of how a district besieged by legal battles, negative publicity, and other attacks emerged successfully, having learned important lessons.

Chapter 3 documents the Sacramento District's construction of two sister dams in the Central Valley that received congressional authorization at the same time. These were Buchanan Dam, which impounds Eastman Lake, on the Chowchilla River, and Hidden Dam, which impounds Hensley Lake, on the Fresno River. The Sacramento District's planning and construction of the dams in the 1970's spurred a heightened interest in the history of the area. Evidence of the several Indian cultures and artifacts from the first settlers including their remains were discovered after the National Park Service's Interagency Archeological Services performed cultural resource field work at the proposed Buchanan Dam site between 1964 and 1972. The District dedicated Buchanan Dam along with Hidden Dam in June 1976. Both projects offered downstream flood protection for area residents, an expansive wildlife preserve mitigation area, as well as recreational facilities and a history that is now well documented and has added to the cultural richness of the area.

Chapter 4 discusses the construction of the Little Dell Dam, the Corps' largest project in Utah. In 1956, 13 years after the Great Basin of Utah became the Sacramento District's responsibility, the Little Dell Dam and Lake became a long-lived project, which required constant nurturing and diplomacy over 30 years. This was among one of the first projects for the District where the community showed the willingness to share the costs of a Federal water project. Little Dell helped set a precedent for other water projects, including the nearby Central Utah Project. Although the project was authorized under the Flood Control Act of 1960, it was never funded. After many years of studies and design changes, which directly affected the cost-sharing of the sponsors, the project began to move forward after the 1983 flood. More than a thousand homes were flooded, and hundreds of residents were forced to evacuate. This

was the impetus for flood control protection, and the Little Dell Dam captured National attention, yet the project was downsized in 1985 to build only the 21,000 acre-foot reservoir. After several more years of funding issues, the actual construction started in May 1989 and the filling of the completed reservoir began in 1993. The Little Dell Project pointed the way for future water-resources projects under the new cost-sharing provision of the Water Resources Development Act (WRDA) of 1986. An early willingness by the District to adapt regulations to meet local needs resulted in the construction of a smaller project at less cost.

Chapter 5 follows the timelines of three important flood control projects: the Sacramento River Bank Protection Project, the Redbank and Fancher Project, and the Merced County Streams Project. The Sacramento River Bank Protection Project began in 1963 and was completed in 1974. The project provided 81 miles of bank erosion control as well as setback levees on the Sacramento River while the Redbank and Fancher Creeks Project consisted of 7 components, which provided community flood protection based on the use of dry dams. Design to authorization to construction took approximately 16 years to complete the project. The project proceeded under the passage of the WRDA of 1986. It was at this time that the District realized that in order for the cost-sharing provision in the WRDA of 1986 to succeed, the Corps must treat the communities (non-Federal sponsors) as partners, which meant having their input considered in crafting the Local Cooperation Agreement, as well as having input on the designing and construction the project. The Merced County Streams Project, while originally authorized in 1956 and reauthorized in 1970, was never completely finished. The project had several components, and only one component was completed. Castle Dam was constructed in 1992. As of 2002, no completion date is in sight for the remainder of the project. While small in comparison to other projects, these projects played an important part nationally in redefining and honing a model Project Cooperation Agreement while at the same time producing enormous local benefits.

Chapter 6 chronicles the District's completion of one major navigation project – deepening the 52-mile Stockton Deep Water Ship Channel in 1987. The District also began work on deepening the Sacramento Deep Water Ship Channel, but work has been suspended. In 1963, the District completed a smaller navigation project – the William G. Stone Lock connecting the Port of Sacramento with the Sacramento River. The lock closed in 1987 and has since been in caretaker status.

Chapter 7 examines six projects (Fairfield Vicinity Streams, Cache Creek Settling Basin, Walnut Creek, Wildcat and San Pablo Creeks, Napa River, and the Guadalupe River) that relate to flood reduction in an urban setting. The projects illustrate the balancing of flood protection, environmental restoration, and, in some cases, recreation in residential and commercial development areas. These projects also explain how the Sacramento District's work can affect vast populations and how the Corps interacts with these urban communities to perform the work.

Chapter 8 documents the Sacramento District's participation in eight flood fights between 1973 and 1998. Most of the flood fights were in California, but some also took place in Nevada and Utah. In addition to flood fighting, the District assists in search and rescue operations, furnishes technical advice and assistance, provides emergency repairs to levees and other flood control projects, and supplies materials such as sandbags, polyethylene sheeting, lumber, pumps, or rock for stabilization. Through post-flood response, the Corps is also responsible for performing emergency repair and restoration of flood damaged or destroyed flood control works, such as levees.

Chapter 9 records the evolution of the Regulatory Program, formerly known as the Section 10 Permit Program, from a small staff of four to a staff of 34. Today the Regulatory Program involves regulating both the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. It is a three-pronged program involving issuance of permits on navigable waterways and for work in waters of the United States, to enforcement and investigation of potential violations to compliance inspections of permitted activities.

Chapter 10 looks at the recreational facilities in the Sacramento District. The Operations and Maintenance Branch oversees nine multipurpose lakes,

one river park system, four navigation projects, and other flood control facilities. There is an increased demand for recreation and recreational facilities, and the District views its recreational mission as a basic value for all of its recreational users.

Chapter 11 discusses the vital role that the Military Mission of the Sacramento District plays in supporting the Air Force, the Reserve installations, and occasionally the Marines. The District also performs work for other Department of Defense agencies, including the Defense Logistics Agency, the Defense Mapping Agency, and the Defense Nuclear Agency, and under the "Work for Others" program, the District services new customers such as the National Aeronautics and Space Administration, the Environmental Protection Agency, and the Department of Energy. As the chief design and construction agent for the Air Force, the Sacramento District completed a number of challenging and diverse projects, including airman dormitories, test facilities, maintenance facilities, administrative facilities, runways, medical facilities (including hospitals), airplane hangars, runways, storage facilities, taxiways, and warehouses. The most challenging and special endeavors included the Missile X Program (MX Program) (1978-1982) and the Space Transportation System Program (1977-1985).

Chapter 12 summarizes the District's work as the design and construction agent for the U.S. Army. The Army projects are diverse and include family housing, hospitals, warehouses, runways, roadwork, maintenance facilities, dental clinics, bowling alleys, chapels, and many Basic Maintenance and Rehabilitation projects. These projects took place principally in California, Utah, and Washington states. To support the Army's war fighting mission, the District builds facilities to maintain and repair tanks, helicopters, and training ranges. The District served a number of army bases in California, with Fort Ord and Fort Irwin being two of the largest. The Area Oriented Distribution Center at Sharpe Army Depot was also massive. One of the most complex projects was the Deseret Chemical Depot in Utah.

Since California is a state with the nation's largest defense presence, the District's responsibilities included the conveyance of closing Army and Air Force installations under Base Realignment and Closure (BRAC). The District also had environmental restoration responsibilities for cleaning hazardous materials at the closing installations. The BRAC program in the District's Real Estate Division has achieved notable successes in its disposition of real estate. The Sacramento District had the largest number of active BRAC projects in the Corps on the military side, and the largest Homeowner's Assistance Program. While the workload for military projects has diminished, the District continues to serve its mission well as the design and construction agent for the Army and other agencies.

Chapter 13 records the history of the District's involvement in hazardous and toxic waste cleanup. Most of the military installations with heavy maintenance activities had some type of groundwater contamination. The installations sought assistance from the Sacramento District to clean up the contamination. More work was forthcoming from other sources such as the Farmers Home Administration and the Federal Aviation Agency. In 1990, the Sacramento District received its designation as the Center of Expertise for Hazardous, Toxic, and Radioactive Wastes (HTRW) for the South Pacific Division. In the short span of three years, between 1990 and 1993, the Sacramento District became one of the Corps' premier technical centers in HTRW remediation. The HTRW program in its relatively short 17 years of development has become second to the District's military construction programs and has overshadowed the civil works program. The District's success in undertaking such large remediation projects as Fort Ord and the Sacramento Army Depot has garnered its HTRW Branch many accolades and contributed significantly to new strategies and technologies in the HTRW field nationally.

Chapter 14 is an overview of studies the Sacramento District is currently involved with. Some of the studies are ongoing like the Comprehensive Study, as well as the American River Watershed Project and the Yuba Basin Study. Additionally, this chapter summarizes the final phase of the Debris Commission and explains the process for the publication of the Commission's history before its demise in 1986. This chapter describes the involvement that the District had in assisting CalTrans with an important study to retrofit and replace the San Francisco-Oakland Bay Bridge.

Chapter 1[1]

The Sacramento District's Early Years, 1914 - 1973

The Sacramento District of the U.S. Army Corps of Engineers started in 1914 with a handful of men assembled in Sacramento's Clunie Hotel. It boasts a history as colorful as the land it has helped to develop. Initially a subsidiary office of the Corps' San Francisco District, the Sacramento District would, over the next century, effect great changes and bring distinction to some of the nation's most precious and dramatic terrain.

In its early years, the Sacramento District worked in survey parties and as snag boat crews whose major task was to improve navigation on the Sacramento River. Today the Sacramento District, with a staff of more than a thousand, oversees civil works and military engineering concerns in parts of eight western states including Arizona, California, Colorado, Idaho, Nevada, Oregon, Utah, and Wyoming.

At the time of its creation, the District was bounded by California's great Central Valley, which includes both the Sacramento and San Joaquin Valleys and Rivers. These two powerful waterways established one of the larger drainage systems in this country. The area also contains a delta at the Sacramento's mouth, which along with the Mississippi Delta, is one of the United States' two delta regions.

The Sacramento and San Joaquin Rivers had been crucial to both Native Americans and settlers who lived there. Native Californians found much of their food along the waterways, and they traveled up and down them in tule rafts and dugout canoes. William Leidesdorff,[2] an African-American from the Danish West Indies, settled in what was then Yerba Buena (and later San Francisco) in 1841 and ran the *Sitka*, the first steam ship on the Sacramento River even after the discovery of gold. The tiny *Sitka* took six days and seven hours to travel up the Sacramento River from San Francisco. Later, in 1849, the *McKim*, a large steamboat running from the San Francisco Bay to Sacramento, brought a large and influential group of miners.

The Corps and Early 19th Century Explorations of the West

From its start in 1802,[3] the U.S. Army Corps of Engineers has played a crucial role in settling the American West. John C. Frémont, nicknamed "the Pathfinder," established one of the Corps' first footholds in the West. Fremont was a topographical engineer and Corps officer famous both for his exploratory expeditions through the West and for his stubborn character. He had traversed Colorado and Wyoming and then followed the Oregon Trail to The Dalles in 1842 before heading south through the Cascade and the Sierra Nevada ranges. Crossing the Sierras in winter, he came to rest at Sutter's Fort.

During another expedition in 1845, Frémont came west by way of the Great Salt Lake. His party of 60 men crossed the mountains in late fall and stayed in Monterey through the winter at the invitation of Mexican authorities. This invitation had come with the expectation that Frémont and his party would turn inland from Monterey, steer clear of the coastal areas, and leave in the spring.

But troubles were brewing between Mexican and U.S. interests. Defying his Mexican hosts, Frémont elected to stay on in Monterey. From here, he and his men explored the area's rugged territory.

When California joined the Union at the close of the Mexican-American War in 1850, Corps engineers were dispersed to help fortify the California coast. They also joined ongoing efforts to survey the first transcontinental railroad. In this undertaking, their aid was crucial. Western railroad operations desperately needed engineering expertise, and Corps leadership in California helped expedite what could otherwise have been a painfully slow construction effort.

At this time, interest also ran high nationwide in finding passes through which travelers and goods could cross the Sierra Nevada and Coast ranges, and in finding an expeditious route connecting Califor-

Miners and Settlers during the Gold Rush

nia to the Northwest. Corps engineers also played a key role in these explorations as they comprehensively surveyed, mapped, and photographed the Far West. All of these activities were pivotal in developing America's West, but the defining event was the discovery of gold in the Sierra Nevada foothills in 1849.

The 1849 Gold Rush

John Sutter arrived in California in 1839. He completed his famous fort in 1841 and established the settlement of Sutterville the same year. Several years later, the city of Sacramento was laid out in 1849. As a result of the discovery of gold in the foothills of the Sierra Nevada that year, the Sacramento and Sutterville areas were soon ringed by the homesteads of a steady influx of prospectors. Inland water travel became enormously important almost overnight, both for the transport of miners and for the distribution of foodstuffs and lumber between and beyond the growing cities of northern California.

Initially, miners worked deposits within their claims and panned along the beds of shallow streams. When these sources were depleted within a few years, the prospectors left the flatlands, heading for the hills and the promise of gold in the Sierra's canyon walls.

This exodus from Sutterville and the surrounding areas would prove problematic. The growing numbers of miners now working the Sierra's ancient stream channels and surrounding layered rock sent debris-laden runoff away from their sites into valuable water sources. The effects of this runoff began to be seen when the rains came.

Flooding in the Valley and Hydraulic Mining

A flood is a high flow or overflow of water from a creek, river, or similar body of water, taking place over a period of time too long to be considered a flash flood. Flooding is caused by winter or spring rains, paired with melting snows that can swiftly inundate river basins or overflow creek banks. Tropical systems can also produce precipitation-causing flooding.

Settlers along the Sacramento and in the Sierra Nevada soon discovered that floods could easily devastate the area, destroying lives and property. On January 7, 1850, the deluge came; after two days of incessant rain, the city of Sacramento was deep in water.[4]

A new, more expedient mining method (hydraulic mining) exacerbated the flooding. Miners in the Sierra Nevada's canyons found that reaching any gold buried in ancient stream channels involved removing dense layers of soil and rock. In the spring of 1852, enterprising miner Anthony Chabot discovered that by using iron-reinforced wooden penstocks and a canvas hose, he could guide a 50-foot column of water at the section of soil and rock he wanted to work, breaking up both the incidental layers and the gold layers. He then dug through the runoff of silt, sand, and gravel to capture the gold – a method called "ground-sluicing." Chabot's rather simple invention was the forerunner of modern hydraulic mining devices.[5]

Improvements on Chabot's design quickly followed: iron and steel nozzles replaced wood, and sheet iron was used instead of canvas hoses. Hydraulic mining boomed immediately, sparking an overwhelming need for plentiful and accessible water. This new mining method called for canals, pipelines, and flumes, and these soon proliferated throughout the Sierras.

Hydraulic mining was economically feasible for hydraulic miners, but city residents, the shipping and navigation industries, and farmers suffered. Hydraulic mining at its peak in the Sierras used some 600,000 acre-feet of water every month. For those attempting to navigate rivers and to farm neighboring lands, the new technique proved costly as hydraulic-mining runoff debris entered the large rivers and clogged once-navigable waters. The debris also reached the area's valleys with every rainstorm, coating farmlands and raising water levels so high that the number of floods in the valley increased disconcertingly.

Although the threats posed by floods became even greater, residents determinedly looked the other way. As the years passed, they refused to learn nature's hard and obvious lessons, and they maintained a steady confidence in their ability to control floods that was hardly supportable given the circum-

Hydraulic Mining - Malakoff Diggings, CA

stances. Needing ever-higher levees, at ever-higher costs, the City of Sacramento imposed taxes to cover complicated flood-control systems. At one point, Sacramento even brought in millions of tons of dirt in order to raise the level of its streets.[6]

The new arrivals eventually learned that they could not easily manipulate the environment or stop nature's forceful hand.[7] Sacramento Valley residents appealed to the legislature and the courts, and in 1884, they ultimately prevailed over the miners. The courts ruled that mining debris must be kept out of any water source that was a tributary of streams. Mining remained legal as long as miners kept debris out of the drainage systems bordering their claims, but miners found it nearly impossible to comply with the court order. Although some diehards stayed on, miners increasingly abandoned their claims by 1900.

California Debris Commission

Congress established the California Debris Commission on March 1, 1893. The Commission had jurisdiction over hydraulic mining of the territory drained by the Sacramento and San Joaquin river systems. Projects authorized by the Commission resulted in improvements to the San Joaquin and Sacramento Rivers.

President Grover Cleveland appointed Corps officers Colonel G.H. Mendell, Lieutenant Colonel W.H.H. Benyaurd, and Major W.H. Heuer to serve on the commission under the Chief of Engineers and the Secretary of War.[8] The officers were charged with protecting and reclaiming the rivers. They were to regulate hydraulic mining, and made the Commission's first order of business the construction of debris control dams across major tributaries drained by the Sacramento and San Joaquin Rivers. The Commission also authorized wing dams built at right angles in these rivers to send the current out by way of the main channel to help scour debris from the rivers. In addition, they required miners to build small dams to keep their debris out of the streams.

These projects were effective in halting debris movement out of the mountains and were beneficial for the farmers and shippers who depended on the rivers, but did little to help the miners who, by the time the dams were completed, were essentially gone. However, the Commission's contribution to sorely needed river management, flood control, reclamation, and navigation intensified and became a major focus of Corps activity in the twentieth century.

River Management

Throughout the late nineteenth century, river travel in the Sacramento District had been hampered not only by hydraulic debris but also by sandbars, snags, and other impediments. Such problems with river travel sparked stiff competition from railroads and overland wagons, which further enfeebled commercial activity on the Sacramento and San Joaquin Rivers. By the start of the twentieth century, the Corps focused on planning for river management, reclamation, and flood control. The Corps also placed emphasis on what was later to become California's two inland ports at Sacramento and Stockton. Their importance could not be overlooked.

The Port of Sacramento had prospered during the mid-1800's, helping to move miners and equipment to the gold fields. However, the Corps had done little to manage the Sacramento River during these years.

Later, the Corps approved an ambitious plan to dig a 30-foot channel between Suisun Bay and Sacramento. The improvement of navigation on the Sacramento River resulted in the Sacramento River Project. This project culminated in the construction of the Daguerre Point Dam in May 1906, exclusively for debris on the Yuba River ten miles upstream from the town of Marysville. The Corps built the dam to serve as a catch basin for debris.

The Port of Stockton had quickly become the barge and riverboat entrance to the San Joaquin Valley, serving the fertile agricultural farms of the Central Valley. In January 1933, a shallow-draft channel (one less than 15 feet) was cleared on the San Joaquin, enhancing access to and from Stock-

ton. Later, in 1935, Congress authorized a deep water channel (a channel with a draft of more than 15 feet) designed for open-water navigation, which was completed by 1940.

Early Flood Control and the Jackson Report

Levees and concrete barriers failed on more than one occasion to stop Sacramento River flooding. In March of 1907 the entire Sacramento Valley was flooded, with the mid-valley region from Marysville to Colusa particularly hard hit. In this flood, the U.S. Geological Surveyors gauged the Sacramento River's peak flow at 600,000 cubic feet per second. The previously recorded peak flow was 300,000 cubic feet per second. In 1909, another flood came of the same magnitude.

Constituents demanded action. After the 1904 flood that galvanized an organized effort to address the problems of rivers and reclamation, the River Improvement and Drainage Association called for a convention and became a powerful advocacy group for reclamation and flood control. Thomas H. Jackson, a West Point graduate and new member of the California Debris Commission, began to address solutions to the flood-control problem. Jackson eschewed existing Corps dogma, concluding that a bypass (building a second river channel into which the river would spill over during periods of high water) was the simplest alternative.

Jackson set out this and other proposals in the Commission's Jackson Report, which was presented to the U.S. Congress in 1911. This was the first comprehensive plan for improving navigation and providing substantial flood control for the Sacramento and San Joaquin Rivers. The report entailed the enlargement and construction of levees, bypasses, and weirs along the Sacramento River. The report also encouraged dredging the Sacramento River channel to enlarge it between Cache Slough and Suisun Bay. Suction dredges named after the two rivers were used to help dig out the channel; by June 30, 1917, they had removed 24 million cubic yards of mud.[9]

The Flood Control Act of 1917 (which approved for the first time Federal flood control outside of the Mississippi valley) included authorization for the Sacramento River Project, which was called for in the Jackson Report.

The Jackson Report remains the foundation of the Sacramento River Flood Control Project. At the state level, the State Flood Control Act of 1911 explicitly adopted the Jackson Report. The California legislature also enacted laws in 1913 to place the Sacramento Valley and the adjacent Sacramento-San Joaquin delta and the lower San Joaquin Valley under the state's Sacramento and San Joaquin District.

The State of California's involvement also led to the creation of what later became the California Reclamation Board, commonly known as the Reclamation Board, whose members ensured that future planning involving water management conformed to the Jackson Report and that any planning was driven partly by community interests. Before the Reclamation Board was founded, landowners reclaimed bordering waters in any manner that suited them—actions that were almost always detrimental to their neighbors.

It was clear, perhaps even prior to the channel work, that the Sacramento and San Joaquin Rivers needed to be treated as a single unit. This would ensure that both the rivers and the surrounding area could be fully protected and their best uses assured. Thus was begun a new planning philosophy in the region and navigation on the waterways improved, and valley residents felt safer from flooding. Both Stockton and Sacramento were prospering by 1918. Moreover, the area's agricultural development increased.

The Sacramento District Comes Into Its Own: 1914-1929

Before 1907, the Sacramento area had been part of the Corps' San Francisco District. But increased attention on the importance of the Stockton and Sacramento areas spotlighted the need for an additional planning body to manage projects closer to home.

The Sacramento and San Joaquin Rivers were already economic powerhouses. Both rivers were home to the stern-wheeler vessels that, as early as 1900, had been bringing more than a million tons of goods and 300,000 passengers every year to the docks and wharves of Sacramento city. Indeed, these waterways had fueled human life in this area for centuries. This, coupled with Stockton's emergence as the San Joaquin Valley's new commercial navigation hub, was evidence that a Corps district in the Sacramento area should be established. In 1914, the District began to come into its own as the Second San Francisco District, initially operating as a subsidiary of the San Francisco District.

Soon after it was designated, the new District began providing services to the military for World War I. Once the war began, survey and completion of large river- and harbor- improvement projects lessened in importance. War-related work increased so rapidly that the District found itself contracting out for tasks such as dredging. It also began postponing studies like the one in 1916 to explore the feasibility of a deep-sea shipping channel on the Sacramento River. Now the District joined the war effort, by seeking to increase arable land for wartime food production. Thus weir and levee construction became its all-encompassing task.

In the 1920's, traffic on the Sacramento and San Joaquin Rivers declined. Severe drought plagued the area year after year, and expanding irrigation projects drew vast amounts of water from the rivers. As the rivers grew shallower, traffic along them and in the Delta decreased dramatically, and cargo was again carried mainly by rail and truck.

In 1925, Congress requested from the Corps and the Federal Power Commission a cost estimate to survey navigable rivers of the United States to determine if the rivers could support other activities such as irrigation, hydropower, and water supply.

In April 1926, the Corps submitted a report to Congress that was subsequently published as House Document 308. A by-product of the report was an inventory of all the nation's rivers and streams—information that Congress hoped might result in the integrated development of North American waterways.

This report included estimates for work on the Sacramento and San Joaquin Rivers. An increase in the District's staff and new projects followed in rapid succession.

The Feather River Project specified improvements and levee modifications. The Sacramento Channel Project involved a feasibility study for a deep water channel and harbor. The Sacramento River Flood Control Project was by far the largest flood control project in California, comprising 1,000 miles of levees, a major bypass flow way, and several large reservoirs with dedicated flood control storage. The Stockton Deep Water Channel Project called for dredging the channel starting from the mouth of the San Joaquin River at Pittsburg to the Port of Stockton.

All this work made it apparent in 1929 that there was a need for the District to operate as a body independent of the San Francisco District. The formation of a new district in Sacramento would ensure localized supervision of all of these projects. In 1929, the Sacramento District was officially created.

The decision to create a new district meant taking a good look at agriculture, the region's enormous economic base. Though the Central Valley comprises only 35 percent of the state's total area, it contains more than 60 percent of the state's arable land. In 1879, the California Legislature's Committee on Agriculture recognized the value of farming in the area, announcing to the legislature that farm production had been far more profitable than gold mining, even during the mines' best and most active years.[10] During the 1930's, the value of all resources associ-

ated with the area's agricultural production – land, buildings and livestock – totaled a stunning $15 billion.

The District's groundwater levels, therefore, were matters of grave concern. Years of unchecked irrigation and overzealous tapping had drained underground water. The rivers' salinity also increased. When a river's saline level rises past a certain level, its water becomes useless for irrigation and unacceptable for industrial or domestic use. Though salt was introduced naturally into these waterways from the San Francisco Bay, it normally was washed away by river flow.

In the 1930's, the Sacramento District worked on solving the problem of salinity intrusion. The District also maintained navigation on the Sacramento and San Joaquin Rivers, the Delta, and Suisun Bay. The District also completed the San Joaquin River-Stockton Deep Water Channel authorized by the 1935 River and Harbor Act and constructed some of the vital components of the Central Valley Project. Seventeen major studies within the District resulted from the initiation of extensive surveys, with the majority of the studies completed before the attack on Pearl Harbor in 1941. The studies were Big Dry Creek Reservoir, Isabella Dam and Reservoir, Pine Flat Dam and Reservoir and Kings River Channel, Success Dam and Reservoir, Terminus Dam and Reservoir, Lower San Joaquin River and Tributaries, Tuolumne River Reservoirs, Melones Reservoir, Merced Stream Group, Bear Creek, Farmington Reservoir, New Hogan Reservoir, Sevier River, Black Butte Reservoir, Folsom Reservoir, Sacramento River, and Major and Minor Tributaries.

The District's Call to World War II Military Duty

The ranks and workload of the Sacramento District mushroomed with military wartime construction during World War II. Before the war, the Sacramento District employed 300 people. This figure doubled with the war effort, reaching 600 in 1941. At the close of 1942, the District had nearly quadrupled, ending the year with a staff of 2,000.

Military mobilization began in mid-1940 after the German conquest of France. The Corps began constructing Army Air Corps facilities, and after Pearl Harbor, became responsible for constructing Army military facilities throughout the world.

From 1940 to 1945, the Corps completed thousands of mobilization construction projects, including arsenals, production plants, storage depots, training schools, ports of embarkation, hospitals, Japanese-American relocation centers, and prisoner-of-war camps. Marion Morton, who spent 26 years working for the Sacramento District, found this wartime period especially exciting.

> *The transition from civil to wartime military construction was to me a marvelous adaptation. Inspectors and workers on earthwork and hydraulic jobs found themselves on-the-job learners of building and paving. Because of the pressures of wartime needs, they soon became seasoned and experienced. When the unfamiliar functions were transferred from the Quartermaster Corps, they were somehow assimilated, and made to produce the results intended.*[1]

Early in this transition, the District's workers constructed Camp Stoneman, a staging area for soldiers in training located near Pittsburg, California, in 3 months. Construction teams built lodgings and dredged the waterfront to accommodate the deep water vessels that ferried the troops to San Francisco. The District also began construction of a second facility, Camp Beale, near Marysville. Upon completion, it functioned as a city, servicing the living and training needs of 43,000 troops.

Early in 1941, the District's workers made improvements on Mather Field and Sacramento Air Depot, both of which had been underused between the wars. The District also expedited the construction of a base outside its boundaries in Ephrata, Washington, completing the Ephrata's airstrip in five weeks.

The Corps' wartime construction projects carried a hefty price tag. By 1942, these operations cost $20 million a day and totaled $11 billion.

During this boom, the Sacramento District's physical presence expanded. Field offices went up in Rio Vista, Marysville, Bakersfield, Fresno, and Reno. The District's military boundaries increased as well. Before 1941 these boundaries corresponded with those of California's Central Valley, but in 1942, Stead Air Force Base at Nevada's Reno Army Airfield became a part of the District's jurisdiction.

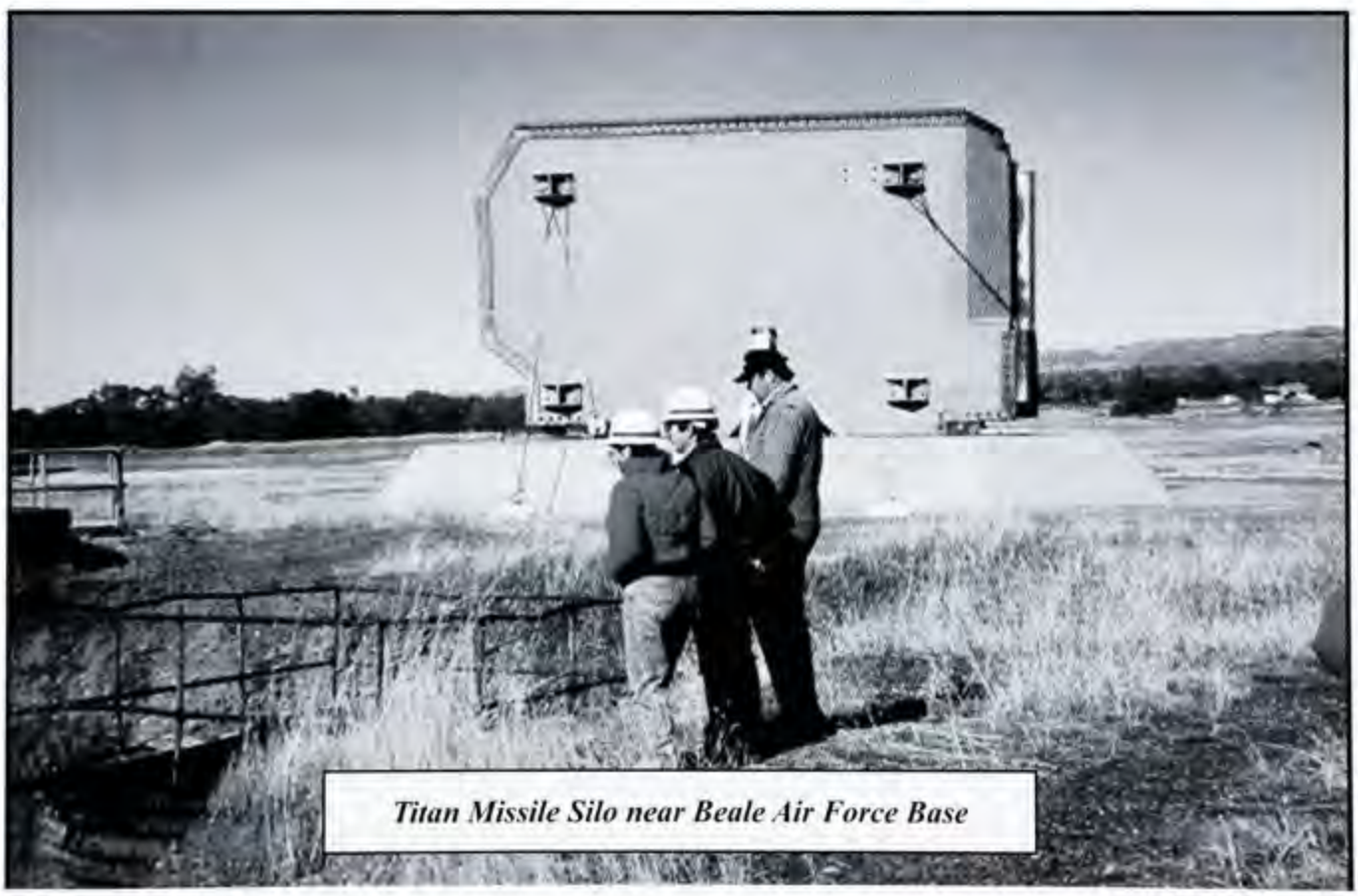
The Sacramento District also absorbed the Salt Lake City District as a result of a nationwide Corps effort to reorganize and to reduce administrative costs during wartime. During this transition, the 900 staff members at the Salt Lake City District shrank to 150, and its operations changed to those of a Sacramento field office.

After the victory in Japan and the end of the war, the large bases under the Sacramento District's auspices served as debarkation points for returning soldiers. The District's military functions and related activities (except underground explosives testing in Utah) dramatically declined in 1947.

Post-War Military Projects

By 1947, a new Cold War-era arms race was under way. District personnel were soon involved in gathering data for military personnel seeking locations in which to conduct large-scale underground explosion tests. Three sites were established: the Dugway Proving Grounds in Utah, Buckhorn Washington in Utah, and Grand Junction in Colorado. The completion of 70 underground explosions by 1952 signaled the cessation of western states testing in 1954.

Engineer Jim Coombs considered this underground explosion testing a pivotal assignment for the District. The lack of data on the effect of underground explosions and the manner of testing made the Corps' underground explosion tests a real challenge for the District. The data collected became the basis for the atomic testing in Nevada, and as



Titan Missile Silo near Beale Air Force Base

Engineer Jim Coombs remembers, galvanized the District in this effort.[12]

In 1951, following the outbreak of the Korean struggle a year earlier, the District's military work boundaries expanded again. Extending northward, the boundaries encompassed Sonoma, Napa, Solano, Sacramento, San Joaquin, Calaveras, and Alpine Counties. The Corps focused once again on familiar military construction and design tasks. During the Korean conflict, the United States dispatched sailors, soldiers, and airmen as a part of United Nations forces fighting the North Koreans and Chinese. Using runways and warehouses that had been built or expanded by the Sacramento District, military personnel departed for the Pacific from Travis, Mather, and McClellan Air Force Bases, Sierra Ordnance Depot, Sharpe Army Depot, and Lathrop and Tracy Depots. By 1953, the conflict had ended in Korea, but the role of the District in post-War projects continued to expand. In 1955, the District's military boundaries expanded to include all the counties of Nevada except Lincoln and Clark. The District's buildup during this time meant more challenging work for its members. The Strategic Air Command (SAC) expanded as a result of the Korean conflict, and the need of additional bases during the 1950's resulted in a request for the Sacramento District to build a modern air base for SAC. The War Assets Administration declared World War II-era Camp Beale as surplus, transferring it into one of the SAC bases. The District completed the airstrip at the former Camp Beale site in 1957.

After the USSR's successful launching of the artificial satellite Sputnik I in October 1957, the construction of Intercontinental Ballistic Missile (ICBM) sites was a nationwide, high-priority effort. In 1959, the District joined the effort when the Air Force contracted it to construct three Titan ICBM sites in northern California.

The District Enters Global Communications

Sacramento District engineers kept up their steady pace during the late 1950's and early 1960's. Military construction programs undertaken during this period included missile silos, runways, bases, community centers, medical facilities, stores, dorms, offices, and steam plants. But one project marked the District's entry into the nascent global communications field: before the close of the 1950's, the District had built the world's first automatic teletype installation. The Automatic Teletypewriter Switching Center included a transmitter station near Davis, California, a receiver station located on a mesa east of Middleton, in Lake County, California, and a relay tower mounted on the summit of Mt. Vaca near Vacaville, California.

The construction of the relay tower proved to be particularly challenging for the District. Engineers encountered inhospitable conditions on Mt. Vaca, including high winds and narrow trails. They struggled to transport heavy materials to the site and battled the elements when putting these materials in place. Once completed, this station became the official site for all U.S. Army teletype messages west of the Mississippi River. It also served as a relay point for radio messages between the Pacific Coast and Honolulu, Tokyo, and the Far East. It was an ambitious step toward expanding global communication.

Sacramento District: Hub for Military Design Works

At the start of the 1960's, District workers' responsibilities increased again as they faced their largest workload since World War II. SAC's extensive buildup and the Titan project were largely responsible for this. To accommodate the increased workload and shifting priorities, the Corps created the Corps of Engineers Ballistic Missile Construction Office to streamline ICBM construction. Though this meant the District no longer was responsible for the Titan project, the South Pacific Division transferred the San Francisco District's military design and construction work formally to the Sacramento District in July 1961. The Division also assigned all of San Francisco's civil and military real estate activities to the Sacramento District. These transfers meant that the District's engineers took over a huge number of military design and construction projects.

New Letterman Army Hospital
Presidio of San Francisco, CA - Circa 1967

These included military work at Hill Air Force Base, Dugway, Castle Air Force Base, Travis Air Force Base, Wendover Air Force Base, Sharpe General Depot, Golden Gate Cemetery, Letterman Hospital, Almaden Air Force Station, Fort Ord, Hamilton Air Force Base, Oakland Army Base, Benicia Arsenal, the presidios of San Francisco and Monterey, Fort Mason, San Francisco National Cemetery, and many other facilities.

The District was involved in two other projects in the 1960's related to the arms race against the USSR. In 1961, as part of a joint agreement between the Corps and NASA, the Sacramento District constructed two static test stands for the Saturn rocket engine. Shortly thereafter the District's engineers were responsible for building a base for the Sentinel, an Anti-Ballistic Missile (ABM), designed to provide long-range defenses against ballistic missiles.

The war in Vietnam also made an effect during the 1960's and 1970's, when the District took on the new wartime role of constructing veterans' hospitals. The District constructed the Western Medical Institute of Research at the Presidio of San Francisco and alongside it, the 550-bed Letterman General Hospital, dedicated in 1969. In addition to veteran's hospitals, the District constructed general hospitals, including the Silas B. Hayes General Hospital at Ford Ord in 1971 and a smaller hospital at Mather Air Force Base near Sacramento in 1968.

The Sacramento District had become the American West's hub for military design work. In 1970, the Division assigned to the District the design and construction work for Los Angeles and Seattle. The Seattle District had held centralized responsibility over military and design construction for the entire Pacific Northwest prior to this reassignment. This meant that the Sacramento District now oversaw the design work for California, Oregon, Washington, Nevada, Utah, Arizona, Idaho, and Montana—some 864,000 square miles of new territory. Between July 1, 1970, and June 30, 1971, the District awarded 146 military construction contracts in its newly expanded boundaries.

Post-War Civil Works Projects

Although most major navigation projects were completed on the San Joaquin and Sacramento rivers before World War II, some important undertakings had been delayed due to the war effort – notably, the Sacramento River Shallow Draft Channel and the Sacramento Deep Water Ship Channel. The shallow-draft project was authorized in 1899, with subsequent modifications in 1912, 1927, and 1935. Other post-War civil works navigation projects included the Sacramento River Flood Control project, the Suisun Bay channels, and the Baldwin and Stockton channels. Flood control projects were the Sevier River and Jordan River projects in Utah.

The 100-mile-long Sevier River, south of the Great Salt Lake in Utah which once supported riverbank crops, began to flood nearby fields and homes in the mid-1930's. After World War II, the Corps began to correct this river's problems. The excavation of banks and adding levees and a dam achieved excellent results. By 1951, improvements to the Sevier River were complete. Flood-control work was also done on Utah's Jordan River, which flowed into the Great Salt Lake and had the potential to flood both Salt Lake City and its outlying suburbs.

In the 1960's, the Sacramento District engineers undertook some new challenges. Established in 1964 and located first in Sacramento and later in Davis, a Hydraulic Engineering Center sought to improve hydrologic engineering techniques, use computer-aided simulation for flood designs, develop evaluative tools, as well as provide training for new hydraulic engineers.

Around the same time, the Corps established the Automatic Data Processing Center. Its large computer helped lighten the engineers' workload.

In January 1968, Sacramento became the nation's second largest Corps district when 104,000 square miles were transferred from the Los Angeles District. Also added was the Great Basin Area including sections of Nevada, Utah, Idaho and Wyoming—a region that had played a key role in World War II when its arid, mountainous terrain served as a backdrop for pilot training, aircraft repair, military storage, and detention camps.

When the Post Office Department, once Federally funded, became the self-sustaining U. S. Postal Service (USPS) in 1970, the Corps designed and constructed its new facilities for approximately two years until the USPS took over its own construction work. During this process, the Sacramento District oversaw all USPS design and construction improvements in those areas within its military boundaries of California, Nevada, and Utah.

Sacramento Deep Water Ship Channel

The deep water channel received authorization in 1927, and was enlarged as a result of the River and Harbor Act of 1935. (The River and Harbor Act of 1875 originally authorized the Corps to work on Sacramento River navigation. Congress modified the Act in 1882, 1889, and 1894).

While the outbreak of war in Korea delayed the Sacramento Deep Water Ship Channel project, its completion in 1963 was one of many large projects that the District undertook. The River and Harbor Act of 1946 paved the way for District engineers to draw up plans for the deep water channel – 30 feet deep and 43 miles long – between Suisun Bay and an inland harbor at Sacramento. At Lake Washington, the District installed a triangular harbor and turning basin and a barge canal with a navigation lock to connect the harbor with the Sacramento River. District engineers also installed a single leaf combination highway and railroad bascule bridge across the canal at the harbor end of the navigation channel.

By the time the channel was finished, the area it served was teeming with new residents. They included a high proportion of farmers who staked lands on flood plains, filled in swamplands, and conducted business in the harbor towns of Sacramento, Stockton, San Francisco, and Oakland.

Sacramento Deep Water Ship Channel

Significantly, the Sacramento Deep Water Ship Channel project strengthened bonds between the District, the State, and the local residents' interests in deep-draft vessels navigating the channel. The Federal Government and the Sacramento Chamber of Commerce shared the costs for the Sacramento Deep Water Ship Channel and the responsibility for its operation and maintenance. Corps engineers performed the initial dredging and excavation, and then maintained the finished channel. Local interests provided rights-of-way, relocation of utilities, and the installation of belt railroads and erection of terminals.

The Central Valley Project

In the 1930's, the U.S. Bureau of Reclamation's Central Valley Project (CVP) helped protect the Central Valley from crippling water shortages and devastating floods. After the completion of maintenance work in the late 1930's, the Central Valley's river systems demanded careful supervision.

The River and Harbor Act of 1935 also authorized the Central Valley Project (CVP), an irrigation plan to transfer excess water from the Sacramento River to the often-parched tracts in the San Joaquin Valley. This project became, in essence, the water plan for the entire state of California. Water problems had plagued the Central Valley for years, and the competing interests of farmers and those dependent on the rivers meant that advocates of irrigation and navigation improvements clamored for attention.

The Bureau of Reclamation and the Corps vied for the opportunity to construct the facilities for the colossal CVP, kicking off feuding between the two agencies that lasted for decades.

Historically, the Bureau of Reclamation's primary purpose was to supply water for irrigation and domestic use, and the Corps' responsibility was for flood control. After an internal feud between the Corps and the Bureau over the construction of Pine Flat Dam on the Kings River (the Corps ultimately built it), President Franklin D. Roosevelt approved the CVP on December 2, 1935, and transferred it from its status as a state project to the Federal Department of the Interior, permitting the Bureau to

build it. The Bureau of Reclamation and various state agencies now became involved. Although the Sacramento District had hoped to design and construct the CVP project, the District cooperated with the Bureau and other agencies and participated in the needed construction. The Flood Control Act of 1944 helped to define the responsibilities of both agencies.[13]

Flood Control Acts of 1936 and 1944

The Flood Control Act of 1936 gave the Corps responsibility for nationwide flood control as a matter of policy. It stated that flood control is an appropriate Federal responsibility. The Debris Commission's (which was a part of the District) focus on flood control laid the groundwork for future flood-control projects in the area. The physical and economic survey of water resources helped to forge a blueprint for area flood control.

Later, the Flood Control Act of 1944 resulted in the raising, digging, lengthening, widening, and/or straightening of a system of levees and channels. However, only ten years later, the Yuba River overflowed its banks, and the levee protecting Yuba City gave way. It was California's worst flood to date, killing 38, injuring 3,227, and submerging over 100,000 acres of farmland. District men and women worked day and night securing the riverbanks and rebuilding levees for months afterward.

Engineers constructed numerous dams after the Flood Control Act of 1944, including a new Folsom Dam on the powerful American River in 1956. (The original dam was built in 1893 to address the American River's significant flood threat to the city of Sacramento.) The new dam was three times the size of the original. This new dam contained a hydroelectric project and reservoir that would become an important part of the CVP. The Corps transferred the completed dam to the Bureau of Reclamation for operation.

The Flood Control Act of 1944 (Section 2) also called for a system of levees and channels. During the 1950's, 107 miles of levees were built in the northern end of the Sacramento Valley, and 41 miles were built north of Stockton. Existing levees were strengthened south of Stockton, and various creeks and lakes statewide were outfitted with new levees and channels.

The State along with neighboring agencies cooperated in the process with the Corps to complete these major river projects. They were usually polled about potential projects, and agreements were drafted outlining the local and Federal Government's respective responsibilities before the projects could begin. Sometimes these State and local agencies partially financed the projects, and often they were asked to maintain and improve the new utilities upon the project's completion.

National Environmental Policy Act of 1969

The National Environmental Policy Act's (NEPA) passage in 1969 would forever change the Corps' way of proceeding with new projects. Henceforth, an Environmental Impact Statement and alternatives were mandatory for each project significantly affecting the environment. In other cases, a finding of no significant impact (FONSI) would be sufficient. The Environmental Impact Statement would be submitted to the appropriate state and Federal Governmental offices and made available to the public. The House and Senate Committees could then choose to hold hearings on any plan. Legislation resulting from these hearings authorized the project, and subsequent acts determined funding.

From Tentative Beginnings to Flagship District

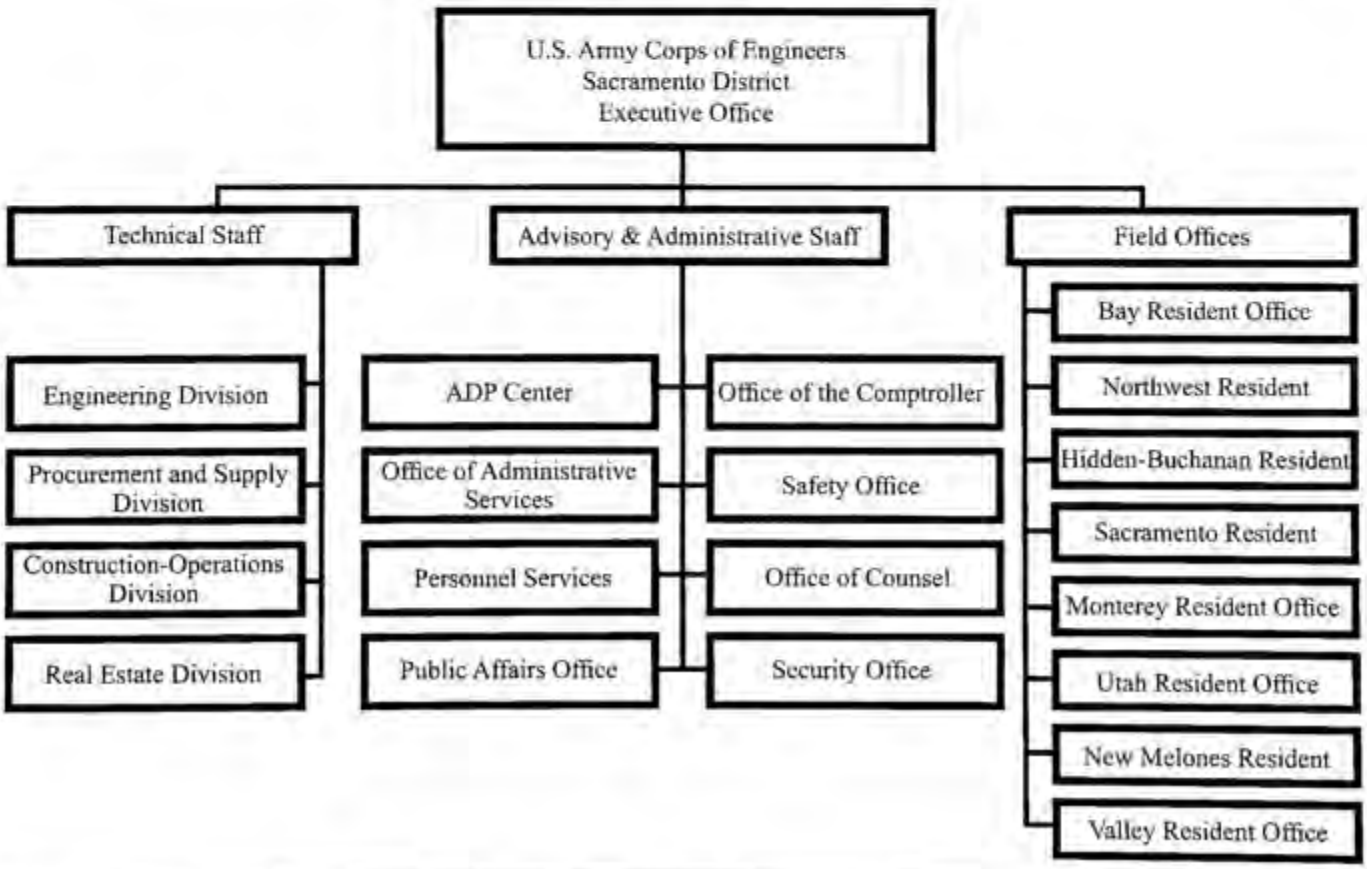
From a workforce of a few employees assembled in a hotel in 1914 to a staff that increased to nearly 2,000 during military buildup in the mid-1940's to a stabilized staff of more than 1,000 in 1973, the Sacramento District served a growing civil and military mission.

Following the Corps' early explorations of the West, the District played a key role in comprehensively surveying, mapping, and photographing the far West. Civil works occupied the District in its early years from 1907 to the 1930's, while it operated as part of the San Francisco District, to the creation of the Sacramento District in 1929.

Initially, the District's major mission was to improve navigation on California's two powerful waterways—the Sacramento and San Joaquin Rivers. Through the California Debris Commission, the District regulated hydraulic mining. The District subsequently developed the first comprehensive plan for providing substantial flood control for the Sacramento and San Joaquin Rivers through the Jackson Report, which created a bypass channel, enlarged and constructed levees, and weirs along the Sacramento River. The Sacramento River Flood Control Project was by far the largest flood control project in California, comprising 1,000 miles of levees, a major bypass flow way, and several large reservoirs with dedicated flood control storage.

While Civil Works occupied the District in the early years, the growth in its military work was in response to military needs. During World War I, and after, the District sought to increase the flood protection to arable land used for wartime food production in the Central Valley, and to develop and improve the Ports of Stockton and the Sacramento. During the war years from 1940 to 1945, the District's military construction mushroomed with the development of thousands of mobilization construction projects. These included arsenals, production plants, and storage depots as well as training schools, ports of embarkation, hospitals, Japanese-American relocation centers, and prisoner-of-war camps along with Army military facilities throughout the world. With the outbreak of the Korean conflict, the District's boundaries expanded along with its increase in military construction. Underground explosion tests along with work on the SAC's ICBM program saw an increase in military design as well as construction in the late sixties and early seventies. By 1968, the Sacramento District was the second largest district in the Corps.

Sacramento District Organization, 1973



The early 1970's would see a District poised for change. An infusion of new blood, with the old guard retiring, coupled with the challenges of the environmental movement would test the District, and through the process make it more responsive to changes that would inevitably shape its course and future.

Accommodating Expansion: New Blood Enters the District, 1973-2000

After the Sacramento District came into being in 1929, the Flood Control Act of 1936 paved the way for an expansion of the District's workforce. The act stated that the improvements on rivers and other waterways for flood control fell under the jurisdiction of the Secretary of the Army with the supervision of the Chief of Engineers. Therefore, those projects slated for "308" survey studies in the Flood Control Act of 1927 would now be examined in depth, thereby requiring an expansion in the District's workforce. The District started hiring young engineers steadily in 1937, when the head of the Engineering Division employed a full third of the engineering graduates from the University of California, Berkeley, class of 1938.[14]

Eleven years later, in 1949, the Chief of Engineers instituted the Corps-wide Junior Engineering Training Program, popularly called JET, to bolster engineering recruiting nationwide. The program sought young capable engineers and rotated them among various positions including planning, engineering, and construction-operations. Through this process, newcomers could develop a broad-based, well-rounded approach while learning from those who had devoted their entire careers to the Corps. George Weddell, an intern in the JET program of 1949 (who by 1971 had become Chief of the Engineering Division), recalls his experience:

> *The District hired fifteen people to start out this experiment. It was on a trial basis and it worked well up until the time of the Korean War, and then it had to be suspended. But then it was resumed, and that was the focal point at which we relied on the Engineering Division and the Construction Operations Division to keep feeding in new blood at the bottom. It was the lifeblood of our organization.... From that we developed a nationwide career development program for scientists and engineers of the program.... Fifteen of us were pared down...upon completion and time off for the Korean hostilities. I think only six or seven wound up staying with the District.*[15]

The District enjoyed a stable workforce during the 1940's, 1950's, and 1960's. The career employees, those who stayed for decades, came to know best the Corps' long-term responsibilities and goals. The years yielded a number of second- and even third-generation Corps employees. The stability of this workforce fostered a sense of continuity and also created a corporate memory that has proven invaluable. District Commander George Fink (1969-1970) remembers:

> *Fortunately, in the District, the civilians are there forever. We had people in [the] Sacramento [District] that had been there 30 or 40 years. If you hadn't been there thirty or forty years, you were a rookie, so they have, [and] they provide, that corporate memory.*[16]

The Sacramento District's workforce had evolved into a tightly knit organization by the 1970's, contributing to the development of what some staff perceived as a distinct character. This stable workforce owed much to the city's amenities—a quiet environment for family life in the area, the equitable climate, and the relatively low cost of living. There also were job-related reasons for high staff retention including challenging engineering work.

As the South Pacific Division's largest district, the U.S. Army Corps of Engineers' Sacramento District has repeatedly risen to meet dramatic challenges. Over and over it proved its worth by administering

the Division's financial, accounting, and budgetary needs, and stepped up to support its sister districts when called upon. For example, the Sacramento District assumed some of the design and construction tasks for the San Francisco and Los Angeles districts when their workloads were excessive. In 1973, the District employed approximately 890 full-time employees, 583 of them for civil works projects and 287 for military projects.

The Sacramento District administered programs for construction, engineering and design, real estate, research, and other activities. In 1969, the civil works budget was $26.5 million and the military budget $42.9 million, both having increased overall steadily from a little under $70 million to more than $152 million by 1973. Of the District's three principal divisions (Engineering, Real Estate, and Construction-Operations) Engineering was the largest in manpower. District Commander Donovan (1970-1973) later recalled the professionalism of the engineers and the planners in the District. According to Donovan, there were knowledgeable and brilliant engineers to tackle the challenging military and civil works projects and staff fully capable of handling any construction and design project that the District addressed.[17]

The District needed this expertise and more, for its principal concern was obtaining adequate numbers of personnel to handle the workload, finding space for them, and meeting deadlines to obligate funds to avoid losing the money. This often amounted to a precarious balancing act.

The Beginning of Environmental Activism

By the early 1970's, environmental awareness became more widespread than ever. Undoubtedly sparked by American biologist Rachel Carson's 1962 best-selling book *Silent Spring*,[18] grassroots environmental organizations sprang up nationwide to work for political change. The National Environmental Policy Act passed in December 1969, and the first Earth Day on April 22, 1970, focused on the environment and saw millions of Americans become more conscious of environmental issues. In 1970, a presidential advisory committee recommended consolidating agencies to form the Environmental Protection Agency (EPA), and two years later Congress passed the Clean Water Act of 1972, over President Richard Nixon's veto.

California was home to some of the nation's most active environmental groups and some of the savviest and best educated voters. Not surprisingly, the state was also home to numerous endangered species. The District found itself needing to respond to an increasingly aware and vocal public. At the same time, it faced a plethora of environmental regulatory requirements pouring out of an aroused Congress.

Significantly, many in the District were sympathetic to the new concerns of the early 1970's. District Commander James C. Donovan, as a military officer in his first command, adopted a pro-environmentalist agenda. Michael Bonner, who came to the District in 1971, remembers Donovan as... probably one of the first District engineers who had a leaning towards green. Donovan believed that we needed to be thinking about the effects of what we do on the environment, and of course in that time frame that's when NEPA [National Environmental Policy Act] and CEQA [California Environmental Quality Act] were coming into vogue. So there was a change beginning in how the Corps of Engineers thought about our effect on the environment.[19]

When asked about his penchant for the environment, Donovan explained: "I think my hunting and fishing really did sensitize me to the need for habitat."[20] Donovan did much to promote the Corps' environmental positions, particularly in the New Melones Dam project. Maintaining an active public-relations campaign, he appeared in public regularly and addressed environmental groups, authored articles that appeared in various newspapers, and created a newsletter entitled "PACE: Public Activities of the Corps of Engineers" that stressed environmental advances.

"I spent a lot of my time as the spokesman for the Corps and the spokesman for the District," Donovan later recalled. "You might say I handled the outside work, and the staff handled the inside work." Among the staff, he was viewed as a General George Patton for the energetic way he lunged into projects, and

for his sometimes verbal abuse of some of the senior staff.

Thus the Sacramento District was poised to meet dramatic challenges in the 1970's and thereafter. The District responded to an increasingly aware and vocal public. At the same time, it faced numerous environmental regulatory requirements flowing from an attentive Congress. The District's ability to adapt to change was about to be soundly tested as it undertook one of its most extensive projects – the construction of the New Melones Dam.

Endnotes

[1] With the exception of the last two subheadings, This chapter is in part a summation of Joseph J. Hagwood, Jr., *Commitment to Excellence: A History of the Sacramento District, U S. Army Corps of Engineers: Sacramento, 1929-1973.* Sacramento: 1976. However, some parts are based on new research. Although Hagwood provided a bibliography, no footnotes or endnotes were provided in his book.

[2] Leidesdorff also has the distinction of launching the first steamboat to sail on San Francisco Bay. See Sue Bailey Thurman, *Pioneers of Negro Origin in California.* San Francisco: Acme Publishing Co., 1952.

[3] The history of the Army Engineers can be traced back to 1775. Following the Revolutionary War, Congress disbanded the Corps of Engineers. It was reestablished in 1802.

[4] Robert Kelley, *Battling the Inland Sea: Floods, Public Policy, and the Sacramento Valley.* University of California Press, 1989, p. 10.

[5] Robert Kelley, *Gold vs. Grain: The Hydraulic Mining Controversy in California's Sacramento Valley.* Glendale, CA: Arthur H. Clarke, Co., 1959, p. 26.

[6] Robert Kelley, *Battling the Inland Sea: Floods, Public Policy, and the Sacramento Valley,* p. 15.

[7] *Ibid.*, pp. 10-11.

[8] Joseph J. Hagwood, Jr., *The California Debris Commission.* Sacramento: US Army Corps of Engineers, 1981, p. 31.

[9] *Ibid.*, p. 282.

[10] Robert Kelley. *Gold vs. Grain: The Hydraulic Mining Controversy in California's Sacramento Valley*, p. 81.

[11] Joseph J. Hagwood, Jr., *Commitment to Excellence: A History of the Sacramento District, U.S. Army Corps of Engineers: Sacramento, 1929-1973,* p. 63.

[12] *Ibid.*, p. 77.

[13] Currently under the direction of the Department of the Interior, the U.S. Bureau of Reclamation was created in 1902 to ensure water for farmers and cities in the West. The agency conducted a massive construction program of dams, reservoirs, and pipelines. The U.S. Army Corps of Engineers has been in existence since 1775. In addition to its military design and construction responsibilities, the Corps is in charge of the construction and maintenance of the nation's waterways, flood damage reduction, ecosystem restoration, and watershed planning among other responsibilities. Some of these responsibilities are shared with other agencies.

[14] Joseph J. Hagwood, Jr., *Commitment to Excellence: A History of the Sacramento District, U S. Army Corps of Engineers, 1929-1973,* p. 40.

[15] Interview Dr. Willie Collins with George Weddell, August 25, 2000.

[16] Interview Lee Pendergrass with Brig. Gen. (Ret.) George Fink, March 3, 1989.

[17] Interview Willie Collins with Colonel James C. Donovan, April 7, 2000.

[18] Rachel Carson, *Silent Spring.* New York: Fawcett, 1962.

[19] Interview Dr. Willie Collins with Michael Bonner, March 30, 2000.

[20] Interview Willie Collins with Col. James C. Donovan, April 7, 2000.

Chapter 2

The New Melones Dam Project:

Riding with the Changes

Perhaps no other Corps project so typifies the culture of change that engulfed the Sacramento District in the 1960's and 1970's as the New Melones Dam Project. This project broke ground in 1966, but not before years of environmental study, lawsuits, and hearings made it one of the most controversial Corps projects in the American West.

To fully understand the challenges of the New Melones Dam project, one must first look at the District's preceding two decades, which were marked by expansive growth followed by the development of a work force characterized by longevity and stability. These factors created a culture within the District that made adapting to the impending national culture of political and social change very challenging.

By the time the New Melones Dam Project came to the table in 1966, the District was already in the midst of adjusting to the realities of having to be accountable to vastly divergent interests that included river activists, environmentalists, farmers, and small-town valley businesses and area residents. This set the stage for the District's massive new project – the New Melones Dam. The story of its construction is one of an organization undergoing a trial by fire as it attempted to satisfy new laws and adapt to a new way of looking at the environment.

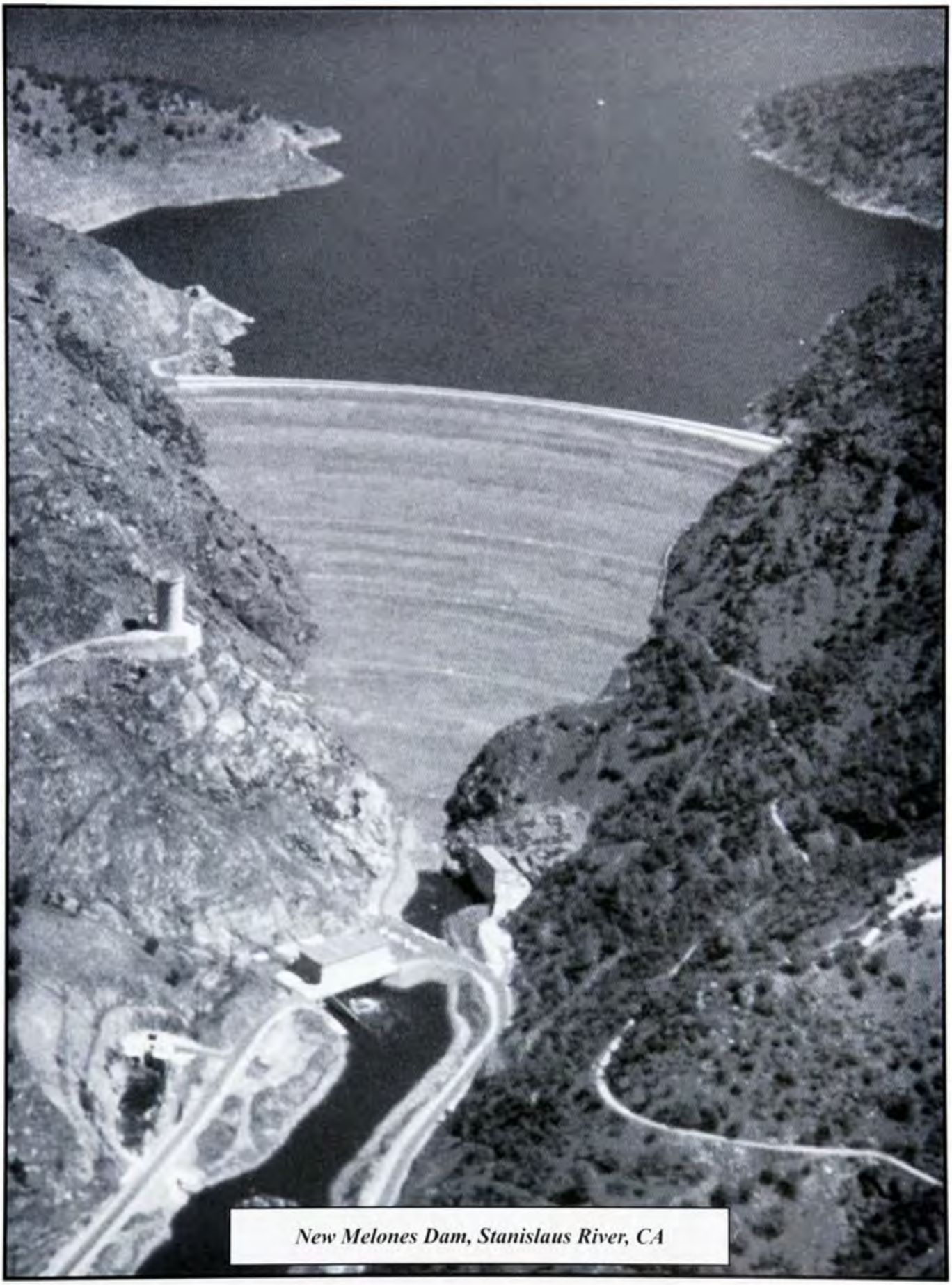
The Evolution of a Dam

The first Melones Dam was built on the Stanislaus River in 1926. The original dam had been built to provide irrigation water to local farmers. However, by the 1940's, floodwaters were rising perilously and frequently in California's Central Valley. The fears and worries of farmers and officials in that agriculturally rich region rose along with water levels. And rightly so, for a combination of heavy rain at the area's lower elevations and snow at the higher ones threatened to submerge crops. Approximately, 35,000 acres of farmland along the lower San Joaquin River and the Stanislaus River were at risk of flooding many delta towns including Oakdale, Riverbank, and Ripon. In 1944, Congress authorized the Flood Control Act of 1944, Public Law 534, to construct the New Melones Dam, to stanch potential flooding and also to serve local irrigation and hydropower needs.

The proposal for the New Melones Dam, located 40 miles east of Stockton and 7 miles north of Sonora, prompted many discussions among the Army's Chief of Engineers, the Bureau of Reclamation, and the California Department of Water Resources. The central issue was how to balance competing interests in a single resourc3 – the Stanislaus River. Tensions arose between the Corps of Engineers and the Bureau of Reclamation over the jurisdiction and administration of the Stanislaus River, as well as several other rivers. Congress resolved the interagency conflict over the Stanislaus in the omnibus Flood Control Act of 1962 by authorizing the Corps to build the dam and the Bureau of Reclamation to operate the dam and reservoir.[1] After several revisions to the original authorization, the proposed dam project took on some additional dimensions, including recreation, water-quality control and improvement, fishery enhancement, and environmental mitigation, and the District proceeded with the plans to construct the dam. As construction continued on the dam, the Sacramento District's Department of Real Estate acquired 27,000 acres of land in 197 tracts between 1968 and 1971.

On October 10, 1972, the initial contractor bidding for the project yielded the lowest bid of $83.2 million, but with the delays resulting from the legal appeals, the original low bidder was unable to extend the bid, so a new request for bids in December 1973 resulted in the award of the contract for $109,709,637 in March 1974. The contract was awarded to the joint venture of Guy F. Atkinson Company, Gordon H. Hall, and the Arundel Corporation, known as the "Melones Contractors," for the construction of the dam and appurtenances. In addition to the main dam, appurtenances, and the power plant, the contract included the construction of three bridges: Archie Stevenot Bridge on Highway 49, the Parrotts Ferry Bridge and road relocation, and Camp Nine Bridge and road relocation.

The project team members at the District overseeing the contracted work included Resident Engineer Joe Nelson, Assistant Resident Engineer T. Smith, Field Engineers R. Leatherman and R. Houtrouw,



New Melones Dam, Stanislaus River, CA

Embankment Engineer Clark Stanage, Resident Geologist Justin Moses, and Chief Inspectors H. Barz and J. Cogan. The District executed supplemental contracts for $5.3 million to the Allis-Chambers Company for two power turbines, a $6.2 million contract to General Electric for two 150-megawatt generators, and a contract for $39,944.95 to the Melones Contractors for the construction of the power plant and appurtenant structures.

Construction of the Spillway and Powerhouse

For the release of overflow water from the reservoir, the District constructed an ungated spillway that extended for more than a mile and emptied into Bean Gulch, which is a small streambed that eventually joins the Stanislaus River near the New Melones Switch Yard.[2] The majority of material for the dam embankment came from the spillway excavation.

In addition to the spillway, the District oversaw construction of a two-unit powerhouse located on the north bank downstream from the dam. Construction began on the powerhouse in 1976 with its completion in 1979. The powerhouse structure required the excavation of 278,000 cubic yards of earth and the placement of 75,000 cubic yards of structural concrete. Appurtenances of the powerhouse included outlet works, tailrace channel, and related structures. The capacity of the powerhouse's 300 megawatts, as well as the average generating capacity, is approximately 279 megawatts, resulting in approximately 455 million kilowatt-hours of energy annually. This is equivalent to the annual electrical requirements for approximately 72,000 households.

After overcoming many obstacles, the New Melones Dam Project was finally completed in 1978. At the time of completion, the dam was one of the largest and highest earth-and-rock dams in the United States. At 625 feet high and 1,560 feet long with a storage capacity of up to 2.4 million acre-feet of water, the New Melones Dam spanned the banks of the Stanislaus River 60 miles upstream from the river's confluence with the San Joaquin. From the reservoir's storage capacity, approximately 450,000 acre-feet of space are set aside annually to store floodwater during the rainy season. In 1979, the

Outlet Works, New Melones Dam - Circa 1978

Powerhouse Construction, New Melones Dam - Circa 1977

project was transferred to the Bureau of Reclamation for operation and maintenance.

Today, this multipurpose project provides flood control, recreation, irrigation, water supply, and hydropower, which generates 300,000 kilowatts of power – enough to satisfy the needs of 200,000 households.

The Historical Perspective of the Stanislaus River: Recreationists Discover the Stanislaus River

The deep rooted attraction to the river basin by the river activists and recreationists was one passion that furthered their opposition to the proposed dam, yet the river was once a place used by the local Native American Indians. Long before the area became a destination for outdoor enthusiasts, it played an important role in the lives of the Central Sierra Miwok Indians. The California Gold Rush of 1849 spurred non-native development of the area, and by the 1890's, utility companies turned to the Stanislaus basin for hydroelectric power.[3]

By the mid-twentieth century, recreationists were discovering their own uses for the Stanislaus. Cave explorers, or "spelunkers," first called attention not only to the caves along the river, but also to the Stanislaus as a spectacular river run. One such cave explorer was Ray DeSaussure, a white water rafter who explored the wilderness caves in the steep marble and limestone canyons along the river and marveled at the natural formations and the spectacular arrays of stalactites and stalagmites. Word spread about the beauty of the caves and the lovely river that ran through the canyons. DeSaussure's fellow Sierra Club member Bruce Grant organized an informal white water group in 1952 to explore the river and caves. A year later, this group became established as the Sierra Club's River Touring Section of the San Francisco Bay Chapter.[4]

By the late 1960's, the caves also attracted Friends of the River founder and environmentalist Mark

Dubois. Dubois stated, "After going down the river a few times, I started loving not only the caves, but also the magic of the river, the excitement of the white water, and just the beauty of the canyon and all of its wildlife."[5]

In 1962, Bryce Whitmore started Wilderness Water Ways after touring the river basin on a Sierra Club sponsored trip. After the company was established, it sponsored one of the first trips for the public on the Stanislaus River.[6] "I had the river to myself for a year or two," recalled Whitmore, "until companies such as American River Touring Association and others began taking tours."[7]

Whitmore along with his rafting friends named many of the prized rapids on the 9-mile run from Camp Nine to Parrots Ferry: "Death Rapid," "Cadillac Charlie," "Bailey Falls," "Six Pack," "Rose Creek," and "Mutha."

It was evident that as the white water rafting business began to thrive, the river rafters themselves became some of the first major opponents of the New Melones Dam Project. The Chief of the Investigation Section C of the Engineering Division, Darryl Salladay, worked on the project, and he stated, "As far as opposition is concerned, we were getting letters [of opposition] from people who were using the river for whitewater rafting."[8] By 1965, business for Whitmore's Wilderness Water Ways skyrocketed after articles appeared in the California State Automobile Association and Sunset magazines describing the joy of river running and extolling the beauty in the stretch of the Stanislaus River from Camp Nine to Parrott's Ferry.[9] Many kayakers, raft groups, canoeists, and skin-divers regretted not discovering the river years earlier and forestalling the dam. "How we wish these interested state officials could have been around ten years ago when the federal project was first being pushed by the Army Corps of Engineers!" they declared.[10]

Whitewater Rafting on the Stanislaus River, CA

An Era of Change: Complying with New Federal Environmental Policies

The shifting exigencies and public interest in the environmental movement, as well as the congressional enactment of numerous environmental protection statutes in the late 1960's and early 1970's, had a tremendous effect on the District. Some of the statutes passed included the National Environmental Policy Act of 1969 (NEPA), the Clean Air Act of 1970, the Clean Water Act amendments of 1972, and the Endangered Species Act of 1973.

In general, the Corps had to become more responsive to the environment. In the case of the New Melones Dam Project, the District had to understand what types of effects the proposed project would have on the limestone canyon of the river basin, the archeological and cultural significance of the caves, and the issues of where and how the irrigation water would be used. The change required that employees needed to be educated to the new political and environment climate, and this was a difficult task.

Brigadier General (Retired) George Fink, District Commander in 1969-1970 and also South Pacific Division Commander, 1972-1974, recalled how difficult change was for some of the older staff members:

> *One of the problems I had as both District and Division Engineer is that there were a lot of old-timers that had been around for 30 or 40 years, and the environmental movement was totally new. They had the experience [of] having been around and seen the floods and seen the droughts and they knew the...value of these projects. Therefore, they tended to be much less tolerant of these environmental people than, say, I was as a District Engineer who had only been around for a short period of time. They figured they were irrational and they didn't know what they were talking about, so they just didn't want to deal with them.*[11]

The younger recruits were more receptive to changes, which could be attributed to their age and educational background. "I think at that time the younger graduates were coming out with more of a social concern and not so much technical because [they] had a broader education," recalls George Weddell, former Chief of Engineering Division.

The passage of the NEPA in 1969 (signed into law on January 1, 1970) forever changed the practices of Federal agencies. NEPA was considered the most important and far-reaching environmental and conservation measure ever enacted by Congress. The timing for the construction of a massive project like the New Melones Dam proved to be a trial by fire for the Sacramento District during this environmental movement. Joe Countryman, former chief of Civil Design Branch, stated that the project was "all new ground both for the environmentalists [and] for the Corps of Engineers. The Corps got very tentative... and...allowed the environmental community to take the initiative and control the press and a lot of the [public] response,"[12] Countryman recalls.

At this time, environmentalist and Sierra Club State Water Committee Chair Gerald Meral saw it differently. To Meral, the environmental struggle was uphill because the Los Angeles Times and the Sacramento Bee news coverage was pro dam, while the San Francisco Chronicle's coverage barely gave the environmentalists a marginal hearing.[13]

The Corps had to contend with more than environmentalists, river activists, and environmental impact statements. Congress also required the Corps to adhere to many laws like the Fish and Wildlife Coordination Act of 1934, which was put in place to protect, rear, stock, and increase the supply of game and fur-bearing animals. Amendments to the act in 1958 added provisions to recognize the vital contribution of wildlife resources to the nation. Several other statutes that the Corps had to comply with included the U.S. Historic Preservation Act of 1966, which allowed preservation of historical and archeological sites. Two years later, the Wild and Scenic Rivers Act of 1968 provided that select U.S. rivers and their immediate environments be preserved in

free-flowing condition because they possess remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

In addition to the new Federal statutes, environmental protection mandates also emerged at the state, county, and local levels, including the Delta Water Protection Act of 1959, the California Environmental Quality Act (CEQA), and the state Wild and Scenic Rivers Act.

The Environmental Impact Statement: The New Melones Dam Battleground

The District's project team members working on New Melones Dam not only had to understand and comply with new Federal laws, they also had to deal with a new kind of environmental activism. The District released the final Environmental Impact Statement (EIS) for the New Melones Dam Project in May 1972. District Commander James C. Donovan (1970-1973) recalls the difficulties of preparing the EIS at a time when the concept was new:

> *When we received changes in our operating procedures that required EIS's, we all looked at each other and said, " What is an EIS?" We had to devise a method of writing one and put ourselves in the place of Congress, who had passed this legislation, and try to live up to the spirit of the legislation. So we formed a civilian advisory committee and worked with a group of consultants to help prepare the EIS. The guidance we received from the Office of the Chief of Engineers about the content of an EIS was minimal. The entire Federal establishment had to adjust to the requirements of NEPA, and no one knew really what an EIS was supposed to be exactly. But we were going to make a complete, accurate, and professional statement about the impact of New Melones on the natural environment and on the human environment. We were very clearly pioneers.*[14]

Under Colonel Donovan, the District halted the bid-solicitation process for dam construction in the middle of drafting its final EIS. Donovan wanted to assure himself and the public that the Sacramento District had done everything possible to comply with the new policies and laws regarding the environment.[15]

Darryl Salladay, Chief of the Investigation Section C of the Engineering Division, recalled that one of the major arguments from the river activists and environmentalists was the EIS did not address the use of water, for example who was going to use the water and how would it be allocated.[16] The Bureau of Reclamation ended up preparing the supplemental EIS that addressed the use of the water.[17]

Even after the submission of the final EIS, several issues surfaced. The first situation was known as the "white water issue." The river activists wanted to keep the stretch of river known as "Camp Nine" untouched for recreational purposes. The proposed project for constructing the dam and filling the reservoir would ultimately destroy this section of the river. The District had no option but to list the "whiter water issue" and the conflict that arose as an "Adverse Environmental Effects Which Cannot Be Avoided" (in the language of the EIS).

The second obstacle the project team members faced was that NEPA required an alternatives analysis be written for the proposed action. This was documented in a six-page chapter in the original EIS, which outlined the alternatives. Yet, the Environmental Defense Fund (EDF) still considered bringing suit, maintaining that the alternatives were insubstantial at best, and that "the entire report is written under the presumption that the project will continue to be built as presently planned."[18] [19]

Still another significant issue was where and how the dam's irrigation water would be used. New Melones Dam was expected to yield 285,000 acre-feet of irrigation water annually. The project's feasibility studies assumed that this water would be used in the Stanislaus River basin, with any surplus diverted to the southern San Joaquin Valley through the Central Valley Project's aqueduct. Environmentalists opposed "further diversion of water from streams draining into the Central Valley without first assur-

ing that water quality needs in the Sacramento-San Joaquin Delta would be met."[20] Also, in the response to comments to the EIS, the Sierra Club indicated that its primary concern was "the proposed use of the water in the East Side Division." [21] (The East Side Division is defined as New Melones Dam, the reservoir, and the Stanislaus River.) Members felt that there was ample evidence of an overproduction of agricultural crops in California (therefore the water could be better used elsewhere).[22]

Stopping the Dam in Defense of the River: New Melones Dam Project Goes to Court

In challenging the dam, the river activists and the environmental interest groups drew strength from NEPA. At the time NEPA was passed, it was said to have been the "Magna Carta" of the country's environmental movement. The essential purpose of NEPA is to ensure that Federal agencies give the same consideration to environmental factors as to other factors in making decisions. Therefore, it was the responsibility of the Federal Government to administer Federal programs in the most environmentally sound fashion. NEPA established the Council on Environmental Quality (CEQ) in the executive office of the president. The CEQ's duties included advising the president on environmental issues and interpreting NEPA provisions for agencies and the public. NEPA also required archeological surveys be completed for Federal projects. It also mandated that public documents, such as environmental assessments, be prepared, which weighted the environmental costs of the proposed project and how to prioritize environmental concerns.[23]

Following the creation of the EPA in 1970, political resistance to Federal water projects increased, and from review of the associated environmental document, public scrutiny of such projects and participation in their reviews soared. The resistance to this project increased popularity of the Stanislaus River among rafters and other recreational users, which also added to this resistance.[24]

The District having to comply with the new Federal laws and regulations not only attracted criticism from environmentalists, but also opened the door to legal suits from private organizations. In 1972, longtime Corps critic Gerald Meral, Sierra Club State Water Committee Chair, noted the growing popularity of court actions. The EDF's consideration of the New Melones Dam project as a potential candidate for court action pointed to the many conservation organizations and the (EDF) tactic to forestall Corps' projects by using lawsuits. EDF's method used scientific knowledge and the testimony of scientists as defense in the courtroom.[25]

In June 1972, the EDF succeeded in halting the project for an entire year with a lawsuit.[26] The white water rafting companies, such as American River Touring Association, Adventures Unlimited, American Guides Association, Outdoors Unlimited, White-Water Expeditions, Wilderness Water Ways, Wilderness World, River Adventures-West, Duncan-Coldwell, and the Sierra Club, joined the EDF in the suit against the District. Three issues were mentioned in the suit opposing the project. The first issue was for the preservation of a stretch of white water that had become a popular recreational rafting course. The second issue was for the inundation of one of America's deepest limestone canyons, and the third issue mentioned was for the archeologically and culturally significant caves located in the canyon. Later, EDF then added to its concern over the projected use and storage of the irrigation water.

In yet another turn of events, the Sierra Club State Water Committee Chair and staff scientist for EDF, Gerald Meral, organized the scientific evidence against the dam, asserting that the District had evaded the benefit-to-cost ratio by inflating the benefits and underestimating the costs, thus making the proposed project the preferred alternative. Furthermore, Meral argued that the District grossly exaggerated the projected recreational use for the reservoir. The District Court for the Northern District of California heard the case in the fall of 1972, and on November 14, 1972, the court ruled that the EIS was adequate and ordered a supplemental EIS be prepared to address particular issues like the preservation of the archeological artifacts.

In January 1973, the District filed the supplemental EIS, which the court declared adequate the following March. Opponents of the dam challenged the ruling on the supplemental EIS, taking it to the United States Court of Appeals for the Ninth Circuit. The court upheld the District Court's ruling, and the United States Supreme Court, to whom the opposing groups went next, refused to hear the case.[27]

The motives of EDF for the suit were beginning to be questioned by the project proponents. According to historians W. Turrentine Jackson and Stephen D. Mikesell, there had been some newspaper accounts and editorials that suggested the suit was simply a means of protecting the direct financial interests of the various commercial rafting companies that were among the plaintiffs in the case.[28] The rafting activists denied the charge. "We were on a parallel track with EDF," declared Dick Linford, a co-owner of Echo, a white water- rafting company. "This is a great river. We can make a business here.[29] What a lucky spot to be in – to be environmentally correct and be able to make a business go."[30] Friends of the River's Mark Dubois agreed: "We all fought for the place that we fell in love with. In some cases, there was a financial connection, but in most cases, it was a love affair with a place."[31]

To the rafting activists and other opponents, the issue was whether the District was complying with all the Federal requirements in good faith. The opposition also doubted that the District could oversee construction by private contractors and maintain quality control while complying with archeological preservation and other types of mitigation.

Potential Earthquakes Bring To Light Engineering Issues

Besides environmentalist opposition, the District also worried about the ever-looming threat of major earthquakes. The location for New Melones Dam is an area in the Sierra Nevada's foothills, which is known for its fault lines. The fault lines had historically been considered "dead" because of their advanced age and the nearly complete absence of recent quakes. In 1975, that attitude changed when an earthquake occurred in northern California near the Oroville Dam. The District then reevaluated the New Melones' geological and seismological environment and hired the consulting firm of Woodward-Clyde. Seismographs were installed around the reservoir in an area 13 miles wide and 32 miles long. Woodward-Clyde recorded micro seismic activity before, during, and after filling of New Melones Lake.

The District engaged the services of several other consultants including Clark Stanage, an Embankment Dam Engineer for the District, to offer the New Melones project engineers information on geological principles as well as design and construction criteria. These consultants became known as the New Melones Board and were specialists in the fields of engineering geology, applied soil mechanics, and geotechnical engineering.[32] In a July 1977 meeting, the Board found that the embankment of New Melones was stable enough to endure large-magnitude quakes.[33] The Board went on to explain that an earthquake on the magnitude of 5.7 had a 30 percent chance of occurring during the life of the project.[34] In addition, the Board recommended building an embankment dam that could withstand shaking from the known fault. Also, the materials necessary for such a large dam had to be quite specific in size and gradation.[35]

Surveying and Protecting Cultural Resources

The New Melones Project was met with many challenges, such as flood control, environmental effects from the proposed project, and seismological concerns. The District also needed to consider the area's archeological, cultural, biological, and recreational resources. Although minimal surveying efforts began in the late 1960's to survey the river basin and adjacent canyons, it was not until the passage of Public Law 93-291 in 1974 that any real funding became available. Subsequently, it took time for the District to implement the surveys, and the costs were high. The $2.8 million cost in 1976 for mitigation of the cultural resources made the New Melones one of the nation's largest cultural resources efforts, as well

as the District's first large-scale cultural resource mitigation project.[36] Moreover, Federal laws and regulations were evolving during the course of planning and the construction of the proposed project, and thus the issue of compliance was not clear. According to Patti Johnson, the District Archaeologist, "the resource mitigation effort was a highly visible program and one that was easily challenged since decisions of what was important and how much mitigation was 'enough' were very subjective."[37] River activists and other opponents frequently questioned the adequacy of the District's cultural resources survey and mitigation as a means to delay project completion.

The endangerment of losing cultural property required the District to complete a cultural assessment study and to execute a Memorandum of Agreement (MOA) between the Corps and the state.[38] The MOA would allow thorough guidance for completing the assessment and implementing any avoidance and minimization measures. According to the former District Commander Donald O'Shei (1976-1979), the MOA represented a significant step toward realizing the overall project's completion. It required the approval from the State Historic Preservation Officer who had been appointed by Governor Edmund G. Jerry Brown at that time. O'Shei stated, "Without the MOA the project would have not proceeded."

Since the mitigation effects for the cultural resource process were so new, there was a learning curve not only for the State Historic Preservation officer, but also for the District and other Federal agencies, such as the National Park Service, the National Advisory Council on Historic Preservation, and the archeologists in the academic community. The large number of historic and prehistoric sites requiring evaluation in a relatively short period of time sometimes compromised the archeologists' ability to respond with meaningful research in the tradition to which they were accustomed.

Lewis Whitney, Chief of Civil Design Branch, recalled that the process was anything but smooth sailing. No one agreed with the mitigation recommendations for the cultural resources, whether they had worked on the project or not. Divergent voices complained about the process of the cultural resource compliance that had to be followed. Michael Moratto, a consultant responsible for some of the District's archaeological surveying in 1974-1976, noted the conflicts between the timelines of the archaeological digs and the actual construction of the dam.[39] President Jimmy Carter's Interior Department staff, Whitney recalled, were not great advocates of the project, and some of the members of Friends of the River were pressuring their congressional representatives about the integrity of the Cultural Assessment Report. In one public meeting with the State Historic Preservation Officer to hammer out the MOA, the discussion became so heated that someone in the audience even threatened to blow up the dam, according to Whitney. Nevertheless, the Sacramento District and the State Historic Preservation Officer persevered and finally signed an agreement finalizing the MOA.[40]

After the MOA was signed, evidence of a Native American presence at the New Melones location dating back to prehistoric times required that the District exercise extreme care to not damage these sites and the newly discovered artifacts. But according to Patti Johnson, the District's Archaeologist, the Corps recognized that there would be an "irretrievable loss" of data, whether it was from prehistoric or historic sites. A primary objective of the District was to preserve most of the sites above gross pool elevation. The Central Sierra Miwok objected to the dam in general and to the inundation of the burial place in particular.[41] Whitney remembers "that the Central Sierra Miwok were quite concerned about the burial locations." It was through their concern that some of these grave locations above gross pool were preserved. However, the District's contractors and many other members of the archaeology community supported preservation of the sites. Patti Johnson sums up the problems as follows:

> *When the Department of Interior turned over responsibility for cultural resources mitigation to the Sacramento District in 1976, construction of New Melones dam was underway. The pressure to hurry before the dam was completed coupled with the need to hire a large number of field workers, some of whom were not trained in archeological methods, along with the requirement to work on numerous sites at once resulted in issues of quality control. Although this was recog-*

nized early-on, remedies were not usually satisfactory.[42]

In 1978, the publicity and voices of dissent around the District's cultural resource effects prompted the Secretary of the Interior to ask the Advisory Council on Historic Preservation to investigate the Corps' efforts at archeological and historical resource mitigation. From this meeting, a Joint Review Committee was assembled the following year to evaluate all of the mitigation efforts. The committee worked together with the Department of the Interior, the Advisory Council, the Corps, and the State Historic Preservation Officer, and concluded that the mitigation program was inadequate. On the Advisory Council's recommendation, the District formed an interagency task force of archeologists.[43] This task force visited the area in March 1979 and reported that: "(1) Inundation of significant cultural resources below the elevation of 808' was imminent and unavoidable given the evidence concerning the reservoir filling schedule as provided by the Corps of Engineers; (2) the majority of the cultural resource sites below the elevation of 808' have been suitably recorded; and (3) additional studies were needed of the resources below elevation 808."[44]

Shortly after the Joint Review Committee made the recommendations, a General Accounting Office document was made available and reported that "the Corps efforts to preserve archeological and historical resources at the New Melones Dam project in California had been clouded by the lack of Federal guidance on the adequacy of archeological preservation."[45] In addition, the results of a 1974-1976 cultural resource survey proved that this was one of the largest cultural resource mitigation projects the Corps had been involved in. The Stanislaus River, lying at the heart of the southern Sierra Nevada, had been a major route of travel for centuries. It was no surprise that the survey yielded a dense area of cultural sites along the river and the surrounding area. The survey showed that this region, which was a repository of more than 10,000 years of Native American cultural activity, was one of the richest archaeological sites in California. The survey encompassed 30,000 acres and documented 629 archeological sites, only 180 of which had been previously acknowledged. These sites included petroglyphs and approximately 66 known sites that may have contained remains of the Central Sierra Miwok people. The survey also yielded a large number of Gold Rush locations from the 1850's, including cabins, mine shafts, miners' water diversion projects, mills, and mining towns. Lastly, homesteads, village sites, and cemeteries provided significant records of the early farming in California that took place after the Gold Rush waned.[46]

Saving Caves and Endangered Species

A few of the caves set to be inundated were home to a rare *Banksula melones* or "harvestman" spider, which the District relocated before inundation. The Corps sponsored two transplants of the *Banksula melones* spider and other fauna from caves slated for inundation to an inactive mine shaft a mile and a half away. A considerable collecting effort went into this project, and another seven caves set to be submerged were also checked for the spider. While the District succeeded in transplanting the harvestman *Banksula melones* to a nearby mine, prior to the inundation of caves, in a follow-up study, the harvestman was found in 18 caves and is now considered safe.[47]

The caves themselves, beyond their importance to the harvestman spider, were of concern. The Corps consulted the National Speleological Society and, based on their recommendations, the District mitigated the loss of the caves by purchasing and protecting other similar caves beyond the reservoir and project area. Lewis Whitney remembers questions being raised even before the filling began about the adequacy of the cultural resources work.[48]

Camp Nine or Die: River Activists Fight to the Bitter End

Even as these various protective measures were taken with regard to the cultural resource issues, critics continued to oppose the project and object to the manner in which environmental effects were evalu-

ated. Lewis Whitney and Joe Countryman felt that the opponents were out of line. Countryman says,

> *Out at Sacramento State, the environmental movement was getting started. I took a graduate course out there in water resources and the environment. It turns out the professors and the people they brought in to teach this class were [with] Friends of the River. One of the things that really galled me: you had a choice, you could turn in a final exam or a term paper for this project or you could attend the "Stop New Melones" rally.*[49]

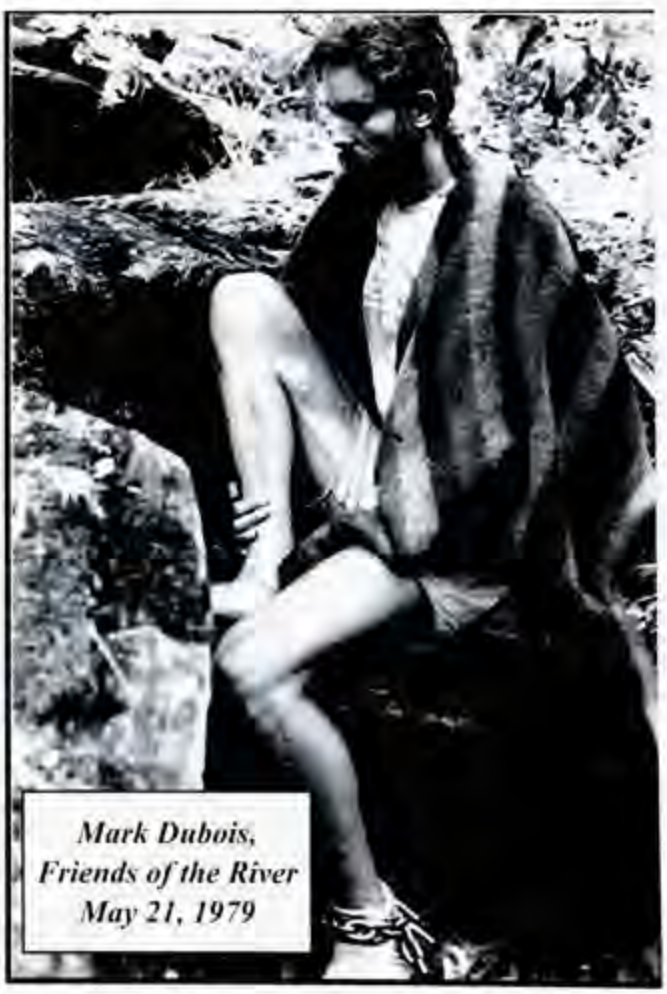
Whitney remembers the river activists alienating members of the District by not first checking their facts before spreading the word that mistakes were made on the EIS.[50]

River rafters also saw a direct threat to their treasured lower section of the rapids when, in the spring of 1979, the Corps added water to the reservoir to test the power plant's new turbines. Friends of the River leader Mark Dubois proclaimed that he would rather drown than watch the reservoir rise and promised to chain himself to a rock in the Stanislaus Canyon 2-1/2 feet from the water's edge.

In a three-page typed letter to Colonel Donald O'Shei sent the day before following through with his plan, Dubois informed Colonel O'Shei of his intentions. The District's intention was to keep the water level below the 808-foot elevation. Dubois resolved to hide in the canyon somewhere between the dam and Parrotts Ferry, locking his foot at an elevation of 2 to 3 feet above the dam's water level in hopes that his action would delay the filling.[51] Dubois granted an interview to Harold Gilliam, who wrote an environmental column for the San Francisco Chronicle-Examiner. The story of his protest appeared May 21, 1979.

On Monday, May 21, 1979, after purchasing a star drill, I-bolt, and a chain from a hardware store, Dubois hitchhiked to the river. Approaching an historic mining site downstream, Dubois spotted a little cave behind a full-bloom buckeye tree just big enough to hide a person from sight. He chained himself there and waited to see if the District would begin to fill the reservoir. Longtime friends agreed to check on him every other day until the water got to his knees, and then not return, fearing for his own safety. The Sacramento District informed Friends of the River that their intent was to limit the pool level to around 808-foot elevation and the Corps' control of the filling the reservoir was not precise. Governor Brown at a press conference also called for no filling above Parrotts Ferry. Dubois' collaborator paddled in several reporters on separate occasions. Tom Harris from the San Jose Mercury News and Bill Rood from the Los Angeles Times both interviewed Dubois while he was chained to the rock. Dubois remained where he was from Monday to Saturday.[52] The state's request that the filling of the reservoir stop at the 808-foot elevation is what made Dubois unchain himself.

Dubois' New Melones protest was partially effective. Then-governor Jerry Brown sent a telegram to President Jimmy Carter. Carter supported Brown's contention and ordered that water be released from the reservoir. This action affected road access to the power plant below the dam, and caused damages



Mark Dubois, Friends of the River May 21, 1979

to some downstream areas estimated at $200,000-$300,000.[53]

The Corps action did not bode well with the project proponents of the dam. Chairman and board member of the Monterey Peninsula Water Management District William R. Gianelli, in an undated handwritten note to Colonel O'Shei wrote: "I find your action repulsive to those of us who have fought for years to get New Melones Dam built. When will the Corps develop a little back-bone!!"[54]

Despite Dubois' action, there was skepticism as to whether he was ever actually at risk that day. Roger Janssen, a project engineer of the Sacramento District, did not believe Dubois was chained to a rock at New Melones reservoir. The Sacramento District had their park rangers along with the Bureau of Land Management employees and the sheriff's department with helicopters combing the canyon, but they did not find Dubois. While Janssen did not believe Dubois was in the lower canyon, most of the District did. Two television stations with cameras interviewed him chained to this rock with the water slowly rising. While chained to the rock, Dubois recalled hearing the search parties coming from miles away. He stated that at the sound of searchers, he could "just dig down into my little tiny cave and put a dead branch in front."[55]

Filling the Reservoir

The actions of Mark Dubois in May 1979 seemed to galvanize the dam proponents and strengthen their resolve to complete the project. Joe Countryman remembers that Dubois' actions seemed to turn the tide of the project in favor of the pro-dam advocates:

> *The thing that made the project finally go was when the guy [Dubois] chained himself to the rock.... You know, when he went through that publicity stunt, that really galvanized the downstream people to a degree that they had never been before.... And they started getting 100 percent behind the project and doing everything that was necessary to get the project started. It really turned out to be the turning point for the pro-dam people. I mean this just really teed people off to an unbelievable extent.*[56]

The proponents Countryman was referring to included four counties (Calaveras, San Joaquin, Stanislaus, and Tuolumne) and five cities (Escalon, Modesto, Oakdale, Ripon, and Stockton), as well as local area water districts. In addition, the State Department of Fish and Game favored the project because of the positive effect it would have on the declining king salmon population. On many occasions during the progression of the dam project, these parties voiced their approval of the dam project in publicly held meetings and in the pages of California newspapers.

In retrospect, Dubois himself felt that the valley farmers' perception of the river activists and environmentalists did not help their cause. Dubois believed that the hippie-like appearance of the young urban refugees who were against the dam alienated and polarized them from the farmers and valley residents who supported the dam.[57]

At this time, the tides were turning, and Darryl Salladay, the Chief of the Investigation Section C of the Engineering Division, worked on the project and remembers the Corps learning from both supporters and opponents. The farmers and others who stood to benefit from flood control began a "Build the Dam" campaign, which ran counter to the environmentalists' "Camp 9 or Die" campaign. The District valued both local and state support. Salladay also recalled that the evolving environmental laws, like complying with the Endangered Species Act, was a far cry from the simpler compliance requirements formerly mandated by such agencies as the U.S. Fish and Wildlife Service.[58]

Lessons Learned and Post-New Melones Effects

As a direct result of the struggle over the New Melones Dam Project, the Supreme Court began advocating closer Federal-state cooperation when dealing with Federal reclamation projects. Former District Commander Donald O'Shei (1976-1979) recalled that the lessons learned were "primarily political" and reactionary. The New Melones project had been the subject of a state referendum placed before the voters. At the same time Jerry Brown ran for his first term as Governor, the initiative to limit the size of the New Melones Reservoir (Proposition 17) was on the ballot. The measure was defeated, and Jerry Brown was elected as Governor. The Brown administration took an ideological tact, which was perceived as anti-technology and anti-big project.[59]

The controversy and complicated new state and Federal environmental statutes enacted during the New Melones days markedly affected the District. For one thing, the District modified its response to public concern for the environment and increased public participation strategies during the project planning stage. Colonel O'Shei (1976-1979) felt the District became flexible and was open as a result of the project:

> *Historically, the Sacramento District had the reputation of being a rather hardball organization. I think that we had tended to display a lot more flexibility than perhaps some of our leaders were looking for or expected from us at that time. I think eventually that this display of flexibility really got the job done ... [I]t became the corporate wisdom of the District, and I think the Sacramento District probably never was as hardheaded an organization as their reputation was credited with.*[60]

The Chief of Civil Design Branch, Lewis Whitney, believed that the Corps performed admirably in the face of controversy. The New Melones Dam was one of the first projects subject to the new California and Federal environmental laws. Whitney remembers a slogan born then which said, "It isn't we and the environmentalists. We're the other environmentalists."[61]

River activist, Gerald Meral, saw a different effect on the Corps and Sacramento District. The New Melones era was a time of tremendous change for the Corps. The idea of environmentalists placing a measure on the ballot and challenging a Corps project shattered the Corps' belief that they enjoyed broad based public support. That the Corps came close to losing the measure was a big shock, having a psychological effect on the agency. The Corps wanted to be loved and not controversial, but yet they were controversial.[62]

During Colonel Donovan's tenure (1970-1973), some river activists and members of the local Sierra Club began working closely with the District. The group endorsed the lower river plan for a whitewater run on the Stanislaus River, which revived a

Parrotts Ferry Bridge

section of the river, Corps Lieutenant General Frederick J. Clark called the white water run a "model of the Corps' new concern for the environment."[63] The local Sierra Club's water resources coordinator wrote a letter to the Secretary of the Army extolling "Colonel Donovan's sensitivity to environmental concerns and recommending" him for a promotion in the middle of the litigation.[64]

In April 1974, in response to Friends of the River's circulation of the statewide petition to place the "Save the Stanislaus" initiative on the ballot, the District's Public Affairs Office issued a brochure entitled "The River Initiative: 'The Other Side of the Coin'" giving the Corps' side of the story.[65] In March 1976, perhaps in response to the failure of Senate Bill 1482 to place portions of Stanislaus River from Camp Nine to Parrott's Ferry in California's Wild and Scenic Rivers System, the Public Affairs Office issued another brochure entitled "New Melones Lake: A Fact Sheet."[66] Whitney remembers that project team members "were constantly reminding each other not to become project advocates."[67] Joe Countryman recalls that the public's perception of the farmers as proponents of the dam who were fighting the rafters made the public sympathetic to the farmers' plight. In the court of public opinion, says Countryman, the farmers won.[68]

While the river activists lost the battle over protecting portions of the Stanislaus under the Wild and Scenic Rivers system, three years later the Tuolumne River was saved as a result of its protection as a wild and scenic river. In the ensuing years three more rivers were added to the Wild and Scenic Rivers system—the Kings, Kern, and Merced. Dubois reflected: "Now, there's more people who support the idea of setting aside more wild rivers for permanent protection."[69]

The New Melones fight had a local, regional, and national effect influencing the District, the South Pacific Division, and the Corps in general. At the dedication of New Melones Dam on July 11, 1979, Chief of Engineers Lieutenant General John W. Morris summarized the project as a test for the Corps as an institution, and remarked that no other Federal agency had been asked to change so much overnight and then successfully accomplish the change. In his view, the New Melones project tested the Corps; the Corps passed.[70]

Federal Priorities, States Rights

Further legal entanglements came about when the Bureau applied to the state for permits to store water at New Melones Reservoir. The State Water Resources Control Board replied in April 1973 with "Decision 1422," which placed 25 conditions on New Melones water appropriations permits including storage restriction. The permits did not allow water for consumption or power generation to be stored in the lake. Then, in June 1973, the state sued the Bureau of Reclamation for a declaratory statement that the Federal Government is bound by the conditions of the permits. The Federal Government, in October 1973, counter sued the State Water Resources Control Board, seeking a ruling that would prohibit the state from placing any conditions on what was a Federal reclamation project. The Federal District Court ruled in favor of the Bureau, and 2 years later in October 1975, the Ninth Circuit Court affirmed that decision. However, when the appeal was taken to the U.S. Supreme Court, it ruled that a provision in the 1902 Reclamation Act allowed the state to impose conditions on "control, appropriation, use, or distribution of water in a reclamation project, which are not consistent with congressional directives." While these lawsuits were pending in court, opponents of New Melones put Proposition 17 on the November 1974 ballot. It sought to limit the size of New Melones Lake. It was defeated.

On May 29, 1979, Assembly Bill 2164 passed, allowing New Melones Lake to be filled to capacity. When it reached Governor Brown's desk, however, he vetoed it. A year and a month later, the Ninth Circuit Court would also uphold the state's authority to put conditions on water permits and ordered the Melones Lake storage level set at 820 feet above sea level. Later that year the state Water Resources Control Board set the limit at 844 feet. This level kept the lake at just over 18 percent of its original capacity. The legal issue in this Federal versus state contest was whether a state body could make operation-

al decisions about a Federal project, especially after the project had been authorized and constructed.

In an interesting twist and paradox, New Melones Lake reached and exceeded its state-imposed fill limit in January 1982, as a result of heavy seasonal rains. By the next year, the lake was flooding upstream areas, and floodwater was flowing through the spillway. After hearing arguments from the U.S. Government that the time was right to maximize the purposes for New Melones' (provide greater power and additional irrigation water), the Water Resources Control Board felt it could no longer justify withholding the Bureau's permits. In March 1983 it finally lifted all restrictions on filling New Melones Lake.[71]

In June 1987, the issue of where and how the dam's storage of irrigation water would be used reoccurred when the Bureau of Reclamation requested permission to divert additional water from New Melones. Friends of the River, which had fiercely opposed the filing of the dam in 1974, objected, stating that the Bureau's current application "admits much of the water in the reservoir has yet to be used, proving the Stanislaus Canyon was prematurely flooded." In short, there was not sufficient evidence of the need for so much water. Conservation Director Betty Andrews remarked: "They dammed the Stanislaus River in 1979, drowned the river canyon, and more then eight years later, they're still arguing about what to do with the water!"[72] The South San Joaquin and Oakdale Irrigation Districts along with the state Department of Fish and Game objected. The protests ceased after the Bureau agreed to provide water releases for further studies on the fish population in the Stanislaus River.

Costs versus Benefits

Since its completion, the New Melones Dam Project has provided significant flood control protection. "[T]hrough 1993, the dam and lake prevented a cumulative total of $128,500,000 in flood damage" according to Central Valley Project statistics.[73] The archeological studies conducted at New Melones project site resulted in some 416,000 artifacts being catalogued. Some of the artifacts are on display at the New Melones Visitors' Center.

The District also oversaw the construction of recreational amenities at New Melones, including a Visitors Center and a Administration Complex that started in 1990 and completed in March 1992. The number of visitors enjoying New Melones Reservoir has seen a steady increase over the years.

In the original design, the New Melones project team engineers ensured that the dam could supply 200,000 acre-feet of water each year. At the time of construction, this was a crucial projection, since current and future water shortages were of grave concern. That concern remains today, though the maximum supply is realized only intermittently.

The New Melones Dam Project cost nearly $383 million to construct. Based on the Sacramento District's 1961 figures, the benefit-to-cost ratio of this endeavor was 1.7 to 1, meaning that the project would earn $1.70 for every dollar spent on its construction and continued operation and maintenance. Critics of the project took issue with the Corps' 1.7:1 analysis, calling it an overestimation of benefits and underestimation of costs that was either inaccurate or intentionally biased. The project opponents cited evaluative errors in many areas, including irrigation, flood control, recreation, area redevelopment, fish and wildlife, and water-quality control. They insisted that the project life used to determine the ratio employed an incorrect interest rate and did not figure in various environmental costs.[74]

New Melones saved millions of dollars in damage that would otherwise have been incurred during the floods of 1983 and 1997-1998. The New Melones Dam and reservoir have drastically lowered storm damages along the Stanislaus and San Joaquin Rivers during subsequent floods since the construction of the project. Over the last 20 years, the largest flood in the watershed occurred during 1997. During this event, the project reduced flows from 80,000 cfs to about 7,000 cfs. During the 1983, 1986, 1995, and 1997 storm events the project prevented damages estimated at $13.1, $103, $2.1, and $176 million, respectively.[75] Based on current (2000) price levels, this amounts to a total of approximately $357 million in flood damages that were prevented. The project also helped reduce damages during smaller flood events.[76]

In intervening years, however, California's droughts and legislation such as the Central Valley Project Improvement Act have limited the available water, leaving New Melones unable to meet its obligations for irrigation, water-quality improvement, and wildlife enhancement. The Stockton East Water District, which contracted for some of the New Melones water, has filed suit against the Bureau of Reclamation for failing to meet contractual obligations. The local fishing industry has also been adversely affected. When the dam water recedes to drought levels, the temperature of the water released by New Melones is too high for spawning and kills newly hatched fish.

Conclusion

The New Melones Dam became one of the District's first water projects to fall under contentious public scrutiny. It galvanized environmental and commercial interests. Former Brigadier General (Retired) George Fink notes: "New Melones Dam was progressing, but it got caught-up in this environmental movement. It wasn't that New Melones per se was a bad project, but it was the tenor of the times."[77]

Today, the national mood has changed towards the building of large dam projects. Dam building in California has slowed since the New Melones fight. Since the construction of the New Melones Dam, the Sacramento District has constructed two additional large scale dams: Castle Dam in California and Little Dell in Utah. The only major dam built in the West since New Melones was the Seven Oaks Dam, a single-purpose flood control project built by the Los Angeles District, which was completed on November 15, 1999. Although Marc Reisner, the author of the book entitled *Cadillac Desert*, overlooks Seven Oaks Dam, his observation tells the story:

> *Coincidentally or not, however, the filling of New Melones Lake brought the first Age of Dams to a close—at least in the American West. In California, virtually nothing has been built since. It has been the same everywhere else.*[78]

On reflection, the construction and operation of the New Melones Dam can be considered a success story for the Corps and the Bureau of Reclamation. The dam stands as an icon of California's conflicting arguments over water and its uses – arguments that have affected other water-development projects and forever altered the degree of public participation in them. The Stanislaus River's Camp Nine was the most popular white water run in the West, and the river became a national symbol for river conservationists.

The story of the New Melones Dam Project is an example of how the District, besieged by legal battles, negative publicity, and other attacks, can still emerge successful, having learned important lessons. The interpretive exhibit at the New Melones Visitor Center entitled "The River vs. The Dam" fairly and succinctly explains the larger conflict as such:

> *Throughout the 15 years of design and construction (and beyond), the New Melones Dam became a forum for heated debates, revealing the often complex and convoluted process by which water projects are conceived and completed. The debate involved valley farmers, river activists, conservationists, archeologists, economists, state water experts, Congressmen, and thousands of citizens who had a stake in the dam, the land, and the river. Such battles over water use in California abound and solutions are rarely perfect. In the end, the benefits of larger water supplies, flood control, increased electricity, and irrigation do not come without losses to individuals and the environment. The New Melones struggle, like other water struggles, points to an America with conflicting priorities – our need for water and energy continues, yet our desire to protect and preserve natural beauty remains strong.*[79]

Endnotes

[1] W. Turrentine Jackson and Stephen D. Mikesell, *The Stanislaus River Drainage Basin and the New Melones Dam: Historical Evolution of Water Use Priorities.* California Water Resources Center, University of California, No. 178, June 1979, p. 1.
[2] Interview with Gary Cawthorne, New Melones Power Plant, U.S.Bureau of Reclamation, June 5, 2002.
[3] William Joe Simonds, "The East Side Division, The New Melones Unit" in *The Central Valley Project Historic Reclamation Projects Book, 1994-96.*, p. 95.
[4] *American Whitewater*, Vol. 1 #1, May 1955, p. 1.
[5] Interview Willie Collins with Mark Dubois, May 19, 2001.
[6] Tim Palmer, *Stanislaus: The Struggle for a River*. University of California Press, 1982, p. 68.
[7] Interview Willie Collins with Bryce Whitmore, May 23, 2001.
[8] Interview Dr. Lee Pendergrass with Darryl Salladay, March 16, 1989.
[9] "Sometimes it's peaceful and then again...sometimes it's not." in *Sunset*, May 1965, pp. 30-32.
[10] Mary Ellen Whitmore, "The Upper Stanislaus Gorge (from Powerhouse No. 9 to Parrots Ferry)" in *American White Water: the Journal of the American White-Water Affiliation* , Autumn, No. 3, 1970, p. 4.
[11] Interview Dr. Pendergrass with Brig. General (Ret.) George Fink, March 3, 1989.
[12] Interview Dr. Lee Pendergrass with Joe Countryman, September 13, 1989.
[13] Interview Willie Collins with Gerald Meral, May 14, 2001.
[14] Interview Dr. Willie Collins with Colonel (Ret.) James C. Donovan, April 7, 2000.
[15] "Bids for New Melones Dam are Delayed" in *Sacramento Bee*, March 13, 1972, p. B1.
[16] Barbara Andrews and Marie Sansone, "Who Runs the Rivers? Dams and Decisions in the New West," *Stanford Environmental Law Society*, 1983, p. 284.
[17] Interview Dr. Lee Pendergrass with Darryl Salladay, March 16, 1989.
[18] W. Turrentine Jackson and Stephen D. Mikesell, *The Stanislaus River Drainage Basin and the New Melones Dam: Historical Evolution of Water Use Priorities*, p. 110.
[19] This statement was not based on fact because EDF could not have known what the District motives were.
[20] U.S. Army Engineer District, Sacramento California, "Environmental Impact Statement: New Melones Lake, Stanislaus River, California," May 1972, p. 84.
[21] U.S. Army Engineer District, Sacramento California, "Environmental Impact Statement: New Melones Lake, Stanislaus River, California," May 1972. List of Attachments, Letter addressed to Colonel James Donovan, dated March 13, 1972, from Michael McCloskey, Executive Director of the Sierra Club.
[22] *Ibid.*
[23] Frona M. Powell, *Law and the Environment.* West Educational Publishing Company, 1998, p.214.
[24] The Stanislaus River witnessed increased use and "quickly became the most popular whitewater river recreation area west of the Mississippi River." see W. Turrentine Jackson and Stephen D. Mikesell, *The Stanislaus River Drainage Basin and the New Melones Dam: Historical Evolution of Water Use Priorities*, p. 101. Also see Donald C. Jackson, *Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West* and *Great American Bridges and Dams.*
[25] Gerald Meral, "Conservation Commentary," in *American Whitewater*, Autumn, 1972, vol. 8, No. 3, p. 116.
[26] Interview Willie Collins with Geral Meral, May 14, 2001.
[27] John D. McCubbin, Assistant District Counsel, Sacramento District, "Legal History of New Melones Case," pp.1-2.
[28] W. Turrentine Jackson, Stephen D. Mikesell. *The Stanislaus River Drainage Basin and the New Melones Dam: Historical Evolution of Water Use Priorities*, p. 110.
[29] Mike Flynn, "Oakland Firm's River Trips Answer City Folks Urge for Challenge" in *San Francisco Business Journal*, March 15, 1982, p. 6.
[30] Interview Willie Collins with Joe Daly and Dick Linford, May 16, 2001.
[31] Interview Willie Collins with Mark Dubois, May 9, 2001.
[32] Clark Stanage, Sacramento District, "Chief of Engineers Design and Environmental Awards Program: New Melones Project," October 22, 1980, p. 2.

[33] The New Melones Board of Consultants letter further says, "Types of materials in all zones of the dam, the very conservative upstream and downstream slopes and freeboard, the high density and strength of the materials as placed, all combine to make this an exceptionally stable embankment when subjected to seismic loading. In our judgment, the embankment will remain stable not only during a local earthquake up to M 6.5, but also during local earthquakes of much greater magnitude."
[34] Clark Stanage, Sacramento District, "New Melones Dam," no date.
[35] Interview Dr. Lee Pendergrass with Clark Stanage, September 12, 1989.
[36] Interview Dr. Lee Pendergrass with Patti Johnson, March 14, 1989.
[37] Correspondence with Patti Johnson, May 30, 2002.
[38] "...the law obligated the Corps to conduct cultural assessment studies of lands planned for inundation and provided for a review and regulatory function by an independent federal agency, the Advisory council on Historic Preservation. The law also required the Corps to enter into a Memorandum of Agreement with an affected state whenever its actions threatened to damage any property on or eligible for the National Register of Historic Places. In July of that year the Corps entered into a MOA with the Advisory Council and the State of California, setting forth a plan for studying the canyon's resources below the 808-foot reservoir level." See Barbara Andrews and Marie Sansone, "Who Runs the Rivers? Dams and Decisions in the New West" in *Stanford Environmental Law Society*, 1983, pp. 385-386.
[39] Interview Willie Collins with Michael Moratto, August 29, 2001.
[40] Interview Dr. Lee Pendergrass with Lewis Whitney, September 10, 1989.
[41] Interview Willie Collins with Jennifer Bates, September 17, 2001.
[42] Written Correspondence from Patti Johnson, May 30, 2002.
[43] Comptroller General of the U.S, "Uncertainties Over Federal Requirements for Archeological Preservation at New Melones Dam in California,," December 21, 1979, p. 11.
[44] Interagency Task Force, New Melones Cultural Resources Mitigation Program Report, March 22, 1979, p. 2.
[45] Comptroller General of the U.S, "Uncertainties Over Federal Requirements for Archeological Preservation at New Melones Dam in California," December 21, 1979.
[46] Michael J. Moratto, Judith D. Tordoff, and Laurence H. Shoup, "Culture Change in the Central Sierra Nevada: 8000 BC-AD 1950." Final Report of the New Melones Archaelogical Project, Washington DC, vol. 9, 1988.
[47] Elliott, W.R., "Final Report on the New Melones Cave Harvestman Transplant," 1978, and W.R. Elliott, "Damming Up the Caves," *Caving International*, vol. 10, 1981, pp. 38-41.
[48] Interview Dr. Lee Pendergrass with Lewis Whitney, September 10, 1989.
[49] Interview Dr. Lee Pendergrass with Joe Countryman, September 13, 1989.
[50] Interview Dr. Lee Pendergrass with Lewis Whitney, September 10, 1989.
[51] Letter to Colonel Donald O'Shei from Mark DuBois, May 20, 1979.
[52] Interview Willie Collins with Mark Dubois, May 9, 2001.
[53]Interview Dr. Willie Collins with Keith Davis, July 18, 2000.
[54] Handwritten Memo from William R. Gianelli to Colonel Donald O'Shei, no date.
[55] Interview Willie Collins with Mark Dubois, May 9, 2001.
[56] Interview Dr. Lee Pendergrass with Joe Countryman, September 13, 1989.
[57] Interview Willie Collins with Mark Dubois, May 9, 2001.
[58] Interview Dr. Lee Pendergrass with Darryl Salladay, March 16, 1989.
[59] Interview Dr. Lee Pendergrass with Colonel Donald M. O'Shei June 5, 1989.
[60] Interview Dr. Lee Pendergrass with Colonel Donald M. O'Shei June 5, 1989.
[61] Interview Dr. Pendergrass with Lewis Whitney, November 8, 1989.
[62] Interview Willie Collins with Gerald Meral, May 14, 2001.
[63] Thorne Gray "Melones Trade-Off:...," *Sacramento Bee*, March 27, 1973.
[64] Letter to Honorable Howard H. Callaway from Jacob H. Miller, n.d.
[65] U.S. Army Corps of Engineers, Sacramento District, "The River Initiative, 'The Other Side of the Coin,'" April 1974.
[66] U.S. Army Corps of Engineers, Sacramento District, "New Melones Lake: A Fact Sheet," March 1976.
[67] Interview Dr. Lee Pendergrass with Lewis Whitney, September 10, 1989.
[68] Interview Dr. Pendergrass with Joe Countryman, September 18, 1989.

[69] Interview Willie Collins with Mark Dubois, May 9, 2001.
[70] U.S. Army Corps of Engineers, Public Affairs Report, July 27, 1979, p. 1.
[71] "State Finally Ok's Full Use of New Melones" in *Union*,March 9, 1983.
[72] "Stanislaus Water Bid Prompts Fight" in *Sacramento Bee*, June 24, 1987.
[73] U.S. Army Corps of Engineers, Sacramento District, Public Affairs Office, Sacramento, CA, October 1994.
[74] Thomas Parry and Richard B. Norgaard, "Wasting a River," *Environment*, vol. 17, no. 1, pp. 18-19.
[75] The cost are estimates are not accepted by all experts.
[76] U.S. Army Corps of Engineers, Sacramento District, "Sacramento and San Joaquin River Basins, California, Post-Flood Assessment," March 29, 1999, and U.S. Army Corps of Engineers, South Pacific Division, "Water Resources Development in California," 1995.
[77] Interview Dr. Lee Pendergrass with Brig. Gen. (Ret.) George Fink, March 3, 1989.
[78] Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water*, 1993, p. 510.
[79] U.S. Department of the Interior, Bureau of Reclamation, "New Melones Visitor Center Exhibit Interpretive Text" by Dr. Jim West, Regional Archeologist, April 1995.

Chapter 3

Sisters in the Valley:

Hidden Dam and Hensley Lake, Buchanan Dam and Eastman Lake

Tiny compared to their northern neighbors, the Fresno and the Chowchilla Rivers each have only one major water supply reservoir. Hidden Dam on the Fresno River impounds Hensley Lake, and the Buchanan Dam on the Chowchilla River impounds Eastman Lake.

Both dams were authorized in 1962 to provide flood control, irrigation, recreation, and fish and wildlife benefits. The two projects were sisters in the sense of having received congressional authorization at the same time,[1] and because they are a mere 17 miles apart. The construction planning for Hidden and Buchanan Dams began in January 1964, and construction began in July 1971. The dams were jointly dedicated on June 12, 1976.[2]

Both projects had tremendous local and political support. Harold "Bizz" Johnson, a Congressman from California and a staunch supporter of the project, noted, "You can seldom get two projects like this in any part of the country."[3]

The Sacramento District contracted the services of the Perini Corporation to build the dams. Although the District continues to operate them today, they are integral parts of the Bureau of Reclamation's Central Valley Project.

Hidden Dam and Hensley Lake: Project Description and Background

Hidden Dam lies 15 miles northeast of Madera, California. Sheltered by a narrow valley and backed by the area's gently rolling foothills, this 5,730-foot-long earthfill structure impounds Hensley Lake (formerly named Hidden Lake) and rises to a height of 163 feet. Hensley Lake is 3.2 miles long, has a storage capacity of 90,000 acre-feet, and covers approximately 1,570 surface acres when the reservoir is at the maximum operating level. In addition, the project authorization called for 13 miles of channel improvements upstream from the river crossing of Chowchilla Canal. The Madera Irrigation District, the non-Federal sponsor for Hidden Dam, had long-

Hidden Dam and Hensley Lake, CA

term contracts for irrigation water from the project. Between 1969 and 1974, the Sacramento District's Real Estate Division purchased 3,190 acres of real estate, nearly all in Madera County, for the Hidden Dam Project.

Groundbreaking for Hidden Dam was on June 24, 1972. At the peak of construction (between May and November 1974), the contractor, Perini Corporation, employed approximately 350 workers on both the Buchanan and Hidden Dam projects. In April 1975, Resident Construction Manager Louis A. Gerdine announced that the dam was three months ahead of schedule and almost complete.[4] The downstream improvements of the Fresno River were completed in April 1976.

The Hidden Dam multipurpose project was designed to have a benefit-to-cost ratio of 1.8 to 1.[5] The benefits of the project included stabilizing seasonal distribution of water flows downstream, providing irrigation water for dry farmland, providing flood protection to the city of Madera, eliminating some turbidity and sediment associated with floodflows, and providing for approximately 13 miles of downstream levee and channel improvements on the Fresno River.

Other benefits were improved sanitation, with the reduction of pollution from septic tanks, cesspools, and pit privies, as well as increased recreational usage of Hensley Lake and warm-water sportfishing.[6]

But the project also had some adverse environmental consequences. Among these were the conversion of 1,570 land acres to a lake, as well as a loss in riparian habitat and increased concentration of salts and pesticides in water as a result of agricultural use.

Native Americans and First Settlers: The Early History of the Hidden Dam Area

Long before the authorization of the Hidden Dam Project in 1962, the Fresno River would shrink to a trickle in summer but surge high in the winter. The river ambled for centuries out of the Sierra Nevada, running its course into the San Joaquin Valley. It once served as a boundary separating two central California Indian cultures: the Miwok and Yokuts.

Before the dam and lake were constructed, the early local inhabitants and their history remained virtually unknown, but archaeological and historical studies for the project between 1966 and 1975 contributed to new information and findings. The two Indian nations flourished on either side of the river, living well off the ample water and raw materials on the land around them. They encountered whites for the first time in 1848 with the arrival of James D. Savage, a New Yorker who fought in the Mexican War with John C. Frémont's California Battalion. Savage was nicknamed El Rey Huero or "The Blond King" by the Native Americans. He lived with both the Miwok and Yokut Nations, ingratiating himself with several Native American women, marrying them, learning their languages, and establishing a sphere of influence over their people.

Following close behind Savage were the gold miners. Their numbers strained his relations with the Native Americans, and soon Savage found himself fighting the very people he had befriended. He was appointed to the rank of major during the Mariposa Indian War of 1851, the most famous conflict between southern Sierran Indians and miners. (The name was somewhat of a misnomer, since most of the fighting took place in Madera County.) While leading a battalion against the Yosemite nation, Savage became the first white person to enter Yosemite Valley.

Hensley Lake near Madera, CA

After the war, Savage settled in what became the Hidden Reservoir area where he established several trading posts. Eventually, he became wealthier as a trader and entrepreneur than many of those who came for gold. Walter Harvey, a political opponent, shot and killed Savage in 1852.[7] Savage was buried in the Kings River area near Campbell's Ferry. His remains were relocated from the banks of the Fresno River and reinterred above the Buck Ridge day use picnic area, one of the recreational sites near the dam. Marking his grave is a stone monument and four adjacent granite slabs, each engraved with highlights of Savage's life and legacy. This interpretive historical display is open to the public year-round.

Among the area's other settlers were the Hensleys, a prominent family whose members accidentally discovered gold in the Fresno River in 1861. What was later known as the Hensley Bridge, built in the 1890's, got its name from the Hensley family. Nearly a century later, Hidden Lake would be renamed Hensley Lake in their honor.[8]

Flood Control Benefits of Hidden Dam

Since their construction, Hidden Dam and Hensley Lake have appreciably minimized flood damage, principally along the Fresno River. The dam and lake were both first tested with the rains of 1978, at which time the water level in Hensley Lake rose to its highest levels since the dam's construction. Hensley Lake Park Manager Keith Davis concluded that actual peak flows into the lake totaled 8,000 cubic feet per second. The downstream capability of 5,000 cubic feet per second meant that the dam prevented some damage in Madera and low-lying areas of the river.[9]

The largest flood in the watershed occurred in 1997. During this rainstorm, the project reduced flows from what would have averaged 13,000 cubic feet per second to less than 5,000 cubic feet per second. During the 1983, 1986, 1995, and 1997 flood events, the project prevented damages of an estimated $2.9, $1.9, $2.2, and $5.7 million, respectively. Based on current price levels, this amounts to a total of approximately $16 million in flood-damage prevention.

Hidden Dam and Hydroelectric Power

Besides providing flood control among other purposes, the creation of energy was an additional rationale and end use of the Hidden Dam Project below the spillway. The 1970's saw an increase in domestic consumption of oil and fluctuations in oil prices. In 1979, Iran cut its supply of oil to the United States. The Corps nationwide embraced the concept of public power at multipurpose projects. The Madera Irrigation District, which held a contract for irrigation water from the reservoir, began to consider the feasibility of building hydroelectric power plants below the spillway on the Madera Canal. Permits were filed and the required preliminary studies began,[10] culminating in the Madera Irrigation District's construction of four plants on the Madera Canal by April 1986.[11]

Managing Natural Resources and Irrigation Water Allocations

Workers on the Hidden Dam and Hensley Lake Project enhanced natural resources by creating wildlife ponds with water bars to promote rearing of various fish species. In addition, nesting boxes were installed for ducks, bats and songbirds.

While the enhancement and creation of natural resources was beneficial, the farmers were not satisfied with the water allocated for irrigation. The Madera District provides a supplemental water supply to agricultural users based on both water from Hensley Lake, as well as rainfall and runoff. During the rainy season of 1995, the Sacramento District released storage water from Hidden Dam, yet the Madera District perceived the Sacramento District's release as restrictive. Composed of community members, the Madera District contended that its projections for runoff were more accurate than the Sacramento District's computer projections.[12] The Madera District complained to lawmakers, urging them to pressure the Corps into relaxing its flood-control measures so that additional storage water could be saved until needed for irrigation. The protests were to no avail; the District held firm. Corps Public Affairs Specialist Jason Fanselau justified the Corps' action: "The dam was built for the purposes of flood control," he said, "and that's how the agency must operate the facility."[13]

Recreation Improvements at Hidden Dam and Hensley Lake

In addition to flood control and irrigation, recreation management at Hensley Lake was a long-term

objective of the Hidden Dam project.[14] Prior to the dam's construction, the area offered few opportunities for recreation. The Fresno River flowed intermittently during the summer months. The inadequate flow failed to accommodate water-oriented recreation, and much of the land was in private hands, thereby limiting public access.

To improve the recreation facilities, the Sacramento District began receiving bids for the construction of the project. The cost estimate came in at $1.2 million to complete the two-phase project. Park Manager Keith Davis later recalled that the construction of Phase 1 of the recreational plan in March 1976 and Phase 2 in February 1978 proceeded quite smoothly, with only a few hitches. For example, the steepness of the terrain posed problems when developing lakeside campgrounds.[15] During construction in 1977, a long drought season began taking its toll on the lake. A large compressor was needed to pump air into Hensley Lake to alleviate the disappearing oxygen content[16] and to sustain the fish population. Although the low lake level had negative effects on the aquatic species, this did not hamper the ongoing construction activities.

District planners showed environmental sensitivity in the design and location of the recreational facilities. In a design memorandum, the planners reported, "careful attention had been given to the location of facilities in a manner compatible with the natural terrain.[17] Six recreational areas, which included Hidden View, Buck Ridge, Arrowhead, Dry Creek, Savage, and Observation were proposed, as well as a wildlife management area and an observation facility. The entrance of Hensley Lake accommodated the wildlife area and comprised approximately 500 acres of grassland and brush for wildlife and game. The recreational facilities included a day-use area with 55 picnic units and a campground with 66 camping units. All of the recreation sites included a water supply and distribution system, sanitary facilities, day-use parking facilities, and ramps for boat launching.

The newly created recreational facilities opened in June 1978, and the District welcomed the public to recreational sites at the Hidden View Campground and at the Buck Ridge Day Use Area. The visitors' center, located above the dam, opened later that year, along with 16 miles of new hiking trails. No fees were charged for recreational facilities at either Hidden or Buchanan Dams until 1985.

Visitation to the recreational facilities has steadily increased since the facilities opened, but the numbers are lower than the District's original projections. More than 200,000 visitors used the Hidden Dam recreational facilities during the first year, which had been considerably less than the expected 390,000. The District had hoped that the number would eventually rise to as many as 1,500,000 per year. Ed Armbruster, Park Manager, indicated that the pattern of usage of the park had been steadily increasing, with some decreases during the drought years.

Buchanan Dam and Eastman Lake: Project Description and Background

Sixteen miles northeast of Chowchilla, California, the Chowchilla River widens into Eastman Lake. Eastman Lake is an isolated reservoir impounded by deep walls along the Buchanan Dam. Commenting on the area's relative isolation, Jerry Magnuson, Senior Park Ranger for Eastman Lake said, "The road to Eastman comes here and ends. You're either coming to the lake on purpose or you're lost. You drive eight miles on a road that doesn't go anywhere else."[18] Eastman Lake was named after a project proponent, who was a local judge and a past secretary-manager of the Chowchilla Water District. A monument at the park entrance marks the location of the copper-mining ghost town of Buchanan, which flourished from the 1860's to the 1930's.

The Buchanan Dam Multiuse Project consisted of a dam and lake for flood control, recreation, fish and wildlife, and supplemental channel improvements downstream. The significant benefits of the project included flood control for the urban and suburban areas of the city of Chowchilla,and a decrease in flooding along the lower San Joaquin River. In addition, this project provided an annual supply of

Buchanan Dam and H.V. Eastman Lake

24,000 acre-feet of new water for irrigation, recreational facilities, and approximately 1,500 acres for wildlife management and cultural resource mitigation.[19]

The District used a rock fill design for the dam, specifying a maximum height of 205.5 feet and a crest length of 1,800 feet with a gross capacity of 150,000 acre-feet of water.[20] Between 1968 and 1972, the Real Estate Division purchased 3,450 acres, which consisted of 130 acres for easements. All but 200 acres of the purchased land was within Mariposa County, and the remaining acreage was in Madera County, which was used for Buchanan Dam and Eastman Lake.

Political Support

Local support for the Buchanan Dam and Eastman Lake project was strong. The River and Harbor Act of 1927 that provided surveys and emergency relief as well as widespread damages from the floods of 1938, 1965, and 1968-1969 more than convinced the local constituents, the state, and local politicians of the need for the dam and lake. President Dwight Eisenhower twice vetoed authorization for the dam in the 1950's, along with hundreds of other projects. Still, Representatives B. F. Sisk of Fresno and Harold T. "Bizz" Johnson of Roseville, whose district once included Madera County, continually pushed for construction.

In addition to local support, state backing for the project was strong. Senator Alan Cranston and Representative Harold T. Johnson led a California delegation to Washington, D.C., in 1973 to urge additional funding for both the Bureau of Reclamation and Army Corps of Engineers projects. Their efforts proved successful. The proposed increased funding included $1.2 million for the completion of the Buchanan Dam before the following year's runoff season began.[21] The estimate for the total cost of the project was $21,800,000, with the non-Federal cost sharing at $1,580,000 and a benefit-to-cost ratio of 1.9 to 1.[22]

There were some concerns about adverse environmental effect: specifically, loss of riparian vegetation, probable increased agricultural production, and the potential for further development. But for

the supporters, these concerns did not outweigh the long-range benefits that the project promised.

Cultural Resources

The area's physical setting had long remained relatively unspoiled before the Buchanan Dam project began. Centuries before, the Miwok and Yokuts inhabited the area.[23] The Sacramento District's planning and construction of the dam in the 1970's spurred a heightened interest in the area. Evidence of the locale's largely neglected but rich history became known when the National Park Service's Interagency Archeological Services performed cultural resource field work and excavations at the proposed Buchanan Dam site between 1964 and 1972. Within the project's boundaries, 69 cultural sites including prehistoric villages, campsites, and bedrock-milling stations were discovered. Archaeologists recovered approximately 6,000 artifacts from the excavations. As a result of the dam construction, few archeological resources were lost, such as two cemetery plots with human remains interred prior to 1900.[24]

Scholars and others also began delving into the area's rich archeology. From the mid-1960's through the 1970's, two doctoral dissertations on the area's cultural resource sites were written.[25] Once the dam site was added to the National Register of Historic Places on March 22, 1976, archeologists undertook even more of an interest on the cultural resource efforts and the mitigation of these sites.[26]

Construction and Dedication

The District established a resident office headed by Resident Engineer Louis A. Gerdine and his assistant, Captain Robert Mentell, in the town of Raymond. By 1973, contractors had completed 44 percent of Buchanan Dam's construction. Despite all the support, blasting at the dam site disconcerted a few local residents. The description in a local newspaper in 1974 stated: "In Raymond, only a mile or two away as the crow flies, houses shiver, dogs howl and sometimes a window cracks from the blasts."[27] With the exception of this construction noise, the dam proceeded without major glitches. The dam

Miwok/Yokuts Fishing Technique

began operations in 1976 after the completion of the work in November 1974.

The District dedicated Buchanan Dam along with Hidden Dam in June 1976. Federal District Court Judge M. D. Crocker of Fresno served as the master of ceremonies,[28] and speakers included Representative B. F. Sisk of Fresno and Representative Harold T. Johnson, once the representative for Madera County and affectionately referred to as "the grandfather of irrigation projects" due to his continued support and efforts in pushing for appropriations for water projects. Brigadier General Richard M. Connell, South Pacific Division Chief, also addressed the gathering.

The writer of an editorial in the Fresno Bee praised the project, but also voiced frustration regarding the amount of time it had taken to get it built:

> *Not that we don't believe the dams aren't praiseworthy. On the contrary, we would argue taxpayers get more for their money from such multi-purpose water resource development projects than from almost any other type of public facilities. But what galls us is that it took so long to bring the dreams of these benefits to fruition. The Army Corps of Engineers and the Bureau of Reclamation fought over which agency would handle the job. The Corps won. At last the dams are a reality. We are glad. It is about time.*[29]

No real discontent over the dam and lake surfaced until March 1978, when several local residents expressed concern over a recent rise in the Fresno River. Engineer David L. Mark of the Sacramento District wrote an article in the Fresno Bee assuring residents that "instruments buried in the foundations and in the fills themselves are monitored daily to see how the structures are acting. So far, everything is normal and well within the limits predicted."[30]

Recreation, Fish, and Wildlife

Eastman Lake opened to the public on July 1, 1978. At that time, the lake contained 145,000 acre-feet and was only 5,000 acre-feet short of capacity and three feet short of the spillway elevation. It was at this time that the California Department of Fish and Game stocked the lake with fish.

Fifteen hundred acres of water and land were devoted to fish and wildlife management as mitigation for the effects of the construction of the reservoir. The wildlife management program included the creation of spawning areas for warm water fish species, as well as a revegetation plan to plant native trees and grasses. The mitigation area also ensured protection for the Sierra region bald eagle (*Haliaeetus leucocephalus*) whose nesting and forging habitat included the narrow canyons surrounding Eastman Lake. On-going monitoring of the eagles at Eastman Lake revealed their numbers were climbing and in 1993, a pair of these eagles successfully hatched young.[31] Over the years, the District introduced a Florida strain of black bass into the lake, and a hybrid population now thrives. The hybrids comprise 50 percent of the total bass population, with Floridian and non-Floridian strains both at 25 percent of the population.

Troubled Waters

In June 1989, the California Department of Food and Agriculture detected in both Eastman Lake and upstream in the Chowchilla River, hydrilla verticillata, a noxious submerged aquatic weed. "The infestation in the 26 miles of river above Eastman Lake is unique in that it was the first time in California that hydrilla had been found in a 'natural' water system,"[32] said Jerry Magnuson, Senior Park Ranger. An intensive eradication program began in August of that year. Television and print reporters were present for the launching of the program of chemical treatments to eradicate the weed.[33] The lake also needed to be lowered, and from 1989 to 1993 it went down as many as 28 feet to keep the plant from

spreading to other bodies of water. In addition, the park suspended all water-related activities, quarantining the lake on June 23, 1989. The park remained open for nonwater activities, but visitation dropped by a third. As part of educating the public about the weed, the park distributed and posted informational pamphlets throughout the park.

The state and Corps shared the cost of the eradication program, which averaged approximately $1 million annually.[34] In 1990, the Corps conducted a $15,000 reconnaissance study. The California Department of Food and Agriculture acted as the non-Federal sponsor of the study, sharing 50 percent of its cost to determine the benefit-to-cost ratio for the eradication program and the extent of the problem.[35] In 1993, 6,484 plants were found in the entire watershed. By 1999, the number was down to 32, and the eradication of hydrilla was nearly complete.

Lake activities have since resumed, and visitation is back up, reaching its highest numbers during wet years like 1983 and 1986. However, a number of factors have had an overall negative effect on the visitation like the hydrilla quarantine and restrictions on boating and shoreline fishing. In 1995, boating was once again allowed on the lake, but only on the lower two-thirds and only during daylight hours. Then, on July 22, 2000, the California Department of Fish and Game permitted 24-hour fishing to resume from the shoreline and allowed boats on the lower two-thirds of Eastman Lake.

Conclusion

The Hidden Dam and Hensley Lake Projects brought three major benefits to the area residents and to the visitors. First, as a result of Hidden Dam, there is now downstream flood protection for the surrounding area.

Second, residents and nonresidents can now enjoy the area's recreational facilities. Instead of a river that would nearly dry up in the summer, the local residents are delighted to have a lake.[36] The pattern of recreational use also has changed. Before the dam was built, local residents had used the area to a very limited degree. As a result of the project, local residents now fish, camp, hunt, and enjoy other types of recreation.[37]

Third, although the dam inundated the area that is now Hensley Lake, the cultural mitigation that preceded its construction unearthed the history of the area inhabitants. That history is now well documented and has added to the cultural richness to the area.

Due to the easy access leading to Hensley Lake, it has attracted more pleasure-seekers than the isolated Eastman Lake. Senior Park Ranger Jerry Magnuson observed that Hensley Lake has had greater recognition than Eastman Lake even though they are only a few miles apart. Magnuson noted that more and more visitors are coming from farther away to enjoy all of the recreational facilities. While still underused, the growing population has ensured that the area undoubtedly will be seeing an increase in usage in the coming years.[38]

Endnotes

[1] Hidden Lake, Fresno River Project and the Buchanan Lake, Chowchilla River Basin Project were authorized by Section 203 of the Flood Control Act of 1962 (Public Law 87-874).
[2] Carl Deming was the Park Manager at Eastman Lake from 1975 and was largely responsible for the development and operation of the park. Since 1998, Park Manager Ed Armbruster has managed the two parks.
[3] "2 New Dams Will Add to Valley Water Resources" in *Fresno Bee*, June 13, 1976.
[4] "Two New Dams Are Almost Ready," in *Fresno Bee*, April 15, 1975.
[5] U.S. Army Corps of Engineers, Sacramento District, "Final Environmental Statement, Hidden Lake, Fresno River Basin, California," April 1971, p. 2.
[6] U.S. Army Corps of Engineers, Sacramento District, "Final Environmental Statement, Hidden Lake, Fresno River Bain, California," April 1971.
[7] William A. Scheidt, "A History of the Hidden Reservoir Area: Fresno River, California," February 1, 1966, pp. 18-34.
[8] "Hidden Lake Comes into View" in *Fresno Bee*, October 30, 1973.
[9] "Hidden, Buchanan Dams Prove Themselves—Stop Flood Damage" in *Fresno Bee*, March 24, 1978.
[10] "Madera Irrigation District Asks Hydroelectric Permits" in *Fresno Bee*, September 22, 1979, p. A11.
[11] "Madera-Chowchilla Power Authority, Hydroelectric Projects – Madera Canal." Unpublished. May 26, 1987.
[12] Interview Willie Collins with Don Roberts, April 23, 2001.
[13] "MID Concerned over Water Releases," in *Madera County Tribune*, December 9, 1995.
[14] U.S. Army Corps of Engineers, Sacramento District, "Operations Manual, Hensley Lake," 1986.
[15] Interview Dr. Willie Collins with Keith E. Davis, July 24, 2000.
[16] U.S. Army Corps of Engineers, Sacramento District, "Drought Takes Toll at Corps Lakes," *PAR for the Corps*, August 12, 1977.
[17] U.S. Army Corps of Engineers, Sacramento District, "Hidden Reservoir: Fresno River, California, Master Plan and Initial Recreation Facilities, Design Memorandum No. 15," January 1968.
[18] Interview Dr. Willie Collins with Jerry Magnuson, Senior Park Manager, August 3, 2000.
[19] U.S. Army Corps of Engineers, Sacramento District, "Environmental Statement, Buchanan Lake, Chowchilla River Basin, California," pp. 1-2.
[20] U.S. Army Corps of Engineers, Sacramento District, "Report on Preliminary Cost-Allocation Studies, Buchanan Project," October 1965, p. 3.
[21] Leo Rennert, "State Water Officials Seek US Funds Hike" in *Fresno Bee*, May 22, 1973.
[22] U.S. Army Corps of Engineers, Sacramento District, "Environmental Impact Statement, Buchanan Lake, Chowchilla River Basin, California," p. 2.
[23] U.S. Army Corps of Engineers, Sacramento District, "H.V. Eastman Lake and Its Forgotten Frontiers."
[24] U.S. Army Corps of Engineers, Sacramento District, "Buchanan Reservoir, Chowchilla River, California, Supplemental Cemetery Plan, Tract 105C," October 1967, p. 2.
[25] See T.F. King, *Political Differentiation among Hunter-Gatherers: an Archaeological Test*, Ph. D. Dissertation, Department of Anthropology, University of California, Riverside, 1976, and Michael J. Moratto, *A Study of Prehistory in the Southern Sierra Nevada Foothills, California*, Ph. D. Dissertation, Department of Anthropology, University of Oregon, Eugene, 1972.
[26] The Corps funded a contract for $28,402 to Anne Peak and Associates in 1975, and one to W. Wiant for $662 and one to F. Reinman for $8,310 in 1976.
[27] Eva Burns Lyons, "Those Dam Blasts: They Shake Up Foothills Residents—Even Fresnans" in *Fresno Bee*, July 25, 1974.
[28] "2 New Madera County Dams Will be Dedicated Saturday," in *Fresno Bee*, June 8, 1976.
[29] "Hidden and Buchanan Dams" in *Fresno Bee*, June 12, 1976.
[30] David L. Mark, P.E., "Success of New Dams" in *Fresno Bee*, March 30, 1979.
[31] U.S. Army Corps of Engineers, Sacramento District, Public Affairs Report, August 1993.
[32] Jerry Magnuson, "The Impact and Control of Hydrilla at Eastman Lake," January 19, 1994, p. 1.
[33] U.S. Army Corps of Engineers, Sacramento District, Public Affairs Report, November 1989.

[34] *Ibid.*
[35] U.S. Army Corps of Engineers, Sacramento District, Public Affairs Report, January 1990.
[36] Interview Dr. Willie Collins with Keith E. Davis, Former Park Manager, July 24, 2000.
[37] Interview Dr. Willie Collins with Jerry Magnuson, Senior Park Manager, August 3, 2000.
[38] Interview Dr. Willie Collins with Jerry Magnuson, Former Park Manager, July 24, 2000.

Chapter 4

The Little Dell, Utah, Dam and Lake:

Small Project, Big Implications

The Little Dell Dam and Lake in Utah was a comparatively small-scale project for the Sacramento District although it is the largest Corps project in the state of Utah. Despite its size, few Corps projects have had such an on-again, off-again status or sparked such continual disagreements over cost. The Little Dell Project required the District's constant attention over 30 years to stay alive. However, all of the District's attention paid off when the project became a national priority.

One of the first projects that showed the willingness of the community to share the costs of a Federal water project, Little Dell helped set a precedent for other water projects, including the nearby Central Utah Project.[1] The concept of Federal and local cost sharing was part of the Water Resources Development Act (WRDA) of 1986. Planning for the Little Dell Dam and Lake project began in 1956. The dam was finally dedicated in August 1993.

Background and Need

The Great Basin of Utah became the Sacramento District's responsibility in 1943. The Great Basin encompasses a land area of approximately 28,000 square miles and a water area of 1,800 square miles.[2] By 1968, the Sacramento District had jurisdiction over all but the northwest and southwest corners of the state.[3]

Utah, like other western states, is dependent on capturing snowmelt to meet municipal water and irrigation demand during the long summer months. Utah has a statewide annual average of 13 inches of precipitation.[4] Therefore, the storage of adequate water in its reservoirs is critical.

In the early 1900's, Salt Lake City Engineer John S. Eastwood contracted Parrott Brothers to construct Mountain Dell Dam. The Mountain Dell Reservoir was built in 1917 and provided the Salt Lake City area with municipal water. Over the years, Mountain Dell Dam could no longer provide sufficient water for the growing region of Salt Lake City. Moreover, in extremely wet years, the high spring snowmelt from Red Butte Canyon, and Emigration and Parleys Canyons severely flooded Salt Lake City.

Although the Sacramento District had jurisdiction regarding flood control projects, the community had begun to seek their own solutions to the flooding issues. In the 1940's, Dr. Ray E. Marsell, geologist and former Utah state employee, recommended to the Salt Lake City Commission that construction of a storage facility on Dell Creek could provide a solution to the flooding of Salt Lake City.[5] However, it was not until the devastating flood of 1952, which inundated over 400 city blocks in the 1300 South flood plain (13 South Street of Salt Lake City) and caused $6 million dollars in damage, that local leadership took action. City Superintendent Charlie Wilson (also known as "Mr. Water"), Commissioner Grant Burbidge, and City Engineer Roy McLeese joined Dr. Marsell in his proposal for a dam on Dell Creek. The local sponsors sought the Corps' assistance.[6] When these four men pushed for the creation of a dam, Mayor Earl Glade asked the Sacramento District to study the problem.

Federal Studies for a Utah Project

In 1956, the Corps initiated studies of the project, and in 1959, Utah Senator Wallace F. Bennett (R-Utah) introduced a bill in Congress to authorize Federal construction of a 175-foot-high dam at an estimated cost of $6,052,000. This was a cost-shared arrangement. The Federal share was to be $3,843,000, or approximately 63 percent of the cost, and Salt Lake City's share would come in at $2,209,000, or approximately 37 percent.[7] "The project represents a constructive Federal-local partnership effort," Bennett told his Senate colleagues at the time.[8] The Metropolitan Water District of Salt Lake City (MWDSLC) and Salt Lake County were the non-Federal sponsors or local sponsors of the project.

Although the Little Dell Project was authorized under the Flood Control Act of 1960, this 50,000 acre-feet project was never funded. The local sponsors' general perception was that any Federal project was either too big or too expensive. "Every time the

Little Dell Dam and Lake, Utah

federal government spends money, we go far beyond what private industry would do," declared an editorial in the local paper.[9] Due to this skepticism, the local sponsors questioned the Corps' first 1961 estimate. In that estimate, the project was designed with a spillway that would accommodate a flow of 3,600 cubic feet per second for a total cost of $5.8 million. This price had been scaled down from an earlier estimate of $7.2 million.[10] The MWDSLC then hired the international engineering consulting firm of E O. Larson and Berger Associates, Inc., to produce its own cost assessment. The firm concluded that an adequate project could be built for $1.5 million.

Delays and disputes on the cost of the project reached a boiling point, and Salt Lake City officials lodged the complaint that, "the federal agency [Corps] is too far removed from the area involved... [and] its report is inaccurate in several respects."[11] Dr. Marsell, geologist and former state employee, concurred with the Larson and Berger Associates' estimated cost, while Senator Bennett and others asked, "How come the federal estimate is so high?" The Sacramento District's response was that the "federal project probably contained some additional flood control features not found in the Larson and Berger Associates cost estimate."[12] The Chief of the Sacramento District's Planning and Reports Branch Amalio Gomez responded that the "government is working under a higher flood control safety protocol. Our hydrologists were convinced that it is possible to get a major cloudburst in the area."[13]

The cheaper project was so appealing that in January 1962, Salt Lake City Commission decided to abandon the District's proposal and proceed with plans to build Little Dell Dam. As the plans progressed, however, the cost of the project grew. Utah lawmakers then intervened to urge Congress to authorize the Corps' proposal again, which had now become a $23 million project, and included a 50,000-acre-foot reservoir. The Flood Control Act of 1968 subsequently authorized the project, but there was not enough interest in Congress to fund it. In 1970, the Senate approved a $150,000 appropriation for studies of the Little Dell Flood Control Project.

Off to a Slow Start

In 1974, the Corps downsized the project in the Final Environmental Impact Statement proposing a scaled-down reservoir of 30,000 acre-feet located on the Dell Creek, a tributary to Parleys Creek that included a 275-foot high dam across the Dell Creek, which meant relocating Highway 65. The proposed project also included diversion structures that would take water from several locations including Emigration Canyon and Parleys Creek and divert the flow into Little Dell Lake. The District held a public hearing and listened to input from the community that indicated they desired to pursue the project. The multipurpose project included not only flood control, but municipal and industrial water supply, recreation, as well as fish and wildlife enhancement.[14] The benefit to cost ratio was 1.7 to 1.

By 1975, Salt Lake City and County officials decided to proceed with the dam. The city contributed 928 acres of land in Parleys Canyon, and at the same time Congress approved modifications to the 1968 authorization under the Water Resources Development Act of 1976. The project, though not budgeted due to the congressional logjam of water projects, was considered a "new construction start."[15]

Unfortunately, the Little Dell was not the only Utah project seeking Federal dollars at the time. The highly controversial Central Utah Project (CUP), which provided water for industrial and municipal uses along the Wasatch Front, was often in competition with Little Dell. CUP's many challenges and delays had a negative effect on Little Dell's funding standing.[16]

In the mean time, the District continued planning studies for the dam in 1976 despite a lack of funds. The local Corps' representative, Lee McQuivey explained:

> *From our point of view, since 1976, the project has been ready for construction. What was lacking was a congressional appropriation to build it. State and local officials haven't been pushing very strongly. Instead, they have been fighting for the massive Central Utah Project. Little Dell has been an incidental project, which was lost in the shuffle.*[17]

By 1977, with ten years of planning and more than a million dollars already spent on planning studies, the fate of Little Dell appeared gloomy. The Sacramento District warned Salt Lake City and County officials that their four-member Utah congressional delegation was preoccupied with the $700 million-plus Bonneville Unit of the CUP. By 1977, the Jimmy Carter administration further complicated the fate of the project due to the lack of attention by the administration.

Despite the lack of additional funding for Little Dell, the Sacramento District obtained a permit in 1979 under Section 404 of the Clean Water Act of 1972 that allowed for the placement of fill material into three streams, including Parleys Creek (the site for the proposed Little Dell Dam) above Salt Lake City. "We have a new requirement on our projects to get a 404 permit," explained the Corps' Joe Countryman to local officials. "If funding should become available, we would have to have that [permit]. We're going ahead to get the permit."[18]

This kind of preparedness was precipitous, and in 1982, in response to the U. S. Senate Committee on Appropriations Report No. 97-256, the Sacramento District completed a reanalysis for the benefit-cost ratio for the project. This new analysis showed benefit-cost ratios of 2.3 to 1 at an interest rate of 3-1/4 percent, and a benefit-cost ratio of 1.3 to 1 at an interest rate of 7-7/8 percent. The data from the recent study was presented in a meeting with local officials including Vaughn Wonnacott, the General Manager of the Salt Lake City's water district. The new data showed that the dam could be built for $80 million. The local water district committed $5 million in cost sharing for the project in consideration of President Ronald Reagan's objective for cost sharing on water projects.[19]

State Street, Salt Lake City, Utah - 1983

The Flood of 1982: Impetus for Moving Forward

Still, the project did not move forward. An editorial in the *Deseret News* asked, "Would it take a new flood to get Little Dell built?"[20] The editor reflected on the devastating flood of 1952 that had prompted city officials to begin planning for the Little Dell Dam. His question was answered in short order.

In 1982, a record-breaking 3.72 inches of precipitation fell on Salt Lake valley between September 25 and September 28. More than a thousand homes were flooded and hundreds of residents were forced to evacuate. Then, during the 1983 spring runoff, 13 South Street, near the storm drain conduit where the water flows from Red Butte, Emigration, and Parleys Creek Canyons, turned into a river. The City's declaration of an emergency led to the immediate construction of dikes along 13 South Street to funnel the floodwater. The manmade street canal extended for 3 miles. Even with the diking of the street, the Salt Lake County Flood Control District reported that some 1,500 sites were adversely affected, resulting in millions of dollars in damage.

The flood was a difficult lesson, and it provided the impetus for the citizens of Salt Lake County to approve a $33 million bond measure to cover restoration costs as well as a capital improvement program to improve flood control facilities. Attempts to save residences took more than 50,000 man-hours. "State Street became a river, and 13 South Street and the proposed Little Dell flood project made national news every night on the TV," noted Nick Sefakis, the new General Manager of MWDSLC.[21] Former Director of Flood Control Terry Holzworth observed, "the [public] interest seems to follow very closely… [on] whatever events have just occurred."[22]

A Call to Action

The flood of 1983 seemed to align flood control and water supply interests. Within a month following the flood, the Salt Lake County Flood Control Director Terry Holzworth urged the construction of

the Little Dell Dam. "We're going to push very hard for that," he said.[23] Director of Public Utilities LeRoy Hooton, Jr., observed that the 1983 flood became the driving force for a flood control project. For the first time, a strong congressional delegation led by Utah Senator Jake Garn (R-Utah), Utah Governor Matheson, Ted Wilson, the Mayor of Salt Lake City, as well as the Salt Lake County Commission formed a unified front for the construction of Little Dell Dam in order to prevent floods.[24] Hooton, Jr., stated:

> *There was a renewed consensus among local water-supply and flood-control officials for a dam. This time, Congress also saw the need to appropriate the money. Senator Garn was confident that Federal money was forthcoming. Also, as a result of national news coverage of the disaster the Mayor of Salt Lake City testified before the Senate Environment and Public Works Committee. The Senate Appropriations Subcommittee quickly voted $5.5 million to begin work on a dam.*

Such enthusiasm notwithstanding, the issue of cost and cost sharing again intruded. The District's estimate had risen to $81,430,000, which was a dramatic change from the $32.6 million projected in 1974. Corps official Lee McQuivey was blunt about the effect on local residents of the Reagan administration's proposed policy on cost sharing. He emphasized quick action on pursuing the $40 million needed from local agencies since delays would only increase the share that locals needed to contribute. Local officials got the message. "It appears that local support will have to be brought together soon, as the President's proposed cost-sharing program will all but drive the cost of the project beyond the means of the co-sponsors," noted LeRoy Hooton, Jr., the city's public utilities director.[25] Salt Lake City officials, along with county and state officials, formed the Little Dell Dam Task Force for the purpose of securing Federal funds for the project and invited Assistant Secretary of the Army for Civil Works William Gianelli to a briefing.[26] Local sponsors were discouraged with the new cost-sharing requirements and the total cost of the Federal project. They once again began considering a private project.

Privately or Federally Built Dam?

Despite the task force's efforts, local leaders balked at paying their $41,835,000 share. The task force then won approval to hire Bingham Engineering Firm at a cost of $369,000 to come up with a plan for a downsized, non-Federally funded project. Throughout this process, the Sacramento District consistently offered its technical support, coming just short of advocating the project. "Don't sit back and relax. You have to convince the decision makers that [Little Dell] should be a 'go,'" urged Arthur Williams, a Sacramento District Project Engineer.

The engineering firm's first proposal called for a reduction in reservoir capacity from 30,000 acre-feet to 24,000 acre-feet, the abandonment of recreation plans, and the elimination of diversion tunnels for spring runoff from Emigration and Mill Creek Canyons into Parleys Canyon. This reformulation brought the cost down. In addition, the Bingham Engineering Firm eliminated various types of structures and proposed an even smaller dam with a 21,000 acre-foot reservoir at the cost of $27,045,246, which would be paid by the local sponsors.[27]

The local officials told the Sacramento District of the proposed plans to build a smaller dam on their own. Additionally, the task force asked that prior Corps engineering studies be turned over at no cost to the local agencies since "they are public information and were paid for by taxpayers, anyway."[28]

The local sponsors reached a preliminary decision on August 9, 1984, to build the Little Dell Dam without the help from the Federal Government. Leroy Hooton, Public Utilities Director, explained, "Building the dam locally will end decades of waiting for congressional funding for the Little Dell Project. It would be an uphill battle to get federal funding in light of the debate over cost-sharing and the fact that no new projects are being approved."[29] He cited the need for flexibility in design and construction as another reason for going it alone. Other reasons that focused on the Corps came from General Manager of MWDSLC Nick P. Sefakis and County Director

of Flood Control Holzworth. Affordability, size, and Corps pressure on the local sponsors to accept an unwanted project were reasons for pursuing the non-Federal project. "If you guys won't come and listen to us, then we'll do something on our own" said Sefakis.[30] "They [the Corps] felt that the local people should be paying more of the cost, but even in the beginning, the price tag was well beyond the local sponsors' means of paying for it and I think that drove [local sponsors]...to look for alternatives."[31]

Abandoning the Corps, however, did not mean abandoning the hope for Federal money.[32] Sponsors also explored adding Little Dell to the CUP Project. The Central Utah Water Conservancy District had agreed to loan MWDSLC $20 million at a low 3.22 percent interest to cover its share of the Little Dell project. "We'll keep going on both approaches and take the better of the two when we get there," said Hooton.[33] He also felt that there was concern at the congressional level that Utah was trying to push two funding projects, Little Dell and CUP, through Congress.[34]

Cost Sharing a Federal Project

On August 6, 1985, the Sacramento District contacted the local sponsors to ascertain their support for a Federal project under a new cost-sharing arrangement. The local sponsors still expressed concern over the cost, but nonetheless asked the Corps to evaluate options under the 1985 Supplemental Appropriations Act, dated August 15, 1985 (PL 99-88). After the District reviewed the Interim Policy Guidelines for PL 99-88, changes were made to meet the specific needs of the community as feasible.

At an October 22, 1985, meeting with the Corps, the local sponsors requested a preliminary evaluation of a downsized project with a maximum non-Federal contribution of approximately $30 million. This smaller project called for the elimination of the Emigration Creek diversion tunnel and a significant reduction in recreation plans. Three weeks later, the District presented its preliminary findings. The findings showed that a 21,000 acre-foot reservoir could be constructed for about $50 million. The local sponsors did not commit to the projects presented by either the Bingham Engineering Firm or by the Corps, but requested that the Corps continue with detailed studies of a downsized Federal project.[35] With an eye towards flexibility, the District finalized plans for a smaller project.

The project was finally included in the FY 1995 Supplemental Appropriations Act as a new construction start and pilot program of the Water Resources Development Act of 1986. However, the act stipulated that a local cooperation agreement had to be signed by June 30, 1986. On January 17, 1986, local sponsors decided to go with the Corps to build the Little Dell Dam project. The Director of Public Utilities, Leroy Hooton recalls:

> *The Corps felt that they had made a major investment in this project over the years and had some ownership in it. There was [on the Corps' side]...almost a customer friendly attitude change.*[36]

"I think that the Bingham Engineering Firm exercise that we went through persuaded the Corps that they needed to open up a little more on the kinds of things that they would do, including costs and size"[37] said Holzworth. The District's downsized project "may be safer because it included several features that should permit it to better handle a major flood," commented Joe Countryman, a Corps Project Engineer. Countryman also noted that Little Dell could be the first reservoir in the nation built using the new cost-sharing formula advocated by the Ronald Reagan administration. "I think if we reach an agreement by June 30, the project will go."[38] While WRDA 1986 brought about policy changes, its implementation was new to the Corps and Sacramento District, with respect to the cost sharing of flood control projects.[39]

District Engineer Colonel Arthur Williams stated that this was the first cost-sharing civil works project under the proposed new guidelines and recalls how all options were open to discussion at the January 10, 1986, meeting with the local sponsors. In negotiations for cost sharing with the local sponsors, Colonel Williams observed how the meeting was structured: "We just want to talk about this and see how we would go about cost-sharing." At the

Utah Flood Gauge Station, Spanish Fork, Utah - 1983

end of the meeting, Colonel Williams exclaimed: "God, they've got to be pleased with this back in [the] Washington arena." After talking to the Chief of Engineers and the Secretary of the Army, Colonel Williams said the reply was, "Well, that's a good start."[40]

While the local sponsors committed to Little Dell, they still had not determined where and how the local match would be divided among the City and local water district. The core members of the Little Dell Task Force (Hooton, Holzworth, and Sefakis) had many meetings where they struggled with how to apportion their respective share. It all came together on January 10, 1986, following a meeting with the Corps. At that gathering, they agreed to a 21,000 acre-foot reservoir and the deferment of recreation that would cost approximately $48 million. At that meeting, on the back of a napkin, they started playing with numbers. Hooton, Holzworth, and Sefakis figured out the local share of the cost.[41]

On January 16 and 26, the MWDSLC Board and Salt Lake County voted to support construction of the District's downsized project. Thus, after more than three decades of off-and-on discussions about the dam, the local sponsors now found themselves in a race to complete the Local Cooperation Agreement (LCA) by June 30, 1986, or risk losing the funding approved by Congress.

The District had the foresight to facilitate the LCA process because of time constraints. In anticipation of the local sponsor's acceptance of the project, the Sacramento District met with the South Pacific Division in November 1985 to discuss the accelerated processing of documents for the LCA. The accepted downsized project and the economic feasibility of the project, the Environmental Assessment (EA), and the Post Authorization Change Notification (PAC) all had to be reviewed and approved through District channels before the LCA could be executed. "Essentially, the project was reformulated and redesigned within the nine months available between enactment of PL 99-88 and the mandated LCA signing date," said former Section B Chief of the Civil Design Branch, Johnnie Mack.[42]

A New Revised and Downsized Project

The revised project consisted of a reservoir extending 1.4 miles upstream with a capacity of 20,500 acre-feet and a surface area of 249 acres, which would furnish a 500-year level of flood control to some 1,500 acres of residential, commercial, and industrial property in Salt Lake City. The benefit to cost ratio was 2.7 to 1, with an estimated average annual benefit of $5.8 million dollars. The dam was proposed to be located on the Dell Creek, a tributary to Parleys Creek. The dam's construction was proposed as an earthen structure 224 feet high from the canyon floor, and 1,700 feet in length. After completion, the Little Dell Dam would provide a firm yield inflow of 3,100 acre-feet and an average yield of 7,940 acre-feet.[43]

Little Dell Dam was designed to operate in conjunction with the existing 3,200 acre-foot Mountain Dell Reservoir and yield approximately 7,920 acre-feet for municipal water. A cost-share breakdown put the local share at 42.5 percent of the project's cost, and the Federal share at 57.5 percent of $57.9 million.

The District obtained the approval of all the pertinent documents from the South Pacific Division[44] by May 27, 1986, as well as and the Chief of Engineers' approval for the recreation deferment.

The official ground-breaking ceremony took place in Parleys Canyon on Utah Highway U-65, approximately 3.5 miles east of the Emigration East Canyon exit. Many of the local representatives were on hand for the ceremony, as well as Utah Senator Garn, Lt. Governor Val Oveson, Utah Representative Wayne Owens, Acting District Engineer for the Sacramento District Lt. Colonel Robert A. Bauman, South Pacific Division Engineer Brig. General John F. Sobke, Assistant Secretary of the Army for Civil Works Robert W. Page, and Salt Lake City Mayor Palmer A. DePaulis.

The chairman of the Board of the MWDSLC Charles ("Mr. Water") Wilson dedicated the project by launching a cluster of helium-filled balloons over the dam site. "I've spent a lifetime worrying about this area. I'm proud to be part of this," said Wilson.[45] Lt. Colonel Robert A. Bauman agreed, "This is one of our greatest successes. This project is exactly what Congress had in mind when they buried the 'pork barrel' in 1986." Robert W. Page, Assistant Secretary of the Army for Civil Works cited that the Little Dell Lake went before both houses of Congress and was an example of judicious planning.[46] A reminiscent Senator Garn said of the plans for the dam back in 1963, "One of my biggest regrets has been that we did not go ahead with construction of Little Dell at that time."[47]

The District contracted with Harper Excavating of Salt Lake City to excavate the dam's core trench and adjacent areas, and conduct test fills. The actual dam construction began in 1987, when the Utah Department of Highways relocated portions of Highway U-65 in order to clear the project site. In May 1989, the Sacramento District awarded a contract to two North Carolina firms, the Clement Brothers Co. and J. E. Starnes Co., to build the dam for $31 million ($7 million below the government's estimate, believing that they could remove and process dam embankment material from the proposed borrow zones with less effort than had been estimated by the Corps). The dam was to be completed by September 30, 1991.[48]

Work progressed on the dam, but the firms encountered repeated financial problems that affected progress. These problems were so pervasive that at one point, the District considered terminating the contract and resoliciting for another contractor to complete the work. By February 1991, Little Dell was a year behind schedule. The contractor's project manager, Sam Brudette, told the Salt Lake Tribune in January that the firm had encountered unexpected and expensive obstacles entailing a shortage of suitable fill material for the dam in the immediate area.[49] This contention was rigorously evaluated by the District and found not to be true. There were sufficient materials available in the borrow areas, but the processing requirements far exceeded the contractors' estimate and surpassed the District's initial estimate. Chief of the Sacramento District's Construction Branch, Construction Operations Division, John Corrigan stated that in spite of the issues associated

with processing embankment material for the dam, the work was of high quality. The Corps granted an extension of the September 30, 1991, construction deadline. The additional time to process material from the borrow areas was the primary reason the price tag increased to $60 million, explained engineer Johnnie Mack.[50] "We are disappointed with the cost," said Nick Sefakis, manager of the Metropolitan Water District of Salt Lake City.[51]

At Last, the Dedication… and More Litigation

In spite of the concern over the cost, the local sponsors finally saw the completion of the long-awaited project. A dedication ceremony held on August 5, 1993, marked the completion of Little Dell. Many dignitaries attended the ceremony.[52] The reservoir began filling in 1993. The South Pacific Division Engineer General Milton Hunter, ignoring the numerous obstacles encountered in the project, pointed out the significance of the project, saying, "As we participate with more local sponsors in the west in the years to come, our positive experiences here in Utah will guide and influence us as we bring to fruition other water resources projects."[53]

Although the dam was complete, the litigation over cost was just beginning. Because the contractors had underbid the contract by at least $7 million, they ran into cost overruns and other problems despite the District's efforts to assist and keep the contractors on schedule during the project. The contractor filed approximately $23 million dollars in claims and litigation that took several years to investigate. In the course of scrutinizing the project, the Federal investigators discovered a $333,543 kickback from one of the contractors, Raymond Clement of Clement-Starnes, to John Gann of Ridgepoint Sand and Gravel in Lehi, Utah.[54] The $23 million claim was settled for $750,000.[55]

Little Dell Dam Dedication Ceremony - August 1993

Developing Recreation Facilities

After the dam was constructed and litigation was settled, the local sponsors considered the deferred recreational component of the project. In 1994, the MWDSLC responded to the growing need for recreation in the area. The consulting firm Steinberg and Associates, who specialized in water resources issues and infrastructure, was hired to work on the recreational plan for the lake. Local sponsors were optimistic that the addition of recreation would lower MWDSLC's and the locals' share of the cost.[56] [57] Following lengthy negotiations with the District, the South Pacific Division recommended restoring recreation to the project. The Corps repaid between $4 and $5 million, which enabled MWDSLC to get approximately a $3 million credit in 1995 and 1996. This credit enabled MWDSLC to replenish its savings account, a sum that had dwindled because of the increased costs of the project.

The local chapter of the Audubon Society and Tracy Aviary lodged minor objections, but this did not stop the construction of a 39-acre recreation area featuring 56 picnic tables, two boat launches, 135 parking spaces, 3-1/2 miles of track field, and restroom facilities. The local sponsors constructed the recreation facilities from May 1998 to October 1998 at a cost of $1.1 million. The recreational facilities opened to the public on May 18, 1999.

Conclusion

The Little Dell Lake Project pointed the way for future water resources projects under the new cost-sharing provisions of WRDA 1986. An early willingness by the Chief of Engineers to adapt regulations to meet local needs would have resulted in the construction of a smaller project at less cost. In addition, if water supply and flood control interests had aligned themselves much earlier, the project would have become a reality sooner and would have saved millions of dollars in flood destruction. However, in spite of the off-again on-again status of the project, and the constant squabbling over the price, in the end, everybody embraces a winner. The District's investment in the project was enormous and it paid off. While the contractor experienced financial problems, the quality of Little Dell is unquestioned.

The Corps viewed the project as a hallmark of local and Federal partnering. The local sponsors prided themselves on the project, and at the Corps' request, testified before Congress about partnering. The Sacramento District praised its Utah resident office and district employees who contributed to the project. Ed Hahn, Johnnie Mack, Paul Parsoneault, and Lee McQuivey were all cited for their work on the project.

The Little Dell Lake, Utah, Project is not only a lesson of endurance and accommodation, but also a sign that the Corps and local agencies can share costs, ideas, and responsibilities in ways that are of great benefit to both the government and the citizenry.

Endnotes

[1] Constructed by the U.S. Bureau of Reclamation and the Central Utah Water Conservancy District, the Central Utah Project (CUP) is located in the central and east-central part of Utah and is the largest water resources development program ever undertaken in the state. Upon completion, CUP will provide water for municipal, irrigation, and industrial requirements from the Colorado River. U.S. Bureau of Reclamation projects operate under totally different funding guidelines. Projects are paid back over time and are reimbursable.

[2] U.S. Army Corps of Engineers, South Pacific Division, "Water Resources Development in Utah," 1995, p. 7.

[3] U.S. Army Corps of Engineers, Sacramento District, "Little Dell Lake Dam and Appurtenances."

[4] Nevada is the first.

[5] LeRoy W. Hooton, Jr., "Little Dell Dam and Reservoir Project" in *Bulletin Board*, March 7, 2000, p. 1.

[6] The City had a long history with the U.S. Bureau of Reclamation. In 1935, the City voters approved the Metropolitan Water District of Salt Lake City and later in 1937 the debt obligation to participate in the construction of the Provo River Project by the Bureau. The City also perceived the Bureau's mandate as irrigation and the Corps' mandate as multi-use projects.

[7] From 1956 to 1968, Senator Bennett (R-Utah) would introduce at least five appropriations bills for Little Dell.

[8] Frank Hewlett, "Bennett Urges 'Little Dell'" in *Salt Lake Tribune*, February 17, 1959, p. 3.

[9] "Settle the Little Dell Dispute" in *Deseret News*, February 15, 1962, p. 10A.

[10] "District Lets Little Dell Study Pact: Board Outlines Inquiry Needs" in *Salt Lake City Tribune*, March 8, 1961.

[11] "Settle the Little Dell Dispute" in *Deseret News*, February 15, 1962, p. 10A.

[12] "Local Plans Lauded for Little Dell Dam" in *Salt Lake City Tribune*, January 19, 1962.

[13] "Harrison Still Favors Locally Built Dam" in *Deseret News*, February 1, 1962.

[14] U.S. Army Corps of Engineers, Sacramento District, "Final Environmental Impact Statement, Little Dell Lake, Salt Lake City Streams, Utah," September, 1974, p. 1.

[15] A new construction start is a new investment decision to fund initiation of construction of a project with expectation to continue funding through completion of the project. The term is used with regard to budget proposals and appropriation actions for initial funding of new projects for construction. Electronic mail from Engineer Mike Nolan to PAO Director Jim Taylor, June 11, 2001.

[16] In 1974, the Sierra Club, Trout Unlimited, and Natural Resources Defense Council challenged the CUP on the basis of an inadequate environmental study.

[17] Jim Woolf, "Little Dell Project Stirs New Interest" in *Salt Lake Tribune*, October 19, 1980, p. 2B.

[18] Joseph Bauman, "Corps Seeks Dell Fill Permit" in *Deseret News*, March 26, 1979, p. B9.

[19] Jim Woolf, "Little Dell Dam Worth Building, Army Says" in *Salt Lake City Tribune*, October 19, 1982.

[20] "Must It Take New Flood to get Little Dell Built?" in *Deseret News*, May 17-18, 1983.

[21] Interview Willie Collins with Nick P. Sefakis, May 1, 2001.

[22] Interview Willie Collins with Terry Holzworth, May 3, 2001.

[23] "What lies ahead?" in *Deseret News*, June 26, 1983.

[24] Interview Willie Collins with LeRoy Hooton, Jr., May 1, 2001.

[25] David Schneider, "Officials Say Time is Now to Build Little Dell Dam," in *Deseret News*, April 12-13, 1983.

[26] County Director of Flood Control Terry Holzworth served as Task Force Chair along with Hooton, the Director of the Utah Division of Water Resources Dan Lawrence, and the MWDSLC Manager Nick Sefakis.

[27] Jim Woolf, "Up to $81 Million Could Be Cut from Little Dell" in *Salt Lake Tribune*, January, 19, 1984.

[28] Lee Davidson, "Big Dam or Little Dam? Officials to Decide" in *Deseret News*, July 25, 1984, p. B3.

[29] "Corps Dumped, Little Dell Proceeds in Utah," *Waterline*, August 29, 1984, p. W-1.

[30] Interview Willie Collins with Nick P. Sefakis, May 1, 2001.

[31] Interview Willie Collins with Terry Holzworth, May, 2001.

[32] Jim Woolf, "Water District Endorses Little Dell Funding Plan" in *Salt Lake Tribune*, September 28, 1984.

[33] *Ibid.*

[34] Interview Willie Collins with LeRoy Hooton, Jr., May 1, 2001.

[35] John Mack, "Little Dell Lake, Utah, PL 99-88 Cost-Sharing Negotiations Case Study," July 1986, unpublished paper.
[36] Interview Willie Collins with LeRoy Hooton, May 1, 2001.
[37] Interview Willie Collins with Terry Holzworth, May 3, 2001.
[38] Jim Woolf, "Build Little Dell Dam, S. L. Water Board Says," in *Salt Lake Tribune*, January 17, 1986, p. 1.
[39] See Martin Reuss, "Reshaping National Water Politics: The Emergence of the Water Resources Development Act of 1986," October 1991, for an historical evolution of the Water Resources Development Act of 1986.
[40] Interview Willie Collins with Arthur Williams, November 29, 1999.
[41] Interview Willie Collins with Nick P. Sefakis, May 1, 2001.
[42] U.S. Army Corps of Engineers, Sacramento District, "Little Dell Breaks Ground" in *Public Affairs Reports*, July-September 1988, no. 6, p. 3.
[43] Western Regional Climate Center, Internet address: wrcc@dri.edu.
[44] The documents consisted of the General Design Memorandum Supplement, Final Post-Authorization Change, Environmental Assessment, Finding of No Significant Impact, and Local Cooperation Agreement.
[45] Jim Woolf, "Work Begins on Little Dell After 50 Years of Plans" in *Salt Lake Tribune*, July 12, 1988.
[46] U.S. Army Corps of Engineers, Sacramento District, "Little Dell Breaks Ground" in *Public Affairs Reports*, July-September 1988, no. 6, p. 3.
[47] Steve Fidel, "Little Dell: Moving from a Dream to Reality Takes 30 Years" in *Deseret News*, June 15, 1986.
[48] U.S. Army Corps of Engineers, Sacramento District, "Little Dell Main Dam Contract Let" in *Public Affairs Reports*.
[49] US Army Corps of Engineers, Sacramento District, "Delays Put Little Dell a Year Behind Schedule" in *Public Affairs Reports*, February, 1991 no. 2, p. 1.
[50] Written correspondence to Willie Collins from Johnnie Mack, May 22, 2002.
[51] Jim Woolf, "Price Peaking at $60 Million as Little Dell Dam Nears Completion," in *Salt Lake Tribune*, October 1, 1992.
[52] Some of the dignitaries in attendance were Governor Michael Leavitt, retired Senator Jake Garn, South Pacific Division Engineer Brig. Gen. Milton Hunter, District Engineer Colonel John Reese, and Salt Lake City Mayor Deedee Corradini.
[53] U.S. Army Corps of Engineers, Sacramento District, "Little Dell Dam Dedicated" in *Public Affairs Reports*, September 1993, p. 4.
[54] Ted Cilwick, "Feds Bust Little Dell Kickback Scheme," in *Salt Lake Tribune*, August 18, 1994.
[55] Interview Willie Collins with Carl Korman, March 2, 2000.
[56] Steinberg and Associates discovered that the Corps devised the wrong formula when instructing MWDSLC to pay 50 percent of the separable and 50 percent of the joint cost. Changing the legislation in WRDA 94 was the first option, but since there was no WRDA 94, the change was accomplished administratively.
[57] In mid-1986, recreation was deferred. Flood control and water supply were the basis for the project.

Chapter 5

Flood Damage Reduction Projects:

Sacramento River Bank Protection Project, Redbank and Fancher Creeks Project, and Merced County Streams Project

Introduction

The Sacramento River Bank Protection Project was a comprehensive project involving erosion control on existing levees, as well as the creation of setback levees on the Sacramento River. The overall project extended more than 150 miles along the Sacramento River and was completed in several phases. The purpose of the project was to minimize the need for emergency levee repair, periodic dredging, and the loss of land due to bank erosion.

The Redbank and Fancher Creeks Project was located in the north-central area of Fresno County, which was bounded by the San Joaquin River to the north and the Kings River to the south, and included the northeastern portion of the Fresno-Clovis Metropolitan Areas, as well as rural lands to the east. This project provided the community with flood protection that is based on a series of dry dams. This type of dam are ungated, have a fixed gate, and only store water during flood events. Once flows exceed the opening of the gate, the backflow is held in the reservoir. At the end of the storm, the excess backflow contained behind the reservoir continues to pass until the reservoir is dry again.

The Redbank and Fancher Creeks Project included enlarging the existing dam (Big Dry Dam) and constructing two new dry dams. The dams were designed to operate interactively and be integrated into the existing countywide flood control system for the Fresno-Clovis Metropolitan Area. Together, the design was to provide for significant flood damage protection at a 200-year level of flood protection.

The Merced County Streams Project, located in the eastern portion of the San Joaquin Valley between the Merced and Chowchilla Rivers in both Merced and Mariposa Counties, was similar to the Redbank and Fancher Creeks Project in that the District enlarged two existing dry dams (Burns and Bear Dams) to increase their level of flood protection. Additionally, the Merced County Streams Project provided 33 miles of levee and channel improvements along the Bear Creek Stream Group.

Sacramento River Bank Protection Project

The construction for the Sacramento River Bank Protection Project was separated into several phases. The first phase of construction began in 1963 and was completed in 1974. Construction involved 81 miles of riverbank and provided public use facilities including boat launching ramps and access roads at three locations. At that time, the cost of construction totaled $40.7 million, of which $26.6 million was Federal, and the local sponsor provided the remainder of $14.1 million.

The bank protection work had some adverse effects to wildlife habitat, as well as effects to a riparian corridor. In May 1976, at the request of the Sacramento District, the U.S. Fish and Wildlife Service issued their "Fish and Wildlife Management Plan for the Sacramento River Bank Protection Project, California," reporting that construction during Phase I (1963-1974) of the Sacramento River Bank Protection Project had significant detrimental effects on wildlife, including threatening the area's endangered species, one of which included the valley elderberry longhorn beetle who lives in the valley elderberry shrub (host plant). The report also stated that substantial portions of prime riparian vegetation had been lost. The U.S. Fish and Wildlife Service proposed that mitigation include habitat restoration on 668 acres of project area including berms and that the formation of an interagency committee was

Valley Elderberry Longhorn Beetle

needed to investigate, guide, and evaluate all present and future riverbank protection.[1]

The Corps issued a draft Fish and Wildlife Mitigation Study in 1978 outlining three potential mitigation plans. In the first plan, the Corps proposed mitigation for 260 acres for the areas in which vegetation was allowed on berms but had been removed during construction. The second plan provided mitigation for the 668 acres recommended by U.S. Fish and Wildlife Service, which included the 260 acres provided for in the first plan, and 408 acres in which riparian vegetation had been removed as "deferred levee maintenance." At the time of removal, this vegetation had not been in compliance with Federal regulations or with the California Reclamation Board's levee maintenance criteria so it was removed during construction. Under this plan, mitigation for these areas would be the responsibility of non-Federal interests since maintenance was a non-Federal responsibility. The third plan provided for mitigation for all 668 acres, but outlined different cost sharing. This plan, suggested by the State of California, defined the mitigation cost as "project responsibility" and not "deferred maintenance." Hence, the costs of mitigation would be shared in the same way as the other project costs – one-third non-Federal and two-thirds Federal.[2] This dispute over cost sharing delayed mitigation for many years. Further delays occurred when the provisions of the Water Resources Development Act of 1986 (WRDA), in which Congress authorized mitigation according to the recommendations of the second plan (668 acres), only allocated $1,410,000, which was the estimated cost of the first plan that only included the 260 acres.

In addition to the bank protection work, recreation sites were also developed during the first phase, including Hogback Island, Live Oak, Garcia Bend, Georgiana Slough, and Sutter Boat Launching Area.[3] Some of these locations were used during the second phase of construction, which started in 1975 as staging locations. Phase 2 of construction ended in 1996 and totaled $118.4 million.[4]

At the completion of each unit of both phases, they were transferred to the State for the future operation and maintenance.

Redbank and Fancher Creeks Project

The history of the Redbank and Fancher Creeks Project parallels the 16-year drought that lasted between 1970 and 1986, as well as time spent by authorizing legislation funding for major water resources projects. This project became one of the District's first cost-sharing agreements under the cost-sharing provisions of the WRDA of 1986. The cities of Fresno and Clovis had persistently been at risk from flooding because of the massive runoff from the foothills and nearby Sierra Nevada streams. Topographically, the Fresno and Clovis areas have no natural outlet from the Sierra foothill runoff. The District solved the problem by constructing surface impoundments for the smaller streams and constructing traditional dams for the larger one. This system also fed into a network of underground pipelines, ponding basins, and pumping plants.

Historically, the runoff from the foothills regularly flooded communities and adjacent lands between 1872 and 1912. Many of the streams and tributaries had poorly defined channels, with some of the channels degraded by farming and irrigation practices. As a result, the runoff water, also called "sheet flooding,"[5] inundated broad agricultural and urban areas. The city of Fresno is situated at the terminus of the flood plain of the Redbank and Fancher Creeks, which includes many tributaries such as Big Dry Creek, Pup Creek, and the Alluvial Drain. This flood plain became known as the "Sinks of Dry Creek" in the early 20th century. During the 1940's, the first project by the Corps in this watershed resulted in the construction of the Big Dry Creek Dam and Reservoir, which the District subsequently enlarged as a part of the Redbank and Fancher Creeks Project.

Disastrous floods hit the cities of Fresno and Clovis in 1938 and 1955. These floods galvanized the local citizenry into demanding a greater level of flood protection. In 1956, the newly elected Congressman, Representative B.F. Sisk (D-Fresno), succeeded in obtaining authorization for a feasibility study for possible solutions to the flood problems of Redbank and Fancher Creeks, Big Dry Creek, Pup

Alluvial Drain Detention Basin

Creek, and Alluvial Drain as well as their tributaries. However, 23 years passed from the authorization of the study to the completion of the Feasibility Report and the Final Environmental Impact Statement in 1979.

In 1955, one year prior to the initial authorization, the California legislature created the Fresno Metropolitan Flood Control District (FMFCD). A year later, the local electorate overwhelmingly ratified the FMFCD's creation and its taxing authority. A flood occurred in 1958, and nine years later a record flood event occurred. "Our community wasn't demanding action be taken on the flood of 1958's authorized feasibility study until the 1969 flood hit and basically shut down the community," noted FMFCD General Manager/Secretary Douglas Harrison. "We like to count the life of the project from 1970 to completion."[6] The feasibility study finally received funding in 1970, 14 years after it was first authorized.[7]

The Community Designs an Urban Drainage Plan

Fresno County leads the nation with its agricultural production valued at $3.6 billion. The city of Fresno also has the distinction of being the largest metropolitan area in the country that relies on ground water as its sole source of residential, municipal, and industrial water.[8] With no plan for urban drainage, every building constructed in Fresno from 1872 to 1955 created an immense amount of added runoff.

A flood control system that could at the same time capture the runoff waters and replenish the groundwater was a major challenge for the new FMFCD. The answer was a network of underground pipelines, ponding basins, and pumping plants to manage the runoff water within the city. Local engineer George Blair was responsible for the urban drainage and flood control master plan that also specified a planned rural flood control system that became the Redbank and Fancher Creeks Project. Blair and his

firm, now known as Blair, Church, and Flynn Engineering, is still used by the FMFCD as its primary master planner.

Blair, Church, and Flynn Engineers completed a master plan that provided for separate but highly integrated urban and rural stormwater management systems that controlled runoff from routine storms and provided flood protection from major storms.

The master plan slowly gained consideration from the District project engineers. During the analysis of the 1979 feasibility report for the Redbank and Fancher Creeks Project, Sacramento District Commander Colonel Frederick Rockwell and Project Manager Jinji Kobayashi presented 14 alternative plans for the local community's consideration.[9] Yet, due to the lack of a natural outlet for the water runoff from the foothill streams and the unique character of the watershed, there were few true alternatives to a watershed-wide flood detention design.

Project Design and Evolution

The long-term tenure of Douglas Harrison, General Manager and Secretary of the FMFCD since 1972, had been an asset to the Redbank and Fancher Creeks Project. Harrison not only oversaw the project from its initial studies in 1970 to completion in 1994, but also brought together an advisory committee that included both agricultural and urban interests. This committee helped advance the undertaking from 1983 until 1986 when the project received congressional authorization. The advisory committee addressed key issues, including the project design, assignment of local sponsorship, and method of funding the local community's share of the cost. The communities preferred a 100-year flood protection; that is, a flood with a 1 percent chance of taking place in any year. A higher design standard would be acceptable if the local economy could afford it.

Aside from economic considerations, the most difficult issue the engineers faced was to design a flood control project for an area lacking a natural outlet. The FMFCD's engineers had no alternative but to excavate basins to catch the runoff from the smaller creeks and traditional dams on the larger streams. The Corps, at first, resisted the community's recommendation for excavated basins, preferring dams. However, after additional studies of its own and much discussion, it agreed that although the basin's design was new to them, it made sense for this situation.

The Corps' final project design called for the construction of three basins, modification of an existing dam, and construction of a new dam. The recommended basins consisted of a 940 acre-foot detention basin on Redbank Creek, a 495 acre-foot detention basin on Pup Creek, and a 385 acre-foot detention basin on Alluvial Drain. The design also called for raising the existing Big Dry Creek Dam by 7.6 feet in order to increase the reservoir's capacity from 16,500 to 31,800 acre-feet. Finally, the District proposed constructing a 9,908 acre-foot dam and reservoir on Fancher Creek. With a benefit-to-cost ratio of 1.6 to 1, the project's design promised to substantially reduce flood losses in the Fresno-Clovis metropolitan area and on surrounding agricultural lands.[10] In addition, the project would not only provide flood protection, but also recreation and ground-water recharge.

The District also oversaw the completion of two cultural resource surveys in 1975 and 1982 that identified four prehistoric sites, two in Big Dry Creek and two in Fancher Creek Reservoir. No sites were found in the detention basins.

The Redbank and Fancher Creeks Project was remarkable in that during the 16-year period from the final feasibility study in 1970 to funding for construction in 1986, the District managed to keep the project alive in the absence of appropriated funding. Those years paralleled the drought on major water resources legislation in Congress and the impasse over user fees, cost sharing, and the appropriate Federal role in future water resources development. Eventually, the success for funding this project was the product of the very active support of the local community.

WRDA of 1986: Cost-Sharing and the Redbank and Fancher Creeks Project

With the passage of the Water Resources Development Act of 1986, the Redbank and Fancher Creeks Project proceeded. The estimated cost of $84.6 million was apportioned as follows: $64.9 Federal and $19.7 non-Federal. With the authorization, the drafting of the Local Cooperation Agreement (LCA), which was subsequently called a Project Cooperation Agreement followed.

The negotiation of the cost-sharing provisions in the WRDA would develop into larger concerns. Because of the LCA issues, the small $84.6 million-dollar project became part of a broadly based impetus for change on a larger national level. Harrison worked extensively with other flood and water-management agencies and the Corps to highlight the problems that the other agencies were experiencing with the Corps' LCA procedures.

For the cost-sharing provision in the WRDA of 1986 to succeed, the District realized that the communities must be treated as partners, with their input considered in crafting the LCA's and in designing and constructing projects. For its part, the FMFCD noted that the non-Federal sponsor paid a major part of the construction cost; provided the lands, easements, and rights-of-way; conducted the ongoing operation and maintenance; and guaranteed the project against future failures and rehabilitations. Because of those responsibilities, the FMFCD felt that as a partner it had a vested right to be an active player in the contracting process and in crafting the agreements.

On August 1, 1987, the Sacramento District and the FMFCD finally arrived at a cost-sharing agreement under the WRDA of 1986. Several public officials including state representatives, Acting Assistant Secretary of the Army for Civil Works John Doyle, District Commander Colonel Wayne Scholl, and Chairman of the FMFCD board James Markarian attended the ceremony. Doyle and Markarian signed the agreement. Doyle, in pointing out the significance of the agreement, said, "It's very much a joint effort. ...The $84.6 million Redbank and Fancher Creeks project is the Corps' first[11] since the WRDA of 1986....".[12] District Commander Scholl added, "Just as important as sharing the costs of the project is the sharing of ideas between the Corps and the flood control district."[13]

Construction of the Redbank and Fancher Creeks Project Opposition Brought on Eminent Domain

The construction of the Redbank and Fancher Creeks Project consisted of seven phases. The first was the enlargement of the Big Dry Creek Dam and Reservoir. The elevation of the existing dam increased flood control capacity from 16,500 acre-feet to 31,800 acre-feet, producing a total reservoir area of 2,800 acres.

The second phase was the construction of Fancher Creek Dam and Reservoir. The new dam and 1,400-acre reservoir were built adjacent to the Friant-Kern Canal. The reservoir has a capacity of 9,098 acre-feet.

Construction of Pup Creek Detention Basin was the third phase. This 65-acre basin was located on Pup Creek at Temperance Avenue and had a flood control capacity of 495 acre-feet.

The fourth and fifth phases included construction of the Alluvial Drain Detention Basin and the Redbank Creek Detention Basin. The Alluvial Drain Detention Basin consisted of a 60-acre basin with a flood control capacity of 385 acre-feet. The 170-acre basin Redbank Creek Detention Basin was built with a flood control capacity of 940 acre-feet.

The reconstruction of the Big Dry Creek Crossing of the Friant-Kern Canal was the sixth phase. This operation unit protected the canal from flood flows in excess of the capacity of the current crossing.

The final component, the Fancher Creek Detention Basin, was funded and built by the non-Federal sponsor. This 255-acre basin is located on the Fresno Canal at McCall Avenue and had a flood control capacity of 1,670 acre-feet.

The FMFCD's General Manager Douglas Harrison praised the Sacramento District for working with the local flood control district and accepting alternatives to dams such as the detention basins, coordinating project construction units, and allowing the local flood control district to use off-road haul routes so that some of the largest construction equipment could be brought in and costs could be reduced.

However, Harrison also felt that in the process of planning and constructing the Redbank and Fancher Creeks Project, the District failed to recognize the expertise of the local flood control agency in designing and constructing flood control facilities. "There was the built-in assumption that the District had not only the best expertise in the world on building flood control projects, but also the only expertise in the world on building flood control projects," said Harrison.[14]

The project attracted broad institutional support from small farmers who owned property in the rural watershed areas. However, one large landowner, Bert Crane, opposed the enlargement of the Big Creek Dam based on environmental issues and easements planned for his property. The project design called for a fee interest and flowage easements from Crane's property. Crane petitioned the neighboring city of Clovis, the Congress, and the state legislature to no avail. After the Corps attempted to purchase the needed interests in the property, Crane refused to accept the government's offer so the Corps filed an action for eminent domain in Federal District Court. Crane first challenged the project on environmental grounds, which after considerable argument, the court found to be without merit. Subsequently, at the trial, the government determined that Crane's property value was $950,000. Crane claimed a value of over $4 million. During an 8-day trial, the parties presented testimony from a number of expert appraisers, soil experts, and agricultural market

Redbank Creek Detention Basin, CA

analysts on issues of highest and best use, market value, and use of the property as orchards. The jury returned an award of approximately $1,200,000 to Crane.

The Project Comes Together

The dedication of the Redbank and Fancher Creeks Project occurred on October 22, 1993, at the Big Dry Creek. No longer would the sinks of Big Dry Creek fill and bring destructive flooding to the Fresno-Clovis area. The added benefits included conservation of runoff to replenish the ground water, increased capability to conserve and manage surface waters, and reduced costs of mandatory flood proofing and insurance. The local flood control district petitioned the Federal Emergency Management Agency (FEMA) to remap the flood plains with the protection features in place. The FEMA Zone A flood designations were all eliminated in those areas, and approximately $4 million a year in Federal flood insurance premiums were virtually eliminated.

District Commander Colonel John Reese praised FMFCD General Manager Harrison for developing the model for the cost-sharing agreements that were now being used for all Corps projects nationwide. "His involvement has been invaluable to us on this project," Reese said."[15]

While the ground water on the east side of Fresno is still severely over drafted, conservation measures and the ability to capture the rural streamflows and replenish water in the earth substructure have helped to stabilize the water supply and control flooding in this vital agricultural area. The Redbank and Fancher Creeks Project, while small in comparison to other projects, played an important part nationally in redefining and honing a model Project Cooperation Agreement while at the same time producing enormous benefits locally.

Merced County Streams Project

The Merced County Streams Project was known in the District as the "orphaned project." It was initially authorized by the Flood Control Act of 1944 and reauthorized in 1970. The California Reclamation Board was and still is the non-Federal sponsor. As designed, the project involved construction of new reservoirs, enlargement of existing reservoirs, and channel modifications. However, to date, only one phase of the project has been completed. That phase is the Castle Dam, constructed in 1992. Changing physical and economic conditions since the 1970's challenged the economic feasibility of the remainder of the project's components. A number of internal and external problems also encumbered the project. As of 2002, no completion date has been set.

Project Description

As a result of the project's first authorization in 1944, the Sacramento District had constructed four dams and reservoirs by 1957 – Mariposa, Owens, Burns, and Bear. A reauthorization in 1970 included the construction of two new reservoirs, enlargement of existing reservoirs, and levee and channel modifications on three stream groups in the vicinity of Merced.

The Merced County Streams Project is located approximately 110 miles southeast of San Francisco near Merced on Highway 99. Highway 99 bisects the San Joaquin Valley near the city of Merced and is one of the dominant north-south freeways in California. Major population centers include Merced, Atwater, Los Banos, and Livingston. Much of the surrounding area is agricultural land with an elevation averaging 150 feet above sea level.[16]

After feasibility studies, the District in May 1976 presented several flood control plans including recreational facilities at a public meeting. Because local landowners opposed recreational programs and wanted no public access to their land, the recreation features were eliminated.[17] In 1980, the Merced

County Board of Supervisors and the California Reclamation Board supported a mutually acceptable plan at meetings held in January and February 1980. The construction of Castle Dam followed. The deferment of the original project components resulted in a single project.[18]

Challenges of the Local Sponsor

The Merced Irrigation District (MID) and the City of Merced partnered with Merced County to form an alliance known as the Merced Streams Group (MSG). The MSG would operate and maintain the project. The MID was to perform the maintenance work. However, financial problems beset these local sponsors, and they have struggled to meet their project obligations as both Merced County and MID experienced cash flow problems and lacked adequate funding. In the early 1990's, droughts reduced water sales and worsened MID's financial situation.

To solve the financial problems, the California Reclamation Board attempted to create a flood control district in Merced County. Assemblyman John E. Thurman (D-30th District) introduced California State Assembly Bill 2926 on March 2, 1982, to authorize the California Reclamation Board funding on a cost-shared basis with local government. The Department of Water Resources and the Department of Finance opposed the cost-sharing language so the bill passed the California Assembly and the Senate without the cost-sharing language. Since the county had no flood plain maps to determine which properties in the county would benefit from flood control, no proper assessments could be made, and nothing came from the enabling legislation.

Castle Dam as a Single-Purpose Project

Castle Dam is a single-purpose flood control structure located on Canal Creek, a tributary of Bear Creek. The project consisted of approximately 859 acres, including the detention dam and spillway, reservoir pool, access roads, dikes. In addition, the reservoir was built to have the capacity of 6,400 acre-feet [19] The Corps' economic analysis in the General Design Memorandum of 1980 stated that the benefit-to-cost ratio was 1.14:1. The construction schedule for the uncompleted work was designed to be completed by 2002. This work included the Oak-

Castle Dam and Reservoir, CA

dale Bridge and the rock protection work at the weir on Edendale Creek.

The purpose of the project was to increase the level of flood protection from a 1-in-50-year event to a 1-in-200-year event for the Merced urban area and also to protect Castle Air Force Base. Helping to fund the dam were the California Reclamation Board and MSG. The estimated Federal cost was $37,260,000 and that of the two non-Federal sponsors, as estimated in 1969, was $2,450,000. The revised cost as of 2001 was $35 million. This work included raising the existing Bear and Burns Dams and constructing the bypass channel upstream of Merced.

Construction

The Phase II General Design Memorandum[20] described the project as having the following components: Castle Dam (completed in 1992) on Canal and Edendale Creeks, the construction of a main Canal Check Structure (completed in 1994), rehabilitation to the Fahrens Creek Gates (completed in 1994), the construction of a turnout structure on Edendale Creek (completed in 1998 and modified in January 2000), as well as the construction of a bridge over Edendale Creek upstream of the Highway 59 bridge crossing[21] (completed in March 1999). In 1995, the District completed a trash rack modification to the dam and restored Edendale Creek, which is upstream of the Highway 59 bridge crossing at Old Railroad Crossing in 1999.

Compliance Issues

Although the environmental effects of the project were minimal, mitigation in the form of restoration and creation was completed between the levees on the Bear and Fahrens Creeks. The restoration included the establishment of riparian vegetation and associated marshland.[22] This was done as part of the environmental compliance for the National Environmental Policy Act (NEPA), as well as compliance under the Endangered Species Act. Additionally, brush piles in the mitigation areas were provided for cover for upland species as a part of the dam's construction.[23] By modifying the footprint of the project, the project did not adversely affect the area's endangered species, which included the bald eagle, blunt-nosed leopard lizard, Aleutian Canadian goose, and American peregrine falcon.[24]

In addition to the vegetation and wildlife restoration compliance the District performed, two cultural resource surveys were completed, which documented four cultural sites at Castle, 31 at Bear, four at Haystack, and 17 at Burns. Some of the sites included prehistoric bedrock mortars, villages, lithic scatters, rock art, historic settlements, cabin foundations, and mining remains. Fortunately, the project had little effect on these resources.[25]

Project Responsibilities

The Sacramento District transferred the dam to MSG for operation and maintenance in April 1995. However, neither the local sponsors nor the California Reclamation Board was satisfied. "They [the Corps] turned the project over to us even though we weren't quite ready to accept the project and everything wasn't completed on it, at least it wasn't to our satisfaction," said Director of the Merced County Public Works Department Paul Fillebrown. The project should "truly be complete for the sponsor and not have shortfalls in it,"[26] stated the California Department of Water Resources Project Manager Ken Finch. "Once the District completes a project and delivers it to the California Reclamation Board, there is no recourse and the state has to accept it – good or bad – and live with the consequences of lawsuits," declared Finch.

The California Reclamation Board and Merced County maintained that the project was incomplete because of a faulty design in the turnout gates that would result in insufficient water discharge during flooding. Moreover, the design and construction of the check structure did not allow for ease of operation. The need for "drop logs" to stop the water necessitated the procurement of a crane rather than mobile or manually operated gates. Ken Finch went back and forth with the Corps for more than a year before the District enlarged the facilities.[27] The problem with the turnout gates was due to a change in use of the structure.

The purpose of the check structure was to cut off floodflows during the winter months down the Main Canal. When the check structure was closed, flows were diverted down Edendale Creek and Canal Creek through their respective turnout structures. When Castle Dam was originally designed, in order to minimize costs, the District made a decision for the use of manually installed flash boards that would be adequate to shut the flows off in Main Canal since it was expected that this check structure gate would be closed and opened only once at year at the start and end of flood season. After completion of Castle Dam, Merced Irrigation District required full use of Main Canal during the irrigation season, which overlapped with the flood control season. This overlap caused a dual use of the canal, requiring the canal's check structure gates to be opened and closed much more often than anticipated and under differing flow conditions.[28]

FEMA and the Corps: Two Differing Parameters

The need for the District's certification of the levees along the Main Canal caused more problems for the MSG. The District's flood plain modeling indicated that the check structure at Edendale Creek was inadequate to handle designed releases into Castle Reservoir. Before the District completed Castle Dam, a change in the FEMA maps expanded the original flood plain limits. The revision showed an increase in the basin hydrology. Consequently, at the completion of Castle Dam, an increase in flooding was shown in some areas due to this change in criteria. The County determined that if the District was able to certify the Main Canal for a 100-year event, the FEMA maps could then be further revised to show a decrease in flooding along Fahrens Creek. An initial inspection by the Corps' District staff expressed identified concerns that the canal did not meet FEMA freeboard criteria, and staff had other concerns whether Main Canal would not fail during a 100-year event.

The Main Canal had been originally constructed around the turn of the century using horses and wagons and questionable construction techniques, as well as questionable materials. In many places leaks were observed in the canal embankment. The County argued that Main Canal had stood the test of time, never having failed during its 100-year life, and saw no reason to believe that the canal would fail in the future. Congressman Gary Condit's staff appealed to the Corps' Headquarters, and Headquarters agreed with the County. The District then certified the Main Canal to retain a 100-year event, and the levee was never modified.

Localized heavy rainfall in an already saturated foothill watershed filled local creeks, causing three flood events in January, February, and March 1998, which tested the Castle Dam. The project worked as designed during the floods except for the Main Canal/Edendale Creek check structure that sustained damage. A General Reevaluation Report (GRR) is currently being written and is scheduled to be completed in October 2005. The GRR will then be followed by the design phase that is projected for completion in October 2008. The proposed work will include raising the existing Bear and Burns Dams, as well as constructing a bypass channel upstream of Merced. The revised estimated cost as of 2002 is approximately $35 million.[29]

Burden of Responsibility for All

Burdened with a number of problems, the Merced County Streams Project still moves slowly toward completion. The MSG and the California Reclamation Board's divergent views have not aided in the project's progress.[30] One example is that at one point, the California Reclamation Board and the local sponsors could not agree with the District on what should be done.[31]

Currently, there is still a good level of support from the city of Merced and the MID. The California Reclamation Board and the local sponsors are eager to work with the District to complete the remainder of the project. With the scheduled completion of the GRR, the District, the Reclamation Board, and the local sponsors should be able to bring this project to completion.

Endnotes

[1] U.S. Department of the Interior, Fish and Wildlife Service, "Fish and Wildlife Management Plan for Sacramento River Bank Protection Project, California," May 1976, p. 42-43.
[2] U.S. Army Corps of Engineers, Sacramento District, "Draft Fish and Wildlife Mitigation Study for the First Phase of the Sacramento River Bank Protection Project, California," July 1978.
[3] Second Phase, Appendix A, p.18-19.
[4] U.S. Army Corps of Engineers, "Water Resources Development in California," 1995, p. 83.
[5] "Long Awaited Flood Control Measures Initiated," in *Fresno Business*, vol. 88, no. 9, September 8, 1967. p. 1.
[6] Interview Willie Collins with Harvey Douglas Harrison, February 7, 2001.
[7] U.S. Army Corps of Engineers, Sacramento District, "Redbank and Fancher Creeks Investigation: Information for Phase I Conference," 1971.
[8] Jeanie Borba, "Water Crisis Years in Making..." in *Fresno Bee*, June 18, 1989, p. A1.
[9] U.S. Army Corps of Engineers, Sacramento District, "Transcript of Public Meeting on Investigation for Flood Control and Related Purposes, Redbank and Fancher Creeks, California," December, 5 1973, p. 7.
[10] U.S. Army Corps of Engineers, Sacramento District, "Design Memorandum No. 1, Redbank and Fancher Creeks, California, General Design Memorandum," February 1986. p. 1.
[11] The LCA for the Little Dell Project, Utah, is dated June 10, 1986, and the LCA for Redbank and Fancher is dated August 1, 1987. Therefore, Little Dell is the first Sacramento District project under WRDA 1986.
[12] Charles McCarthy, "Redbank Contract is Signed" in *Fresno Bee*, August 2, 1987. p. 1.
[13] U.S. Army Corps of Engineers, Sacramento District, "Redbank and Fancher Creeks Contract Signed" in *Public Affairs Report*, July-August, 1987, pp. 87-8.
[14] Interview Willie Collins with Harvey Douglas Harrison, February 7, 2001.
[15] U.S. Army Corps of Engineers, Sacramento District, "Redbank and Fancher Project Turned Over to Sponsor" in *Public Affairs Report*, December, 1993, p. 7.
[16] U.S. Army Corps of Engineers, Sacramento District,. "Merced County Streams, California, Supplemental General Design Memorandum, Project Design," October 23, 2000, Incomplete Draft Document. p. 2.
[17] U.S. Army Corps of Engineers, Sacramento District, "Transcript of Public Meeting, Merced County Streams Project, California," May 1976, p. 1.
[18] U.S. Army Corps of Engineers, Sacramento District, "Merced County Streams, California, General Design Memorandum Phase I, Plan Formulation," March 1980, p. 1.
[19] U.S. Army Corps of Engineers, Sacramento District, "Merced County Streams, California, Environmental Impact Statement," March 1980, p. 1.
[20] U.S. Army Corps of Engineers, Sacramento District, "Merced County Streams California, General Design Memorandum, Phase II, Project Design," October 1981, p. 1.
[21] U.S. Army Corps of Engineers, Sacramento District, "Merced County Streams Group, Castle Dam and Reservoir, Merced, California, Operations and Maintenance Manual," pp. 1-1 and 1-2.
[22] U.S. Army Corps of Engineers, Sacramento District, "Draft Special Report: Fish and Wildlife Mitigation and Enhancement Features, Merced County Streams, California," October 1977, p. 24.
[23] U.S. Army Corps of Engineers, Sacramento District, "Merced County Streams Group, Castle Dam and Reservoir, Merced, California, Operations and Maintenance Manual," p. 8-1.
[24] U.S. Army Corps of Engineers, "Merced County Streams Project: Endangered Species Biological Data and Blunt-Nosed Leopard Lizard, Field Survey Report." December 1980, p. 2.
[25] U.S. Army Corps of Engineers, Sacramento District, "Merced County Streams Project, Castle Reservoir, California, Intensive Cultural Resources Survey," March 1982, p. 3.
[26] Interview Willie Collins with Ken Finch, January 15, 2001.
[27] Interview Willie Collins with Ken Finch January 15, 2001.
[28] Interview Willie Collins with Perry Metzger, September 10, 2002.
[29] Interview Willie Collins with Kevin Roukey, September 10, 2002.
[30] *Ibid.*
[31] Interview Willie Collins with Judy Soutiere, October 12, 2001.

Chapter 6

Flood Damage Reduction in Urban Areas:

Fairfield Vicinity Streams, Cache Creek Settling Basin, Walnut Creek, Wildcat and San Pablo Creeks, Napa River, and the Guadalupe River

This chapter examines six projects that deal with flood control in an urban setting. These projects illustrate the balancing of flood protection, environmental restoration, and in some cases, recreation in residential and commercial development areas. The collaboration efforts for these projects also demonstrate how the Sacramento District's work can affect vast populations and how the Corps interacts with urban communities to perform the work.

In an urban setting, streams, creeks, and rivers flow closest to the people and communities that the Corps seeks to serve. In many cases, these waterways are literally in residents' own backyards. As such, the communities are justifiably most concerned about their safety and increasing environmental issues. As the communities work with the Corps, these communities seek to restore their creeks, streams, and rivers so that they become an asset rather than a liability.

The Fairfield Vicinity Streams Project affected both the cities of Fairfield and Suisun, as well as unincorporated areas of Solano County. Although Cache Creek flows primarily through Cache Creek Canyon and wildlife areas, it is 2 miles north of the city of Woodland and has affected the city's storm water drainage system. The city of Walnut Creek kept a portion of its creek in one of the last areas of the city where the creek ran in a natural setting. The Walnut Creek Project offered new methods of flood control using covered channels. The Wildcat and San Pablo Creeks Projects demonstrated the use of consensus building among all stakeholders and showed new ways of justifying a project's benefit-to-cost ratio by using the social well-being of low-to-moderate-income communities. The Napa Creek Project became the model for consensus building and environmental restoration with the "living river" concept. The Guadalupe River Project showed how the Corps was not only able to provide flood protection, but to successfully strike a balance among fish habitat, flood control, and recreation, as well as revitalize a portion of the city of San Jose.

In most of these projects, the District's image was greatly enhanced through its efforts at working closely with the local sponsors to achieve both flood control and environmental restoration. Unlike flood control projects on levees in a rural setting, the loca-

Fairfield Flood, North Highway 12 at Union Avenue - Circa 1982

tion of the projects in major urban areas has enabled many residents to see the Corps' work firsthand.

Fairfield Vicinity Streams Project

The Sacramento District's Fairfield Vicinity Steams Project has significantly reduced flooding and flood damage in Fairfield, California, and in the neighboring areas of Suisun City and unincorporated areas of Solano County. The project was a joint effort with the City of Fairfield and the California Reclamation Board. The project included modifications to five streams, improvements to stream channels, and recreational facilities. It also included flood protection for the Fairfield vicinity including Suisun City and the upstream county area, vehicle bridges, a pedestrian bridge, access roads, parking areas, and environmental mitigation efforts. The project was financed through a storm drainage maintenance fee.

Deferred Project and Residential Development

The Senate Public Works Committees authorized the Fairfield Vicinity Streams Project in December 1970 under provisions of Section 201 of the Flood Control Act of 1965. The Chief of Engineers approved the Phase I General Design Memorandum in May 1976 and the Phase II General Design Memorandum in March 1977. The 200-year flood protection plan consisted of modifications to five streams: Ledgewood Creek, Pennsylvania Avenue Creek, Union Avenue Creek, Laurel Creek, and McCoy Creek. The plan called for unlined channel improvements (with the exception of one lined creek channel), diversion channels, drop structures, and improvements to two existing detention basins.[1]

In September 1977, with the strong support of the Reclamation Board, the City of Fairfield placed a tax initiative to fund the project before voters. Electors defeated the project by a narrow margin because of the tax assessment imposed to operate and maintain the flood control structures estimated at $50,000 annually. Key opponents of the initiative resided in the outlying areas of Solano County, areas less affected by floods than the cities of Fairfield and Suisun. Following the initiative's defeat, at the request of the City of Fairfield, the Corps assigned inactive status to the project.

After the defeat of the tax initiative, the city of Fairfield and the surrounding areas continued to grow. The City actively acquired the right-of-way for needed creek improvements as residential and commercial development advanced. The City approved a large subdivision of residential housing along Ledgewood Creek, one of the major streams of the project, requiring the developer to build an adjoining flood control channel.

Flood of 1982 and Project Reactivation

On January 4, 1982, one of the most significant storms in the city's history hit the city of Fairfield and the surrounding vicinity. The City of Fairfield calculated that over a 24-hour period, precipitation exceeded a 200-year storm, resulting in water 6 feet deep in some areas.[2] Bridges and roadways flooded, with emergency staff evacuating more than 300 families. Although significant flooding occurred in 1973 and 1978, the flood of 1982 compelled the City of Fairfield to request reactivation of the flood control project. The reactivated project would be downsized from a 200-year event to a 100-year event, primarily to reduce costs and to incorporate the earlier Ledgewood Creek channel improvement work. The Reclamation Board and the Corps returned the project to active status in June 1982.

The City of Fairfield accepted the District's recommended revised plan. The total project cost of $35.4 million required a non-Federal share of $22 million and $13.4 million in Federal costs. The project offered a benefit-to-cost ratio of 1.31:1. The plan provided for the improvement of 25,133 lineal feet of channel (half of the recommended plan in 1976) and 25,133 lineal feet of hiking and biking trails.[3] The proposed plan also provided flood protection to 3,900 acres of land in the Fairfield vicinity, including Suisun City and the upstream county area.[4] The Reclamation Board constructed 22 bridges, subcon-

Ledgewood Creek, North of Highway 12 at Sunset Avenue - Circa 1982

tracting the City of Fairfield to complete 15 of the bridges, with the state completing seven.

The City of Fairfield sponsored the recreational component of the project. The scope of proposed recreational facilities included the biking and walking trails, a pedestrian bridge over Air Base Parkway, access roads, parking areas, a boat-launching ramp, and a staging area at Cordelia Road for the Ledgewood Creek Trail.

The Corps relieved county residents' concerns over protecting the environment by revegetating areas of the channel where construction destroyed native vegetation. Since Ledgewood Creek supported a small run of steelhead trout, the City of Fairfield built baffles so that the fish could pass.

Local Financing and Opposition

Now that the District had activated an approved project, the City of Fairfield, the local sponsor, needed to find a way to finance their share of the costs and to advocate the new plan. Sonoma County and the City of Suisun opposed the project so the City of Fairfield had the task of stressing to them the benefits of the flood control project. The county residents were content with the natural free-flowing streams and were not concerned if excessive storm-waters flooded their 5-to-10-acre parcels. The city of Suisun, on the other hand, was downstream at the bottom of the flow, subject to the risks of a 1- or 2-year storm event as opposed to the 100-year protection as proposed in the project. In spite of Suisun's vulnerability to potential flooding, Suisun City representatives opposed the project on the grounds that they wanted to make a roadway out of portions of the floodway. Like Fairfield, Suisun also had to acquire and provide land for the project.

Director of Public Works Ronald Hurlbut and Assistant Director of Public Works Morrie Barr were the City of Fairfield's representatives for the project. They both knew that the City of Suisun and the County needed strong coaxing before they would lend their support. Barr concentrated on convincing Suisun that their desired roadway should be left for the streams. After many discussions with the County, Barr gained their support for the project.[5]

Because voters had already defeated a ballot initiative the first time, the City of Fairfield avoided another ballot measure and instead instituted a sewer maintenance fee, assessing properties within the city limits. This fee met the approval of both the City of Suisun and the County. With the Reclamation Board and Corps behind the project, California Congressman Vic Fazio now pushed for congressional authorization of the work.

The Project Is a Reality

The Corps, Reclamation Board, and the City of Fairfield executed a Local Cooperation Agreement on June 3, 1986, and construction began in October 1986.[6] In 1991, the Corps completed the project and transferred it to the local sponsor for operation and maintenance. The project's performance since completion more than justifies its cost. Flooding at Air Base Parkway to Travis Air Force Base, as well as other flood-prone areas, has significantly been reduced. At this time, the relationship between the local sponsors and the Sacramento District was good, the Director of Public Works Hurlbut recalled, "The Corps was cooperative, sensitive to local concerns and issues, and kept the project moving."[7] Commercial and residential development in Fairfield has continued, but with flood protection measures in place, residents have reasonably good assurances that their property is protected.

Cache Creek Settling Basin

The Cache Creek Settling Basin Project was a joint project between the California Reclamation Board and the Corps. The Reclamation Board has been administratively a part of the California Department of Water Resources since 1969, but retains all the powers and responsibilities dating from its inception in 1911. The Reclamation Board has cooperated with the Corps in controlling flooding along the Sacramento and San Joaquin Rivers and tributaries for more than 90 years.[8]

The settling basin designed to keep Cache Creek's sediment out of downstream channels had outlived its usefulness after more than 40 years even with modifications, including enlarging and raising the levees, among other changes. The Sacramento District first completed the project in 1937. Subsequent modifications were made in the 1940's, 1950's, and 1970's. The Sacramento District and the Reclamation Board dealt with several issues to arrive at the completion of the project, including whether to create a wildlife refuge in the project area, how to define the structure, and differences of opinion on the design standard and the extent of protection required for the interior of the levees.

Background

The Cache Creek basin is naturally divided into an upper drainage area that includes Clear Lake (perhaps the oldest lake in California) and its tributaries, and a lower drainage area that includes Cache Creek and its tributaries in the Central Coast Range of northern California. The latter is the study area discussed here. Historically, the Lake Miwok Indians were the only inhabitants of the area for 8,000 years until the Europeans came. Europeans occupied the area in the late 19th century. Cache Creek got its name from fur trappers "caching" their furs.

Cache Creek originates at the east end of Clear Lake approximately 110 miles north of San Francisco. It flows southeast through Cache Creek Canyon and across the valley floor 2 miles north of Woodland (off Interstate 5) and 15 miles northwest of Sacramento, discharging into the Yolo Bypass. The creek drains a total of 1,150 square miles south through the rugged Cache Creek Canyon into Capay Dam, and east through Capay Valley past the agricultural lands of Yolo County into the Yolo Bypass.

The lower Cache Creek basin provided several benefits: it flooded the agricultural land during the winter and provided farmers high-quality land for seasonal crops, replenished the groundwater in the basin, provided habitat for wildlife, and afforded an environment for waterfowl by watering its ponds. The main function of the 1937 Corps-built Cache Creek Settling Basin, a unit of the Sacramento River Flood Control Project,[9] was to "preserve the floodway capacity of the Yolo Bypass by trapping sediment loads carried by Cache Creek during the flood

season and preventing the sediment from depositing downstream in flood control and navigation channels."[10]

Since its initial construction in 1937, the basin has undergone a number of modifications: the construction of the southern levee in 1940, a cobble weir in 1944, a training levee in 1950, a 3-mile extension upstream from Woodland, and a 2-foot extension of the cobble weir in 1973.[11]

The Reclamation Board, responsible for the operation and maintenance of the Sacramento River Flood Control Project, wanted a long-range solution to the settling basin problem and sought the Sacramento District's assistance. In 1979, the District studied the problem, determining that the large volume of sediment transported downstream to the basin exceeded the storage capacity of the basin. The sediment carried into the Yolo Bypass also compromised the navigation channels of the Yolo Bypass, Sacramento River Deep Water Ship Channel, and the San Francisco Bay system. Additionally, there was bank erosion between Rumsey and Woodland as a result of gravel mining, and hillside and sheet erosion in the Capay Valley section of the creek.

The Sacramento District presented alternatives for resolving the Cache Creek basin problem at two well-attended public meetings[12] held March 20 and 21, 1978, in Woodland. The plan presented at those meetings included several modifications: raising the perimeter levees of Cache Creek an average of 12 feet, enlarging the existing project levees from the mouth of the settling basin upstream to County Road 102, replacing a cobble weir near the southeast corner of the basin with a larger concrete weir, removing the existing training levees, and constructing a new training levee and channel adjacent to the new western perimeter levee to provide 50 years of sediment storage capacity (340 acre-feet annually). The project had a benefit-to-cost ratio of 2.0 to 1, based on 1979 estimates.

In addition to these structural solutions, Congressman Vic Fazio (D-CA) proposed to buy out the farmers who raised crops inside the basin and convert the basin to a wildlife refuge. The Department of Fish and Game supported this proposal, and the Chief of Engineers in 1981 recommended that the Corps implement the wildlife refuge. However, the Assistant Secretary of the Army disagreed and recommended that the U.S. Fish and Wildlife Service was the appropriate agency to fund and implement the wildlife refuge.[13] The Service, citing a lack of funds, was unable to support the project. This feature of the project then became reclassified as "deferred."[14]

With the wildlife refuge issue resolved, the Reclamation Board and the District now needed to agree on a design standard, on a definition of the basin, and on the extent of protection for the interior of the levee. After a review of the Sacramento District's design for the project, a disagreement ensued between the Corps and the Department of Water Resources (DWR) over the design standards for the project based on what definition one used to define the basin. The DWR's Division of Safety of Dams defined the basin as a jurisdictional dam whose design standards were below the norm. The District, however, maintained that the project was a retention basin. The District compromised by incorporating some of the design recommendations of the Division of Safety of Dams into the design, provided that the State would pay the incremental difference. The State could not afford the additional costs, however, and therefore accepted the Corps' design standards. The DWR urged the Corps to protect the interior of the levees with riprap. The Corps proposed to provide rock protection only at critical locations. Yet, the District's design for a new south levee inside the existing settling basin cut off the discharge of the city of Woodland's stormwater, which flows into the Cache Creek Settling Basin. To prevent this, the Corps called for the construction of a channel for the city of Woodland's storm drain water. This channel accommodated an unregulated flow of approximately 900 cfs.

After the resolution of the design, Congress authorized the project under the omnibus Water Resources Development Act of 1986. The Sacramento District began construction in 1990 after the Department of the Army and the State of California signed a Local Cooperation Agreement. The District completed most of the project in 1993 at a cost of approximately $22 million, with the Federal Government paying approximately 67 percent ($14.8 million) and the state 33 percent (7.2 million). The benefit-

cost ratio in 1994 was 1.4 to 1, with average annual benefits of $2.6 million in flood damage reduction. An innovation in the construction of the project was the District's use of a new kind of concrete called roller compacted concrete (RCC) defined as "a dry concrete consolidated by external vibrators with rollers."[15] With the project completed, the Corps transferred the project, including its operation and maintenance, to the state on December 2, 1994.

In the winter of 1995, significant levee erosion occurred due to wind-wave action, requiring the installation of bank protection. The Corps began levee repairs by providing rock to protect the banks in 1996. In the original design, the Corps only provided for rock protection in critical locations, while the DWR wanted more extensive rock protection of the interior of the levees. The Corps' original decision to provide only minimal protection "proved the DWR right" recalled Chief of Flood Plain Management for the Department of Water Resources Ricardo Pineda.[16] The work should have been done beforehand.

Erosion also resulted from the unregulated channel for the city of Woodland's storm drain water. Negotiations have been in progress for five years trying to arrive at whether the Reclamation Board or the Corps was financially responsible for the erosion. The city of Woodland hopes that through the advocacy of Congressman Doug Ose (R-CA), the Congress will allocate funding to fix the problem. As of 2002, the issue was in the feasibility stage.

While the Cache Creek Settling Basin Project has performed well since its construction, there are four issues that remained unfinished: the installation of a low-flow diversion culvert, the construction of a diversion structure across the Yolo Bypass to convey the low flows north of the Yolo Shortline Railroad's trestle to the Tule Canal, the mitigation measures for effects to the city of Woodland's stormwater drainage system, and raising the reconstructed weir by an additional 6 feet in 2018. The floodflow capacity of the Yolo Bypass is maintained through the construction and modifications of the Cache Creek Settling Basin Project. The farmers continue to raise crops in the basin, and the City of Woodland awaits the resolution of the discharge of its stormwater into the Yolo Bypass.

Conclusion

The Cache Creek Settling Basin Project has worked well since its construction. The modified basin alleviated the problem of sediment deposit and eliminated any impediment to the flow of waters into the Yolo Bypass. The project demonstrated how the Corps and the Reclamation Board resolved differences and the flexibility required of each agency to complete successful projects. The resolution to the city of Woodland's problem and the other unresolved issues should satisfy all parties.

The Walnut Creek Flood Control Project: Reducing Urban Floods

The Walnut Creek watershed covers 180 square miles and lies between the Berkeley Hills on the west and Mount Diablo on the east, flowing north at the confluence of San Ramon and Las Trampas Creeks to Suisun Bay. In the 1940's and 1950's, the city of Walnut Creek was a serene little town nestled in a valley approximately 20 miles east of San Francisco Bay in Contra Costa County. Walnut Creek flowed through the town and supported a wide range of aquatic plants and other wildlife. However, as more and more residents moved to the area during the late 1940's, the rural ambience that had attracted them in the first place came increasingly under threat. This was largely because the city officials, not realizing how to use the local creeks to their advantage by showcasing them and preserving their rustic beauty, routinely allowed developers to cover the waterways with buildings and parking lots.

"No one then realized how much Contra Costa would grow – people weren't environmentally sensitive. They were interested in building homes for people who wanted homes," said Assistant Public Works Director Bud Murphy.[17]

As suburban sprawl continued throughout the 1950's, it was Walnut Creek's waterways that paid the heaviest price. The first culvert enclosing Las

Trampas Creek was built in 1958, and the Corps designed a culvert that forced San Ramon Creek underground.[18] Today, San Ramon Creek runs under a large shopping center.

Flooding Problems in Walnut Creek

Walnut Creek had experienced perennial flooding in its 6,670-acre flood plain that has caused damages since 1958. Flooding affected residential, commercial, and agricultural areas.

The formation of the Contra Costa County Flood Control and Water Conservation District (CCFCWD) in 1953 faced opposition from some of its members who felt that flooding in the area would have been more effectively prevented over the long-term with the construction of a dam and reservoir. However, no such structures were built, making concrete channels the only option to send water flowing down the creek swiftly enough to prevent floods.

In order to provide flood protection to the city of Walnut Creek and the neighboring cities of Concord, Pleasant Hill, and Martinez, the Walnut Creek Flood Project would have to enlarge and straighten the channels of Walnut Creek and lower San Ramon Creek through levees and channel stabilization structures.

Origins of the Project

In accordance with the Chief of Engineers' recommendations in the Flood Control Act of 1960 (House Document 76, 86th Congress), Congress authorized the Walnut Creek Flood Control Project. Construction planning began in 1961. The actual work started in 1964 and continued sporadically until 1991. When completed, the project encompassed 22 miles of channel and 14 miles of levee near the residential, commercial, and agricultural areas of Walnut Creek and the neighboring cities.

The project's first reach (phase) comprised the lower portions of Pine and Galindo Creeks (an area added in a post-authorization change). The second reach comprised the upper Pine Creek watershed, extending 4 miles upstream from the Bay Area Rapid Transit line to the Arroyo del Cerro-Little Pine Creek Reservoir.

The total cost of the project was approximately $95.6 million. The Federal share was $69.3 million and the non-Federal cost was $26.3 million. The final phase was completed in early 1991.[19]

Public Input and Design Changes

The Action for Beauty Council (ABC), founded in 1966 with the self-described aim of "keeping Walnut Creek an outstanding city" by promoting civic beautification projects, was one of the first civic groups interested in restoring the town's namesake creek and its tributaries. Other groups would emerge as the project progressed, including the city, the CCFCWD and the East Bay Regional Park District.

ABC met with the Corps in October 1969 to submit plans for a way to retain the creek's natural ecology while protecting the city from devastating floods. However, their proposed plan would cost twice as much as the Corps' plan so CCFCWD and the District proceeded with the concrete channel up to the Walnut Creek Elementary School with little additional local feedback.[20] A covered concrete channel was constructed in 1971 from the Broadway conduit to Capwell's department store.

After the project was underway, its non-Federal sponsor, the CCFCWD, formally requested that the District consider widening its scope to include improvements to lower Pine and Galindo Creeks. The City of Concord's Council members indicated they wanted to include channel improvements on these creeks as part of the authorized project (Resolution No. 4018, dated March 23, 1970). Two post-authorization changes, one in April 1970 and another in December 1973, extended the authorized project to include the lower and upper portions of Pine and Galindo Creeks.[21] These post-authorization changes resulted from a transfer of work from the U.S. Soil Conservation Service (SCS, now the Natural Re-

sources Conservation Service (NRCS) of the U.S. Department of Agriculture) to the Corps.

The SCS planned both downstream channel improvements and flood detention storage for Pine and Galindo Creeks. However, before the SCS project was approved, the Agricultural Committee of the U.S. House of Representatives determined that the flood control benefits accruing to the channel improvements on lower Pine and Galindo Creeks would be primarily urban, not rural, in nature and thus that these channel improvements were not an appropriate project to be handled by that agency. As a result, Congress transferred the project to the Corps.

From 1973 to 1977, several plans for channel improvements were presented to the public for its consideration, including trapezoidal earth channels, rock-lined trapezoidal channels, open rectangular concrete-lined channels, covered concrete channels, and an combination of types at designated reaches.

This resulted in several design changes. The District's original design for Reach II, Willow Pass Road to Rudgear Road, called for channel enlargement and a reinforced concrete-lined channel for San Ramon Creek.[22] Some community members wanted to preserve the creeks in their natural state, while others wanted to cover them with concrete. In the end, the CCFCWD pointed out that the concrete lining could be put in an earth channel. CCFCWD's Deputy Public Works Director Milt Kubicek defended their action: "The District is not anti-creek. We have to look at whether it is practical. Can we afford it? Can we maintain it in the future?"[23]

At a public meeting held on April 10, 1972, concerned residents and city officials voiced opposition to the proposed project, citing negative effects such as the destruction of natural beauty, deprivation of wildlife habitats, and fewer recreational options for residents and visitors. Less than a year later, the District Commander Colonel James C. Donovan, Chief of Engineering Division George Weddell, and other District staff responded to the residents' concerns. In a public meeting held March 27, 1973, they announced the cancellation of the construction contract:

> *We are still working on a bypass system which would leave the reach from Creekside Drive to Rudgear Road essentially like it is, which would also leave the reach in front of the high school... essentially as it is and it would require no major alterations to Walnut Creek in the Civic Center region.*[24]

At this time, Donovan preferred the covered channel concept:

> *You will be able to incorporate with the least loss of land on either side...the city's bike trail and hiking trail concept..., landscape those banks and provide – even though it's not the natural creek – a very aesthetically pleasing area.*[25]

By this time, residents and property owners had enlisted the aid of the Sierra Club, whose attorneys had hinted that they might seek a court injunction. Thus, the Sierra Club and residents, in addition to Representative Jerome Waldie (D-CA), praised Donovan's decision to delay the project. At this point and throughout the completion of the project, the Sacramento District, the CCFCWD, and environmentalists united to seek alternative solutions to concrete channels while preventing flooding and saving creeks from destruction. Contra Costa was one of the leading counties in this nationwide trend.

By 1973, the project was approximately 35 percent complete. The finished work consisted of 13.1 miles of channel improvement, 9.2 miles of levee construction, landscaping, and drop structures No. 1 and No. 2. The District transferred the completed construction work to local interests for operation and maintenance. The remaining work involved improvements at Civic Park (Walnut Creek), Las Lomas High School (San Ramon Creek), Creekside Drive to Rudgear Road (San Ramon Creek), upper and lower Pine and Galindo Creeks, and the San Ramon bypass. This work took place between 1978 and 1984. Other modifications were eventually made on Walnut, San Ramon, and Las Trampas Creeks.

Five Plans on the Board

Colonel F.G. Rockwell, Jr., the District Engineer from 1973 to 1976, urged written input from all concerned citizens. Since the first public meeting in October 1972, the District had examined 20 alternative plans, most of them not economically feasible. Of those 20, only five were deemed representative for comparison and public discussion.

Plan 1 called for an open channel with a bypass channel in Civic Park, providing a pond and landscaped arboretum or park. Plan 2 proposed a covered channel with a pond. Plan 3 proposed a covered channel bypass following the alignment of the Southern Pacific Railroad right-of-way from Murwood School on the San Ramon Creek to the railroad bridge over Walnut Creek near Ygnacio Valley Road. Plan 4 recommended bypassing all floodflows in Las Trampas and San Ramon Creeks from the existing channel in the Civic Park area. Plan 5 proposed a bypass alignment preserving the existing creek on the Las Lomas High School campus and in the Creekside Drive to Rudgear Road area.[26]

At the public meeting on April 11, 1974, Colonel Rockwell, Jr., and District associates presented the five plans. Rockwell concluded that plans 2 and 5 were the two plans that would "appear to be the most viable alternatives within the community as we see it to solve the flood problem."[27] Southern Pacific Railroad's decision to abandon its railroad enhanced the option to build the bypass channel.

After extensive public input and examination of the plans, District Engineer Colonel Donald M. O'Shei released the Final Environmental Impact Statement in 1976. O'Shei made it clear that "where feasible, measures have been adopted to retain existing riparian vegetation by construction of bypass channels."[28] The District considered the bypass channel for San Ramon and Las Trampas Creeks as a workable alternative to other flood control prevention methods. The plan also complied with all U.S. Fish and Wildlife Service and National Environmental Policy Act requirements within the channel's construction.

Prior to 1975, the Sacramento District had completed a number of studies on streams related to the Walnut Creek basin. In July 1977, the District released a second Final Environmental Impact Statement, which declared that several creeks including Walnut Creek and Walnut Boulevard Channel as well as Murderers, Grayson, Tice, Las Trampas, San Ramon, Bollinger and Sycamore, would be left natural. In addition, a bypass channel would be constructed to circumvent San Ramon Creek from Rudgear Road to the Walnut Creek area in Civic Park in downtown Walnut Creek.

Recreation, Beautification, and Other Proposals

In 1982, one of the wettest years on record, creek flooding caused several million dollars worth of damage in Contra Costa County. The CCFCWD reacted to this flooding by planning for concrete channelization that would increase the carrying capacity of Grayson Creek and its tributaries. While this plan was separate from the District's work, it further galvanized environmental groups such as Friends of Creeks in Urban Settings (FOCUS) to pressure CCFCWD to seek alternative solutions. That spring, Contra Costa County adopted one of the most stringent creek protection ordinances in the nation. It required that the management of the runoff from creeks ensured the creeks' ecological health. By 1984, the lack of a funding appropriation to complete the District's studies halted the proposed project. Meanwhile, new civic and environmental groups emerged, advocating the preservation of Walnut Creek and its tributaries.

Bev Ortiz, a Walnut Creek resident and FOCUS founder, lived near Grayson Creek, one of the tributaries of Walnut Creek. Ortiz convinced the CCFCWD to accept alternatives instead of lining the creeks with concrete. Another local resident and environmental activist living near Tice Creek, Pam Romo (known locally as "the creek lady"), put it aptly: "Walnut Creek was named Walnut Creek because it had a creek, not a concrete channel. [CCFCWD] should try to create a solution for the

creek that is environmentally sound and adds to the aesthetics of the creek."[29]

Although recreation had been discussed during the late 1960's and early 1970's, it was not until November 1983 that a non-Federal sponsor came forward to provide project-related recreational development and share the cost of recreational facilities. The City of Walnut Creek, the East Bay Regional Park District (EBRPD,) and Contra Costa County proposed plans for a paved multipurpose path along Upper Pine Creek from Ygnacio Valley Road to Valley Vista Road where occasional rest areas would have benches and landscaping. The proposal also envisioned a paved multipurpose trail with rest areas along San Ramon Creek. For the San Ramon Creek bypass, the agencies proposed the integration of the natural creek channel into the downtown commercial core.[30] Construction of the San Ramon Creek bypass began in September 1985, and construction of upper Pine Creek began in August 1986.

The City of Walnut Creek did not sponsor the recreational facilities at that time; so all recreation work was deferred.[31] But in the early 1990's, in an attempt to "put the creek back into Walnut Creek," city engineer Brian Murphy along with Pam Romo presented an ambitious plan for recreation inspired by designs in Boulder, Colorado, and San Luis Obispo, California. It called for making 3 miles of the city's creeks into a greenbelt that would be suitable for recreation and would provide a focal point for downtown-area commerce. The plans called for hardened trails in the creek's bottom next to the low flow channel. The Corps developed a recreation plan for the Civic Park area to the downstream section of the San Ramon Creek bypass where the abandoned Southern Pacific Railroad bridge remained. The plan contrasted with the City's plan in that the District wanted to keep the trail on the creek's upper banks to prevent damage to the vegetation in the creek's bottom while protecting the trail for very minor flooding, and increase safety. Also the Corps and NRCS (with whom the Corps contracted for the plans and specifications) conducted engineering and geo-technical analysis that indicated the creek banks were too unstable to allow trails in the creek. However, Ms. Ortiz and others persuaded the City council and City staff not to sign a recreation cost-share agreement in 1992, and the District's recreation plan was not built. The City never did build the in-creek trail design as originally proposed.

ABC, the environmental group, continued to focus on their efforts to save the creek and preserve the riparian vegetation. At an annual luncheon in November 1984, the City of Walnut Creek unveiled a design for a creek beautification project, including a plaza with a sculpture near Civic Drive and Carlback Avenue. The City of Walnut Creek applied to the Corps to fund 50 percent of the project, to be coordinated with the $32 million San Ramon Creek bypass, but was unsuccessful.[32]

In 1987, the CCFCWD requested that the Corps defer closing the investigation of creek studies and seek project authorization on sections of Murderer's, Grayson, San Ramon, Tice, and Green Valley Creeks. Upon the Corps' favorable recommendation, the Sacramento District initiated a cost-shared feasibility study in 1989 for the upper reaches of San Ramon Creek above the San Ramon bypass and Tice, Murderers, and Green Valley Creeks.

After the District's feasibility evaluation, which included current hydrology, topographical mapping, flood plain delineations, and new economic baseline studies, the feasibility study and the resulting evaluation found that previously estimated flood control benefits for all five creeks had been exaggerated and that only one alternative offering 25-year level protection on Murderer's and Grayson Creeks was economically practicable. Since benefits were lower and costs higher, many of the potential solutions had a perceived environmental effect. The CCFCWD decided to exercise the 30-day termination clause in the Feasibility Cost Share Agreement, and further studies and additional work were not performed.

Conclusion

The Sacramento District showed diligence and patience in working with Walnut Creek residents to help preserve the creek in their city, balancing priceless natural beauty with concrete channels and other esthetic factors. The project suffered because of having to wait for Southern Pacific's delayed decision to abandon its railroad tracks and because of delays in the real estate acquisition.

The District and the community examined many studies and alternatives. The concept of covered channels through an urban area was new for the District. After the District obtained approval for Federal participation in the covered flood channels, the policies that evolved from this process served as a model for other cities nationwide to follow and provided the direction for the Chief of Engineers' policy on Federal participation in covered flood control channels. This policy stated, "If during the planning process, it appears that covered flood control channels are desirable, reporting officers may evaluate them and include them when they best serve the public interest.[33] Project Engineer Mike Nolan, who worked on the Walnut Creek Project in the 1970's, reflects on the reasons for the success of the project: "The local citizens' desire to maintain a natural creek through a bypass in an urban area along with Southern Pacific Railroad abandoning their tracks provided the opportunity for the bypass to save portions of the creek along with flood protection."[34]

The Walnut Creek Flood Control Project became a project that illustrated a new direction to flood control. The Sacramento District, through its use of covered channels in an urban setting, preserved natural resources. An examination of the structures and flood control measures along the Walnut Creek channel, from its mouth at the Bay to the upper reaches in the city of Walnut Creek, shows mile by mile how views of flood protection have changed over four decades.

Wildcat and San Pablo Creeks

The Wildcat and San Pablo Creeks Project, located in the communities of North Richmond and San Pablo in Contra Costa County, focused primarily on flood reduction but also addressed the social well being of area residents, environmental quality, and regional economic development. Authorized for construction in 1976, the project represented one of the first opportunities for the Sacramento and San Francisco Districts and the local sponsor to reach out to all stakeholders during the design process and create a community design team. The success of the design team concept served as a model for consensus building in subsequent projects. That success relied heavily on the local sponsor, the Contra Costa County Flood Control and Water Conservation District (CCFCWD), and local residents who saw the project not only as a means of eliminating devastating floods, but also as a way to improve their social and economic living conditions.

Project Setting

Wildcat and San Pablo Creeks now provide habitat for wildlife, fish, and vegetation, and are a serene haven for residents of the unincorporated area of North Richmond and the city of San Pablo. They also serve the more practical function of providing drainage and flood protection.

The two creeks, at their closest point in the city of San Pablo, are a mere 300 yards apart. In the early 20th century, during periods of heavy rainfall, this close proximity became more of a confluence of both creeks that led to the creation of a common flood plain in the vicinity of 24th Street in San Pablo. The creeks were subsequently split apart in order to provide drainage for agricultural fields.[35] Wildcat Creek is one of the last remaining creeks in the San Francisco Bay area that retains an almost continuous riparian corridor along its banks.[36] Environmental restoration and mitigation have been more extensive on Wildcat Creek since its headwaters emanate from Wildcat Canyon Park.[37]

Paying Taxes for Floods and More Floods

Wildcat Creek runs through North Richmond, an area that began as a Kaiser-built African American community.[38] Henry Kaiser owned and operated four shipyards, producing 747 large ships that set production records. The Kaiser ship industry changed Richmond from a predominantly white community of 23,600 residents to a diverse population of over 100,000 people within a year. Kaiser scoured the country for recruits, finding thousands of willing volunteers in the rural African American population of the South. North Richmond evolved as an African

American community where many of its residents worked in the shipyard.

Because of the housing discrimination in Contra Costa County during this time, North Richmond evolved during World War II into a segregated community. Most African Americans living in Contra Costa County bought or rented property in this area.

Life was hard. Fortunate residents had to settle for low-paying jobs, while most others were either unemployed or on welfare. According to the 1980 U.S. Census, 64.5 percent of the families in North Richmond had female heads of households and lived below the poverty level. In San Pablo, 16.1 percent of families lived below the poverty level.[39]

While many of the residents owned their own homes, many of the houses were substandard and were located on a flood plain that would become inundated every year. The appraised value of homes in this area and the owners' limited income prevented the community from raising revenue through taxes or bonds for constructing or maintaining flood control improvements.[40] Wildcat and San Pablo Creeks historically flooded severely about once every 3 years.[41] Consequently, the value of the houses declined annually, making it increasingly difficult to arrive at a favorable benefit-to-cost ratio.

Residents and business owners along the creeks' flood plain faced serious health, safety, and economic threats. Urbanization including construction of structures and paving produced increased runoff rates into the watershed. In San Pablo, despite such hazards, building near and right on the creek banks was the norm since the creek's proximity provided an easy accessible water source for many early residents. San Pablo's low-lying and poorly drained areas also were subject to tidal influences that worsened damage during periods of flooding. This was further aggravated by poor drainage, and both creeks posed flooding problems for residents. Silt entered homes, damaging property and creating hardships. During flood periods in North Richmond, the only way to travel was by boat.

In response to the problems of flooding, the 1960 Flood Control Act authorized the Corps' San Francisco District to prepare a study of potential solutions. However, no action materialized due to a lack of economic justification. Sixteen years later in 1976, the U.S. Senate and House Public Works Committees (under the provisions of Section 201 of the 1965 Flood Control Act) finally authorized a flood control study and construction for the Wildcat and San Pablo Creeks.

The Model Cities Program Embraces the Creeks

Responding to urban riots and crime, insufficient housing, poor educational opportunities, and unemployment in the 1960's, President Lyndon B. Johnson proposed the Model Cities Program for impoverished communities. By 1971, the Housing and Urban Development's Model Cities Plan for Richmond selected Wildcat and San Pablo Creeks and the San Pablo Bay shoreline as targets for recreational and commercial redevelopment.

CCFCWCD requested the Corps to reopen the 1976 study and consider the broader objectives of social well being of area residents, environmental quality, and regional economic development. The Corps continued the study in January 1971, and in 1973, the first feasibility report embraced the concept of the Model Cities Plan, affirming that "flood control and associated recreation is inseparable to the social, economic, and environmental objectives of the Model Cities Program."[42]

The selected plan called for 5 miles of channel improvements on both creeks with trails, recreation facilities, environmental mitigation, and preservation of open space. Congress authorized the project for construction in 1976, and the San Francisco District completed the General Design Memorandum, Phase 1, for flood control and allied purposes in August 1978. The construction authorization benefit-to-cost ratio was 1.6 to 1.0, providing 100-year flood protection in 1976; by 1978 when Phase 1 was completed, the benefit-to-cost had dropped to 1.14

to 1. With this less attractive ratio, CCFCWD's support for the selected plan was tentative, prompting the suspension of the Corps' design work in 1980.

However, the 1982 rainstorm of record led the CCFCWD to assign a higher priority to a comprehensive flood control project. The estimated damages in 1982 were $2.7 million.[43] Floodwaters destroyed the culverts between the two creeks. As a result, water and sediment inundated homes and created life-threatening conditions requiring the evacuation of residents.[44] In response to the flooding, CCFCWD proposed an alternative flood control plan that decreased project cost by reducing right-of-way requirements along the creeks. CCFCWD also prepared a report on the environmental effects of the proposal. While the plan reduced the local share of the costs and provided the same level of flood protection, it only addressed the creek areas downstream of the Atchison, Topeka, and Santa Fe Railroad tracks.

The Evolution of Community Activism

CCFCWD and the Richmond community convened a conference on June 27, 1984, in North Richmond at the Reed-Shield Community Center that addressed drugs, crime, and halting the channelization of the creek. The conference attracted a large audience, consisting of the CCFCWD, the San Francisco District, environmentalists, environmental regulatory agencies, and several citizen groups. The community realized that North Richmond was in a flood plain and without a storm drain system. The community knew they did not have the necessary infrastructure to support improvements. Following discussions, residents began to look at Wildcat Creek as a potential asset rather than simply a threat. Galvanized by this idea, residents now determined to fight for a flood control plan they could afford and that would preserve the wildlife, recreational, and esthetic values of Wildcat and San Pablo Creeks.

The leader of the community's mobilization efforts was an African American woman named Lillie Mae Jones. Ms. Jones was a resident and activist who had come to California during the war years. She later became a community worker involved in the Southside Community Center in South Richmond. That experience taught her organizing skills that led to her appointment as chair of the Neighborhood Coordinating Council, which soon included representatives from North Richmond. The council's deliberations addressed the flooding problems, and in 1984, she turned to a friend, Alan LaPointe, a member of the Urban Creeks Council, for help in addressing the issue.[45]

LaPointe knew Luna Leopold, a professor in the Department of Geology and Landscape Architecture at the University of California, Berkeley. Leopold, former head of the Water Resources Division of the U.S. Geological Survey, urged his student, Ann L. Riley, to help the community. Riley met with Lillie Mae Jones. Among their first achievements was getting Verde Elementary School designated as a magnet school to study the environment, regional trails, and a living creek – all ideas entertained in the Model Cities Plan. They articulated, for the time, a visionary and environmentally sensitive project.

Divergent Plans Become a Consensus Plan

On May 19, 1983, the CCFCWD committed to providing cost sharing at the level of 35 percent. In response to this commitment and the Assistant Secretary of the Army's approval, the Corps allocated funds for engineering and designing the project. In October 1983, the Sacramento District resumed working on the Model Cities Plan and the environmental assessment for the long-delayed project.

In response to the Plan, the Urban Creeks Council (UCC), in cooperation with other environmental groups and with the help of paid and unpaid consultants, set out to prepare a plan of its own. The community coalition with funding from the San Francisco Foundation, Vanguard Foundation, and East Bay Regional Parks District, among others, hired Philip B. Williams and Associates, a San Francisco-based hydrology consulting firm. The UCC-led coalition sharply criticized the Model Cities Plan for its failure to take the environment into consideration. Flood control was important, argued the UCC, but

so was marshlands and flood plain restoration, fish protection, a riparian forest, and a regional trail.

In June 1985, the U.S. Fish and Wildlife Service reviewed the preliminary selected Model Cities Plan and found that although this was a betterment project in the long run, it would degrade the marshes due to the construction and in the process threaten the Federally listed endangered salt marsh harvest mouse and the California clapper rail (bird). Subsequently, the U.S. Fish and Wildlife Service adopted the UCC's plan as "the prudent and reasonable alternative."[46]

The sponsor, CCFCWD, realized that community support and acceptance were critical so a design team was formed with all stakeholders. Contra Costa County Supervisor Tom Powers provided staff and office space to hold the design team meetings. The Sacramento District convened many meetings with the community's environmental groups, the CCFCWD, and the community of North Richmond to refine the plan for the project. The Corps and CCFCWD did extensive hydraulic and environment studies and modeling, and through the process, changes were made to the UCC's plan.

In 1986, the Sacramento District released a preliminary selected plan calling for approximately 18,000 feet of channel and flood control improvements on Wildcat Creek and 12,400 feet on San Pablo Creek. The selected plan's reach 1 consisted of trapezoidal, earth-lined channels, rectangular concrete-lined channels, and a sedimentation trap on Wildcat Creek. For reach 2, the selected plan required concrete trapezoidal and rectangular channels on Wildcat Creek and a concrete-covered bypass channel for San Pablo Creek.[47] All parties embraced the selected plan.

Construction Begins, Problems Arise

In 1986, the project broke ground, with the work apportioned into four phases. Phase 1 encompassed San Pablo Bay to the North Richmond Bypass (both creeks). Phase 2 comprised the North Richmond Bypass to the Southern Pacific Railroad (both creeks). Phase 3 included the Southern Pacific Railroad to Atchison Topeka Railroad (Wildcat Creek). Phase 4 covered the Southern Pacific Railroad to Rumrill Boulevard (San Pablo Creek only). All phases were completed by 1995. The construction resulted in a few problems, including a controversial environmental issue and an archeological discovery.

The construction of the project resulted in loss of native vegetation and wildlife habitat. To mitigate for the loss, the Sacramento District incorporated 23.8 acres of environmental features within the channels. Bob Snieckus, a landscape architect with the NRCS, worked with the CCFCWD, Corps, and the community developing the mitigation plan and recreation design memorandums. During the phase 1 construction, the contractor bulldozed a half-mile stretch of trees and shrubbery along Wildcat Creek, eliminating some of the environmental features that the District incorporated. The incident received local coverage and outraged several environmentalists in the community. CCFCWD apologized for the misunderstanding.[48] However, the contractor simply followed the plans as written and agreed to by all parties, and according to Sacramento District Project Manager Paul Bowers, it was the environmentalists who misinterpreted the plans during the design review process.

In 1989, during construction of phase 2, the contractor discovered archaeological sites while excavating San Pablo Creek. Andres Rosales Galvan, a member of the Ohlone Tribe, was the project's Native American consultant during construction because of concern of these potential sites. The construction unearthed 105 sets of skeletal remains. The excavation of the burial sites required additional cultural resources mitigation. From the archaeological evidence, the area might have been occupied at least 2,000 years ago.[49] The discovery of the burial sites delayed construction for four months. CCFCWD wanted to ensure the community of its commitment to the project's mitigation. Toward this end, it took this responsibility on directly and hired the necessary county employees to ensure the mitigation project's success. The Sacramento District completed the flood control work in 1996.

Recreational Components

The recreational components of the project were an 8,100-foot paved trail, a parking and staging area with access from Richmond Parkway, a wildlife observation platform at San Pablo Marsh, interpretive panels, and restrooms. A proposed pedestrian bridge over Southern Pacific Railroad and Atchison Topeka and Santa Fe tracks may be constructed in the future.[50] The East Bay Regional Park District co-sponsored the recreational amenities, sharing half of the cost of the recreational trail improvement and assuming expenses for the operation and maintenance of the trail.

The District wanted an environmental classroom at this location, but local residents preferred a baseball field. The construction of the recreational facilities fulfilled a need for the neighboring communities[51] and one day might be a link in the regional trail that will encircle the entire bay.

Lessons Learned in Operation and Maintenance

The Wildcat and San Pablo Creeks flood control plan eliminated flooding in the area. Since the project's completion, the City of Richmond constructed the Richmond Parkway, a large transportation corridor attracting light industry and new residential housing. Land values rose, and upgrading the area has changed the character, and ethnic and racial composition of the residents. For that reason, Lillie Mae Jones questions whether the project was beneficial since many longtime residents can no longer afford to live there.

Originally, the Corps and CCFCWD proposed a design that would channelize 5 miles of both creeks. Facing the problem of making the project affordable, the CCFCWD as non-Federal sponsor pushed for a bare bones engineering solution that sacrificed marsh and flood plain restoration, fish protection, a riparian forest, and a regional trail. The Sacramento District originally designed a traditional flood control structure including concrete box culverts and channels. After the U.S. Fish and Wildlife Service reviewed the plan and found that it probably would degrade the marshes and threaten endangered species, an environmental approach through consensus planning and design formulated a plan to reduce flooding, but at the same time preserve the riparian corridor, protect downstream marshes, and enhance recreational opportunities.

The Wildcat and San Pablo Creeks design team was successful in incorporating diverse stakeholders and interests in the creation of a design that was a result of consensus planning within the community and with the regulatory agencies and stakeholders. The project demonstrates "how stable channel design concepts, coupled with enhancement features requested by area environmental groups, played important roles in the design of the project configuration," observed Sacramento engineer Edward Sing.[52] The hand-drawn UCC plan's cross section was subsequently used as the Corps logo now appearing on the Corps Flood Control Channel Research Program in Vicksburg, Mississippi.

Salts in the soil and sediment caused problems for the restoration of the riparian environment. Trees and shrubs originally planted in the lower project reaches to replenish a riparian environment on Wildcat Creek never established themselves due to the salt. The widening and excavation of the channel in its lower reaches also exposed a larger area to tidal influences.[53]

The prolific growth of vegetation and trees has been both a blessing and a curse. While it restored the riparian environment, it also made it difficult for CCFCWD to adequately maintain the channel capacity. To the CCFCWD, the project's environmental mitigation has been an experiment that has been only partially realized.[54] The Waterways Restoration Institute maintains that this is a model project,[55] while the county struggles with its operation and maintenance.

The project created a low-flow channel with terraced overflow areas, setback levees, and adjacent recreation trails. The design included a non-symmetrical sedimentation trap that reduced sediment

loads in the downstream channel and San Pablo marsh. The Sacramento District's Operation and Maintenance manual analyzed the stages of vegetation growth within the channels and provided options of vegetation maintenance and removal, sediment removal, and the resulting risk analyses that could be analyzed to make informed operation and maintenance decisions.

Conclusion

The community of North Richmond lived on the "wrong side of the tracks" with the Atchison Topeka and San Fe and Southern Pacific Railroads bisecting their community. To the west, the waters of the San Pablo Bay created a physical barrier to the rest of Richmond and San Pablo.

This historical area of blue-collar ship workers had been caught in a vicious cycle of frequent floods that made the area less desirable. The CCFCWD, environmental agencies, the community, stakeholders, and the Sacramento District tackled and resolved the problem of flooding with the community. In the process of resolving the flooding problem, the Corps and CCFCWD created for the first time an innovative design team. All stakeholders monitored the design and redesign "creek section by creek section." They started at the bay and worked to the railroad tracks that ultimately provided the barrier to stop water from circumventing the downstream flood control projects of Wildcat and San Pablo Creeks in North Richmond. The project's design team was a coalition process, but it did not end there. It tested the latest environmental techniques using hydraulic design.

The Wildcat and San Pablo Creeks Project was a sophisticated project for its time. Future projects can learn from this project how to make a community coalition process succeed, how to integrate environmental vegetation within flood channels, and how to incorporate engineering and environmental solutions to solve flood control problems. The Wildcat and San Pablo Creek Project addressed issues of environmental justice and social implications, and changed a community's social and economic hope for the future by reducing the yearly threat of flooding while embracing natural resources within the community.

Napa River and Napa Creek Project

The Flood Control Act of 1965 authorized the Napa River and Napa Creek Flood Protection Project. After several unsuccessful attempts to design a locally acceptable project, a coalition in the mid-1990's introduced the concept of a "living river." In practical terms, this meant flood control through widened areas in the river's lower reach to accommodate floodwaters. The Sacramento District created marsh plain and flood plain terraces, which increased flood conveyance while also providing an opportunity for habitat restoration. The local sponsor was the Napa County Flood Control and Water Conservation District (NCFCWD), which successfully galvanized a diverse constituency that finally approved a ballot initiative in 1998 for a flood control project after two previous failures.

Project Description

One of California's three surviving free-flowing rivers, the Napa River originates near Mt. St. Helena and runs 50 miles south to San Pablo Bay. The city that shares its name is also in Napa County and is located approximately 45 miles northeast of San Francisco. The river has a drainage basin width of about 426 miles. Sinuous through most of its course, the Napa River supports navigation from San Pablo Bay to Third Street in downtown Napa, and has a large oxbow area within the city limits. Napa Creek, with a drainage basis of 14.9 square miles, joins the river in the city of Napa. With headwaters originating in the Mayacmas Mountains on the west side of the valley, Napa Creek flows southeast and discharges into the Napa River south of the oxbow area.[56]

According to the Federal Emergency Management Agency's (FEMA) records for flood damage payments, the Napa Valley is the fifth most flood-prone area in the United States. Since 1862, floods have cost the Napa Valley an average of $5 million annually. Twenty-seven major floods have struck

Napa River Flood Control Project - Circa 2000

the valley in the last century and a half, including two or three a decade since 1940.[57] In 1963, floodwaters displaced 30 families, and when nearly 50 homes and an equal number of businesses suffered damages, President John F. Kennedy declared Napa County a Federal disaster area.[58] The Napa River Flood Control Project (H. Doc. 222-89/1) suffered a protracted and grim fate until political and natural forces forced the community into action.

The tradition of protecting natural resources in Napa County is relatively recent. Only in 1968 did Napa County initiate creation of an Agricultural Preserve Zone in order to protect county land that was rapidly being lost to urban sprawl. Prior to 1995, flood control in the county was also dismal. The Napa River was in need of both preservation and flood control, but had remained a neglected resource. Suffering from pollution, the river only gained notice when its waters wreaked devastation. Most of the community did not appreciate the river and less so when it flooded.

The flood control project consisted of channel enlargement and realignment, levees and floodwalls, and public boat launching facilities along an 11-mile reach.[59] The project came under fire when San Francisco Deputy District Engineer Lt. Col. Karl Schmid presented the Corps' first 100-year protection project design at a public meeting in June 1975. The design consisted of 10.7 miles of channel modification, 6.1 miles of levees, and a 1-mile floodwall, with the relocation of four bridges and recreational facilities.[60] Local resident George C. Berner called the project a "boondoggle" and a result of "congressional pork barreling." He said, "This is another monument to the Corps of Engineers." One youth in the audience urged local citizens to think twice before accepting a "cement river." John Parella, another local resident, noted that a project can get only so far without citizen input, and resident Gertrude Shipp asked the Corps to investigate Napa Creek flooding before proceeding. At this point approximately $2 million had been spent on the project's design, but Corps officials declared that "whether or not the project is ever built is up to Napa residents."[61]

Napa County and Attempts at Flood Control

The NCFCWD received authority from the California legislature in 1972. Subsequently, NCFCWD became the non-Federal sponsor of the project. Despite the community's resistance, the NCFCWD supported the Corps' 1975 design, but the $42 million project failed at the November elections by approximately 850 votes. In 1976, the Napa City-County Technical Committee (NCTC), a local citizens group, reaffirmed its support for the project. Although the term "environment" was never used, NCTC's initial objections seemed to involve the 11-mile concrete channel called for in the initial 1965 plan. Anticipating potential problems with design details and voter acceptance of the project, the NCTC sought to negotiate with the Corps for an acceptable project. The NCTC's hopes were outlined in a statement that read in part,: "Politicians and government staff began negotiations with Federal engineers in an attempt to build a project here that is esthetically pleasing as well as a deterrent [sic] to downtown flooding."[62] The final project design would need the approval of the voters. During the 1960's, the South Pacific Division favored structural solutions in the form of concrete channels for flood control, as seen in the Napa project and a project in Scottsdale, Arizona, among others.

Two additional organized groups emerged, one for and one against the project. The Napa County Taxpayers Association opposed the undertaking because of its operation and maintenance costs and increased property taxes, and because the association felt that the majority of voters would defeat the project. The organization petitioned to place the project on the ballot a second time. The proponent of the project, the Napa River Tomorrow Committee, prepared a brochure and mounted a modest radio publicity campaign.[63] Meanwhile, the Water Resources Development Act of 1976 (PL 94-587) authorized the addition of the flood-prone Napa Creek tributary to the project.[64]

Although the County Supervisors and Napa Chamber of Commerce believed that the project would revitalize the downtown area, the proposed $52 million project showed a deep split between supporters and detractors. Napa architect Jay Golik objected: "Corps of Engineers flood works is a complete environmental disaster. That project will do more damage to the river environment than any flood ever will."[65] Napa businessman David Mulligan waged a one-man campaign against the project by placing ads in the local newspaper with the view that tides played a very significant role in flooding. While this view lacked empirical proof and reflected more hope than science, it was nevertheless a prevalent belief among many Napans.

> *When we have high tides in the ocean and heavy rains in the valley, the river project cannot take care of nature's doings. The water has to go to the low places—the city of Napa and the lowland marshes. The project won't solve something nature created.*[66]

In 1977, voters rejected the project by an even wider margin than they had the first time. Lamenting the defeat of the project, Napa River Tomorrow co-chairman James V. Jones said, "Anything that will increase property taxes is not going to be passed." The Napa River Tomorrow Committee had gathered over 9,000 signatures to place the river project on the ballot.[67] With the public's opposition to the project, its fate appeared dead.

The NCFCWD requested inactive status for the project in 1977. The project remained inactive since the local community expressed little interest in its reactivation.

Flooding in the Napa Valley

Experience soon taught Napans that the issue was not if the river would severely flood, but when. The largest flood in Napa's history came in February 1986, when a 35-year flood occurred on the Napa River. The loss was enormous, exceeding over $100 million. According to the *Napa Valley Register*, floodwaters decimated 60 to 70 percent of Napa's

main businesses, including 120 stores and offices. A prime commercial thoroughfare, Soscal Avenue, became a river that inundated 15 to 20 percent of the rest of the city.[68] In addition, three people were killed, 27 injured, 250 homes destroyed, and at least 2,500 residents suffered flood damage.[69]

Reactivation of the Project

In the wake of the disaster, Napans found themselves facing the same question again; that is, how to reactivate and finance a flood control project. County Supervisors considered placing a flood control tax on the November ballot. This never materialized. However, County Supervisors did pass a measure denying the construction of buildings in flood-prone areas.[70]

In 1984, Sacramento engineer Lester Dixon asked the NCFCWD if it wanted to reactivate the project.[71] At this time, Paul Battisti, a long-time supporter of flood control, was elected County Supervisor and subsequently became chairman of the NCFCWD. Project Manager Paul Bowers remembers that Battisti inspired him "to keep going and persevere because of his vision that this project could be built." Battisti found Napans' apathy towards flood control confounding after the devastating flood of 1986 and felt that repeated defeats at the polls demoralized Napans into thinking that a project was impossible. His underlying reason for seeking office was to galvanize the community behind a flood control project.[72]

At Battisti's urging, the NCFCWD requested that the Sacramento District reactivate the Napa project. Support also came from U.S. Representative Vic Fazio (D-Sacramento), who included $250,000 in a congressional appropriation bill for pre-engineering and design review of the project.[73] The Sacramento District proceeded to resume the flood control project while the City and County worked on cost-sharing issues. At this point, the County Supervisors felt that the project would primarily benefit the city of Napa, not the rest of the county."[The] project is mainly a city project that will do little to benefit the upland valley communities," declared Supervisor Mel Varelman .[74]

When the District reduced the project's scope from the 1975 design to one confined almost entirely within the city of Napa's boundaries, the costs for both land and construction decreased considerably. However, the preliminary study did not clearly define the project. Sacramento District Engineering Project Manager Richard Nishio pointed out that one problem was recreational features: "The County is the project's sponsor, but no entity has taken on the responsibility of sponsoring the recreational aspects of the river."[75] In October 1989, the City agreed to sponsor the recreation component.

Environmental Opposition and Coalition Planning

A diverse constituency began a countywide effort toward arriving at a viable project. By November 1989, a City and County Design Review Task Force included representation from Napa County, state and Federal agencies, and environmental interests. The task force convened more than 30 meetings and established four subcommittees including technical, environmental, informational, and financial.

The Sacramento District presented a design for a 5.7-mile stretch of the Napa River at a press conference on April 19, 1990.[76] The plan also included the District's investigation of toxic waste sites. Subsequently, the Corps, armed with slides and maps, presented the plan at a joint meeting of the Napa County Board of Supervisors and the Napa City Council. Project Manager Richard Nishio also revealed a proposed 1,400-foot bypass for the oxbow segment of the river near the downtown area.[77] The National Economic Development (NED) plan established a benefit-to-cost ratio of 1.10 to 1.0 for the now $137,500,000 project.[78]

Varied ideas for flood control came out of the series of meetings. The Sierra Club expressed grave doubts about how well the NED plan would protect the Napa River environment. The "Corps is

one of the government institutions for which we have a great deal of mistrust,"[79] declared Sierra Club spokesman Genji Schmeder, also a member of the technical committee, in calling for an outside hydrologist and wetland restoration. Napa City officials insisted that the Corps would do its best to protect the environment. Schmeder insisted that the environmental approach include the use of vacant land areas for natural flood basins, wildlife habitat, and public recreation.[80]

In a letter to the *Napa Valley Register* editor, Napa resident Carl Kangas joined Schmeder's call, urging the task force to "restore natural wetlands downstream of Napa by removing levees to allow floodwaters to spread over a larger area."[81] Obviously, there remained skepticism about the Corps intentions. Many felt that this was the "old" Corps trying again to push the 1975 design, which consisted mostly of concrete and rock. The calls for a project responsive to the habitat became more forceful and more frequent. As County and, to a lesser extent, City officials intensified their support for the project, the citizenry grew more vocal in its criticisms. Typical was Napa resident Chris Sauer, who publicly rebuked Napa Mayor Ed Solomon. "If the honorable mayor of Napa were to study environmental issues," declared Sauer, "he would find that the Army Corps of Engineers has a tragic record. Insensitivity to the environment has been a trademark of the Army Corps."[82] The NED plan's support base came primarily from the local sponsor, NCFCWD, and the County Supervisors. "Ten or 20 years ago," observed Battisti, "this flood control was looked at and called a government problem, but that doesn't work anymore. I predict a lot of private involvement"[83]

The project was at a crucial stage of evolution. By February 1990, Sierra Club members and Friends of the Napa River, among others, had become convinced that if the Sacramento District did not revise its preliminary design to address their concerns, the project was doomed. Biologist and Task Force member Michael Rippey blamed the project's precarious status on the county and the task force chairman. "Because Napa City and County officials told the Corps to design it fast and cheap, the District's preliminary design has completely ignored the environment," declared Rippey. Trust, integrity, and mutual respect among all stakeholders were absent.

Local officials soon recognized that the environmental opposition could not be overlooked if the project were to succeed. They had to do something about the perception that the Corps could not be trusted, and they recommended that the NCFCWD hire an outside "watchdog" to monitor and react to District's actions. On the recommendation of the 35-member task force, the NCFCWD hired the San Francisco-based hydrology firm of Phillip Williams and Associates." The firm will probably be a bridge between the more conservative elements of the task force and the more progressive ones,"[84] observed Battisti, who believed that the Corps had become "more sensitive to environmental concerns than it used to be."[85] According to Principal Peter Goodwin of Phillip Williams and Associates, "We're looking at flood alleviation, but we want to enhance the river in the city by use of biological [sic] resources. Instead of using concrete, we'd use vegetation."[86]

Hazard and Toxic Waste Sites

Another issue was the toxic waste sites near the river. The hazardous and toxic waste inquiry was important to the Sacramento District. Congress approved $1.5 million for the Corps to oversee an investigation of the waste sites, and the District in October 1991 hired the environmental consulting firm of Kleinfelder, Inc., to conduct a 3-year study of groundwater contamination along the Napa River and Napa Creek. The investigation found that only nine of the 37 suspect sites needed cleaning as part of the project.[87]

No doubt the ongoing investigation of toxic sites on the river and the publicity that the river was contaminated drew the attention of groups interested in cleaning it up. One such group called Focus Napa River sponsored a panel discussion called "How Clean is the Napa River Today?" At this event audience members heard good and bad news about the river's health. The good news was that the water quality had improved, but the bad news was that the

number of steelhead salmon in the river had dropped from 6,000 to less than 1,000.[88]

A Voice for a Living River

Freelance writer Moira Johnston-Block lived at a marina on the river. Block's home became the meeting place for a dedicated group of volunteers for the Napa River restoration. Her proximity to the river facilitated an appreciation of it as a fantastic resource for the community and economy. In 1994, an informal group of concerned citizens meeting at the home of Johnston-Block formed Friends of the Napa River. The mission of the group was to "protect the health of this river and speak for its destiny, as it could not speak for itself," said Johnston-Block.[89]

Block described the Friends of the Napa River as an "environmentally sophisticated group – a mixed bag of professional people ranging from psychiatric nurses to developers."[90] Friends of the Napa River had its share of detractors, but it was a determined group that eventually succeeded in its goals. The group's first strategic move was to bring state regulatory agencies such as the Department of Fish and Game and politicians such as Senator Barbara Boxer (D-CA) into the process. The group also co-sponsored a tour of the river for 20 Federal, state, and local dignitaries – a diverse group of people with varying degrees of support for the project. Pontoon boats filled with officials, including acting Assistant Secretary of the Army for Civil Works Dr. John Zirschky and Congressman Dan Hamburg (D-California), left from docks near Johnston-Block's home for a 30-minute river tour.[91] The tour effectively enlightened visitors and officials about the magnitude of the project and the flood problem.

Friends of the Napa River's vision was strongly affected by the aftermath of the 1993 Midwest floods. In response to this disaster, the White House authorized the Interagency Task Force's Galloway Report[92] that recommended the use of wetlands to slow and reduce the destructiveness of floods.[93] In 1994, the hydrology firm of Phillip Williams and Associates had reinforced this recommendation only to run into opposition. [94] The Williams' plan, declared Public Works Director William Bickell, would have been fine if the city of Napa did not exist. Still, the Corps did incorporate into its design the concept of using wetlands to store floodwaters.

As planning went forward, flooding returned to Napa in January and March 1995, damaging an estimated 227 businesses and residences, with property loss estimated at $90 million. An additional $30 million in damage occurred in St. Helena where the Vineyard Valley Mobile Home Park was severely damaged. This last flood intensified momentum for getting a viable project built.

Citizens and State Resources Agencies Reject Corps' Plan

In April 1995, the Sacramento District released the "Draft Supplemental General Design Memorandum, Environmental Impact Statement, and Environmental Impact Report"[95] that described the latest proposal for the Napa River and Napa Creek flood protection project. The Corps unveiled the design at the Napa City Council. The proposal drew opposition from several critics. The wet bypass received serious opposition. At the District public hearing to elicit input from local residents, Department of Fish and Game representative James Swanson declared that the oxbow was a critical section for fish passage and degradation to its water quality could result in dead fish floating in the river.[96]

Many citizens and the Federal and state regulatory agencies objected to the proposed plan. The U.S. Department of Interior (which manages the U.S. Fish and Wildlife Service), Department of Fish and Game, Regional Water Quality Control Board, and State Lands Commission all requested that the design and environmental document reissued for additional public review. The public review took place between April and May 1995. The U.S. Fish and Wildlife Service, Department of Fish and Game, Regional Water Quality Control Board, and the State Lands Commission expressed concerns about the salinity intrusion due to channel deepening, the oxbow water quality degradation because of

Allocations for Napa Design, 1989-1996[99]							
FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96
750.000	1,313.000	560.000	2,000.000	850.000	1,400.000	1,600.000	787.000
3,390.000	4,703.000	5,263.000	7,263.000	8,113.000	9,513.000	11,113.000	11,900.000

the wet bypass design, and the disposal of contaminated dredged material. The plan would not obtain the needed water–quality certification. Now all three Corps and NCFCWD presentations had been rejected. "Friends of the Napa River and a whole host of people were about to abandon us completely and go off on a different track," recalled NCFCWD District Chairman Battisti.

The Second Coalition and Political Intervention

Local government officials knew that something had to be done. A delegation of the flood project's Executive Committee (including NCFCWD's chairman Battisti) went to Sacramento to meet with District Commander Colonel John Reese. In December 1995, Chairman Battisti, who led the delegation, cautioned Reese, "The project is going to fail if we don't make some modifications that would satisfy the locals and the environmentalists."[97] In addition, the state and Federal resource agencies saw little chance of the project's current design being approved. Reese cautioned that reformulation could mean that the entire planning process might have to begin anew and new congressional authorization sought. Battisti grasped the response as an opportunity to consider alternatives and suggested bringing all the various interests together in one room to sort those out the possible course of action.[98] Clearly, this was a critical juncture in the project. Would it proceed or remain at a standstill?

Progress on the project had been elusive. Thirty years had passed with no construction since it had been initially authorized in 1965. The Corps was leery of continuing to expend funds or, worse yet, redesign a project that seemed like it was going nowhere. Approximately $11,900,000 had been spent on project design since 1989 (see table above).

The outcome of the local delegation's meeting with District Commander Reese resulted in a two-track planning process. The Corps would continue with the current project design while the community coalition would pursue an alternative design. Environmentalists perceived this decision as a victory. "This is a landmark moment," exclaimed an ecstatic Moira Johnston-Block. "We're coming together with the Corps. We will achieve the world's best and most aesthetically beautiful flood control project."[100] Most local residents, however, feared that without the Corps' complete involvement, the coalition process would fail. They persuaded the Corps to concentrate on the coalition approach and to work with local residents, environmentalists, and other stakeholders on a solution.

Also, during this period, Friends of the Napa River wrote a letter to Senator Barbara Boxer (D-CA), with copies to Dr. John H. Zirschky of the Corps and a number of Federal and state officials, explaining that the project was in trouble and requesting intervention. The letter endorsed and referred to the Galloway Report, stating, "We are concerned that the Army Corps of Engineers' current flood control plan...does not meet either our goals or the new enlightened approach to resource management."[101] Senator Boxer responded to their request by suggesting legislation that would direct the Corps to reevaluate the project from the perspective of environmental restoration. This elicited a strong community response. Fearful that the project would be lost, local officials persuaded Boxer to let the Corps and local residents work together on environmentally sensitive options. District Commander Reese cautioned Senator Boxer that her plan "wouldn't be economically viable under current laws...and that

initial cleanup for the nine toxic sites on the river would exceed $12 million."[102]

On January 16, 1996, Senator Boxer and a small group of community members toured the Napa River Project by shuttle bus. Boxer urged cooperation:

> *Once the community gets together with an agreement on a plan, I think we can make a tremendous case for this project. The most important thing is cohesion, coming together and showing progress; without it, it's hard to keep that money in the budget. We could lose it.*[103]

Boxer's comments and the belief that this could be Napa's last chance to obtain Federal funding for flood control spurred the local interests to begin seriously working together for a feasible project. Dave Dickson, a County administrator, became the County project manager for the flood control plan. Dickson, District Chairman Battisti, and others came up with the idea of a community coalition and a facilitator to develop a project that would revitalize the river and control flooding. Dickson's budgeting experience and consensus-building skills lent credibility to the process. The Corps, Federal and state resource agencies, local environmentalists, business leaders, City and County planners, and their consultants now cooperated in an effort to produce a viable plan within six months.

The Community Coalition for a Napa River Flood Management Plan set its goals as follows:

- A 100-year flood protection plan
- An environmentally restored Napa River
- Esthetic and environmental excellence
- Enhanced opportunities for economic development
- A local financing plan that the community could support
- Compliance with current or modified Federal guidelines

A key concept for the coalition was the term "living river." A subcommittee on Water Quality and Fish Habitat came up with that concept, which received a strong endorsement at the coalition's seventh meeting.[104] By "living river," the coalition meant a river not constrained by concrete floodwalls, but a river whose floodflows spread and that stabilized its own banks with sediment and vegetation. There would be some allowances to protect property, but they would be minimal. The community coalition saw the "living river" as a long-term, sustainable goal.[105] After many meetings, during which there were many presentations and much discussion on project revisions, a revised plan began to emerge. This plan appeared to meet almost all of the community coalition goals. Instead of deepening the river, terraces would be excavated in the overbank. The "wet" bypass would become a "dry" bypass. The terraces would offer the opportunity for restoration of critical habitat that had been destroyed in the Napa River watershed. The Napa River would become a "living river." The revised plan for flood protection for the city of Napa was one that everyone in the community coalition could support.

Preparation for a Third Vote for Flood Control

The NCFCWD knew that voters had twice rejected flood control plans for the Napa River and that for any undertaking to succeed, it would have to be well marketed and financed. The marketing campaign , known as "Yes on Measure A" to levy a sales tax increase for the project, cost $96,000 and began in November 1996. The campaign consisted of a survey and public education plan. With the resource agencies' approval of the revised plan appearing imminent, the Napa County Supervisors decided in August 1997 to place the flood control initiative Measure A on the ballot. It would require a two-thirds vote to pass.[106]

The innovative aspects of the project, specifically a coalition that included the Sacramento District and environmental groups working together, captured the attention of Corps Headquarters. Chief of Planning Edward Dickey praised the innovative approach of combining flood protection with environmental restoration.[107] The community's perception of the Corps improved even more after Dickey's visit. The Corps' work with the community was valuable for both the parties. Napa Valley would have an affordable flood prevention plan, and the District would establish an

admirable precedent for flood management projects. "The Corps' refreshing new attitude is a monumental change in philosophy and approach. They have our gratitude and our respect," stated an editorial in the *Napa Valley Register.*[108]

The state and Federal environmental document released in December 1997 presented the flood plan. The document affirmed that the project would generate additional natural habitat, stabilize water quality, and provide more than a 1-in-100-year level of protection from flooding.[109] The plan and the environmental document were released for public comment at a public meeting held on January 8, 1998, with favorable response.

The Corps' Final Supplemental General Design Memorandum of 1998 indicated that the latest plan was very similar to the rejected 1995 design. For example, there were no changes in the earlier plan's upstream measures. The changes occurred from the bypass area downstream. The dry bypass preserved the water quality of the oxbow, making it more habitable for the fish and their passage. The newly proposed terraces would preserve the existing river while providing increased flood conveyance and habitat restoration. The latest plan retained the floodwalls and setback levees of the 1995 plan.

However, the community perceived the project to be entirely new. The following table shows changes from the first project authorization in 1965 to the accepted plan of 1997. The 1965 authorized plan was the original feasibility plan Congress authorized in 1965. The most severe of all of the plans, it modified the Napa River over the entire project area of 11

Napa River Project – Comparison of Historic Plans[110]

ITEM	1965 AUTHORIZED PLAN	1975 GDM PLAN	1995 DRAFT SGDM PLAN	1997 DRAFT SGDM PLAN
LANDS (acres)	635	900	482	841
DESIGN FLOOD	SPF	100-Yr	100-Yr	100-Yr
CHANNEL MODIFICATION (miles)	11	10.7	3.4	3.4
LEVEES (miles)	9.7	6.1	3.9	2.1 Lowering 2.2
FLOODWALLS (miles)	1.9	1.0	3.6	4.9
INTERIOR DRAINAGE	3 Pump Stations Gravity Drains	Gravity Drains	3 Pump Stations Gravity Drains	3 Pump Stations Gravity Drains
MAJOR RELOCATIONS	3 Road Bridges 1 Railroad Bridge Utility Lines	3 Road Bridges 1 Railroad Bridge Utility Lines	3 Road Bridges 1 Railroad Bridge Utility Lines	4 Road Bridges 2 Railroad Bridges 3 Bridge Mods Utility Lines Track Relocation
RECREATION FACILITIES	7 Miles Trails Boat Launching Ramps Picnic Areas	9 Miles Trails 10 Miles Equestrian Staging Areas	3.6 Miles Trails Landscaping Benches Trash Barrels	3.6 Miles Trails Landscaping Benches Trash Barrels

miles. In several areas, the District's design called for straightening the river to gain hydraulic efficiency. Based on detailed engineering designs and further study, the 1975 GDM plan was a variation of the 1965 plan. The significant change was the reduced level of protection from a Standard Project Flood (SPF) to a 1 in 100 year protection. Napa County voted down twice in 1976 and again in 1977 the 1975 GDM plan. When the project was reinitiated in 1989, the 1975 GDM plan was further refined to the 1995 draft SGDM plan that limited the in-channel excavation by the use of setback floodwalls and levees. This plan was the impetus for the Napa County coalition process, which was begun in January 1996. County voters subsequently approved the plan in March 1998.

The Living River

The "Citizens Guide,"[111] published in 1998 jointly by the Sacramento District and NCFCWD, provided information about the project. The guide included information from the draft Supplemental Environmental Impact Statement/Environmental Impact Report, a refined definition of the "living river," and an acknowledgement of the innovative approach to flood control. The "Citizens Guide" recognized that the traditional approach to controlling the Napa River had failed and that this extraordinary approach respects the river's natural tendencies.[112]

Third Attempt to Pass Flood Control

Napans went to the polls in March 1998 to accept or reject the Napa County flood protection and watershed management plan known as Measure A. Would the voters approve a flood control project after having rejected earlier plans? The results were close but decisive. Of more than 27,000 votes cast, the plan passed by 308 votes. Seven out of 10 (or 68 percent) of voters had voted for the sales tax hike in Measure A. Dozens celebrated at the Napa Town Center and at the Yes on Measure A headquarters. To the community, Sacramento District Project Manager Paul Bowers symbolized the "new Corps." As Moira Johnston-Block remembers, "We were partners. And we truly loved each other, [in] a way in which only people, I suppose, who shared war or any great undertaking can love each other."[113]

Napans had galvanized their diverse constituency and passed their first flood control project ever. Much had to do with the flood control district's educational and media strategy: the hiring of professional pollsters, a large volunteer base, an attractive informational tabloid entitled "Napa Flooding: Our Community Responds,"[114] and a well-financed political campaign. "We knew it would be close, but we could win if we did certain things. We did those things," said NCFCWD District Chairman Battisti.

New Approach to Flood Control

On June 11, 1999, dozens of government officials and community leaders signed a document stating that a Project Cooperation Agreement would be finalized after water quality certification was obtained. Assistant Secretary of the Army Dr. Joseph Westphal said, "The Corps now looks to the Napa project as a model for tackling flood control without degrading the environment."[115] In addition, the project was cited in the White House's "Annual Report on Environmental Quality" as a model of partnering between the Corps and local community organizations.[116]

Water quality certification requirements were met in September 1999, and the Project Cooperation Agreement was signed in February 2000. Congress began construction funding in fiscal year 2000, and physical implementation of the Napa River Flood Protection Project began in earnest. In 2002, NCFCWD was busy acquiring the many parcels of land required for the project and constructing the relocations.

Today the Corps and NCFCWD continue the partnership forged during the coalition process and are dedicated to completing the project in a timely manner. Time will tell if this unprecedented flood plan will be successful. Jeffrey Mount, chair of the geology department at the University of California at Davis, worries that the design cannot thoroughly

anticipate the river's flood patterns and therefore may not provide total protection. However, he still supports the project.[117] Project Manager Paul Bowers said, "Five or ten years from now, when it starts to rain in the winter, people will be able to sleep at night."[118] Another viewpoint was an observation appearing in the magazine of the California Academy of Sciences:

> *If it does work, every river community in the world will have reason to celebrate.*
>
> *And if it doesn't work? We already know how to waste money on a flood-control system that neither worked nor respected the river's environmental values. If the "living river" approach fails to quell flood damage, at least it will help bring back steelhead and Delta smelt, support vast flocks of migrating birds, and move the community to invest in erosion control and sane and measured development. Better a vibrant, healthy, flooded Napa Valley than a dead flooded one.*[119]

Guadalupe River Project

The Guadalupe River drains from northern California's Santa Cruz Mountains through 160 square miles of Santa Clara County into the wetlands of the southern San Francisco Bay.[120] The river has a long history of overflowing and topping its banks. In 1941, Congress authorized a study of the Guadalupe River under the Flood Control Act of 1941 (PL 77-228). The Corps completed flood control studies in the 1970's and early 1980's, culminating in an Interim Feasibility Report and Environmental Impact Statement in 1985.[121] Other than these studies, minimal flood reduction work has been done, and approximately 40 percent of the county's streams and rivers still pose a flood danger.[122]

In 1986, Congress authorized the Guadalupe River Project "to provide [100-year flood protection] and amended the authorization in 1990 and 1991 to add additional environmental protection and include features for recreation."[123] The project consists of 2.6 miles of channel improvements along the Guadalupe

The Guadalupe River Project - Circa 2000

River between Interstate Highways 280 and 880 in downtown San Jose in Santa Clara County. The purpose of this project is to provide 100-year flood protection, fish and wildlife mitigation, and recreation features as part of the larger flood protection plan for the entire watershed and the Guadalupe River Park. (This project is separate from the Upper Guadalupe River Flood Protection Project along eight 6.4-mile sections of the Upper Guadalupe River, which is under the San Francisco District of the U.S. Army Corps of Engineers.[124])

An important part of the Guadalupe River Project is a bypass channel that includes two separate stretches of conduit to move floodwaters, thus preserving a section of natural riverbed as fish habitat. The first conduit is approximately 2,000 feet long and has two 17-foot-high by 24-foot-wide tunnels side by side. The second conduit is approximately 2,600 feet long and has two 17-foot-high tunnels, one 24 feet wide and the other 30 feet wide. The project will pave the way for the completion of the park's downtown sector consisting of a 2.6-mile park, riverside pathways, and terraces that city officials envisaged more than 25 years ago.[125]

The cost of the flood protection and park projects is shared between the Federal Government and non-Federal agencies.[126] Section 902 of the Water Resources Development Act of 1986 (PL 99-662) initially authorized the project, which has been subsequently modified by the Energy and Water Development Appropriations Acts of 1990, 1992, and 2002.

The project's primary sponsors are the Santa Clara Valley Water District (SCVWD) and the Corps. The City of San Jose and the San Jose Redevelopment Agency are sub-sponsors to the SCVWD. When the Sacramento District completes the flood component in 2004, the project will more than double the river's capacity and protect 4,290 buildings (mostly residential and some commercial) from a potential 100-year flood.[127] The benefit-to-cost ratio for the proposed project is 1.85:1. The recreational component is scheduled for completion in June 2005.[128]

The Decline of the Guadalupe River

In 1776, Juan Bautista de Anza named the Guadalupe River "Rio Guadalupe." A year later, the Mexican state of California established El Pueblo de San Jose de Guadalupe as its first state capitol and governmental site.[129] Flooding prompted civic officials to move the site from the Guadalupe River. The rapidly urbanized flood plain has been inundated 14 times since 1944, three years after the Corps began its initial studies. The flood of 1955 was the worst in recorded history, inundating more than 8,300 acres and resulting in more than $1.3 million in damages.

The Santa Clara Valley outgrew its agrarian environment in the 20th century to become the second largest city in California with Silicon Valley as the capital of high tech. With that growth, the river running through San Jose was almost forgotten until it flooded. The Guadalupe River soon fell victim to pollution and debris, with urban development strangling and diminishing its size to an almost invisible ditch in some locations. Because of silting and vegetation growth, the river lost as much as 40 percent of its water-carrying capacity.[130]

In the late 1980's, the increasing awareness of the plight of the river and an environmental consciousness began a tug of war among county, state, and Federal Governmental agencies, and the Guadalupe River began a comeback. As a result, the Chinook salmon and steelhead trout habitat have been improved, making the fish more visible.[131]

Moving the Project Toward Approval

The Sacramento District in partnership with the SCVWD and the City of San Jose had planned for a comprehensive flood control project for over 50 years. However, efforts to implement a plan were frustrated by a combination of lack of funds, political discord, conflicting visions of the flood control design, the inclusion of recreation features in the

plan, and in the 1990's, concerns over endangered native Chinook salmon and steelhead trout.

In 1985, the Corps presented its first plan in a Feasibility Study and Design Memorandum. The Corps proposed a functional 7-foot-high channel of concrete walls through the west side of downtown San Jose to address the problems of flooding due to inadequate channel capacity. However, City officials and the SCVWD visualized a different design. They wanted a revitalized downtown park where the riverbank would be widened into landscaped terraces and where the design of part of the channel would improve and preserve the habitat for fish.[132] The situation was perceived as "SCVWD versus the Corps." The Corps insisted that it would help pay for only a utilitarian flood control project. The water board and other local officials held out for terraced riverbanks.

In 1986, SCVWD accepted the City's approved plan and agreed to extend the project south of the interchange. A General Design Memorandum and an Environmental Impact Report evaluated the inclusion of the recreation plan sponsored by the City of San Jose Redevelopment Agency as a project feature. In 1991, the Corps issued a General Design Memorandum and the Environmental Assessment/ Initial Study for the Guadalupe River Project. The basis for the National Economic Development plan was a 50-year level of protection. The SCVWD preferred suspending this plan and presented convincing arguments for a greater level of protection for such an extensively urban area. The Corps' South Pacific Division concurred and requested a waiver allowing the SCVWD's 100-year plan and recreational elements to be the basis for cost sharing. However, the Office of the Chief of Engineers rejected the plan because it contained recreational elements not authorized by Congress.[133] The 1986 authorization did not include recreation and was only authorized as a flood control project.

The project lingered until two San Jose congressmen, Norman Mineta (D-CA) and Don Edwards (D-CA), pushed through a bill that included recreation as a component of the project to be cost shared. In the latter half of 1991, the Office of the Chief of Engineers reevaluated the project and gave direction to proceed. The Sacramento District's General Design Memorandum of 1991 conformed to the flood protection objectives of the original EIS and the recreational ideas in the City of San Jose's River Park Master Plan.

In 1992, it looked as if the project would finally proceed. On March 24, 1992, the SCVWD and the San Jose City Council met and approved a financing and management plan. By this time, the cost of the project had increased from the original estimate of $102.3 million to $118 million. The SCVWD unfairly blamed the increased costs on the Corps' refusal to pay for recreation. "Negotiations dragged on so long that few details seem very important now," remarked Kay Whitlock, SCVWD Assistant General Manager. She observed:[134]

> *The water district's share has more than doubled, to $19 million, and the city's share nearly tripled, to $4 million, partly because the Corps of Engineers has refused to pay for features it considers purely recreational. Despite the increased costs, water board Chairman Patrick T. Ferraro said he has heard of no objections from other directors.*[135]

In 1992, the Sacramento District and the SCVWD signed a Local Cooperation Agreement.[136] County voters also consented to permit the County to increase flood control assessments for property owners.

The projected completion date for the work was set for 1998. The groundbreaking took place in 1992. Representative Mineta, who as a San Jose City councilman in 1967 had gone to the San Antonio River Walk in Texas and was inspired to create a river walk in San Jose, hailed the project: "Guadalupe Park is a victory of common sense and vision over red tape and bureaucracy."[137] Construction also began in 1992. From 1992 to 1994, the District completed reach 1. From 1994 to 1996, the District completed reach 2, consisting of the widening of the channel, repairing habitat, building weirs, widening the flood plain, and recreational elements.

Flood of 1995

Since the Corps first studied flooding in the Santa Clara Valley in 1941, the Guadalupe River has flooded 16 times. Damaging floods arose along the upper Guadalupe River in 1982, 1983, 1986, 1995, and 1998. The January 1995 flood caused severe damage to more than 150 homes and closed Highway 87 and the parallel light rail line, both major commute thoroughfares. As always, this flood help to galvanize and highlight the urgency of resolving the issues of flood control. The Guadalupe River raged beneath the St. John Street bridge in downtown San Jose at the rate of 66,800 gallons a second, a rate not seen in more than half a century.[138] Two months later in March 1995, the rain revisited an already saturated watershed in the Santa Cruz Mountains. The reservoirs filled, and the storm drains and river could not handle the volume of water. The existing flood control structures were unable to keep up with demands such as this storm placed on their capacity. The normally placid Guadalupe River spilled over in at least four locations through a 2-mile stretch from Alma Avenue to north of downtown.

Environmentalist Objections to the Project

As the Sacramento District prepared to resume construction on the third phase of the project, constructing concrete-lined channels, an alliance of environmentalists, commercial fishermen, and amateur river-watchers complained that the SCVWD had not considered the effect of the structural solutions to flood control on migrating fish. Both the Sacramento District and the SCVWD conceded that the original environmental studies prepared in the early 1980's did not consider the effect of the project on the salmon in the river. However, there were two differing views on these effects. One view held that the design of the flood control project would widen the channel and in the process eliminate trees and brush on the banks of the river. Without the natural overhang of trees and brush, the river would become too warm for the migrating cold-water salmon and steelhead, which swam up from San Francisco Bay to generate offspring in the headwaters in the Santa Cruz Mountains. Another viewpoint was that the project would help the salmon because existing natural and artificial obstructions in the river would eventually be removed.

The Sacramento District and the SCVWD began an investigation into the effect on the fish. Mike Rigney, director of the non-profit Coyote Creek Riparian Station, who studied life along local streambeds acknowledged and credited their efforts. Another environmental group, the Evergreen Resource Conservation District, an elected panel with little influence, joined the chorus of opposition.

The Guadalupe-Coyote Resource Conservation District, a small state-sponsored watchdog agency, announced plans to sue the Corps and the water district in Federal court, demanding a more fish-friendly design for the flood control project. The suit was never filed, but the threat spurred action. The most serious challenge to the project came from an alliance of the Guadalupe-Coyote Resource Conservation District, Trout Unlimited, and the Pacific Coast Federation of Fishermen's Association. Represented by the Natural Heritage Institute, a public-interest law firm, the alliance filed a Notice of Clean Water Act Citizen's Suit in late 1996.

Finally, the U.S. Fish and Wildlife Service told project sponsors that work on the downtown stretch of the river could not proceed without a comprehensive "mitigation plan" to readdress damages from construction that might threaten the fish's habitat.[139] The dispute halted the project in 1996.

To forgo expensive and prolonged litigation, the Santa Clara Valley Water District, the City of San Jose, the City of San Jose Redevelopment Agency, and the Sacramento District agreed to participate in a collaborative process to pursue resolution of the mitigation issues.

Nine Federal, state, and local government agencies joined with the Natural Heritage Institute on what became known as the Guadalupe River Flood Control Project Collaborative. Aggravated because of planning stalled by environmental issues, the leaders of the non-profit Guadalupe River Park and

Gardens Corporation urged the Collaborative to address the flood control issues.[140]

The Regional Water Control Board had issued the District a water quality certification permit with conditions (Conditional Certification under Clean Water Act Section 401: US Army Corps of Engineers, Guadalupe River Flood Control Project dated February 14, 1992). The major condition of the certification required the development of an adequate mitigation and monitoring plan. Although one was developed and initially approved by the state and Federal resource agencies, it later became apparent that the mitigation plan was not adequate.[141]

The staff from the U.S. Fish and Wildlife Service, California Department of Fish and Game, National Marine Fisheries Service, and California State Water Resources Control Board met with the Corps and SCVWD and called to their attention the need to redesign the project to reduce the effect and maximize onsite mitigation, increase onsite revegetation to replace shaded riverine aquatic cover, restore the quality and quantity of affected shaded riverine aquatic cover, supply more fisheries mitigation, and provide thermal mitigation.[142]

The Sacramento District and the SCVWD contracted Concur, Inc., an environmental facilitation firm based in Berkeley, California, to mediate the environmental concerns with the agencies. Representatives from the SCVWD, Sacramento District, National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Game, City of San Jose Public Works, State Water Resources Control Board, Concur, and the Natural Heritage Institute met for two days a month, striving to reach an agreement by a self-imposed deadline of July 1, 1998. This was accomplished by having both a technical committee and an executive committee work together at the same time. Concur uncovered the technical issues and kept the project moving. While the executive committee, who were composed of the decision-makers including Lewis Whitney, Deputy District Engineer of Program and Project Management, identified the Corps' true interest early and quickly made the necessary decisions.

The divergent groups came to a consensus and produced a Dispute Resolution Memorandum signed by all parties. Executive Director Celeste Cantú of the State Water Resources Control Board hailed the memorandum:

> *Preserving populations of native anadromous fish within a leading metropolitan area, while constructing a major flood control facility, will represent a remarkable milestone in environmental engineering in California. We believe the Dispute Resolution Memorandum is a significant step toward this milestone.*[143]

The solution to the problem was to build a bypass channel to divert the water instead of a concrete channel. The solution showed the strength of environmental interests, as well as the willingness of the Sacramento District and the SCVWD to find creative ways to protect the recovering fish population. It was this recovery of the fish that provided evidence and a stronger position for the environmental groups that were petitioning the Department of Fish and Game to consider the two species of Chinook salmon and steelhead trout for protection under the Federal Endangered Species Act.[144]

A Second Groundbreaking

In September 1998, a second groundbreaking was held, symbolizing the redesign of the project with the bypass channel. "It took some time to get everybody to the table, but this solution meets everybody's objectives," said Nancy Bernardi, a board member of the Guadalupe-Coyote Resource Conservation District. Jim Ferguson, executive project manager for the SCVWD, noted that although the tunnels will cost about $12 million, when considering that other costs will not be incurred, it is an efficient solution.[145] The new project costs of $226.8 million included a $25 million increase due to the refined bypass, mitigation costs of $13 million, and the normal cost increases due to delays and inflation.[146]

Conclusion

The cost of flood control and preserving the environment and fish in a river running through a city is an expensive proposition. In the case of the Sacramento District's Wildcat and San Pablo Creeks, Walnut Creek, Napa, and the Guadalupe River civil works projects, structural solutions had to be combined with environmental restoration and preservation of habitats.

It is less costly for the non-Federal sponsor and the Corps if there is an early consensus of design objectives and an understanding of the authorized project. In the case of the Guadalupe River Project, the local sponsors and its constituency failed to fully understand that it was not the Corps who was against recreational component to the project, but that the costs for recreational components were not originally authorized by Congress. As a result, the Sacramento District became the "villain" in a conflict that reinforced the stereotype that the Corps was pro-structural at the expense of the environment.

The Corps embraced the recreational component of the project after its subsequent congressional authorization and completed about two-thirds of the project. However, it faced another obstacle that forced the project's redesign; that is, pressure from environmental groups to preserve the endangered native Chinook salmon and steelhead trout's habitat. This action made it imperative that in future projects, mitigation measures fully satisfy the priorities of Federal resource agencies so that work can proceed without delays.

The resolution and consensus of the problems in 1991 have been a cause for celebration. "This is a great day for San Jose and all of Silicon Valley," said Antonio Estremera, chairman of the water district board of directors. "Since the mid-1950's, repeated flooding along the Guadalupe River has claimed hundreds of properties causing millions of dollars in damage. We've been waiting a long time to stop the flooding and it appears that the wait will soon be over."[147]

When the Sacramento District completes the flood control portion of the work as scheduled in 2004, the project will result in a multitude of benefits and serve as an example of how flood control and preserving the environment can work together.

Endnotes

[1] U.S. Army Corps of Engineers, Sacramento District, "Fairfield Vicinity Streams, Fairfield, California, General Design Memorandum, Phase II, Project Design," May 1976, p. 1.
[2] Interview Willie Collins with Morrie Barr, February 16, 2001.
[3] U.S. Army Corps of Engineers, Sacramento District, "Finding of No Significant Impact, Fairfield Vicinity Streams, California," pp. 2-3.
[4] U.S. Army Corps of Engineers, Sacramento District, Fairfield "Project Resumes" in *Public Affairs Report*, April, 1989, p. 4.
[5] Interview Willie Collins with Morris L. Barr, February 16, 2001.
[6] U.S. Army Corps of Engineers, "Annual Report Fiscal Year 1991 of the Secretary of the Army on Civil Works Activities," vol. II, pp. 35-37.
[7] Interview Willie Collins with Ronald Hurlbut, February 14, 2001.
[8] State of California Reclamation Board, 1991, p. 1.
[9] The Sacramento River Flood Control Project originating in 1917 is the largest Federal flood control project in California, including over 1,000 miles of levees, a major bypass flow way, and several large reservoirs with dedicated flood control storage. The project consists of a system of dams, weirs, and levees to contain floodwaters along the American and Sacramento Rivers that converge at the city of Sacramento.
[10] U.S. Army Corps of Engineers, Sacramento District, "Cache Creek Basin, California, Feasibility Report and Environmental Statement for Water Resources Development," February 1979, p. 14.
[11] U.S. Army Corps of Engineers, Sacramento District, "Cache Creek Settling Basin, Final General Design Memorandum," January 1987, p. 1.1.
[12] U.S. Army Corps of Engineers, Sacramento District, Transcripts of Public Meeting on the Investigation for Water Resources Development in Cache Creek Basin, California, held March 20, 1978, in Woodland, California, March 21, 1978.
[13] U.S. Army, Cache Creek Basin, California, Communication from the Assistant Secretary of the Army (Civil Works) transmitting a report from the Chief of Engineers, Department of the Army, on Cache Creek Basin, April 1983.
[14] U.S. Army Corps of Engineers, Sacramento District, "Cache Creek Contract Coming" in *Public Affairs Reports*, July 1991, p. 3.
[15] U.S. Army Corps of Engineers, Sacramento District, Cache Creek Settling Basin, Design Memorandum No. 1, Supplement No. 1, Concrete Materials, January 1988, p. 4.
[16] Interview Willie Collins with Ricardo S. Pineda, August 3, 2001.
[17] Peggy Sotcher, "Urban Creeks: Avoiding a Concrete Solution" in *Contra Costa Times*, p. 2a.
[18] George Emanuels, *Walnut Creek: Arroyo de Las Nueces*. Walnut Creek: Diablo Press, 1984, p. 183.
[19] U.S. Army Corps of Engineers, South Pacific Division, "Water Resources Development in California," 1995, p. 23.
[20] "City Acts to Save the Creek," in *Contra Costa Times*, November 25, 1969.
[21] U.S. Army Corps of Engineers, Sacramento District, "Supplement II to the Final Environmental Impact Statement," October 1984, p. i.
[22] U.S. Army Corps of Engineers, Sacramento District, "Walnut Creek Project, Design Memorandum No. 2, Channel Improvement Basis of Design – Reach II, Willow Pass Road to Rudgear Road," October 1964, p. 11.
[23] David Newdorf, "Development Threatening the Creeks in Contra Costa," *Contra Costa Times*," December 11, 1985, p. 7a.
[24] U.S. Army Corps of Engineers, Transcript of Public Meeting on Walnut Creek Project held at Meadow Homes Elementary School, Walnut Creek, March 27, 1973, p. 6-7.
[25] *Ibid.*, p. 47.
[26] "Walnut Creek Gets Flood Control Plans" in *Contra Costa Times*, March 19, 1974.
[27] U.S. Army Corps of Engineers, Transcript of Public Meeting on Presentation of Alternative Plans, Walnut Creek – San Ramon Creek, S.P.R.R. Bridge to Rudgear Road held at Walnut Creek, California, April 11, 1974.

[28] U.S. Army Corps of Engineers, "Final Environmental Statement, Walnut Creek Project, Contra Costa County, California," December 1976, p. 2.

[29] David Newdorf, "Development Threatening the Creeks in Contra Costa" in *Contra Costa Times*, December 11, 1985, p. 8a.

[30] U.S. Army Corps of Engineers, "Walnut Creek, California, Project Post Authorization Change Report for the Addition of Recreation Facilities, Upper Pine Creek and San Ramon Creek," July 1987, p. 4-5.

[31] U.S. Army Corps of Engineers, South Pacific Division, "Water Resources Development in California," 1995, p. 23.

[32] Sandy Kleffman, "Plan to Beautify Creek in Downtown Walnut Creek Unveiled" in *Contra Costa Times*, November 16, 1984.

[33] U.S. Army, Office of the Chief of Engineers, Regulation No. 1165-2-118, "Water Resources and Authorities, Federal Participation in Covered Flood Control Channels," p. 1.

[34] Interview Willie Collins with Michael F. Nolan, January 22, 2000.

[35] Interview Willie Collins with Gregory Connaughton, January 16, 2001.

[36] Ann L. Riley, "Overcoming Federal Water Policies: The Wildcat-San Pablo Creeks Case" in *Environment*, December 1989, vol. 31, no. 10, p. 12.

[37] Alvarado Park near Wildcat Creek's headwaters started as a private park in 1909 and then became a part of the city of Richmond. The City transferred Alvarado Park to the East Bay Regional Park District's Wildcat Canyon Regional Park in 1985. During the early 1980's, the County obtained grants from the Urban Creek Renewal for environmental restoration.

[38] Kaiser was one of the largest shipbuilding companies in the U.S.

[39] U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, California, Table 161, p. 6-838.

[40] In 1955-1956, Flood Control Zone 7 for Wildcat Creek and Flood Control Zone 6a for San Pablo Creek were established, collecting money sporadically until Proposition 13 was passed in 1978. Because of the limitation of Proposition 13, the two flood control entities as well as others in the county were left almost destitute and remain so.

[41] U.S. Army Corps of Engineers, Sacramento District, "General Design Memorandum and Basis of Design for Reach 1, Wildcat and San Pablo Creeks," May 1986, p. 4.

[42] U.S. Army Corps of Engineers, San Francisco District, "Wildcat-San Pablo Creeks, Contra Costa County, California, Feasibility Report for Water Resources Development," August 1973, p. 1.

[43] U.S. Army Corps of Engineers, Sacramento District, "Work Slows but not Stops at Wildcat, San Pablo Creeks" in *Public Affairs Reports*, September, 1989, p. 7.

[44] Willie Collins interview with Gregory Connaughton, January 16, 2001.

[45] Willie Collins Interview Lillie Mae Jones, October 31, 2001.

[46] Ann L. Riley, "Overcoming Federal Water Policies: The Wildcat-San Pablo Creeks Case," in Environment, December 1989, vol. 31, no. 10, p. 17.

[47] U.S. Army Corps of Engineers, Sacramento District, "Final Supplemental Environmental Impact Statement II, Wildcat and San Pablo Creeks, Contra Costa County, California," April 1986, p. 1.

[48] Eric Brazil, "Richmond's Bit of Beauty 'Murdered' by Progress" in *San Francisco Examiner*, June 14, 1987, p. 1; Michael Hythe, "Creek Vegetation Bulldozed in Error: Corps, CC Flood Control Chastised" in *West County Times*, June 12, 1987, p. 1, and Michael Hythe, "2nd Flood Control Gaffe Will Stop Marsh" in *Contra Costa Times*, July 10, 1987, p. 1.

[49] U.S. Army Corps of Engineers, Sacramento District, "Major Archaeological Site Found" in *Public Affairs* Report, September, 1989, p. 1.

[50] U.S. Army Corps of Engineers, Sacramento District, "Wildcat and San Pablo Creeks, Supplement No. 5 to Design Memorandum No. 1, Reach – 1 Recreation Facilities," October 1990, p. 2.

[51] U.S. Army Corps of Engineers, Sacramento District, "Draft Environmental Assessment, Wildcat and San Pablo Creeks Recreation Facilities," October 1990, p. 5.

[52] Edward F. Sing, "Stable and Environmental Channel Design," *Proceedings of the National Conference on Hydraulic Engineering*, New York ASCE , 1988, p. 7-12.

[53] U.S. Army Corps of Engineers, Sacramento District, "Wildcat and San Pablo Creeks, Contra Costa County,

California, Environmental Mitigation," February 1989, p. 3.

[54] Willie Collins interview Greg Connaughton, January 16, 2001.

[55] Willie Collins interview Ann Riley, January 22, 2001.

[56] U.S. Army Corps of Engineers, "Napa River/Napa Creek Flood Reduction Project, Final Supplemental Environmental Impact Statement/Environmental Impact Report," March 1999.

[57] Tim Hearden, "For Some, Flood Control Benefits Aren't Theoretical" in *Napa Valley Register*, February 21, 1998, p. 3a.

[58] Tim Hearden, "When the Napa River Rages" in *Napa Valley Register*, November 27, 1997, p. 4a.

[59] U.S. Army Corps of Engineers, South Pacific Division, "Water Resources Development in California," 1987, p. 31.

[60] U.S. Army Corps of Engineers, San Francisco District, "Napa River Flood Control Project, General Design Memorandum No. 1 and Appendices, September 1975.

[61] Pierce Carson, "Napa River Project Called Boondoggle" in *Napa Valley Register*, June 5, 1975.

[62] Pierce Carson, "Napa River Project Reaffirmed" in *Napa Valley Register*, March 19, 1976. The committee's main concern was environmental enhancements including the planting of trees along streets and in soil placed in riprap crevices along the levees.

[63] "Group Forms to Urge Passage of Napa River Flood Project" in *Napa Valley Register*, October 14, 1976. Napa banker Dale Kirkpatrick co-chaired the committee with and Napa banker Dale Kirkpatrick and Napa College instructor George Boyet. Publicist Art Youngberg worked on the pamphlet.

[64] Pierce Carson, "Bigger Flood Project Share" in *Napa Valley Register*, October 25, 1976. The creek addition was a result of the Flood Control Act of 1976 (Public Law 94-587), approved October, 1976.

[65] Pierce Carson, "Many Views on River Project" in *Napa Valley Register*, October 29, 1976, p. 1.

[66] Pierce Carson, "Opinions Many and Heated about Napa River Project" in *Napa Valley Register*, November 4, 1977, p. 1.

[67] Pierce Carson, "River Project Toppled by Over 2-1 Margin" in *Napa Valley Register*, November 9, 1977.

[68] Sean Silverthorne, "Napa Looks at Damages in Millions" in *Napa Valley Register*, February 27, 1986, p. 7a.

[69] Tim Hearden, "When the Napa River Rages" in *Napa Valley Register*, November 27, 1997, p. 1a.

[70] Doug Ernst, "Vote Eyes on Flood Control" in *Napa Valley Register*, March 12, 1986, p. 1.

[71] Interview Willie Collins with Paul Bowers, April 19, 2001.

[72] Interview Willie Collins with Paul Battisti, March 12, 2001.

[73] Libby Lane, "Napa Flood Control Boosted" in *Napa Valley Register*, May 9, 1987.

[74] Jan Goben and Kathleen Dougherty, "Flood Agreement a Step Closer" in *Napa Valley Register*, April 26, 1989.

[75] Libby Lane, "Napa Flood Study Nearly Prepared" in *Napa Valley Register*, September 14, 1989, p. 1.

[76] Jack Katzanek, "Napa County Reveals Flood Control Plans" in *Napa Valley Register*, April 19, 1990.

[77] Jack Katzanek, "Napa County Flood Control Plans Unveiled" in *Napa Valley Register*, May 23, 1990, p. 5.

[78] U.S. Army Corps of Engineers, Sacramento District, "Napa River, California, NED Office Report," April 1990, p. i.

[79] Libby Lane, "Concerns on Flood Project" in *Napa Valley Register*.

[80] Genji Schmeder, "Remember the Environment" in *Napa Valley Register*, November 19, 1989, p. 11.

[81] Carl Kangas, "The Natural Way" in *Napa Valley Register*, November 19, 1989.

[82] "Tragic Track Record" in *Napa Valley Register*, November 19, 1989.

[83] Will Hart, "Napa Officials Worry about Flood Funding" in *Napa Valley Register*, March 29, 1990, p. 1.

[84] Interview Willie Collins with Paul Battisti.

[85] Jack Katzanek, "Consultant to Help Protect the Napa River" in *Napa Valley Register*, July 26, 1990, p. 1.

[86] *Ibid.*

[87] U.S. Army Corps of Engineers, Sacramento District, "Revised Draft Preliminary Assessment and Site Investigation, Summary Report, Napa River Environmental Study," May 25, 1994, p. 60.

[88] Interview Willie Collins with Moira Johnston-Block, March 28, 2001.

[89] *Ibid.*

[90] Derek J. Moore, "Riding the River's Future" in *Napa Valley Register*, July 17, 1994, p. 1a.

[91] Administration Floodplain Management Task Force, Interagency Floodplain Management Review Committee, Scientific Assessment and Strategy Team. "Science for Floodplain Management into the 21st Century: Report of the Interagency Floodplain Management Review Committee," 1994.
[92] Interview Willie Collins with Moira Johnston-Block, March 28, 2001.
[93] Susanne Martinovich, "Hydrologist Says Let Napa River Flow," in *Napa Valley Register*, July 28, 1994.
[94] U.S. Army Corps of Engineers, Sacramento District, "Napa River, California, Draft Supplemental General Design Memorandum/Environmental Impact Statement/Environmental Impact Report," March 1995.
[95] Interview Willie Collins with David G. Dixon, June 20 2001.
[96] Interview Willie Collins with Paul Battisti, March 12, 2001.
[97] *Ibid.*
[98] Paul Bowers, former Project Manager, Napa River Project, Sacramento District, 2001.
[99] Susanne Martinovich, "A New Beginning for Flood Control" in *Napa Valley Register,* December 15, 1995. p. 1b.
[100] Letter from Friends of the Napa River to Senator Barbara Boxer. Copies were sent to Dr. John H. Zirschky, Senator Diane Feinstein, Representative Frank Riggs, Senator Mike Thompson, and Assemblywoman Valerie Brown, August 14, 1995.
[101] Susanne Martinovich, "Flood Project Gets Senator's Attention" in *Napa Valley Register,* January 17, 1996, p. 1a.
[102] *Ibid.*
[103] Interview Willie Collins with former Paul Bowers, July 22, 2001.
[104] Community Coalition for a Napa River Flood Management Plan, "Living River Strategy," May 20, 1997, unpublished paper.
[105] "Flood Control Could Win Big" in *Napa Valley Register*, August 8, 1997.
[106] Tim Hearden, "Corps Fancies Napa Plan."
[107] "Corps Helps Napa, Corps" in *Napa Valley Register,* October 26, 1997.
[108] Tim Hearden, "Measure A Gains Footing from Flood Plan Review" in *Napa Valley Register,* December 19, 1997, p. 1a.
[109] U.S. Army Corps of Engineers, Sacramento District, Files of Former Project Manager Paul Bowers, 2001.
[110] U.S. Army Corps of Engineers and Napa County Flood Control and Water Conservation District, "A Citizen's Guide to the City of Napa, Napa River, and Napa Creek Flood Protection Project," January 1998.
[111] *Ibid*, p. 1.
[112] Interview Willie Collins with Moira Johnston-Block, March 28, 2001.
[113] Citizens for Napa Flood Management, "Napa Flooding: Our Community Responds," 1998.
[114] Mitch Tobin, "Flood Pact Signing Sets Stage for Project" in *Napa Valley Register*, June 12, 1999, p. 4a.
[115] "NEPA and the Integration of Economic, Environmental, and Social Goals" in *1996 Annual Report on Environmental Quality*, p. 7-8.
[116] Katherine Ellison, "Napa Takes Unique Approach to Floods," in *San Jose Mercury News,* July 31, 2000, p.1a.
[117] Timothy Egan, "For a Flood-Weary Napa Valley, A Vote to Let the River Run Wild" in *New York Times,* April 25, 1998, p. A9.
[118] Gordon Slack, "Flooding Room" in *Magazine of the California Academy of Sciences,* Winter 1999, vol. 52, no. 1. 9.
[119] U.S. Army Corps of Engineers, South Pacific Division, "Water Resources Development in California," 1995, p. 24.
[120] U.S. Army Corps of Engineers, Sacramento District, "Guadalupe River Interim Feasibility Report and Environmental Impact Statement," 1985.
[121] Sweeney, Frank, "Many Areas at Risk Despite Major Flood Control Projects" in *San Jose Mercury News*, January 15, 1995, p. 22A.
[122] U.S. Army Corps of Engineers, Sacramento District, "Integrated General Re-Evaluation Report/Environmental Impact Report-Supplemental Environmental Impact Statement for Proposed Modifications to the Guadalupe River Project, Downtown San Jose, California," vol. 1, February 2001, p. S1.
[123] U.S. Army Corps of Engineers, San Francisco District, "Draft Environmental Impact Report/Environmental Impact Statement for the Upper Guadalupe River Project, 2000."

[124] See City of San Jose, "Guadalupe River Park Environmental Impact Report, Guadalupe River Park Master Plan," 1989.

[125] Sweeney, Frank, "Flood Protection Plan Clears Hurdle; River Work Could Resume In Spring," *San Jose Mercury News*, March 8, 2001.

[126] *Ibid.*

[127] Interview Willie Collins with Brandon Muncy, July 22, 2002.

[128] Grant, Joanne, "Taming the River Founders Would Hail Flood Control Plan" in *San Jose Mercury News*, November 28, 1995, p. 1B.

[129] Sweeney, Frank, "Flood Control Project Levee Work Set For Guadalupe" in *San Jose Mercury News*, July 26, 1995, p. 1B.

[130] Sweeney, Frank. "Salmon Persevere in San Jose Water District, Biologists Make Badly Treated Guadalupe River More Hospitable to Native Fish," in *San Jose Mercury News*, May 8, 2001, p. 1F.

[131] Richard, Gary, "Flood Control Holdups Funding, Design Disputes Delayed Guadalupe Project" in *San Jose Mercury News*, January 13, 1995, p. 1B.

[132] *Ibid.*

[133] Huber, Jeanne, "Project Will Sweep History Aside, Guadalupe River Park Finally Gets The Go-Ahead" in *San Jose Mercury News*, March 25, 1992, p. 1b.

[134] Huber, Jeanne, "Downtown Flood-Control Project Draws Closer" in *San Jose Mercury News*, March 24, 1992, p. 1B.

[135] "Local Cooperation Agreement between the Department of the Army and the Santa Clara Valley Water District for Construction of the Guadalupe River, California Project," March 30, 1992.

[136] Ostrom, Mary Anne and Jeanne Huber, "Flood of Praise Greets River Project" in *San Jose Mercury News*, August 26, 1992, p. 1B.

[137] Sweeney, Frank, "Many Areas at Risk Despite Major Flood Control Projects" in *San Jose Mercury News*, January 15, 1995, p. 22A.

[138] Bailey, Brandon, "Wild Salmon an Issue in Riverbed Project, Some Say Guadalupe Flood Control Could Help Fish by Removing Barriers" in *San Jose Mercury News*, October 24, 1994, p. 1B.

[139] Witt, Barry, "Tunnel Would Tame Guadalupe Downtown, Proposal Ends Impasse Over Fish Habitat," *San Jose Mercury News*, July 28, 1998 , p. 1A.

[140] Interview Willie Collins with Brandon Muncy, July 22, 2002.

[141] U.S. Army Corps of Engineers, Sacramento District, "Integrated General Re-Evaluation Report/Environmental Impact Report-Supplemental Environmental Impact Statement for Proposed Modifications to the Guadalupe River Project, Downtown San Jose, California," vol. 1, February 2001, p. S2.

[142] Scott T. Mccreary, Ph.D., and Austin Mcinerny, AICP, MRP, "Negotiating Agreements for Integrated Flood Control: Guadalupe River Flood Control Project Collaborative, Santa Clara Valley, California."

[143] Witt, Barry, "Tunnel Would Tame Guadalupe Downtown, Proposal Ends Impasse Over Fish Habitat," *San Jose Mercury News*, July 28, 1998 , p. 1A.

[144] Gaura, Maria Alicia, "San Jose Revises Flood Control Plan to Spare River, Fish Habitat" in *San Francisco Chronicle*, September 28, 1998, p. A13.

[145] Interview Willie Collins with Brandon Muncy, July 22, 2002.

[146] Sweeney, Frank, "Flood Protection Plan Clears Hurdle, River Work Could Resume in Spring" in *San Jose Mercury News*, March 8, 2001.

Chapter 7

Sacramento District's Response to Floods and Other Disasters, 1978 - 1998

The majority of disaster response from the Sacramento District involves flood fighting. This chapter documents the Sacramento District's participation in eight flood fights between 1973 and 1998. Most of the flood fights were in California, but some also took place in Nevada and Utah. Descriptions of other minor flood fights can be found in the chapters on Fairfield Vicinity Streams, Little Dell Dam, Napa River, and Guadalupe River.

California Flooding

The transition from drought to flooding in California can be swift. A deluge can follow years of drought. "You can never have total confidence that it is not going to flood. If we're going to get enough rain, we will get flooded," recalls long-time Sacramento District Resident Engineer Ralph Cameron, who has participated in many Sacramento District flood fights over the last 30 years.

California's flood season is from November to April. During this 6-month period, the recurrence of storms in California over a century and a half has left devastating footprints.[1] As early as 1866, the battle to take control of the environment and put an end to flooding began in earnest.

The District's Mandate and Responsibilities

The Sacramento District is legally empowered to fight floods.[2] The District also assists in search and rescue operations, furnishes technical advice and assistance, provides emergency repairs to levees and other flood control projects, and supplies materials such as sandbags, polyethylene sheeting, lumber, pumps, or rock for stabilization. Through post-flood response, the Corps is also responsible for performing "emergency repair and restoration of flood damaged or destroyed flood control works, such as levees."[3] The Corps also provides primary emergency support to the Federal Emergency Management Agency (FEMA) under the Federal Response Plan when the President declares a national disaster.

The District's flood-fighting responsibilities extend from California to Colorado, Nevada, and Utah, and include five large basins (San Joaquin, Sacramento, Bonneville, Lahonton, and Upper Colorado) as well as smaller ones. Rivers and streams within a basin are usually similar in many ways; they may have similar watersheds, stream slopes, soil types, and channel characteristics. Furthermore, the projects within a basin likely affect the same mainstem control points so the projects need to be closely coordinated.

The Sacramento District's response to eight recent major and minor floods events (1978, 1980, 1982, 1983, 1986, 1995, 1997, and 1998) illustrates both the stability and vulnerability of existing flood control structures, the need for a permanent solution to deflate flood damages, and the District's prominence in fulfilling the mandate to provide flood fighting and rehabilitation.

Before entering into a discussion of the specific flood events, a look at the policy and procedure for flood fighting is necessary.

Flood Fighting Policy and Procedure

While the Sacramento District can activate flood-fighting readiness within hours, the District's response is supplemental to local reclamation districts and to state water resources agencies. In California, an important component of the mission of the Department of Water Resources is to coordinate the flood response for the state and provide dam safety, flood control, and inspection services.

The California Department of Water Resources and the Sacramento District's working relationship is outlined in a Memorandum of Understanding (MOU) originally drafted in 1955 and modified in 1984 and 1999. The MOU's purpose is "...to facilitate working relations between the parties [Department of Water Resources and the South Pacific Division] providing a better understanding of responsibilities of each party in relation to flood emergency actions authorized under Public Law 84-99."[4]

The District, through its Chief of Water Management, oversees the operation of all flood control dams, debris dams, and weir project operations within the District boundaries in eight western states, as well as the San Francisco District's dams.

There are 19 Corps-owned and operated facilities, all in California. There are 30 Section 7 projects defined as reservoirs with flood control functions that are owned and operated by other organizations: 16 in California, seven in Utah, and seven in Colorado. In addition, the District provides operational aid to several Section 10 projects – small flood control facilities where control has been given totally to the local sponsor – throughout the District's area of responsibility.[5] The District also writes the operational regulations for the flood control projects, reviews the operations in an attempt to improve the operational plans, and provides hydrometeorologic and reservoir operations support to planning studies.

Flood Emergency Stages

The Sacramento District responds to flood emergencies by entering into three phases of readiness: informational, alert, and mobilization.

When a series of conditions has arisen that could cause flooding, the District and the State Flood Operations Center monitor conditions, and the hydrology or geotechnical division becomes active. When warranted by hydrometeorological and reservoir conditions, the District initiates the information phase of readiness, requiring that staff be available to work 24 hours a day for 7 days.

The alert phase is initiated when the California Department of Water Resources determines that a flood situation is or will become a threat to life or property.

Once a flood is imminent or occurring; the state requests the Sacramento District's emergency services. Levees are breached, and flooding is severe.

Sacramento River Boil Repair - Circa 1984

The state Emergency Operations Center is brought in, and the District is actively engaging in a flood fight. In this mobilization phase, the District can spend emergency operations funds for technical assistance to state and local interests and can award emergency contracts for levee stabilization following the Commander's declaration.

These three phases provide interim flood protection for the remainder of the storm season. The last stage of the District's involvement is the restoration and rehabilitation of levees before the next storm season. However, it is sometimes difficult for the District to accomplish this phase because environmental laws, such as the National Environmental Policy Act and the California Environmental Quality Act, require lengthy reviews before work begins.

Flood Prediction

Despite modern hydrometeorological technology, computer maps, satellite photographs, radar, and observed information, weather forecasts are not precise enough for predicting either the intensity or the rate of recurrence of floods.

The District uses weather forecasts from Federal, state, and private sources. However, the data used to arrive at flood probability is dated. "Our dams and our flood control structures [were] based on a data set which was primarily the first half of this century," notes University of California at Davis geographer Jeffrey Mount. The Standard Project Flood protection, a designation that the Corps formerly used, meant a very high level of flood protection based on data to 1950. Since the floods of 1986 and 1997, revisions have been made to previous estimates of the degree of flood protection. For example, a 100-year flood on the American River in 1940 is classified today as a 20-year flood.[6]

Floods generally result from three causes: seepage through or under the levees resulting in a "boil"or leak, erosion of the levee due to current or wave action, or overtopping resulting from river water-surface elevations higher than the levee. In some instances, it is a combination of the three, as seen in the descriptions of the flood events that follow.

The Kings River, California Flood: May 1978

Erosion was the cause of the flood in 1978 on the Kings River. The long-awaited relief from a 2-year drought in California came with storms from December 1977 until January 20, 1978. One weather forecaster called the winter of 1978 "the warm, drought-breaking winter of '78."[7] Heavy rains fell in the foothills and valley, and three of the fixed weirs on the Sacramento River overflowed for the first time since 1975. The storm damaged several mobile homes in the Sacramento River flood plain between Red Bluff and Vina.

On May 4, 1978, District Engineer Donald O'Shei declared a flood-fighting emergency on the Kings River. The District placed 7,000 tons of rock along 1,200 feet of right bank of the river 50 miles below Pine Flat Dam. Following the flood, the District instituted a flood control training operation entitled "Niffy Raincloud." Emergency Operations Manager Roger Pollock staged 19 simulated flood situations, including a levee break and erosion, as a part of the District's training.

The Delta Flood: February 1980

An understanding of the Sacramento-San Joaquin Delta flood plain is necessary to understand the special problems confronting flood responses in the Delta. The Delta's flood plain is a net work of rivers, tributaries, and channels encompassing approximately 1,000 miles, The Delta includes 52 islands, levees, and adjacent mainland.

Delta levees can be classified as either Sacramento District flood control project levees (those that are maintained to Federal standards) or non-project levees (those that may not be maintained to Federal standards). The Federal flood control project levees are primarily along the Sacramento and San Joaquin

Webb Island Levee Reinforcement - Circa 1980

Rivers. Seventy-five percent of Delta levees are non-project levees maintained to varying degrees by island landowners or local water reclamation districts. Farmers built many of the non-project levees that are very high due to constant rehabilitation and have poor foundations built from the readily available peat soil. (The peat soil of the Delta, while highly productive for agriculture, is vulnerable to oxidation and shrinkage, resulting in the Delta "sinking at an annual rate of two to 5 inches--faster than any other place on earth."[8]) As a result of the inferior material and poor foundations of the levees, there have been numerous failures over the years.

Delta islands, which commonly lie 10 to 15 feet below sea level, are constantly in danger of further land subsidence and seepage. The standard height of the original levees was approximately 4 feet. With the constant additions of materials over the years, the height of the average Delta levee is now between 15 and 25 feet.

In 1978, the influx of high water from the Sacramento and San Joaquin River systems, along with winds and high tides, resulted in the failure of four Delta levees in the Webb and Holland tracts. The District and the Office of Emergency Services arranged for equipment and materials to reinforce battered levees and prevent further widening of the breaches.[9] The District inspected 24 trouble spots for FEMA from an emergency operations center in Brentwood from February 21 to February 27, 1978.[10]

As a result of the 1978 flood, President Carter declared the Delta a disaster area.

California Floods: February-March 1983

California Governor George Deukmejian declared 45 of California's 58 counties disaster areas as a result of the 1983 storms. In 1983, the District participated in 12 flood-fight operations in California and four in Utah at a cost of approximately $7 million.[11] Beginning January 25, all weirs except the

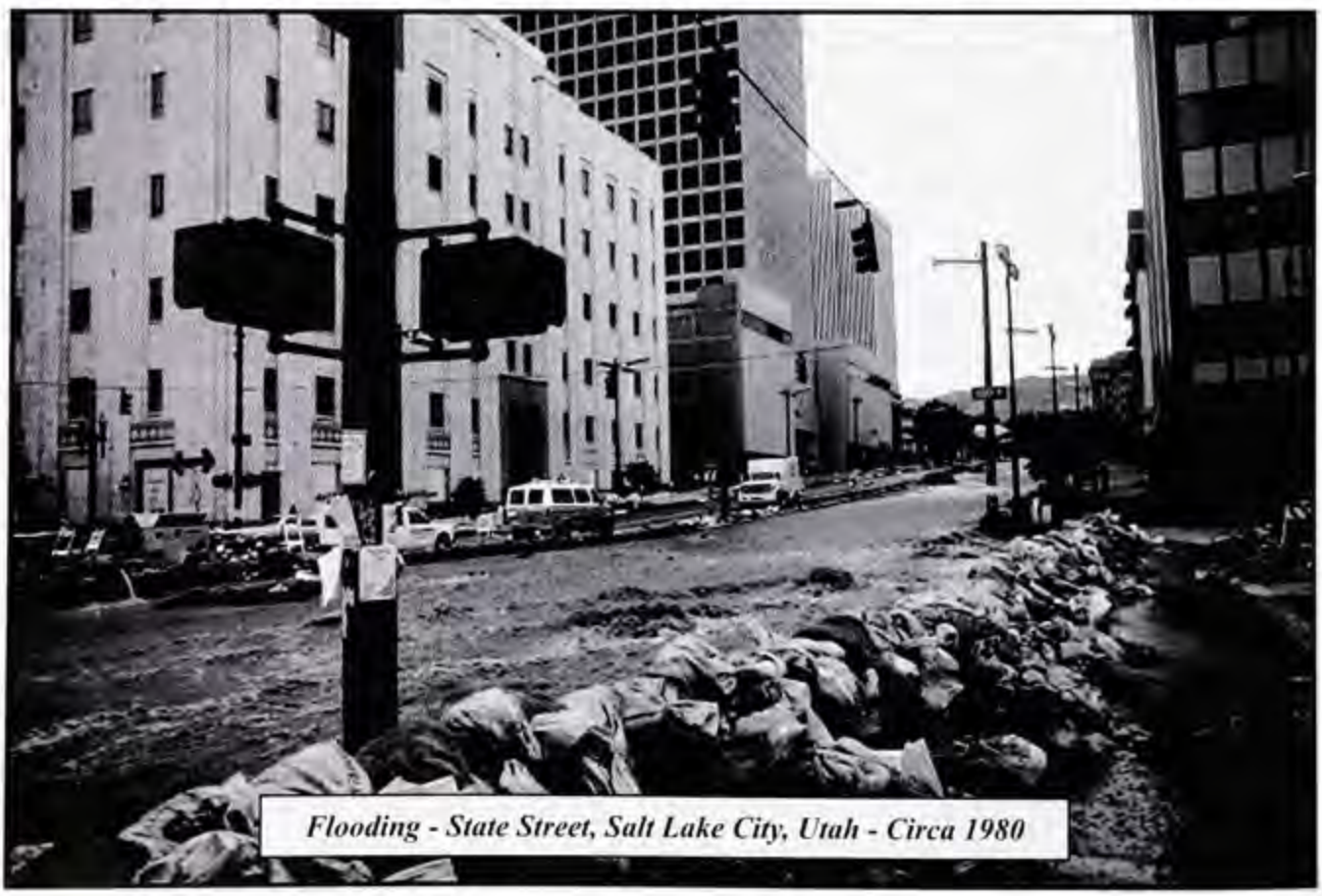
Moulton weir overflowed without interruption until April. By May, the snowmelt exceeded 230 percent of normal. "Water year 1983 will go down as one of the wettest this century in California, with statewide precipitation averaging 190 percent of normal, and in many areas well over 220 percent,"[12] noted the Department of Water Resources.

The Delta area suffered greatly from the 1983 flood. Estimated losses were more than $125 million from the storm. Agricultural loss alone, with an estimated 16,000 acres of inundated farmland out of production, totaled $95 million. An estimated $30 million of this total was loss to public and private property, mostly to Reclamation District levees. Flooding occurred on the islands of Prospect, Sherman, Venice, Webb, Jersey, and Twitchell – all battered by high water and destructive waves.

Areas other than the Delta also suffered from flood damage. On March 29, the San Joaquin River near Vernalis broke through its bank and flooded 4,000 acres of farmland and about 80 homes. Flooding also occurred along Kelso Creek in Kern County. Hydrologist Philip Williams, Principal of Philip Williams and Associates, Ltd., questioned the operation of a number of reservoirs in response to this flood, concluding that a number of the state reservoirs are "impaired by operations contrary to the Corps of Engineers' regulations."[13] District Commander Colonel Arthur Williams responded, assuring Williams that "all flood control structures have been and will continue to be operated according to prescribed criteria."[14]

The Utah Floods: March-April 1983

One of the most severe years for flooding in Utah was 1983. While skiers and resort owners smiled throughout the winter, city, county, and state officials grimaced as they prepared for the worst in the spring. March broke records with torrents of rain and snow. April topped March's moisture content, and hurricane-force winds blew up to 100 miles per hour, causing millions of dollars in damage along the Wasatch Front. A huge mud slide to the south drowned the town of Thistle in the Spanish Fork



Flooding - State Street, Salt Lake City, Utah - Circa 1980

River, and devastating mudslides occurred to the north in Farmington and Bountiful. Two flood-related fatalities occurred in the Wasatch Mountains – one an electrocution and the other a drowning in Little Cottonwood Creek.

In response, the Sacramento District raised and repaired 6 miles of levees on Utah Lake to protect Provo City, built levees around public utilities adjacent to the Great Salt Lake, and dug a tunnel through the dam created by the Thistle mudslides in Spanish Fork Canyon.

The California Floods: February-March 1986

Folsom Dam assisted in preventing the city of Sacramento from inundation from the flood of 1986. Thirty years earlier, the Corps completed construction of Folsom Dam on the American River and then transferred it to the Bureau of Reclamation for operation.[15]

As a multipurpose facility, Folsom dam operates as an integral part of the Central Valley Project, providing water and hydropower to the city of Roseville, a suburb of Sacramento, the city of Folsom, and agricultural districts in the Central Valley and flood control. Floodflows larger than the Auburn River floodway channel are stored in the Folsom Reservoir. During extremely large floods, Folsom dam is operated to reduce the downstream flood stages to levels that are not injurious to life and property. This operation is governed by the Corps of Engineers' criteria stated in its water control manual.

In many respects, the flood of 1986 was the greatest storm of record in several basins. The main effect of the storm centered on central California rather than the north coast and irrefutably demonstrated the vulnerability of the city of Sacramento to the floodflows on the American River. The American River descends from the Sierra Nevada crest to the Sacramento River. The Sacramento and American Rivers converge at Sacramento (the city is often called the "River City)." A 115,000-acre flood plain lies at the confluence, encompassing much of Natomas and Sacramento. If the flood control system fails to contain a major flood event, about 115,000 acres of mostly urban development would be flooded.[16] Although the Sacramento River offers esthetic beauty, recreational opportunities, and water for area farms, home, and businesses, it also subjects the Sacramento area to perilous flooding should a major flood event occur.

The Sacramento River provides much of the water ultimately that causes the overflow of floodwaters and destruction in Sacramento; however, it is the American River that is critical to providing flood protection to Sacramento. The American River neither has the volume nor the size of the Sacramento River, but its high flows can rapidly overwhelm the levee system. Water from the American River descends from the top of a very steep basin at an elevation of 11,000 feet, dropping to Sacramento at sea level in less than 24 hours. Releases from Folsom Dam take less than 4 to 8 hours to reach Sacramento. The basic problem is that water flows so quickly on the American River that there is not enough time to adequately deal with it. This poses grave problems for flood fighting. As Sacramento District Senior Project Manager Bob Childs points out, "You can't flood fight on the American River; you just don't have time."[17]

The 1986 storm event began on February 11, but by Valentine's Day, February 14, a deluge ensued. That day the storm dropped nearly 10 inches of rain in an 11-day period. Relentless flooding on February 17 forced the closure of Interstate 80 near the community of Fairfield. The Auburn cofferdam failed, dumping a tremendous amount of water in Folsom Dam. Fortunately, water managers anticipated the cofferdam's failure and were ready to handle the extra water behind Folsom Reservoir.

It was Mother Nature that spared Sacramento. The city literally came within a few inches of the worst catastrophe in its 137-year history.[18] Three additional hours of precipitation would have overwhelmed the system, flooding as many as 30,000 homes. Flooding threatened the Garden Highway, endangering 15,000 inhabitants of the South Natomas residential area, and threatened the closure of Interstates 80 and 5 and the Sacramento Metropolitan Airport.

Auburn Coffer Dam Failure
February 17, 1986

The Sacramento River rose to its highest recorded stage ever. Black Butte Lake, at the upstream end of the Sacramento River Flood Control Project, filled. Floodwaters severely strained the Sacramento River Bypass[19] System. All five weirs passed major flows, and all 48 gates on the Sacramento Weir were open to pass a record 125,000 cubic feet per second (cfs), 12,000 cfs more than it was designed to handle. The Yolo Bypass worked overtime, passing between 480,000 and 550,000 cfs at its peak, about 10 to 15 percent above design capacity.

The flood of 1986 yet again raised the issue of whether the region had sufficient flood protection. The inflow exceeded the design of the 1 million acre-foot reservoir of Folsom. For 2 days, in order to relieve pressure, the Bureau of Reclamation increased releases to 115,000 cfs, the maximum amount for the design of the levees downstream. As the rain continued, officials boosted those releases to 130,000 cfs for 24 hours.

The Sacramento District went into the information phase on February 14, the alert phase on February 17, and was in the mobilization phase on the evening of February 17 through April 1. The flood fight required approximately 100 Corps personnel in the office and in the field, with additional support personnel indirectly involved. The District provided sandbags, repaired breaks in levees through the placement of material, and constructed additional levees. The intensity of the flood lasted from February 18 to February 25.

The flood caused 13 deaths, and 67 injuries. Property damage was staggering: 12, 447 private homes damaged, 1,382 private homes demolished, 967 private businesses damaged, and 185 private businesses ruined. The total price tag: an estimated $249,551,411 in private damage and $128,937,493 in public damage.[20]

The District achieved several flood-fight victories during this flood event. They first saved a section of the west levee of the Sutter Bypass near the community of Robbins. The next job entailed closing a 40-foot section of the Yuba River levee, which caused more than 20,000 residents of the towns of Linda and Olivehurst to evacuate. The next act was the stabilization of a portion of the levee along the Garden Highway on the left bank of the Sacramento River near the Sacramento Metropolitan Airport. The District brought the eroded area under control by placing aggregate along the landward slope and toe of the levee.[21]

Despite the havoc and flood damage, the Corps estimated that existing local, state, and Federal flood protection facilities prevented approximately $13,428,200,000 in losses (see table below). In spite of the damage, each flood provides new data useful for future planning and calculations.

Flood Damages Prevented by Completed Projects in Each Basin through FY 1986			
Basin	**Cumulative Through FY 1985**	**Fiscal Year 1986**	**Cumulative Through FY 1986**
San Joaquin	$963,093,000	$320,200,000	$1,283,293,000
Sacramento	$1,920,478,000	$13,077,520,000	$14,997,998,000
Subtotal	$2,883,571,000	$13,397,720,000	$16,281,191,000
Other California Projects	$963,093,000	$26,200,000	$37,388,000
Total California	$2,894,759,000	$13,423,920,000	$16,318,679,000
Great Basin			
Bonneville, Utah	$46,536,000	$2,300,000	$48,836,000
Lahonton, Nevada	$815,000	$2,000,000	$2,615,000
Total Great Basin	$47,351,000	$4,300,000	$51,651,000
Total Sacramento District	$2,942,110,000	$13,428,220,000	$16,370,330,000

In 1987, after restudying the levee systems in the area, the District released a report concluding that the city of Sacramento and the lower American River had much less protection than was previously thought. Instead of providing protection against a 120-year storm, the reanalysis revealed that Folsom Dam would only protect the area against a 63-year event. Based on the Corps' findings, new Federal Emergency Management Agency flood maps put nearly all of Sacramento in the regulatory flood plain, creating new Special Flood Hazard Areas.[22] Environmentalist groups such as Friends of the River and the Environmental Defense Fund, Inc., and hydrologist Philip Williams, Principal of Philip Williams and Associates, Ltd., questioned the Bureau of Reclamation's operation of the Folsom Dam reservoir in the 1986 flood.

Congressman Robert T. Matsui from California's 5th District, a long-time proponent of the Auburn Dam, in a letter to the Chairman on Interior and Insular Affairs Morris K. Udall, noted "...recent evidence that the Bureau of Reclamation may have mismanaged water storage and releases from the dams in the Sacramento area." Matsui wrote, "Operators of the Folsom Dam appear to have allowed water storage to encroach upon the storage space reserved for flood control."[23] The Bureau responded to criticisms of its operation in a publication affirming that the dam's operation fully complied with Corps' guidelines.[24] A letter from Chief of the Engineering Division George C. Weddell and a District post-flood report[25] concurred with the Bureau that its operation of the dam was in compliance with Corps guidelines and also noted that "several variables affect the storage and releases [of water]."

The Environmental Defense Fund also critiqued the operation of the dam, concluding that the dam was inappropriately operated and that proper operation would have reduced downstream discharges. In response, the Corps presented a 14-point evaluation of the critique, concluding that the operations of the dam following the storm event were appropriate. The Bureau and Corps both concluded that Philip Williams's assertions were not based on sound technical sources.

The flood of 1986 reenergized the long-term flood control planning process. The flood event prompted the District to reevaluate the system. The evaluation showed three major deficiencies: inadequate levee

heights and channel capacity in the drainage canals along the northern and southeastern flanks of the Natomas basin, significant exposure to levee seepage and resulting instability along the east levee of the Sacramento River, and inadequate flood control capacity along the main stem of the American River.

There was a growing consensus that Sacramento needed better flood protection, but how to accomplish that end was still debatable. District officials considered three options to provide greater flood protection to Sacramento: modifying Folsom Dam at an estimated cost of $137 million, modifying Folsom Dam and raising and strengthening levees and enlarging the bypass at a cost of $450 million, and building Auburn Dam at a cost of $877 million. (Congress had deliberated the issue of Auburn Dam for more than 30 years.)

To address Sacramento's susceptibility to devastating flooding, state and local leaders in 1989 formed the Sacramento Area Flood Control Agency (SAFCA). The California legislature established SAFCA to coordinate flood control on a regional basis. The agency includes the City of Sacramento, County of Sacramento, County of Sutter, the American River Flood Control District, and Reclamation District 1000. SAFCA is a model for local representation on flood planning and an effective force in pushing for needed change.

Structures for flood reduction have been in place for many years. As historian Robert Kelley noted, "The inland sea has disappeared, but it is now clear as it never was before how powerful a river system has been put under control, and how vulnerable that structure of control will always be."[26] The District's Chief of Water Management Paul Pugner reminds us, "Nature has conditioned the streams to deal with high water from flooding; if we stay out of nature's way, we have fewer problems."

In the end, whether 400,000 residents in Sacramento are evacuated or whether local, state, and Federal agencies fight the storm will depend on when Mother Nature decides to stop the rain.

Levee Break Repair, Linda, CA - Circa 1986

The California Flood: January-March 1995

Heavy rains in January and March triggered pervasive localized flooding throughout California. Typical of previous relentless rainstorm systems, moist warm air intermingled with a low-pressure system, producing 3 to 8 inches of rain along the north coast and in the Central Valley. In Sacramento during the evening of January 9, flash floods[27] resulted from intense rainfall in a short period – 1.27 inches of rainfall in 30 minutes. On March 9, storms inundated roads, overflowed creek banks, and broke power lines. The wine country vineyards flooded in St. Helena, and rescue workers evacuated more than 300 people when the Napa River overflowed. Roseville was one of the hardest hit cities.

The winter storms of 1995 caused $13 billion in damages. On January 24, state agencies recorded an estimated $3.9 million in damages to public properties. On January 31, the Governor's Office of Emergency Services' preliminary estimate of losses was $1.3 billion. Two-thirds of the losses were to private homes and businesses.[28] Brig. Gen. Bruce Scott, Commander of the Corps' South Pacific Division, estimated that Corps projects in the state prevented about $420 million in damages. Projects on the Russian River and in the basins of the Sacramento and American Rivers alone helped control flood damage estimated at $20 million.[29]

The Sacramento District received 30 requests for help at more than 50 sites in the Sacramento River and San Joaquin River basins.[30] As a part of its disaster mandate, the Sacramento District along with the Bureau of Reclamation inspected and examined damages to public structure for FEMA.[31] The state made 30 requests for assistance from the District. The District provided investigative services, engineering, and design work; developed estimates on quantities and costs; prepared construction contract documents; and furnished engineering support during construction. For the 1995 flood, the District formed teams to facilitate the repairs. Approximately 15 contracts were let to complete rehabilitation work before the beginning of the flood season in 1996.

Floods of 1986 - Linda, CA

California Flood: New Year's Deluge, January 1997

In mid-December 1996, government meteorologists first identified the "Pineapple Express," named because of its origin in Hawaii where pineapples are grown.[32] It consisted of warm moist air blowing from the southwest, bearing a succession of storms aimed at the California mainland. The storm arrived on New Year's Day, bringing a flood that would be the largest of the century in northern California. It was a classic orographic event, with warm winds from the southwest propelling over the Sierra Nevada and plummeting amazing amounts of rain at the middle and higher elevations. The 1997 flood was the flood of record on many of the rivers and streams in the Sacramento, San Joaquin, and Tulare Lake Basins. The 1997 flood caused extensive damage to large agricultural areas where levees broke, farm homes flooded, and Modesto suffered severe damage.

The Feather River watershed north of Sacramento was one center of intensity for this storm. Although extreme rainfall runoff and flooding occurred on Sierra Nevada streams from Oroville to Fresno, the levees failed with the storms intensity as they did in the 1986 flood. Fortunately, no major levee stability issues arose along the east levee of the Sacramento River. The week after Christmas, storms saturated the area, causing major flooding problems. Two months of rain fell in 16 days. The 1997 flood surpassed the 1986 storm as the flood of record. President William J. Clinton declared parts of California, Nevada, and Idaho as emergency disaster areas.

The January 1997 flood affected both the Sacramento and San Joaquin drainage basins. The first break on the Sacramento levee system occurred at Arboga near Marysville on January 2, 1997, in a location only accessible from the top of the levee. The levee itself became a peninsula about 6 miles long. On January 5, 1997, the levee on the Sutter Bypass breached, and the small town of Meridian was on the verge of being swallowed whole by an inland lake that was forming as floodwaters poured through the levee break. The Corps built a 10-foot-high earth wall around the town to hold back rising floodwaters. The town was saved, but an estimated 40 square miles of farmland flooded.

Within the San Joaquin basin, the record flooding overwhelmed the levee system. One of the main breaks arose on the San Joaquin River west of Fresno. The Stanislaus, Paradise Cut, Cosumnes, and the Mokelumne Rivers also experienced levee breaks during this storm. Million of gallons of water began overwhelming everything. In addition to the failure of the levee system, rivers and streams overflowed their banks, inflicting more devastation. Flooding occurred over 290 square miles, leaving nine people dead and causing over $2 billion worth of property damage.

Local and state flood control agencies appealed to the Sacramento District for help. Under the guidance of Colonel Dorothy F. Klasse, three deputy officers along with many of the 900 civilians of the District assumed work on 50 job sites in Nevada and California. Chief of the District's Water Management Section and a staff of 20 worked around the clock managing the 49 dams that provide flood protection on the Sacramento and San Joaquin Rivers.

The District response required approximately $20 million for responses to floods for this single event. In the ensuing months, the District expended an additional $35 million to temporarily patch the levee systems. In addition to the District staff, inmates and staff of the California Department of Corrections assisted in the flood-fighting efforts, providing more than 2,000 inmates and 164 staff. Their assistance consisted of filling and stacking millions of sandbags in at least 20 counties.[33] The Corps first put its efforts toward flood fighting, but even before the rain stopped and the waters began receding, emergency personnel were onsite coordinating repairs to broken levees.

The Sacramento District rehabilitated more than 600 sites damaged by erosion, levee breaches, water, and landslides. By the end of 1997, the District completed 3 years of work in less than a year, spending more than $100 million for levee rehabilitation between January and December of 1997.

Flood Damages Prevented by Completed Projects in Each Basin through FY 1997			
Basin	**Cumulative Through FY 1996**	**Fiscal Year 1997**	**Cumulative Through FY 1997**
San Joaquin	$1,540,192,000	$826,182,000	$2,366,374,000
Sacramento	$15,034,933,000	$2,065,111,000	$17,100,004,000
Subtotal	$16,575,125,000	$2,891,293,000	$19,466,418,000
Other California Projects	$42,585,000	$2,245,000	$44,830,000
Total California	$16,617,710,000	$2,893,538,000	$19,511,248,000
Great Basin			
Bonneville, Utah	$89,107,000	$8,120,000	$97,227,000
Lahonton, Nevada	$2,815,000	$842,730,000	$845,545,000
Upper Colorado, Colorado	$-0-	$320,000	$320,000
Total Great Basin	$91,922,000	$851,170,000	$943,092,000
Total Sacramento District	$16,709,632,000	$3,744,708,000	$20,454,340,000

By fine-tuning the system of dams and reservoirs along the American, Sacramento, San Joaquin, Feather, and Yuba Rivers, the numerous District-built flood control reservoirs and levee systems aided in reducing human suffering and extensive property damage. At first tally, the levee system prevented an estimated $3.7 billion in additional flood damages and immeasurable human suffering.[34] In California alone, the District awarded approximately 35 emergency contracts for flood-fight and levee rehabilitation work. For the 1997 event, flood fighting and rehabilitation expenditures amounted to $22 million, and $100 million for rehabilitation. The District once again reevaluated the hydrology of the American River Basin, revising its 1986 flow frequency analysis from a 106-year level of protection to 90 years, a low level of protection for Sacramento's 400,000 residents. A large portion of Sacramento, North Sacramento, and Natomas remained in the 100-year flood plain, requiring additional flood insurance coverage.

Levee Rehabilitation Limitations

Under Public Law 84-99, the District only assumes responsibility for repairing damaged levees to their original state. No additional improvements can be made. However, in many instances, levee damage has occurred and continues to happen. In these cases, a much more comprehensive and permanent solution to levee failure is needed, by either constructing additional flood control reservoirs or by improving the quality of the levees.

Local reclamation districts constantly complain to the California Department of Water Resources Chief of Hydrology and Flood Operations that the current restriction on what the Corps can do is not an effective use of money and that additional monies should be spent for more permanent levee fortification.[35] Unfortunately, these large systems of levees that were not originally built by the Corps, which are in both the Sacramento and San Joaquin basins,

Sutter Bypass Levee Break - January 1997

are at serious jeopardy every time there is significant high water.

The Reclamation Board is the Corps' primary sponsor on most of the levees that are in the system. So after the flood event is over, the Corps sends public notices to sponsors, informing them that under Public Law 84-99 the District will consider their request for rehabilitation for damage caused by the most recent flood event.

Another constraint is the environmental issues. In California, endangered species are common throughout the levee system. Before proceeding to repair any levees, the U.S. Fish and Wildlife Service has to provide a biological opinion as to the effect that the District's rehabilitation efforts will have on endangered species - whether that species is the valley elderberry long horn beetle, giant garter snake, the Delta smelt, the San Joaquin kit fox, or one of the many other species. The U.S. Fish and Wildlife Service examines and evaluates the damaged levee site, and the agencies involved in the work must arrive at a consensus on the appropriate repairs in an expeditious manner.

The Nevada Flood – A Confluence of Snow Pack and Precipitation: December 1996-January 1997

The most significant and devastating flood in 1997 occurred in Nevada in the Lake Tahoe, Truckee River, Carson River, and Walker River basins. The storms known as the "Pineapple Express," produced warm torrential tropical rains that began the last week of 1996 and persisted into 1997. The enormous amount of precipitation, combined with the snowmelt below 7,000 feet, appreciably worsened the flooding. The storm moved south along the Sierra Nevada from Lake Tahoe to the Truckee River, the Carson River basins, and lastly to the Walker River basins. Reno's Truckee River sloshed through casinos, and the Carson and Walker Rivers flooded rural communities and agricultural lands.

Flood damages in Nevada were the costliest and most harmful in 150 years, claiming at least one life, inundating about 63,800 acres, and triggering direct damages estimated between $167 million and $619 million.[36] The accessibility of ample storage capacity prevented the storm from reaching a 100-year flood event. Reno and Sparks also suffered heavy damages from the Truckee River.

The California Flood: January-February 1998

A series of storms in 1998 provided twice the normal precipitation in January and three times the normal precipitation in February. Most of these storms generated few problems for the floodway systems except the storm on February 2 and 3. This storm unloaded large amounts of rain on the Coast Range and at the upper end of the Sacramento valley.[37] The flood stages of the upper Sacramento River reached levels comparable to past major storms. The west side Sacramento Valley streams overtaxed drainage capacities of Colusa Basin and later Clear Lake.

In studying the flood of 1998, the District determined there were 36 sub-basins (identifiable hydrologic units) within the main big basins that needed repair. The total expenditure for fighting the 1998 event was $9 million. Twenty-nine million dollars were spent for rehabilitation. As of February 2000 (2 years after the flood), the District had repaired 26 out of the 36 levees. "This is too long." complained Kell Cloward, Chief of the Readiness Branch of the Sacramento District. "We have had a flood, we have got some damage, and we want to repair the damage and be ready for the next wet season."[38]

Conclusion

Successful flood fighting requires cooperative working relationships between the Corps, California Department of Water Resources, U.S. Fish and Wildlife Service, and other Federal agencies such as FEMA. The Sacramento District fulfills its mission to supplement local and state agencies in flood fighting through providing technical advice, emergency repairs, materials for stabilizing the situation, and services to FEMA. After the flood, the District also provides restoration and rehabilitation to flood struc-

Prospect Island Levee Reinforcement - December 28, 1981

tures. The ideal is to complete the restoration and rehabilitation before the following flood season, but the environmental reviews and adherence to the National Environmental Policy Act and the California Environmental Quality Act have slowed the restoration process. Compounding the problem is the lack of a sufficient number of floods to provide accurate flood data for predicting, forecasting, and providing an accurate probability of flood protection. Yet, the technology has greatly improved since the flood event of 1986. The District's Chief of Water Management observations are illuminating and hopeful:

> *Forecasting by the National Weather Service (NWS) and the California-Department of Water Resources has improved vastly since the 1986 flood. Not necessarily the small floods, but the big ones. NWS has improved in their forecasting of the size and timing of the event. Forecasts of aerial events are also improving. The ability to see the event in real-time is wonderful. Doppler radar, computer models, and the speed one can run a model is incredible. In 1986 we did most things by hand, and you have only one chance to make a decision every 2 to 4 hours. Today, we can run a model every 5 minutes and run all kinds of "what ifs" every hour for every project. The results translate to improved operations.*[39]

The two major floods in 1986 and 1997 have forced Congress to appropriate funding for studying modifications to Folsom Dam and for seeking a permanent improvement to the Sacramento and the San Joaquin drainage system by funding the Sacramento and San Joaquin River Comprehensive Study. Most of the reservoirs are multipurpose, and managing them demands balancing competing priorities such as irrigation for farmers, water supply for urban areas, recreation, and endangered species. The Bureau of Reclamation's operation of Folsom Dam in 1986 called into question their adherence to the Corps procedures for the dam's operation. Levees, especially those in the San Joaquin and to a lesser degree in the Sacramento basin, are at best a weak link in the prevention system. Built by farmers and subsequently legislated into the system for protection, many California levees were under designed and consequently fail with the force of rising floodwaters.

Despite a large investment of public funds in dams and levees, flooding has continued to increase, calling for not just temporary solutions, but for permanent resolutions. The Sacramento District has few detractors during a flood fight, but soon afterward, people tend to forget the seriousness of the problem and quickly lose the energy to seek permanent solutions. Thus, the cycle keeps repeating. Nevertheless, the District has admirably fulfilled its mission to provide emergency flood response as well as rehabilitation to its constituents during flood events.

Endnotes

[1] Robert Kelley, *Battling the Inland Sea. Floods, Public Policy, and the Sacramento Valley*. Berkeley: University of California Press, 1989, p. 87.

[2] By the authority of Public Law 84-99, emergency activities pursuant to Public Law 99, 84th Congress, as amended by Section 206 of the Flood Control Act of 1962, and Section 302 of WRDA 1990.

[3] U.S. Army Corps of Engineers, "Digest of Water Resources Policies and Authorities," February 15, 1996, pp. 13-14.

[4] Memorandum of Understanding between U.S. Army Corps of Engineers, South Pacific Division, and California Department of Water Resources for Cooperative Actions Authorized Under Public Law 84-99 for Responding to Flood Emergencies, June 1999.

[5] Paul Pugner to Willie Collins, January 29, 2002.

[6] Norris Hundley, Jr., *The Great Thirst: Californians and Water: A History*. Berkeley: University of California Press, rev. edition, 1999, p. 379.

[2] California Department of Water Resources, Water Conditions and Flood Events in California: Water Year 1977-1978. Bulletin 202-78, December 1979.

[3] *Ibid.*, 393.

[4] California Department of Water Resources. California High Water, 1979-1980. Bulletin 69-80, November 1981.

[5] U.S. Army Corps of Engineers, Sacramento District, "Delta Levees Hold Against New Flood Threat, Holland Break Closed" in *Public Affairs Reports*, April 1980.

[6] U.S. Army Corps of Engineers, Sacramento District, "Sacramento District Flood Fights Cover Four States." *PAR*, Summer 1983.

[7] California Department of Water Resources, California High Water, 1982-1983, Bulletin 69-83, July 1984.

[8] Letter from Philip Williams to Colonel Arthur E. Williams, March 23, 1983.

[9] Letter from Colonel Arthur E. Williams to Philip Williams, April 11, 1983.

[10] After the construction of Folsom in 1956, Corps engineers recognized that the dam would not provide the protection needed for Sacramento. In 1967 the Bureau of Reclamation proceeded with the construction of Auburn Dam upstream. If completed, Auburn Dam would have supplemented and provided the added protection from Folsom Dam. The Bureau of Reclamation completed a coffer dam before the Orville earthquake, seismic investigations, and environmentalists halted the construction of the dam indefinitely in 1975.

[11] **Congressional Research Service, Environmental and Natural Resources Policy Division, Report for Congress,** Auburn Dam on the American River: Fact Sheet , updated June 6, 1996.

[12] *Ibid.*

[13] Interview Willie Collins with Ralph Cameron, n.d.

[14] A bypass is an area of low-intensity, primarily agricultural land that is bordered by levees and expected to be flooded now and then. The farmland can then absorb and slow the floodflow while levees guide the water downstream. This occasional inundation adds to the richness of the soil and enhances the crop output during the growing season.

[15] Bob Teets and Shelby Young. *Rivers of Fear: The Great California Flood of 1986*. West Virginia: C.R Publications, Inc., 1986.

[16] California Department of Water Resources, California High Water, 1985-1986, Bulletin 69-86, May 1988. p.48.

[17] California Department of Water Resources, "Some Zones AR. . . , and Some Are Not in Floodlight," *California Floodplain Management Newsletter*, Vol. 12, no. 1, Winter-Spring, 1998.

[18] Letter from Congressman Robert T. Matsui to Honorable Morris K. Udall, February 26, 1986.

[19] U.S. Department of the Interior, Bureau of Reclamation, Preventing a Crisis: The Operation of Folsom Dam during the 1986 Flood, May 1986.

[20] U.S. Army Corps of Engineers, Sacramento District, Report on the February 1986 Floods: ,Northern California and Northwest Nevada, January 1987.

[21] Robert Kelley, *Battling the Inland Sea*, Berkeley: University of California Press, 1989, p.315.

[22] A flash flood is a local and sudden flood of relatively large volume and short durations. Often a response to thunderstorms, this type of flood is common in arid and semi-arid regions where water suddenly rises or flows in a stream or wash that was previously dry.
[23] U.S. Army Corps of Engineers, Sacramento District, "Storms hit Cal – from top to bottom," *PAR*, February 1995, p. 3.
[24] U.S. Army Corps of Engineers, Sacramento District, "It Could have Been Worse – Projects Help Control Floods," *PAR*, February 1995, p. 11.
[25] U.S. Army Corps of Engineers, Sacramento District, "'95 Floods Created Backwash of Work," *PAR*, August 1995.
[26] U.S. Army Corps of Engineers, Sacramento District, Storms hit Cal – from top to bottom" in *Public Affairs Report*, February 1995.
[27] "'Pincapple express' brings warm air, rain to West," in *USA Today*, January 6, 1999.
[28] California Department of Corrections Press Release, January 21, 1997, #97-005.
[29] U.S. Army Corps of Engineers, Sacramento District, "It Could have Been Worse - Projects Help Control Floods," *PAR*, February 1995, p. 11.
[30] Interview Willie Collins with Gary Hester, January16, 2002.
[31] Nevada Bureau of Mines and Geology, The 1997 New Year's Floods in Western Nevada, Special Publication 23, 1998, p. 3. The large discrepancy in the estimates is due to different sources estimating the losses.
[32] California Department of Water Resources, "The Storms and Floods of 1998 in Floodlight: California," *Floodplain Management Newsletter*, Vol. 12, No. 1, Winter-Spring, 1998.
[33] Interview Willie Collins with Kell Cloward, February 25, 2000.
[34] Written correspondence from Paul Pugner, January 29, 2002.

Chapter 8

Navigation Projects:

Stockton Deep Water Ship Channel, Sacramento Deep Water Ship Channel, and William G. Stone Lock

The Sacramento District completed one major navigation project, deepening the 52-mile Stockton Deep Water Ship Channel in 1987, at a cost of approximately $44 million, on the San Joaquin River.

The District also began work on deepening the Sacramento Deep Water Ship Channel, but work has been suspended. Work on the 58-mile Sacramento Deep Water Ship Channel began in 1989 for a projected cost of $106 million. The Port of Sacramento as local sponsor suspended work in 1991 due to budgetary constraints.

The 1965 River and Harbor Act authorization of the Stockton Deep Water Ship Channel required from the local sponsor cost sharing of approximately 5 percent of the total cost of the project. In comparison, the Sacramento Deep Water Ship Channel authorized under the 1985 Supplemental Appropriations Act (and later modified under the Water Resources Development Act of 1986) required nearly 75 percent of the total costs from the Port of Sacramento.

In 1963, the William G. Stone Lock, a smaller navigation project connecting the Port of Sacramento with the Sacramento River was completed. The lock closed in 1987 and has since been in caretaker status.

The Stockton Deep Water Ship Channel

Beginning in the 1850's, the port at Stockton served as an inland terminal for waterborne commerce on the San Joaquin River. It first provided a barge and riverboat entrance to the San Joaquin Valley. Much later, in 1933, after the channel had been straightened and dredged to a depth of 30 feet, the Port of Stockton became the largest inland deep water port in California.[1]

Located in the heart of the Central Valley, approximately 107 miles from San Francisco, the Port of Stockton remains a major economic asset of the area. It attracts such major employers as military supply depots and food processors. It has become an integral part of the agricultural economy in the Central Valley. Ninety percent of cargo shipped from the port comes from the fertile San Joaquin Valley, which is the seventh largest agriculture producing area in the world. The port's proximity to Interstate 5 also allows it to handle a growing number of containers.

Project Description

Named in honor of California Republican Congressman John F. Baldwin (who served the 6th District from 1955 to 1963 and the 14th District from 1963 to 1966), the John F. Baldwin Ship Channel spans the entire reach from San Francisco to Stockton. The Stockton Deep Water Ship Channel gets its name from the city of Stockton. Although one project in terms of its authorization, the Corps divided the project into four sections for the purpose of study and construction: the San Francisco Bar, the San Francisco Bay to Pittsburg, Pittsburg to Stockton, and Stockton Ship Channel Bank Protection.[2]

The River and Harbor Act of 1965 authorized work from San Francisco Bay to Stockton. Included in this authority was the stretch from Point Edith near Avon to Stockton, and for navigational improvements to the existing channel from the San Francisco Bar to the Port of Stockton. In 1965, Congress authorized deepening the existing Stockton channel from 30 to 35 feet, widening and realigning it in various reaches, and constructing a recreation area on Roberts Island near Stockton.[3]

The authorization also called for protecting the levees along the channel from wave-wash erosion. This required the revetment of approximately 6,500 lineal feet of levees (a job that took 5 years) prior to deepening the channel. The authorization included maintenance by the Corps of Engineers of the existing bank protection along the ship channel.[4] The Port of Stockton was the non-Federal sponsor of the project from Point Edith to Stockton.

The reach of the channel from San Francisco Bar to Point Edith is the responsibility of the San Francisco District. The upriver reach from Point Edith to Stockton is under the Sacramento District's pur-

Port of Stockton

view.[5] The deepening of the channel enabled the port to accommodate larger ships at its refinery and terminal docks. The need for the capability to accommodate fully loaded large tankers for the import of crude petroleum to San Francisco Bay Area refineries was the justification for the Corps' deepening the channel.[6]

New Leadership for the Port

During the 1960's, the Port of Stockton became financially stressed. This was primarily due to changes in world cargo handling, new vessel sizes, a number of staff changes, and a revenue slump that resulted in low staff morale. Despite the Port's financial hardships, the Sacramento District proceeded with studies including the General Design Memorandum. However, in December 1973, District Commander Col. Donald O'Shei delayed the completion of the final Environmental Impact Statement (EIS) after the Port Commission's chairman and various individuals, groups, and agencies expressed concern about potential salinity intrusion due to the deepening. Col. O'Shei assured the chairman that the District was studying the problem, but the commissioner was not alone in his concern about salinity. Salinity threatened the water quality in the Sacramento-San Joaquin Delta.[7]

Realizing the Port's need for strong leadership, the Port Commission appointed Alexander Krygsman as director of the Port in May 1977. The 44-year-old port and steamship industry executive had serious reservations about coming to the Port of Stockton. He was concerned about salinity intrusion, but of greater importance to him was the channel's shallow depth. Krygsman believed that the Port would go out of business in 10 to 15 years if the channel was not deepened.

Engineering and Environmental Studies: A Project Reactivated

When Krygsman began as Port director, deepening the channel was one of his highest priorities. "The deepening of the San Francisco Bar had been completed in 1974, but the remainder of the deepening was put on hold, and when I came to the port, I had to reactivate it." recalled Krygsman.[8] The deepening had been put on hold because of the economic slump and the salinity intrusion problem. Fortunately for Krygsman, 6 months after his arrival the Port reported profits, and he moved quickly to win support for channel deepening from the Port Commission[9] and the Sacramento District Commander.[10]

Deepening the channel, however, required him to address the salinity issue. On December 14, 1979, the chair of the State Water Commission warned Krygsman not to work on the channel unless he could guarantee that deepening it would not lead to saltwater intrusion into the Delta. The project now went on hold while the District conducted studies of the salinity threat. In the meantime, the District looked at blocking the intrusion of saltwater by constructing a submerged sill at the head of the straits, but that recommendation raised little enthusiasm.

Brigadier General Normal Delbridge of the South Pacific Division maintained that the portion of the channel from Stockton to Suisun Bay could be deepened without more saltwater intruding into Delta waters.[11] The District based this conclusion on tests made on the Corps of Engineers' San Francisco Bay Model in Sausalito. The chief of the Central District of the California Department of Water Resources Wayne MacRostie challenged the accuracy of the tests, which he said did not account for the drought years of 1976-1977. However, the District stood by the accuracy of the tests.[12] Finally in 1979, the question was resolved with a 10-year study costing $1.4 million that showed that deepening of both the Sacramento and Stockton Deep Water Ship Channels would have no effect on the Delta's water quality.[13]

Stockton Deep Water Ship Channel

Channel Deepening Becomes a Reality

A Sacramento District workshop held on February 12, 1980, encouraged discussion of the channel deepening project and allowed for public input. At the final public meeting on March 10, 1980, the District presented the results of its studies, including alternatives, effects, and benefits for the channel deepening.[14] No one opposed the project. Instead, 35 speakers expressed their support, including politicians, merchants, farmers, industrialists, labor leaders, and an environmentalist and state agriculture official.[15]

In July, the District released the Final Phase I/II General Design Memorandum and Environmental Impact Statement. The project delays were over. The deepening of the channel meant more cargo, storage, and trade, and promised to affect the entire San Joaquin Valley. Canonie Pacific of Portland, Oregon, successfully bid for the initial $3.6 million dredging contract that was awarded in August 1982.[16] Work on the channel deepening started in January 1983 when the dredge *Marialyee Canonie* began to loosen mud and sand on the channel bottom. Project engineer Don R. Jones calculated that the 52 miles of channel would be completed in 1987 in four phases. The District deferred construction of a planned recreation area on Roberts Island near Stockton.[17]

Officials anticipated few environmental obstacles for completing the work. The District used the material dredged from the channel to create habitat at Donlon and Venice Cut Islands. These were two former islands that had become submerged over the years and now serve as wetlands and habitats for fish and wildlife.[18] On Donlon Island, the Corps in 1985 created 58 acres of habitat using 525,000 cubic yards of dredged material. On Venice Cut Island, the District developed a 143.5-acre fish and wildlife enhancement area and a 61-acre fish and wildlife mitigation area. (The Port's estimated cost, including purchasing land for dumping dredged materials, was $8 million, 10 percent of the projected total cost of $80 million.[19]) In other environmental mitigation efforts, the District constructed an in-stream facility for dissolved oxygen jet-aeration near the Port of Stockton to compensate for any oxygen loss in the ship channel near the port. The facility operates when dissolved oxygen levels drop below 5.2 milligrams per liter during the months of September through November.

In September 1983, the contractor completed the first 10 miles of dredging. A pipeline from the dredge to a 137-acre disposal site, located at the western edge of the port along the San Joaquin River, received the dredged material (during this first of four phases) from the channel. This dredged material provided levee protection for several Delta islands, including Van Sickle.[20] The material contained traces of gold, but efforts to recover the metal proved unsuccessful.

The second phase consisted of dredging 20 miles of the channel from the port's turning basin to Roberts Island, while the third and fourth phases covered approximately 22 miles from Roberts Island to Point Edith near Avon. Bids on the first two phases were below projections and saved nearly $4.6 million. This savings was applied to the costs of the final two phases.[21] Corps Engineer Howie Aubertin's recommendation for the redesign of the width of the 11.3-mile stretch from New York Slough to Avon also saved an additional $7.9 million. Aubertin's design called for reducing a two-way lane to one-way.[22]

Those involved felt that this might be the port's last channel dredged through cost sharing since future Federal legislation would make channel dredging entirely the responsibility of local ports. "If these projects are economically justified," stated the executive director of the Planning and Conservation League in Sacramento, "then the users should be willing to pay for them."[23]

On March 4, 1987, Port of Stockton Director Krygsman announced the completion of the deepening project. He also announced a public celebration to be held on May 29-30, 1987,[24] honoring the feat, under the slogan "37 Feet to the Sea." The implication was that the channel had been deepened to 37 feet rather than the authorized 35 feet.[25] The question as to the actual depth of the channel was raised because of a technical issue during the dredging. To ensure that the channel was at least 35 feet deep, the

Sacramento Deep Water Ship Channel

District dredged it an additional 2 feet to account for potential inaccuracies in dredging technology. As a result, the channel may be 37 feet deep in some places, while in other places it may only be 35 feet deep.

The perceived misrepresentation of the true depth of the channel was one that concerned Sacramento District Commander Colonel Wayne Scholl. On May 26, three days before the scheduled celebration, Scholl said, "I feel these advertisements are misleading." The issue was laid to rest when District Public Affairs Chief James Taylor responded with a public explanation of the discrepancy.

Assembled dignitaries, including William R. Gianelli, former Assistant Secretary of the Army for Civil Works, participated. Gianelli commented that the entire project cost only about $44 million, with the Port of Stockton share at about $2 million.[26]

Sacramento Deep Water Ship Channel

In 1849, the booming town of Sacramento became a port when a schooner laden with iron and steel arrived at the downtown wharf. The river port flourished during the mid-1800's, helping to move men and equipment to gold fields. In 1916 Major Paul Norboe, Assistant State Engineer, grasped Sacramento's potential and began advocating a deeper harbor. Another proponent, William G. "Bill" Stone, later known as "The Father of the Port," also envisioned an inland Port of Sacramento with all the benefits of lower freight costs, new jobs, and industrial development.

Norboe's efforts convinced the state and the Sacramento Chamber of Commerce to initiate a feasibility study for a deep water channel and harbor in 1916.[27] At the end of World War II, Stone convinced Congress to restudy the deep water project. The 1946 River and Harbor Act (Public Law 525) authorized

the Sacramento Deep Water Ship Channel project. The completion of the channel-deepening project in 1963 made way for the first deep-draft vessels arriving in that same year. In 1975, 145 vessels carrying approximately 2 million tons traversed the channel. By 1982, the Port of Sacramento had gained importance as one of the growing seaports in California[28]

However, the depth and width of the existing 30-foot channel between Avon and the Port of Sacramento was unable to accommodate the newer deep-draft vessels that were common since 1980.[29] The Port of Stockton, an economic rival of the Sacramento Port, also needed to deepen its channel. However, with funding for harbor and channel improvements becoming increasingly difficult to obtain, Port of Sacramento Director Melvin Shore and Port of Stockton Director Alexander Krgysman abandoned their rivalries and supported each other's appeals for congressional funding.[30]

The process to deepen the channels began with the revised General Design Memorandum and Supplemental Environmental Impact Statement, which addressed the question of salinity intrusion. The Corps deferred the issue for additional study.[31] The construction of temporary sand sills in the Sacramento River during periods of drought alleviated the salinity intrusion problem.[32]

The 1985 Supplemental Appropriations Act authorized the deepening of the channel from 30 to 35 feet. The Port of Sacramento, the non-Federal sponsor, signed two different cost-sharing agreements in June 1986 and in March 1989. The non-Federal sponsor signed two modifications of the agreement based on the Water Resources Development Act of 1986.

Construction on the project began in December 1988.[33] It extended from Avon in Suisun Bay to the Port of Sacramento, comprising three reaches totaling 58 miles and including portions of Contra Costa, Sacramento, Solano and Yolo Counties.

Clashes over cost sharing increasingly dogged the project. The port's share of project costs came to almost three-quarters of the projected $106 million dollars in 1985.[34] Computer modeling studies revealed that sections of the channel would not have

Port of Sacramento

to be widened as much as originally planned, cutting about $30 million off the total cost and making the project affordable.

On May 12, 1989, a public ceremony observed the commencement of work on the project with Vic Fazio (D-West Sacramento), Bob Matsui (D-Sacramento), Brig. Gen. John F. Sobke, South Pacific Division Engineer, and Sacramento District Commander Col. Jack A. Le Cuyer in attendance.[35]

The District apportioned the project's scope into six contracts, but the contractor, Western Pacific Dredging Company, a division of Riedel International, Inc., of Portland, Oregon,[36] completed only two contracts consisting of 9 miles. Work on the project was suspended after the completion of two contracts because of budgetary constraints.

William G. Stone Lock

The 1946 River and Harbor Act authorized the William G. Stone Lock. The lock, located on the eastern half of the 1-1/2 mile-long barge canal is 86 feet wide, 640 feet long, and has a 21-foot lift capability. It connects the harbor with the Sacramento River and is the only navigation lock in California. In 1963, the District completed the lock.

In 1972, the Federal Government considered closing the lock due to the cost of operations and a decline in commercial cargo. Ten years later, Federal officials ordered the lock shut down as a cost-saving measure.[37] After closing as scheduled, the District agreed to a 1-year lease of the facility to the City of Sacramento. The lock reopened on November 29, 58 days after being closed, because of its importance to the waterfront in Old Sacramento.

Since Federal law prohibited toll charges, acquiring funds to keep the lock open became a problem. The State Department of Boating and Waterways

W. G. Stone Lock Construction - Circa 1961

provided funding up through June 30, 1987. A measure proposed in the Sacramento City Council to continue funding after that date failed, and after serving commercial traffic and recreational boats for 24 years, the lock closed. The Water Resources Development Act of 2000 deauthorized the lock, the bascule bridge over the barge canal, and a portion of the barge canal. The Sacramento District plans to divest the deauthorized structures to other interested local agencies or cities.

Conclusion

While it is customary for the District to dredge a channel from down river up, in the case of Stockton, the dredging of the channel was from

Upriver down. When a channel is dredged in this manner, all sections of the channel need to be completed in order for it to function. Port of

Stockton's director, in an effort to ensure that the project would be completed, pushed for dredging from upriver down. The total port tonnage prior to the completion of the deepening was approximately 2.5 million tons annually. After the deepening, port tonnage increased to approximately 4 million tons annually, having a considerable effect on the volume of the cargo. Contractors transported dredged material from the channel to stabilize Delta levees.

The Port of Sacramento has not fared as well in terms of its tonnage since it has been unable to complete the project. The increased costs of the project according to new Water Resources Development Act of 1986 guidelines, along with the Port's internal management problems and budgetary shortfalls, have made it impossible to reactivate the project for completion.

Endnotes

[1] Steven Ludwig, *tThhe Executive Magazine,* November 1979.
[2] State of California. Senate Committee on Natural Resources and Wildlife,." "A Report to the Legislature, Proposed Improvements to the John F. Baldwin and Stockton Ship Channels: A Review,." April 1972,. p. 6.
[3] U.S. Army Corps of Engineers, South Pacific Division,. "Water Resources Development, State of California," 1987, p. 25.
[4] *Ibid*,., p. 1.
[5] U.S. Army Corps of Engineers,. San Francisco District,. "Draft Interim Design Memorandum No. 5 and Environmental Impact Statement,: December, 1983, p. 1.
[6] U.S. Army Corps of Engineers,. Sacramento District,. "Final Environmental Statement,. Stockton Ship Channel Bank Protection,." June 1971, p. 1.
[7] U.S. Army Corps of Engineers, Sacramento District,. Notice,, December 3, 1976, p. 1.
[8] Interview Willie Collins with Alexander Krygsman, December 20, 2000.
[9] Interview Willie Collins with Alexander Krygsman, December 20, 2000.
[10] Paul Signorelli,. "Port of Stockton Director is Still Bringing in New Business," in *Lodi News-Sentinel*, (December 30, 1977).
[11] Author? "Sill" Proposed to Protect Delta," in *Sacramento Union*, December 14, 1979,. p. A8.
[12] Author? "Water Experts Propose Shutting Oout Delta Salt," in *Stockton Record,* December 14, 1979, p. 43.
[13] Author? "Deepening of Channels Opposed" in *Sacramento Bee,* December 14, 1979, p.. A8.
[14] U.S. Army Corps of Engineers, Sacramento District, News Release, February 12, 1980,. pp. 1-2.
[15] Stanley P. Klevan,. "Stockton Channel Deepening Hearing Draws Near" in *Stockton Record,* March 11, 1980.
[16] Maury Kane,. "Corps Awards Contract for Channel Deepening Project," in *Stockton Record*, August 17, 1982,. p. 1.
[17] U.SS. Army Corps of Engineers, South Pacific Division, "Water Resources Development in California," 1995.
[18] U.S. Army Corps of Engineers, "District Deepening Stockton Ship Channel," in *Par for the Corps*, Public Affairs Report. May/June 1983, pp. 1-3.
[19] Dianne Barth,. "Stockton Port work approved" in *Lodi News-Sentinel,* July 28, 1981.
[20] Maury Kane,. "Port's Channel Proposal would Aid Levee Repairs" in *Stockton Record,* April 19, 1983. p. 1,. and "Flood Repair Might Aid Port" in *Stockton Record*, March 4, 1986.
[21] Maury Kane,. "Port Hopes for Early Deepening Completion" in *Stockton Record,* September 7, 1983, p. 1.
[22] U.S. Army Corps of Engineers, "$7.9 Million Saved on Port Channel," in *Par for the Corps*, Public Affairs Report. May/June 1986, p. 13.
[23] Travis Brown, "Ports Banking on Deeper Delta" in *The Sacramento Bee*, October 14, 1986, p. . B1.
[24] Rick Sandoval,. "Port's New Boast—37 Feet to the Sea" in *The Stockton Record,*. April 8, 1987,. p. B6.
[25] *Ibid.*Rick Sandoval. "port's New Boast—37 Feet to the Sea" in *The Stockton Record.* April 8, 1987. B6.
[26] Paul Feist,. "Port's Day to Celebrate" in *The Stockton Record,*. May 30, 1987.
[27] Amalio Gomez, Amalio "Sacramento River Deep Water Ship Channel: Functional Planning" in *Journal of the Waterways and Harbors Division,. Proceedings of the American Society of Civil Engineers*, November, 1960, p. 53.
[28] Peter Anderson,. "The Importance of the Port of Sacramento" in *Sacramento Union*, February, 1982.
[29] U.S. Army Corps of Engineers,. Sacramento District,. "Sacramento River Deep Wat4er Ship Channel, California,. Feasibility Report and Environmental Impact Statement for Navigation and Related Purposes,." July 1980, p. 14.
[30] Jeff Raimundo,. "Port Directors Halt Feud, Join Forces on Budget" in *Sacramento Bee*, April 8, 1983.
[31] U.S. Army Corps of Engineers, Sacramento District, "General Design Conference on Sacramento River Deep Water Ship Channel California,." April, 1982, p. 17.
[32] U.S. Army Corps of Engineers, "Design Memorandum No. 1 and Final Supplemental Environmental Impact Statement,". March 1986, p. 1.

[33] U.S. Army Corps of Engineers, South Pacific Division, "Water Resources Development in California," 1995. p. 76.
[34] Steve Tetreault, "Fazio blasts port project Cost-Sharing Proposal" in *Yolo County Democrat*, February 21, 1985.
[35] U.S. Army Corps of Engineers,. Sacramento District,. "Deep Water Ship Channel to be Even Deeper" in *Par for the Corps*, Public Affairs Report, May 1989, p. 1.
[36] U.S. Army Corps of Engineers,. Sacramento District,. "Deep Water Ship Channel to be Even Deeper" in *Par for the Corps*, Public Affairs Report, February, 1991, p. 1.
[37] Hugh Wright,. "On Boating" in *Stockton Record*, July 29, 1982.

Chapter 9

Safeguarding the Waters of the U.S.:

Sacramento District Regulatory Branch

Introduction

The Department of the Army Regulatory Program is one of the oldest in the Federal Government. Initially, it served a fairly simple purpose: to protect and maintain the navigable capacity of the nation's waters. Changing public needs, evolving policy, court decisions, and new statutory mandates have changed several aspects of the program including its breadth, complexity and authority.[1]

The Regulatory Program administers and enforces both the Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. Under Section 10, a Corps permit is required for any work in or over navigable waters of the United States. Navigable waters of the United States are defined as waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate or foreign commerce. Under Section 404, a Corps permit is required for the discharge of dredged or fill material into waters of the United States. Many waterbodies and wetlands in the nation are waters of the United States and are subject to the Corps' Section 404 regulatory authority.[2]

Through the Regulatory Program, the Corps ensures that any environmental effect on aquatic resources from development is avoided, minimized, or mitigated. The purpose of the Regulatory Program is to ensure that the physical, biological, and chemical quality of our nation's water is protected from irresponsible and unregulated discharges of dredged or fill material that could permanently alter or destroy these valuable resources.[3]

Prior to 1968, the Corps' Sacramento District Regulatory Branch was known as the Section 10 Permit Program.[4] At that time, the Permit Program regulated approximately 10,000 miles of navigable waters within the District's boundaries. The staff working in the Section 10 Permit Program processed mostly permits for individual boat docks and recreation facilities.

Changing Goals for the Regulatory Branch

In the late 1960's, environmental agencies and groups concerned with the adverse effects on navigable waterways began using the Section 10 Permit Program to levy their concerns against construction activity in the vicinity of the waterways. As a result, the District's goals for the Permit Program changed and included activities that took into account the public interest in protecting and using the water resources. The Permit Program's staff saw an increase to four. During the 1960's, the District issued an average of 107 permits per year. Fiscal years 1969 to 1972 saw between 108 and 203 permits issued with a yearly average of 154, an increase of approximately 50 percent.

Following the passage of the National Environmental Policy Act in 1970, the Chief of Engineers in the spring of 1971 began to enlarge the program, implementing new rules that challenged the workload of District's current program at that time. The enlarged program came as a response to President Richard M. Nixon's Executive Order 11754 to "enhance the ability of the Federal Government to enforce water quality standards and provide a major strengthening of efforts to clean up our nation's water."[5]

In 1971, Sacramento District Commander James C. Donovan (1970-1973) announced that the District would be the point of contact for the latest formal rules establishing the new Permit Program.[6] During this time, the program's jurisdictional boundaries encompassed the Central Valley of California, the northern half of Nevada, most of Utah, and parts of Oregon, Idaho, Wyoming, Colorado, Arizona, and New Mexico.[7]

Sacramento Deep Water Ship Channel Drudging - Circa 1991

Section 404 Clean Water Act Legislation Creates New Regulatory Responsibilities

The emphasis of the program in the early 1970's was the timely processing of permits with little time for compliance and enforcement. With the passage of Section 404 of the Federal Water Pollution Control Act (later renamed the Clean Water Act) in 1972, General George Fink, South Pacific Division Chief, issued a letter instructing the District to give immediate attention to the following ambitious objectives in the regulatory program: (1) review of water bodies to determine jurisdictional limits, (2) timely processing all applications, (3) full consideration of environmental concerns, (4) detection of illegal activities, (5) vigorous enforcement of applicable laws and regulations, and (6) extensive public education.[8] This was a huge order for a staff of four.

Shortly after the establishment of the Section 404 regulating authority, the District regulatory staff and chief counsel attended a number of public meetings held in the District's jurisdiction to disseminate information on the expanded program. Under the Regulatory Program, the District's jurisdiction was augmented to more than 300,000 miles of waterway, which meant studies were completed to determine the navigable waterways within the District boundaries. In terms of geographical scope, the program grew significantly. The following table illustrates the results of the survey.

Waterways within Sacramento District Regulatory Boundaries Considered to be Navigable Waters of the U.S. for Purposes of Administering Navigation Laws[9]

Waterway	Navigable Length (Mi)
State of California	
American River - Mouth to Bradshaw Road	12
Calaveras River - Mouth to 2,000 feet upstream of I-5	2
Feather River - Mouth to railroad bridge at Marysville	28
Lake Tahoe	All
Merced River - Mouth to 1,500 feet upstream of US 99	20
Middle River	All
Mokelumne River - Mouth to Frandy Gage (3.5 miles upstream from New Hope Rd.)	29
Old River	52
Sacramento River - Mouth to Keswick Dam	301
Sacramento River - Deep Water Ship Channel	26
San Joaquin River - Mouth to Sycamore Rd. (7 miles downstream from US 99) Fresno	236
Stanislaus River - Mouth to Highway 120 in Oakdale	40
Tuolumne River - Mouth to Highway 132 at Basso Bridge Crossing	47
All waterways in the Sacramento-San Joaquin Drainage Basin affected by tidal action (not specifically covered above)	
State of Colorado	
Colorado River - Colorado-Utah Boundary to Grand Junction	39
Navajo Reservoir	All
State of Nevada	
Lake Tahoe	All
Colorado River - Nevada-Arizona Boundary to Nevada-California Boundary, including Lake Mead and Lake Mohave	145
State of Utah	
Bear Lake	All
Colorado River - Mouth of Castle Creek to Cataract Canyon (4.5 miles below mouth of Green River)	59
Flaming Gorge Reservoir	All
Green River - Mouth to 20 miles above Green River Station	142
Lake Powell	All

More Organizational Changes, Regulatory Units, and Staff

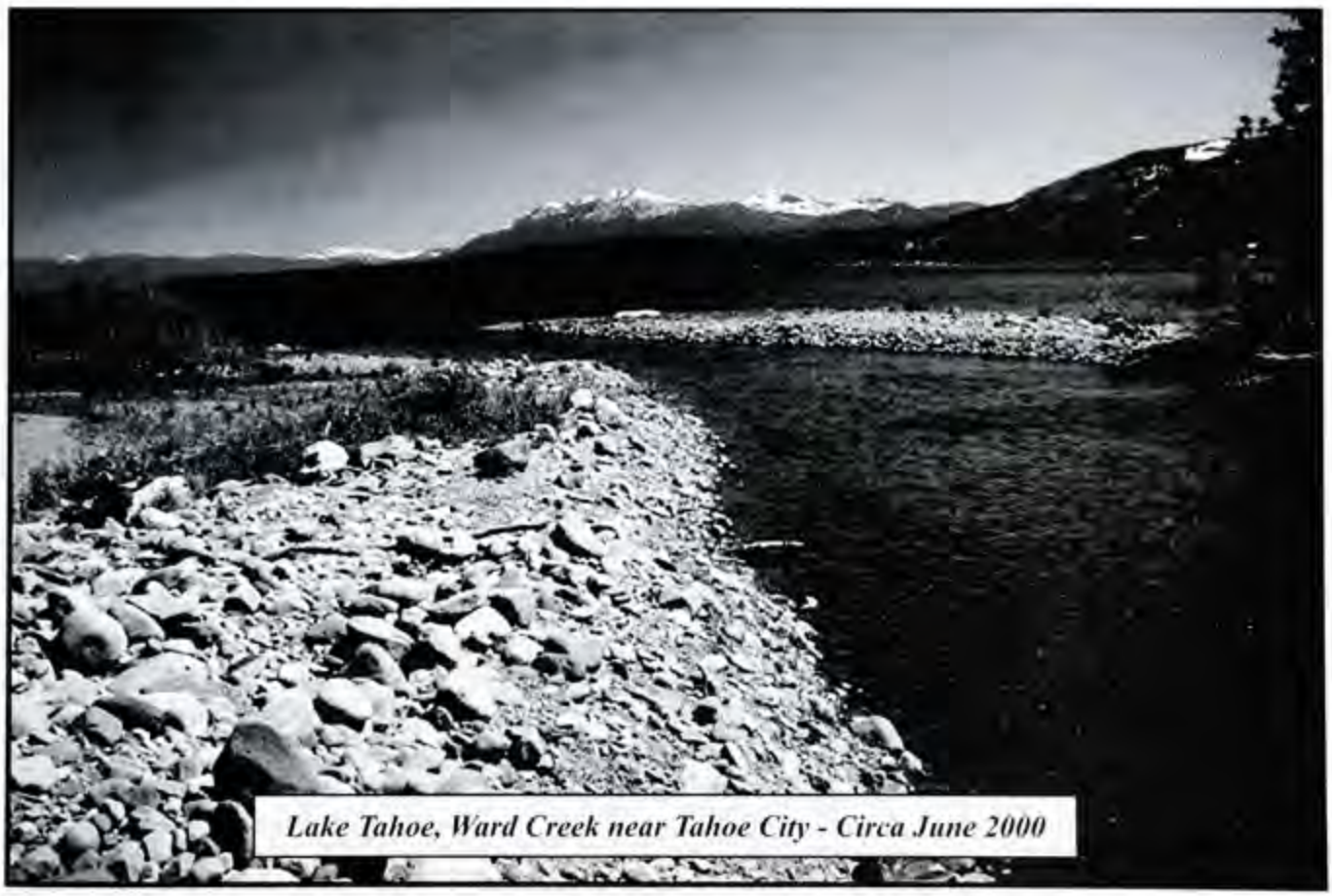
In 1973, the name of the Section 10 Permit Program changed to the Navigation Section. In the District's organizational structure, the Navigation Section was placed in the Construction-Operations Division and Operations Branch, and units were established in the Sacramento office to handle specific geographical areas within California and Nevada.

The major workload of the program continued to be processing permits. The District also initiated an aerial surveillance of critical waterways in the Delta area, but the lack of staff prevented proper review and follow up.

The weakest link of the program in 1974 was the timely and vigorous enforcement of violators who refused to file for permits. The public's interpretation of a navigable waterway sometimes differed from that of the Corps.' In the case of Lake Tahoe, some landowners did not consider the lake a navigable waterway because it did not drain as a river into the sea. While there has been boat traffic on Lake Tahoe for years, permit applicants felt that the government's regulation was an intrusion.[10]

Since the workload steadily increased, the Chief of Construction-Operations Division E.C. McKinsey requested additional staffing for fiscal years 1974 and 1975. The Division granted the request. In 1974, the staff grew from 4 to 10, and then in 1975 the staff grew to 15.[11]

In 1975, the District established field offices in Salt Lake City, Utah, and Grand Junction, Colorado. The Navigation Section now had four units – California, Nevada, Utah including Salt Lake City, and western Colorado – each responsible for a specific geographical area. As of 1975, the District issued 200 to 250 permits yearly with an average of 3 months to process a permit.[12]



Lake Tahoe, Ward Creek near Tahoe City - Circa June 2000

In the landmark case of *National Resources Defense Council (NRDC) v. Callaway* (1975), the Federal District court required the Corps to embrace an all-encompassing definition of Section 404 dealing with the nation's waters, including wetlands. As a result of those changes in the program and laws, the Chief of Engineers began soliciting public comments from those affected by wetland regulations. The meeting for the western region was held in San Mateo, California, on September 12, 1975.[13]

The Corps instituted the new changes in three phases. In Phase I in 1975, permits were now required when using all navigable waters and adjacent wetlands; Phase II became effective in 1976, expanding the permit process into primary tributaries of navigable waters, including natural lakes greater than 5 acres in surface area. After July 1977, Phase III was implemented, which expanded the permit requirement to include headwaters where streams flowed less than 5 cubic feet per second.

In 1976, the District boundaries were changed, placing Suisun Bay and its drainage under the jurisdiction of the San Francisco District to keep the Bay Conservation and Development Commission jurisdiction within the San Francisco District.

By 1977, the Regulatory Section had grown to a staff of 20 employees. In 1978, the staff grew to 28, including four temporary employees. Michael Helm had been Chief of the Regulatory Section to 1978, but in 1979, Arthur Champ became chief, holding the position until 2002.

In 1977, the District began issuing two types of permits, general and individual. General permits were divided into nationwide general permits and regional general permits. Nationwide permits authorize a category of activities throughout the nation and are only valid if the conditions applicable to the permits are met; for example, utility lines and bank stabilization projects. Regional permits are permitted for specific locations and activities, such as emergency flood repair or routine maintenance activities for a specific time and place. Individual permits are issued following a full public interest review of an individual application for a Department of the Army permit. A public notice is distributed, and comments are reviewed. A permit decision is generally based on the outcome of the public interest.[14] The District's Regulatory Program had changed from processing most of its permits for individual boat docks and recreation facilities to concentrating its efforts on permits for discharging fill or dredged material into waters of the United States, including wetlands and more environmentally sensitive areas such as special aquatic sites.

Continuing Challenges in the 1980's and 1990's

Environmental concerns aside, the early 1980's showed promise for constancy in the program. Chief of the Regulatory Program Art Champ expected the program to stabilize; i.e., the rules would remain the same and the program would primarily issue routine permits. The opposite happened. On the national front, the Corps operated in a political climate that vacillated with each administration's attempts to change the regulatory program. Much to Champ's chagrin, he mused, "The rules, expectations, and environmental concerns have continued to change, and the program has gotten progressively more complex."[15]

During the 1980's, the Regulatory Section pursued coordination among its constituents through 12 meetings with Federal, state, and local agencies. The goals of these meetings were to inform them of the permit requirements and to obtain their assistance in reporting violations of the permit requirements. Also the District mapped approximately 300 miles of waterways in coordination with the U.S. Environmental Protection Agency's (EPA) remote sensing lab in Las Vegas, Nevada.

The Grand Junction Regulatory Office received a Citizen's Participation Award from the EPA in 1980 for the equitable manner in which the Grand Junction office administered the Section 404 permit program.

District Commander Arthur Williams (1982-1985) pointedly stated the Corps' crucial role in implementing its regulatory mission and balancing divergent interests, and emphasized the complexity of the task:

It is an extremely difficult mission that has been given to the Corps by the Environmental Protection Agency. You have the Department of Interior, the Bureau of Reclamation, the Fish and Wildlife Service, the environmental interest groups, the developer groups, and so forth. It is very cumbersome. Everybody wants to have a say in it, yet nobody wants to do anything in their own back yard. It is a long process and it becomes very frustrating to the general public and the permit applicants. At the same time, everyone is expecting the Corps of Engineers to be the honest broker.[16]

Areas of Colorado were especially problematic. Some landowners typified the "sagebrush rebellion." Isolated in the sagebrush wilderness, these landowners resisted the authority of the Regulatory Section with the belief that they did not have to live by the same rules that everyone else did and that any regulatory action was excessive. Lewis Whitney, Chief of Engineering Division in 1987, recalled what happened when making Federal congressional visits:

There was a case back on the western slopes of the Colorado that the District would hear for many years when we went to visit the Colorado congressional delegation, where some ranchers had decided that a little waterway in their area was choked off and that they needed to open it up. They got a couple of big dozers and just rolled right in the channel and opened it all up. And of course, it caused all kinds of environmental damage.[17]

The District also sought to improve coordination of the Section 404 permit program with the State of Utah. The District scheduled a meeting with representatives from the Utah governor's office. The case of *Utah v Alexander* brought on behalf of the State Parks and Recreation Department took actions without a permit from the Corps. Utah named the Corps and Section 404 in its complaint, but in the opinion of the Justice Department Attorney, the State of Utah's position was without foundation. The District continued its efforts of public outreach in Utah to improve coordination of the permit program in the state.

In 1982, the alignment of the Regulatory Program of the District was along political boundaries. The Sacramento District jurisdiction now included the Central Valley of California, Nevada, Utah, and western Colorado; the District relinquished Idaho, Wyoming, New Mexico, and Arizona.

An example of the program's response to political change came in 1982 when President Ronald Reagan, through a Regulatory Reform Initiative, sought to decrease the processing time for permits. At the time the initiative was enacted, the Sacramento District took 135 days to make a permit decision. In less than a year, the District reduced permit-processing time to less than 60 days. This was achieved by the assignment of authority to the lowest level. District regulatory staff began handling all aspects of the program rather than dividing those responsibilities between different elements within the organization. For example, the regulatory staff was now involved in processing permit evaluations, enforcement actions, jurisdictional determinations, and compliance inspections – essentially the whole range of regulatory activities.

The reduced permit processing times along with an increase in new permit actions furthered the day-to-day workload, at times increasing conflict with state and Federal agencies, and the small work staff began to feel the effects. A memorandum from the South Pacific Division addressing the subject of the retention of regulatory funds stated how difficult it was to sustain a quality Regulatory Program with a workload increasing 5 to 7 percent and funding resources barely keeping up with inflation at 3.5 to 4 percent each year.[18]

The 1986 revised regulations gave the Corps jurisdiction over isolated waterways, and an interpretation by the EPA about the same time indicated that there was an interstate commerce connection between waters if they provided habitat for waterfowl moving in the interstate flyways. Based on those findings, the Regulatory Branch assumed the regulation of isolated waterways including some vernal pools.

The Regulatory Branch control over isolated waterways caused an enormous increase in workload. Permit applications were becoming more complex

dealing with isolated waterway issues, and often times consultation with the U.S. Fish and Wildlife Service would be initiated to address the associated endangered species of isolated waterways, which delayed the permit processing times. Unfortunately, this increased responsibility did not come with a budgetary increase to hire additional staff. In fact, the Regulatory budget was cut, prompting Brigadier General Patrick J. Kelly to appeal to the Chief of Engineers for help:

> *The FY 87 funding cuts in our Regulatory Program have really hurt, especially in California where we are experiencing constant clashes between development and environmental preservation. Because of the funding shortfall, we have been forced to cut back on enforcement in order to adequately address the issuing of permits.*[19]

In 1987, the Corps published the "Delineation Manual for Wetlands," which serves as a source for identifying and outlining wetlands. Wetlands are defined by three parameters: hydrophytic vegetation, hydric soils, and hydrology. This manual describes wetlands as areas characterized by growth of hydrophytic vegetation, which includes bulrush, cattails, rushes, sedges, and willows, where the soils are saturated during a portion of the growing season or where the surface is inundated with water during some part of most years. Wetlands generally include swamps, marshes, bogs, and similar areas, as well as serving several important functions such as acting as a sieve for the water supply, serving as a rich habitat for plants and animals, and providing important absorption sites for floodwaters.[20] With the inclusion of isolated waterways including vernal pools into the Regulatory authority, the District continued to embrace a policy that required developers to replace or set aside wetlands to offset their projects.

In addition to the 1987 published wetland manual, amendments to the Clean Water Act were made, which substantially strengthened criminal penalty provisions. One of the amendments created the offense of "knowing endangerment," which imposes substantial fines and imprisonment for persons who knowingly violate permit requirements.[21]

In 1989, President George Bush implemented a policy for "no net loss" of wetlands, which meant

Davis Wetlands Project - Circa 1998

no loss of acreage or of ecological function of a wetland.

1990 and Beyond – Section 404 Interpretation Brings More Change

During the 1990's, the regulatory budget remained constant with no increases, requiring the District to shift resources to higher priority work such as evaluating permit requests. Then a major change in interpretation of the Section 404(b)(1) guidelines occurred on February 7, 1990, when the Corps and the EPA entered into a Memorandum of Agreement (MOA) regarding Section 404 mitigation. Mitigation was defined as a sequential process starting with the avoidance of effects, then minimization of the effects, and lastly compensatory mitigation for unavoidable effects to wetlands. This change resulted in a transformed Regulatory Program, which required developers not only to compensate for wetland losses, but also to seek alternatives that would avoid the losses. Theoretically, this approach should have reduced the loss of wetlands, but according to Art Champ, Chief of the Regulatory Branch, there was not sufficient data to support this contention although the following table shows a slight gain in wetlands, in addition to acres of wetlands lost and mitigated.[22]

In the fiscal year 1988, Congress removed the Regulatory Program from the Operation Branch budget within the Corps and allotted a separate line item in the budget with the objective of making the Regulatory Program more accountable for its budget expenditures. Another change in organizational structure and name occurred in 1994 when the Regulatory Section under Operation Branch became the Regulatory Branch under the District's civil works program, but was funded by a separate line item in the budget.

Overall the resources had not provided the Regulatory Program with the ability to effectively carry out the three-pronged program of permitting, compliance, and enforcement. Due to this shortcoming, the Regulatory Branch relied (and still relies) instead on local agencies such as the California Department of Fish and Game as sources of information about potential unauthorized activities. Another valuable source has been landowners who call the District complaining about a neighbor or individual moving earth, discharging material, or redirecting water flow that may affect their interest. The District's Regulatory staff also finds a number of violations while out in the field; yet most are reported by other sources.

The Regulatory Branch informs the public of the permit regulations through public outreach that emphasize the benefits of obtaining a permit, rather than the consequences of not following the regulations. Gravel mining in the Regulatory Branch's jurisdiction presented another challenge. The Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers promulgated the Tulloch rule to strengthen wetlands protection in 1993. The rule stated that the Corps should regulate gravel mining because the "incidental fallback" of the gravel into the water was a discharge that required regulation. Therefore under that rule, the Branch began regulating gravel mining in 1993. This rule had an enormous effect on staff, draining the already stretched human resources in order to implement the enforcement. This was particularly true for the western United States where gravel mining has been more prevalent than in the east.[23] Subsequently, a decision in *American Mining Congress v. United States Army Corps of Engineers* (No. 93-1754 SSH) determined that gravel mining and incidental fallback should not be regulated. So the Branch stopped regulating gravel mining in February 2001.

Legal Action and the Regulatory Program

The purpose of the Section 404 program is to ensure that the physical, biological, and chemical quality of our nation's water is protected from irresponsible and unregulated discharges of dredged or fill material that could permanently alter or destroy these valuable resources.[24]

Compensation for Losses of Wetlands

	Acres Requested	Acres Permitted	Acres Mitigated
California	3,815	1,748	3,214
Colorado	748	606	1,039
Nevada	904	640	1,040

When a project is undertaken in a regulated area without a Department of Army permit or a project does not comply with the permit terms and conditions, enforcement action becomes necessary. When a violation is confirmed, the Corps seeks to resolve it in various ways,

depending on the circumstances. A warning letter is sent to the violator directing that the unauthorized work in waters be stopped immediately. When the work involves construction of an unauthorized structure in navigable waters, the Corps may require that the structure be removed, and if the project involves an unauthorized fill in wetlands or other waters, the violator may choose to immediately remove the fill material. If immediate restoration cannot be obtained, the Corps notifies collaborating agencies such as the EPA and the U.S. Fish and Wildlife Service to work with the violator to restore the effected areas.[25]

Many legal cases have been filed as a result of the Regulatory Program's action with regard to unauthorized activities, which ultimately have generated significant controversy. Although the vast majority of permit violations are resolved through voluntary restoration, fewer than 10 cases out of hundreds have actually resulted in the District suing an entity in court. On the contrary, environmental groups have sued the District. The following are several cases of particular significance that occurred within the District and have had an effect nationwide as well.[26]

Rivers and Harbors Act and the Sierra Club

California et. al. v. Sierra Club et. al. (451 U.S. 286 (1981)) dealt with the issue of whether or not the Rivers and Harbors Act of 1899 allowed plaintiffs to bring a suit and whether or not the State was required to obtain permits because facilities were congressionally authorized for State water project. The Sierra Club and two private landowners sought to enjoin the construction and operation of a water diversion facility associated with the California Water Project, arguing that the facility created an obstruction to navigation in violation of Section 10 of the Rivers and Harbors Act of 1899.

The plaintiffs further argued that the State of California needed to apply to the Corps for a permit for the diversion facility. The District Court granted the plaintiffs' request for an injunction, finding that the Rivers and Harbors Act of 1899 did allow private parties to sue to enforce its provisions and that the State was required to obtain a Corps permits for the action of constructing the diversion facility. The Ninth Circuit Court of Appeals upheld the District Court's decision. However, after reviewing the case, the Supreme Court disagreed with the lower courts and found that no private right of action existed under the Act; therefore, the Sierra Club and the landowners were not entitled to file suit under that statute. Because the lawsuit was not allowed under the Act, the Supreme Court refused to address the issue of whether or not the State had to apply for permits from the Corps.

Great Salt Lake Causeway Case

In Utah, the Corps issued a permit to the State of Utah to breach a causeway across the Great Salt Lake. Breaching the causeway would alleviate flooding caused by rapid increases in the lake's level. Great Salt Lake Minerals and Chemicals Corp. and a private landowner sued the Corps and the State of Utah in an effort to halt the breach (*Great Salt Lake*

Minerals and Chemicals Corp. v. Marsh et. al.) (596 F. Supp. 548) (D. Ct. Utah June 2, 1984)).

The plaintiffs claimed that the Corps had failed to follow the legally required procedures for issuing a permit. Specifically, Great Salt Lake Minerals and Chemicals Corp. claimed that the Corps failed to adequately consider environmental and economic harms caused by the breach. The corporation contended that the breach would cause it to permanently cease operations and would therefore adversely affect the national availability of sulfate of potash, a critical item for the nation's farmers. Because the corporation claimed they supplied 40 percent of the nation's potash needs, the breach would cause national economic repercussions. The District Court denied the plaintiff's request for an injunction against the breach and found that the Corps had complied with all statutory and regulatory procedures in making its permit decision. The Court noted that the Corps properly decided that flood reduction benefits outweighed plaintiff's economic concerns about potential loss of business. The case was decided in the District's favor. In reaching its decision, the court favorably cited the Corps' own economic findings, which indicated that even if Great Salt Lake Minerals and Chemical's business failed, there would be sufficient other potash suppliers nationally and worldwide who could fill the void.

Big Swamp

In *U.S. v. Akers* (785 F.2d 814) (9th Cir. 1986), the Corps initiated an enforcement action against a farmer who had purchased 9,600 acres in both Lassen and Modoc Counties in northern California. The property included 2,889 acres of wetlands referred to as the "Big Swamp." The Big Swamp provided an important habitat for a number of migratory birds such as the bald eagle and peregrine falcon. Akers began extensive grading, which changed the bottom elevation of the landscape. Next, Akers proceeded to drain the property to convert the wetlands to an area suitable for upland crops.

Akers had not previously applied for a Section 404 permit. In early conversations with Akers, the Corps had notified him that a permit would be required before he could continue his work. The Corps filed an enforcement action against Akers; yet he continued working in waters of the United States. Akers claimed that his activities were exempt from regulations under the Clean Water Act because they were part of an ongoing farming activity. The Court disagreed and stated that Akers' activities were a major conversion of wetlands to a new use and this action required a Department of Army Permit from the Corps. The Court issued a preliminary injunction against Akers' activities and directed him to apply for a Corps permit and restore the wetlands.

Stanford Ranch

Some cases have dealt with the creation and restoration of vernal pools and special aquatic features. On March 21, 1989, the Corps issued a permit to the developers of Stanford Ranch, a large development which included residential and commercial lots located in south Placer County, California. A Department of Army permit was issued by the Corps, which allowed placement of fill material in almost 9 acres of waters for roads and building sites associated with the development. The permit also allowed the developer to replace 11.9 acres of topsoil for restoration of alkali seeps in wetlands and tributaries within Pleasant Grove Creek and Antelope Creek drainages. The compensatory mitigation for the projects effects meant that the developer had to create 41.8 acres of wetlands, including 9 acres of vernal pools, and restoration of other vernal pools and wetland areas.

Harrah's

In another case, the program had to stop a project for not complying with a Department of Army permit issued by the Corps. The Harrah's Casino Project in Laughlin, Nevada, adjacent to the Colorado River failed to comply with the permits terms and conditions. In light of Harrah's decision to proceed with the unauthorized work, the District settled the case without litigation by stipulating that Harrah's donate $25,000 to the State of Nevada Wildlife Enhancement Project to rectify damages incurred.

Tsakopoulos

Another significant case involved California landowner and developer Angelo K. Tsakopoulos. In *Borden Ranch Partnership, Angelo K. Tsakopoulos v. United States Army Corps of Engineers, United States Environmental Protection Agency* (261 F. 3d. 810) (9th Cir. 2001), Angelo K. Tsakopoulos purchased a ranch to convert into vineyards and orchards, which eventually were to be subdivide into smaller parcels to sell.

The ranch contained significant hydrological features that constituted wetlands under the Clean Water Act. The Regulatory Branch required Tsakopoulos to obtain a permit and avoid deep ripping in the wetlands including the vernal pools and the vernal swales. Tsakopoulos obtained a permit; yet the permit process was not completed when he initiated work. Thus, he proceeded without a Department of Army permit, and a cease and desist letter was written to him directing that the unauthorized activity be stopped immediately. The Corps notified the EPA, and they issued an Administrative Order. Tsakopoulos filed suit, challenging the authority of the government to regulate deep ripping. "Deep ripping" is defined as "the mechanical manipulation of the soil to break up or pierce highly compacted, impermeable or slowly permeable subsurface soil layers, or other similar kinds of restrictive soil layers."[27] These types of soils are associated with vernal pools. The Government countersued Tsakopoulos for violations of the Clean Water Act. The District Court found that the landowner had repeatedly violated the Clean Water Act and ordered him to pay a penalty of $1.5 million dollars or pay $500,000 in addition to restoring 4 acres of wetlands. On appeal, the 9th Circuit Court affirmed the government's jurisdiction over deep ripping in the vernal pools and swales because it was supported by evidence and had a hydrological connection to a jurisdictional waterway. Tsakopoulos appealed this decision to the Supreme Court, again challenging the government's jurisdiction over deep ripping. The Supreme Court heard the case in December 2002 and upheld the lower court's decisions.

Trends in Permit Activity, 1988-2001

The following table illustrates the level of permit activity and the number of violations for fiscal years 1988, 1994, and 1997, and 2001. The table demonstrates that the number of individual permits has seen a small decline, while the number of nationwide permits and regional general permits have increased over the same time period. The table also shows that the number of violations for not obtaining a permit remained fairly constant over time (70 to 80 per year), while the number of cases for permits that are not in compliance has made a momentous decrease. This significant decrease in noncompliance cases was due to the increase in processing permit actions, therefore reducing the resources available to conduct compliance inspections.

Conclusion

As of 2002, the Regulatory Branch consisted of two Sections, the Central California/Nevada Section and the Intermountain Section. The Central California/Nevada Section is located in the Sacramento District office and includes the San Joaquin Delta Office, the San Joaquin Valley Office, the Sacramento Valley Office, as well as the field office in Reno. The Intermountain Section consists of field offices in Utah, northwest Colorado, southwestern Colorado, and southwest Utah. There are 34 full-time employees in the Regulatory Branch as of 2002, including biologists, ecologists, contact representatives, and two civil and environmental engineers. The new offices in the Intermountain Section reflect the rising number of 404 permits and the Branch's expansion to accommodate them.

The expansion of the District's Regulatory Program has grown from the early days of processing recreational boating permit applications to a myriad of complex permit actions, jurisdictional determinations, as well as compliance and enforcement issues. Changing public needs, evolving policy, court de-

Regulatory Branch Permit Activity and Violations in Fiscal Years 1988, 1994, 1997, and 2001[28]

Permit Activity	FY 1988	FY 1994	FY 1997	FY 2001
Individual Permit Applications	293	93	105	94
Withdrawn Applications	54	22	59	12
Individual Permits Issued	180	76	64	43
General Permits Authorized	443	727	1,196	1,188
Letters of Permission	52	21	13	28
Denials Permit Issuance	12	3	2	1
Violations Reported	76	80	73	67
Violations Resolved	62	49	47	24
Non-Compliance with Permit Deferred	84	8	14	6
Non-Compliance with Permit Resolved	49	9	12	3

cisions, and new statutory mandates have changed several aspects of the program including its breadth, complexity, and authority. Although the political climate can dictate funding and at times challenge to reform the Clean Water Act, the mission of the program remains the same: that is, to ensure that the physical, biological, and chemical quality of our nation's waters are protected from irresponsible and unregulated discharges of dredged or fill material that could permanently alter or destroy these valuable resources.

Endnotes

[1] U.S. Army Corps of Engineers Regulatory Program, www.spk.usace.army.mil/cepak-co/regulatory.
[2] U.S. Army Corps of Engineers Regulatory Program, www.spk.usace.army.mil/cepak-co/regulatory.
[3] U.S. Army Corps of Engineers Regulatory Program, www.spk.usace.army.mil/cepak-co/regulatory.
[4] Required approval prior to the accomplishment of any work in or over navigable waters of the United States, or which affects the course, location, condition, or capacity of such waters.
[5] U.S. Army Corps of Engineers, Sacramento District, Press Release, "Army Engineers Announce new Permit Program," April 8, 1971.
[6] This program received its authority from Section 13 of the Refuse Act of 1899.
[7] U.S. Army Corps of Engineers, Sacramento District, Press Release, "Army Engineers Announce New Permit Program," April 8, 1971.
[8] U.S. Army Corps of Engineers, South Pacific Division, Letter to Sacramento District, October 12, 1973.
[9] U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, www.spk.usace.army.mil/cespk-co/regulatory.
[10] Interview Lee Pendergast with Frederic Rockwell, January 25, 1989.
[11] U.S. Army Corps of Engineers, Sacramento District, Organization Chart, 1974 and 1975.
[12] "Corps Gives Water Rules" in *Deseret News*, November 18, 1975.
[13] U.S. Army Corps of Engineers, Sacramento District, "Army Engineers Announce Schedule of Public Hearings on Revised Regulation to protect Water Quality from Harmful Discharge of Dredged or Fill Material," August 20, 1975.
[14] General permits authorize specified activities and contain conditions to ensure that individual and cumulative environmental effects are minimal. An individual permit involves public notice, a Corps evaluation, and the issuance or denial.
[15] Interview Willie Collins with Art Champ, February 3, 2000.
[16] Interview Willie Collins with Arthur Williams, November 29, 1999.
[17] Interview Willie Collins with Lewis Whitney, November 8, 1999.
[18] Periodic Letter from Paul F. Kavanaugh to Brigadier General N.G. Delbridge, Jr., February 29, 1980, p. 6.
[19] Periodic Letter from Brigadier General Patrick Kelly to Lieutenant General E.R. Heiberg, III, February 13, 1987.
[20] U.S. Army Corps of Engineers Regulatory Program, www.spk.usace.army.mil/cepak-co/regulatory.
[21] Frona M. Powell, *Law and the Environment*. West Educational Publishing Company, 1998, p. 295.
[22] Interview Willie Collins with Art Champ, February 3, 2000.
[23] *Ibid.*
[24] U.S. Army Corps of Engineers Regulatory Program, www.spk.usace.army.mil/cepak-co/regulatory.
[25] U.S. Army Corps of Engineers Regulatory Program, www.spk.usace.army.mil/cepak-co/regulatory.
[26] Lisa H. Clay in the Sacramento District's Office of Counsel assisted with the titles, date(s), synopsis, and the results of litigation in the cases discussed.
[27] U.S. Army Corps of Engineers, Regulatory Guidance Letter 96-2 in *Federal Register*, Vol. 62, no. 10, January 15, 1997.
[28] U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch Data, April 2000.

Chapter 10

Recreation in the Sacramento District

Responsibility for recreation facilities in the Sacramento District falls under the District's Operations and Maintenance Branch, which oversees nine multipurpose lakes, one river park system, four navigation projects, and other flood control facilities. Because park rangers interact with the public, Charles Hess, Director of the Corps' National Operations Division in 2000, referred to them as being the Corps' "face to the nation." There are 2.3 million visitors annually to the District's recreational facilities throughout California. The annual budget to run the District's recreational facilities is between $26 million and $32 million.

Evolution of Recreation Programs in the District

The Corps recognized early the public's desire to have access to recreational areas. Section 4 of the Flood Control Act of 1944 granted the Chief of Engineers the authority to operate and maintain recreational areas.[1] Recreational use of the Sacramento District's facilities in the 1970's consisted primarily of day-use, water-related activities such as boating, fishing, and water skiing, with a limited amount of camping. Additional facilities for the public included access roads, boat-launching ramps, observation points, picnic areas, and campgrounds.[2]

Before 1973, the Sacramento District oversaw recreation areas that were not specifically authorized by Congress for recreation, as shown in the table below.

From 1974 through 1979, the District prepared 10 master plans with a primary focus on recreation with associated flood control projects.[3] The master plans describe the components of conservation, enhancement, development, and management of the project lands, which includes land, water, forest, and other resources as required under Engineering Regulation 1120-2-400. The plans considered the public interest throughout the life of the flood control project. The plans were site specific for each project land location and considered the relationships of the land and water uses to these resources, in addition to facility development, operation, and management. The master plans were dynamic documents, and as recreation needs and trends changed over time, so did the master plans.

Staffing Issues

Because the early Corps philosophy of recreation was to leave the operation and maintenance to local county agencies, the District did not have sufficient personnel at recreational sites. The allocation and hiring of personnel for the recreational areas evolved slowly. In 1971, the District instituted a Reservoir Ranger Program and hired reservoir rangers in 1972 at Pine Flat and New Hogan recreation sites.

Name of Recreation Area	Year Built	Dam Association
Englebright Lake	1941	Englebright Dam
Pine Flat Lake	1954	Pine Flat Dam
Lake Isabella	1955	Isabella Dam
Success Lake	1961	Success Dam
Lake Kaweah	1962	Terminus Dam
Black Butte Lake	1963	Black Butte Dam
New Hogan Lake	1964	New Hogan Dam
Martis Creek Lake	1972	Martis Creek Dam

Contracting for services has steadily increased in the recreation program. The test to see if contracting would be a viable alternative at recreational sites began at New Hogan Lake in 1980. Former Operations and Maintenance Manager Joseph Holmberg recalls:

> *We did a test in 1980 at New Hogan, [of] hiring somebody to collect the fees, and it worked out satisfactorily. Subsequently, the District began contracting for fee collection, garbage hauling, and restroom maintenance. And now we contract out lawn maintenance.*[4]

Original Reservoir Ranger Uniform Patch - Circa 1972

Park Ranger - Interpretive Program at Stanislaus River Parks, CA

District or Local Operation and Maintenance?

The District's entry into recreation slowly evolved in part because of difficulty in establishing a continuous and stable system for operating and maintaining the facilities. In many cases, counties that initially operated and maintained facilities returned them to the Corps because of the mounting costs required to carry out their responsibilities.

Three of the District's early recreational facilities, Lake Isabella, Lake Success, and Lake Kaweah, were built in the mid-1950's and 1960's. After the facilities were completed, the Corps transferred them to their respective counties for operation and maintenance. The initial agreement between the District and the counties stipulated that the counties would manage the camping and day-use activities including boat launching and other recreational pursuits. However, counties soon discovered that the cost of operating and maintaining the facilities exceeded their budgets.

Another problem was the composition of the visitors. In most cases, the majority of the recreational users did not reside in the county of the recreational area. For example, the majority of Lake Isabella's users came from the Los Angeles area, and in the case of New Hogan, the majority of users came from the East Bay. The county took the position of not spending their resources to take care of non-county visitors when those non-residents did not contribute to the tax base. As a result, counties opted out of the initial agreements and turned the operation and maintenance of the facilities back to the Corps.

Kern County leased Lake Isabella from the Corps in 1955, but by 1960 had trouble maintaining the area according to the standards required by the licensing agreement. Cost of operation and maintenance was not the only problem for the county, but also the Corps' enforcement of violations associated with the use of campgrounds, day-use areas, and boat launching areas. The county preferred not to enforce such violations because they felt that enforcement would have an adverse effect on tourism.

Lake Kaweah - Terminus Dam, CA

The District, on the other hand, felt that enforcement was necessary in order to ensure the safety of the public. This philosophical difference between the county and the District came to a head in 1974 when the District began the prohibition of unrestricted camping below the high water line of the lake. This illegal activity had been tacitly permitted prior to 1974. Holmberg summarizes the differing philosophy as follows:

> *What they [business people and residents of Kern County] wanted us to do was counter to our own policies, regulations, and the philosophy of land stewardship. The local County Supervisor, who used to be the aide to the congressman representing the area, began advocating for the transfer of the administration of the lake from the Corps to the U.S. Forest Service. They [business people and residents of Kern County] figured under the U.S. Forest Service's administration, they could do whatever they wanted to on the lake and the U.S. Forest Service rangers would not bother them.*[5]

The District formed a citizens' advisory board to mediate the differences, but the board failed to reach an agreement, and the U.S. Forest Service took over the lake and surrounding land on May 15, 1991.

In addition to cost sharing with Lake Isabella, the District attempted to have other counties cost share in the operation and maintenance of their projects, but to no avail. In a District-wide policy review in 1977, the District concluded that "cost-sharing agreements were unobtainable." "The report stated: "These lakes are located in sparsely populated rural counties...and rural counties [are] unwilling to commit local tax monies to accommodate recreation demands of non-residents."[6]

The Chief of Engineers, LTG E.R. Heiberg, selected Lake Isabella as the U.S. Army Corps of Engineers' 1987 Project of the Year.[7] The Corps based the award on public involvement, public safety, natural resource management, and partnerships.[8]

Changing Staffing and Facility Requirements

By 1977, the District continued the development of the recreation staff by hiring recreation attendants and maintenance employees to fulfill the role of recreation specialists. A full-fledged park ranger program began in the mid-1970's where rangers had citation authority under Title 36 of the Code of Federal Regulations.

To meet the needs of up-keep on the District's recreational facilities, the Sacramento District successfully obtained grants for the ongoing construction and improvement of boat launch facilities, as well as parking areas. For some of these projects, the District obtained permits from the California Department of Boating and Waterways.

Boating and water skiing still represent a fairly substantial part of use at District reservoirs, but an increase in personal watercraft such as jet skis has been significant. A change in camping from "roughing it" with a tent to elaborate motor homes with all the amenities and comforts of one's regular home has increased.

The District's water safety program has had a positive effect on those communities adjacent to the lake projects. In spite of the growth of visits to the District's recreation areas, the number of public fatalities has dramatically decreased from the early 1970's due to the District's emphasis on education and public awareness of water safety and the use of public service announcements, television ads, and brochures in several languages. The program was designed to enhance public awareness of water safety and to provide a positive image of the Corps of Engineers and its management of recreation areas. A total of 1,294 presentations were made to approximately 183,000 students in fiscal year 1984. Since 1989, more than 22,400 onsite contacts through water safety programs were made, and 3,573 offsite programs were conducted. The following table reflects the increased popularity and increased visitation to the District's 10 recreational areas.

Sacramento District Visitor Hours 1995-2001 (in thousands of hours)[9]											
Year	Black Butte	Englebright	Martis Creek	New Hogan	Stanislaus	Eastman	Hensley	Pine Flat	Kaweah	Success	Total
1995	1,389	711	178	3,443	782	590	1,058	4,259	1,889	2,709	17,008
1996	1,283	613	262	3,200	929	638	1,086	3,660	1,795	2,536	16,002
1997	1,116	749	333	2,981	777	608	1,155	3,538	1,587	3,476	16,320
1998	1,663	1,535	350	3,345	1,397	550	1,512	3,643	2,313	2,973	19,281
1999	*	*	*	*	*	511	938	3,303	1,972	2,548	** 9,272
2000	1,714	1,674	245	2,743	1,332	519	880	3,313	1,820	2,581	16,821
2001	1,961	2,044	350	3,309	178	520	1,114	4,016	2,101	2,501	20,374

* *Denotes that information is not available.*

** *Denotes that this total is based on available information.*

Special Authorization for Hensley, Eastman, and Stanislaus River Parks

In the late 1970's, three recreational areas were built in northern California, but unlike those built prior to 1965, Congress identified and specifically authorized recreation in the legislation. These recreational facilities were Hensley Lake (1978), Eastman Lake (1978), and Stanislaus River Parks (1979). (See Chapter 3, Hensley Lake and Eastman Lake.)

Astonishingly rich in wildlife, the numerous recreational areas scattered along the river's banks have become known among writers and the public as the "string of pearls"[10] or recreational jewel. The Stanislaus River Parks offers a totally different type of recreation activity, including white water rafting and fly-fishing among other things. The parks are unique in that they descend along a 59-mile stretch of the river from the foothills to the Central Valley, replete with Gold Rush Era historical structures.

Stanislaus River Park spans four counties (Calaveras, San Joaquin, Stanislaus, and Tuolumne) and attracts visitors from 15 California counties and beyond. The staff of Stanislaus River Parks currently manages more than 400 individual easements, some aimed at habitat protection and others aimed at flood control. In total they comprise approximately 4,347 acres set along 118 miles of shoreline.

The park has been developed incrementally since 1976, with some areas still not developed due to lack of funding. In 1986, the U.S. House of Representatives approved an appropriation of $4.2 million for the development of the 175-acre Knights Ferry Park, the 85-acre McHenry Avenue Park, and the 36-acre Ripon Park. (Subsequently, the park manager announced that none of these three parks would have drive-in camping facilities and that monies for Jacob Myers Park at Riverbank would be delayed by approximately 18 months.)

The busy centerpiece of the Stanislaus River Parks is Knights Ferry, which is a fully developed facility encompassing approximately 175 acres and the site of the Corps' new park headquarters. Knights Ferry is parceled into three divisions: the recreation areas, a maintenance yard, and an information center.

Within the recreation area are three historical structures: Tullock Mill, the Mill Office, and the Covered Bridge, all of them on the National Regis-

Park Ranger and Young Water Safety Enthusiast

ter of Historic Places. The covered bridge is the longest west of the Mississippi River, and one of only 10 remaining in California.

The 6,000-square-foot information center houses the staff's offices, a small museum, and a theater. Park rangers provide interpretive programs underscoring water safety and the natural and cultural history of the area.

Opened to the public on June 17, 1986, the Knights Ferry Park won a design and construction Award of Merit in the Landscape Architecture category of the Chief of Engineers Design and Environmental Awards competition in 1990. The award cited the Knights Ferry structures' adaptive capabilities to the esthetics and history of the site.[11]

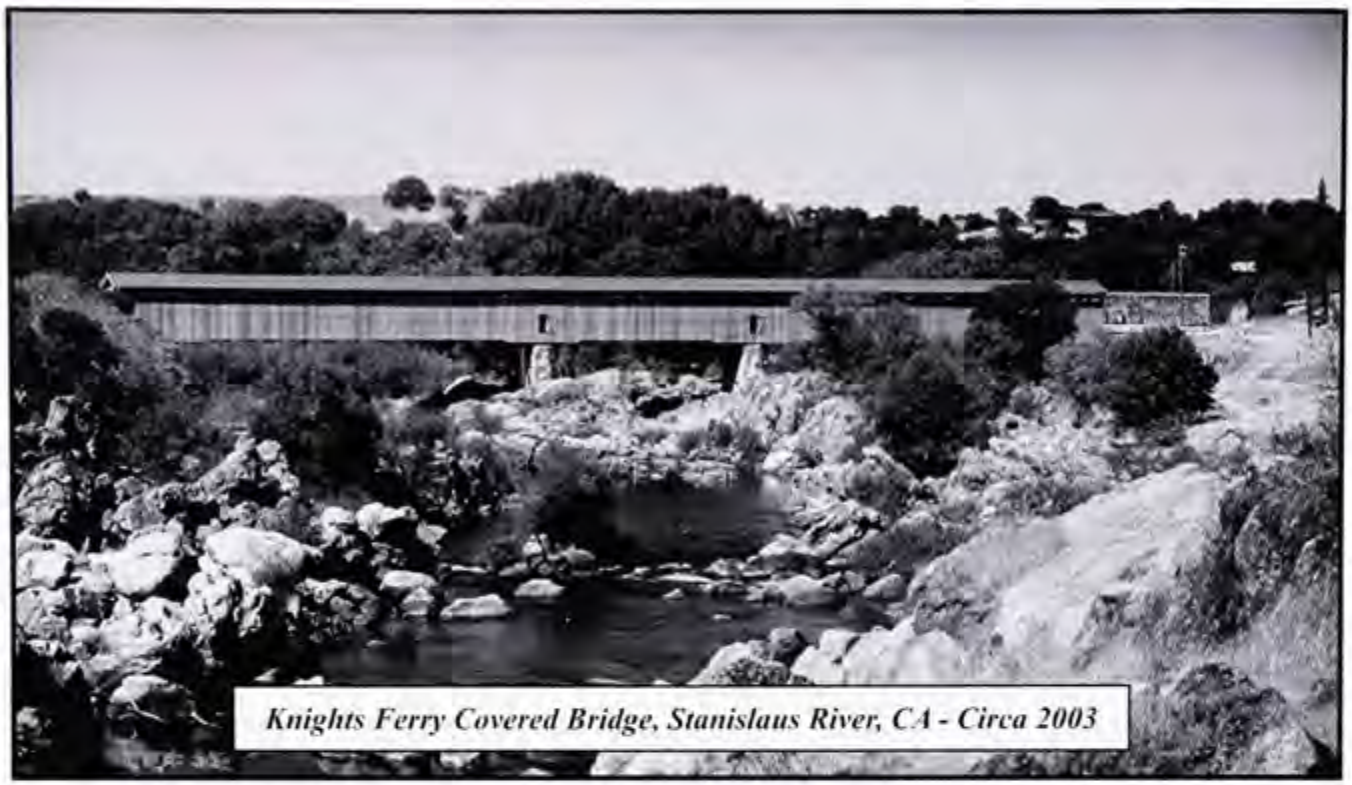
While its visitation is not as high as Success Lake or New Hogan Lake, it has far succeeded the original projections. The Stanislaus River Parks accommodated more than 401,500 visitors in 1998.

Sacramento District's New Responsibility

In the modified authorization on October 23, 1962 (Public Law 87-874), Congress, in an atypical action, mandated the following provision (paraphrased):

> *The Secretary of the Army was assigned the responsibility of maintaining the Stanislaus River from Goodwin Dam to the San Joaquin River to a maximum capacity of 8,000 cubic feet per second (cfs). The Sacramento District has been assigned the responsibility of maintaining the maximum channel capacity and administrating associated easements and public access considerations.*[12]

Beginning at Goodwin Dam and spanning four counties – Calaveras, San Joaquin, Stanislaus, and Tuolumne – the Lower Stanislaus River runs approximately 59 miles to its confluence with the San Joaquin River. The Sacramento District maintains



Knights Ferry Covered Bridge, Stanislaus River, CA - Circa 2003

this area, adhering to the four components of the authorization: (1) protecting the channel's capacity at a maximum of 8,000 cfs, (2) preserving existing fish and wildlife habitats, (3) preserving salmon and steelhead spawning gravels, and (4) providing public access to the river for recreation.

The park's master plan called for 16 recreational areas (nine have been fully developed to date) scattered along the Stanislaus River's banks. Additionally, the plan called for developing a 5-mile reach for whitewater kayaking as partial mitigation for the loss of white water due to the creation of New Melones Lake.

The Corps' responsibilities for the historical resources with the parks consist of protection, preservation, management, and mitigation. Sites in the historical district are Goodwin Dam Recreation Area, Two Mile Bar Recreation Area, Six Mile Bar Recreation Area, Valley Oak Recreation Area, McHenry Recreation Area, Ripon Recreation Area, and Knights Ferry.[13]

Protecting Salmon and Privacy

On several fishing and hunting trips they took together in the early 1970's, District Commander James C. Donovan and W. Ray Arnett, Director of the California Department of Fish and Game (1970), talked about the condition of the lower Stanislaus River. It was then that Arnett, knowing that the Stanislaus was one of California's few remaining natural spawning places for the Chinook salmon, pointed out to Donovan the "need for freshwater releases out of Melones to enhance the anadromous fish habitat of the Stanislaus River."[14] In addition to meeting the needs of fresh water for the salmon's habitat, restoration efforts were needed. Dams often prevent the natural replenishment of riverbed gravel needed for spawning so new gravel must be brought in and placed at various locations to restore the habitat. Because of the need for gravel was so important, it was listed as a feature the final Environmental Impact Statement (EIS) for the lower Stanislaus River project.

The original Master Plan of 1977 called for the acquisition of approximately 725 acres of land for public access, recreation, and facility development. The District had to acquire additional lands totaling 5,000 acres for lease since the authorization called for the maintenance of an 8000-cfs channel for flood control. To ensure the protection of habitat for salmon spawning, the Master Plan stated explicitly:

> *Without approval by the Corps, the landowners will be prohibited from removing or altering native vegetation, removing, shifting, or altering gravel deposits, or constructing or improving structures on lands within the easement.*[15]

In addition to the salmon restoration, various sites along the river were to be developed to provide public access and recreation. Landowners at one of the public meetings for the project said, "…here we have this wonderful resource, but we as landowners, Colonel, are being inundated with trespassers who are trying to get to the river."[16]

According to Donovan, the District wanted to purchase and manage the land along the river as easements to provide public access, thus solving the problems associated with trespassers on private property. At a public meeting, Colonel Donovan solicited a show of hands to this question: Who would be willing to sell the Corps 3 or 4 acres or 2 or 3 acres, whatever is required?

> *And almost every person who owned land along the river would raise their hand, saying, "Fine, I would love to sell you a couple of acres to cut down on the trespass, control the public, keep them out of my pastures, and keep them out of my orchards."*[17]

In keeping with Donovan's wishes, the District's Chief of Real Estate investigated the idea. Subsequently, Morgan Wheeler recommended that the District purchase easements on the land with the title retained in the landowner's name.[18] Previously, most leases that the Corps purchased were for the Corps' use of the land; this may have been the first time that the District purchased leases for the purpose of fish and wildlife habitat restoration.

Waterskiing at Englebright Lake, CA - Circa 2000

The District purchased two types of easements: "ingrants" consisting of rights or privileges bought by the Corps, and "outgrants" consisting of rights or privileges granted to non-Corps entities, persons on fee-owned property, or private property. The three types of ingrants were Fish and Wildlife Habitat Protection Easements, Flowage Easements, and Flowage and Channel Maintenance Easements. The five kinds of outgrants were Easement, Consent to Easement, Lease, License, and Special Use Permit.[19]

Between 1975 and 1983, the Real Estate Division purchased 960 acres in fee and 3,900 acres in easements: a total of 498 tracts, including several historic landmark buildings. In 2000, the Real Estate Division is still in the process of acquiring land. Stanislaus County owned the majority of the land (3,100 acres), with the remaining portions in Calaveras County (170 acres) and San Joaquin County (1,560 acres).

Mitigating the Loss of White Water on the Stanislaus

The District also needed to address another problem in the Stanislaus River Park area resulting from the construction of the New Melones Dam and Reservoir; that is, the loss of whitewater recreational opportunities on the river. The District determined that those 4 miles of Class IV whitewater (advanced, intense, powerful, but predictable rapids requiring precise boat handling in turbulent water) on a 5-mile reach below Goodwin Dam would be used as a partial mitigation replacement for whitewater loss from the inundation of New Melones Lake.[20] This idea gained a positive response in 1972 and signaled a new era of cooperation at the time between the Corps and rafters.

However, in 1973, rafters felt that the actions were a sham. The 5-mile reach was no substitute for the Camp Nine run and was not economically viable according to the 10 commercial concessionaires who earned their living from rafting the Stanislaus River. Rafters lamenting the loss of the Stanislaus to New Melones Dam said, "If a destroyed river can justify a slalom course, then a slalom course can justify more destroyed rivers."[21] Still the park's recreational facilities were important, as an article in the *San Joaquin Country Times* stated:

> *When the entire "string of pearls" project is completed, canoeists or rafters will be able to float from Knights Ferry all the way down to the Mossdale Y., stopping along the way to camp out overnight.*[22]

In April 1974, when inundation of the Camp Nine whitewater run by New Melones Lake was imminent, the District formed a Whitewater Advisory Committee to help determine possible alternatives for whitewater boating and rafting activities affected in the areas of the Stanislaus River. In a subsequently published brochure, Colonel F.G. Rockwell, Jr., explained that

> *The reach between Goodwin Dam and Knights Ferry was found to have a potential for kayaking and a slalom course and that further investigations of the lower river would be included in the recreation plan...*[23]

The District acknowledged that the slalom course could only be a partial replacement and proceeded with the purchase of leases for the proposed park.

In April 1979, the District announced the creation of Stanislaus River Parks, consisting of "downriver recreation" to partially replace the loss of white water upstream, canoeing, kayaking, fishing, picnicking, and camping.[24] The District planned for 16 recreational areas with varying amenities along the river. District planners designed some recreational areas for visitors desiring to float down the river; while other parking facilities accommodated pedestrians and motorists.

Popularity and Historical Visitation at Stanislaus River Parks

In spite of the park's relatively slow development, visitors have continued to flock to it in increasing numbers that have exceeded expectations. A recent planning study regarding patterns of visitation and park use shows that the recreation management Master Plan of 1977 projection of use over a 50-year period underestimated the popularity of the park. Since 1977, changes in demographics, recreation use patterns, and environmental sensitivity indicate that in 1998, Stanislaus River Parks recorded 401,500 visitors who spent over 1,397,000 hours pursuing recreational interests within the park system.[25] Data from 2001 indicates 485,380 visits and 2,457,849 visitor hours. The majority of visitors to the park system are derived from 15 counties. Surveys conducted between 1983 and 1985 concluded that 63 percent of visitorer Park visitors" s reside within 25 miles of the park system, while 37 percent resided outside of 25 miles of the park system.

Successes and Challenges

As of 2000, many of the amenities at the Stanislaus River Parks are free, but fees might be instituted in the future. The District is not in the business of providing rafting services to the public, and to ensure the safety of visitors, it has since the early 1980's entered into licensing agreements with rafting companies. The District licenses four private outfitters to provide rafting and livery services at Stanislaus River Parks on these 59 miles of river.

Efforts to replace the whitewater experience of the upper Stanislaus River have not been entirely successful; that is, the 5-mile run from Goodwin Dam to the San Joaquin River is not a whitewater experience.[26] As the District's operations manager observes, attempts to partially mitigate the loss of whitewater on the upper Stanislaus River with the run on the lower Stanislaus have had mixed results.

To many local recreationists and users of the park, it seems that the Corps has not lived up to its promise of developing the lower Stanislaus. There are nine of the 16 recreational parks that have been developed. The remaining seven parks still lack the necessary funding for complete development. Two factors explain this disparity: (1) the Corps purchased more land for access areas than was originally envisioned, and (2) the Ronald Reagan administration made retroactive the 1965 Public Law 8972, specifying that a non-Federal sponsor had to pay half of the cost for construction.

Overall, the creation of Stanislaus River Parks has enhanced the local environment while providing increased recreational opportunities and the interpretations of cultural and natural resources. Fifty-nine miles of riparian habitat are maintained and protected from removal or spoilage, and major recreational facilities that heretofore did not exist are now available. Attempts at rehabilitation of salmon spawning have met with mixed success, but the Stanislaus River Parks administration has established a good relationship with several environmental groups regarding this issue. The District also has enjoyed other successes; several historical structures at Knights Ferry have been rehabilitated or their deterioration arrested, and four rafting companies licensed by the Corps provide white water opportunities to the general public.

Conclusion

Several challenges remain for the District with regard to the operation and maintenance of the recreational facilities. To meet the needs of the public's appetite for increased recreation and recreational facilities, the District's Operations and Maintenance Branch is constantly seeking ways to use congressional funding for its recreation sites. The Corps and the Sacramento District pursue partnering with local cities and counties to share in the operation and maintenance of facilities. A component of Pine Flat and Success recreational areas are operated and maintained by the neighboring governments. In 2000, the District was successful in partnering with the City of Ripon to operate and maintain the Ripon Recreation Area. This area had been included in the master plan for the Stanislaus River Parks, but

never was developed because of the lack of funds. As a result of the partnership, the City of Ripon has leased the area, providing recreation and access to the Stanislaus River.

While not as pressing as some of the older recreational areas in the East, there is a need for the renovation of the District's aging facilities and a growing maintenance backlog.

The Sacramento District's lakes and rivers offer a full range of water-oriented recreation opportunities. Facilities are available for camping, boating, picnicking, swimming, hunting, fishing, hiking, and sailing among other possibilities. While its level of funding does not reflect its large public role, the Sacramento District views its recreational mission as a basic value for all of its recreational users as it continues to meet the challenges of partnering with local cities and counties for operation and maintenance, as well as protecting the natural resources of these areas.

Endnotes

[1] Flood Control Act of 1944, Public Law 534, 78th Congress, Sec. 4.
[2] U.S. Army Corps of Engineers, "Water Resources Development by the US Army Corps of Engineers in California,"1973, p. 5.
[3] U.S. Army Corps of Engineers, Sacramento District, "Englebright Master Plan," December 1975, "Buchanan Dam – H.V. Eastman Lake," July 1974, "Black Butte Lake," February 1977, "Lake Kaweah," September 1976, "Hidden Reservoir (Hensley)," January 1968, "Martis Creek," November 1977, "New Hogan," October 1976, "Pine Flat," October 1976, "New Melones (Stanislaus)," April 1977, "Success Lake," December 1977.
[4] Interview Lee F. Pendergrass with Joseph Holmberg, June 8, 1989.
[5] *Ibid.*
[6] U.S. Army Corps of Engineers, Sacramento District, Policy Review of PL 89-72, Memorandum to South Pacific Division, November 7, 1977.
[7] U.S. Army Corps of Engineers, "Isabella Lake Wins Project Award," in *PAR*, June 1987, p. 2.
[8] U.S. Army Corps of Engineers, Sacramento District, "Say goodbye to Isabella" and "Controversy swirled along the Lakeshore," *Public Affairs Report*, June 1991.
[9] U.S. Army Corps of Engineers, Sacramento District, "Visitation Statistics of the Operations-Technical Branch," 2002.
[10] Donovan in an interview with the author claimed, "So I term this the "string of pearls," but the term was originally used by John McFall (D-Ca) who Tim Palmer in *Stanislaus: The Struggle for a River* dubbed the father of New Melones Dam and subsequently by writers and other including the late author Thorne Gray for the *Modesto Bee* who wrote *The Stanislaus Indian Wars: The Last of the California Northern Yokuts*, 1993.
[11] U.S. Army Corps of Engineers, Sacramento District, "District project wins a Chief's Award of Merit." *PAR*, January 1990, p. 1, and "Chief Presents Project Award," *PAR*, April 1990.
[12] U.S. Army Corps of Engineers, Sacramento District, "Stanislaus River Parks," 1999.
[13] U.S. Army Corps of Engineers, Sacramento District, "Stanislaus River Parks Operational Management Plan, Historical Properties," December 1, 1989, pp. 6-11.
[14] Thorne Gray, "The River Runs Dry" in *Sacramento Bee*, August 11, 1974.
[15] U.S. Army Corps of Engineers, Sacramento District, "Master Plan. . . ," 1977, p. 6.
[16] Interview Willie Collins with Colonel James C. Donovan, April 7, 2000.
[17] *Ibid.*, p. 20.
[18] *Ibid.*, p. 21.
[19] U.S. Army Corps of Engineers, Sacramento District, "Stanislaus River Parks Operational Management Plan," December 1, 1989, p. 1.
[20] *Ibid.*
[21] Carl Trost, "Build a Slalom Course, Destroy a Dozen Rivers" in *American Whitewater: the Journal of the American Whitewater Affiliation*. See also: "Another Look at the Corps" in *American Canoist*, July/August 1972.
[22] "Local River Park Takes Shape" in *San Joaquin County Times*, January 7, 1987.
[23] U.S. Army Corps of Engineers, Sacramento District, "Study of Alternative Opportunities for Whitewater Boating/ Rafting Activities, New Melones Lake, California," July 1976.
[24] U.S. Army Corps of Engineers, Sacramento District, *PAR for the Corps*, April 27, 1979.
[25] U.S. Army Corps of Engineers, Sacramento District, "Planning Study, Stanislaus River Parks," 1999?
[26] Interview Dr. Willie Collins with Jim Sandner, August 14, 2000.

Chapter 11

Sustaining the Air Force and Support for the Nation:

Sacramento District's Military Mission

In 1973, the national defense in the Nixon administration began to wane with troop withdrawals from foreign soil. A cease-fire permitted the U.S. troops' departure from the Indochinese war zone. At the conclusion of the Arab-Israel War in 1973, troops retreated from the Middle East. Under the administration of President Gerald Ford in 1974, there was an increased wariness of a growing Soviet military threat. The policy of détente triggered a larger defense readiness. Yet, the funding for military design and construction was relatively flat thus impacting the military design and construction mission of the Corps nationally.

As a consequence, the Army in general went through a period of short funding for military construction work. Responding to this shortage, the Corps of Engineers consolidated the design work in a few districts across the nation. The Military Branch of the Sacramento District before the consolidation was the design and construction agent for the various military commands: the Army, the Air Force, Reserve installations, and occasionally for the Marines. The District also performed work for other Department of Defense agencies including the Defense Logistics Agency, the Defense Mapping Agency, and the Defense Nuclear Agency. Under the "Work for Others" program, the District serviced new customers like the National Aeronautics and Space Administration, the Environmental Protection Agency, and the Department of Energy.

The Chief of Engineers chose the Sacramento District as one of the Districts to accept design work from other Corps' Districts. Richard Vasquez, who worked in the District in various capacities as well as Assistant Chief of the Military Branch for many years from 1958 to 1986, proffered reasons for the Sacramento District being chosen for the transfer of design work. "Sacramento was a very efficient and well-known District. "We had a great reputation in the Military Design Branch under Frank Pieretti and Lou Santin. Frankly, other Districts were dropping the ball and the Office of the Chief of Engineers was not happy and neither were the customers," recalls Vasquez.[1]

The Sacramento District developed an organizational philosophy that carried through the 1970's as a "lean, mean, and effective District" that could successfully perform a great deal of work with a small staff, recalls Chief of the Military Design Branch Lou Santin. The Sacramento District's reputation extended back to the 1950's when the District proved its competence and capability. The staff developed a pride of workmanship particularly with Air Force customers and also with the Army customers.[2]

Consequently, the Sacramento District, having performed admirably as a premier design and construction agency whose reputation was nationally known, became the recipient in 1970 of the design work of the Los Angeles District.[3] The transition was not smooth. No District likes to see its work taken from it and Los Angeles was no exception. Their reluctance stemmed from the distance of 350 miles from Los Angeles to Sacramento as well as having little confidence that the separation of design in Sacramento and construction in Los Angeles was going to work.

A year later, the Sacramento District assumed the Seattle District's military mission extending the District purview to eight states including the four northwestern states that Seattle had served including Washington, Oregon, Idaho, and Montana[4] in addition to the Sacramento District's states of California, Utah, Arizona, and Nevada. The transition of Seattle's military mission to the Sacramento District was much smoother than the Los Angeles District. While some of the Seattle District staff did not want to relocate to Sacramento, the staff was very cooperative. The Sacramento District wisely continued to use many of the architect and engineering firms in Montana and in Seattle awarding new contracts to many of the same firms that Seattle had used. The Sacramento District experienced some difficulty in trying to train new project managers who were unfamiliar with the installations that had been under Seattle jurisdiction. The District established a Northwest Resident Office with D.J. Nelson as Resident Engineer and a staff of 15 based in Seattle to handle the work.

This new expanded territory made the Sacramento District unique in that it served all of the Army and Air Force major design programs from the Rocky

Mountains to the Pacific and Canada to Mexico. The District performed design work for the northwest area, construction in northern California, northern Nevada, and all of Utah, and the Los Angeles District performed the construction in southern California, southern Nevada, and all of Arizona. To be sure, the District covered a large geographical area with a wide variety of projects and a relatively small staff. The District actually had more staff assigned to civil works in 1973 than to military. In 1973, the full-time staff allocation for military was 274 personnel while 572 personnel were assigned to civil works for a total of 846 full-time personnel.[5] The District retained the military mission for installations in the Pacific Northwest until 1982, when it was transferred back to the Seattle District.

The District's projects were diverse in the early 1970's including medical complexes and hospitals for both the Air Force and the Army. Major factors impinging the nature of the military program included: the weapon systems and platforms such as the Air Force MX Missile Program, and the Space Transportation System Shuttle at Vandenberg in the late 1970's to the mid-1980's, and the conversion of an installation function in the late 1970's and mid-1980's, and in the 1990's, the Base Closure and Realignment program.

The Postal Program is one example of how efficient and quickly the Sacramento District could respond to new challenges. When the Postal Service first talked to Special Assistant to the Engineering Division Roan Aicklen about potential work, Aicklen had an organizational chart drawn up to handle the program within 48 hours.[6] The Postal Branch, while short-lived, was so large that it was a separate branch called the Postal Facilities Branch with a staff of 23 employees under the Engineering Division and was one of the most important programs of the District in years. Congress had directed the Corps to upgrade nationally approximately 30,000 post offices, and the Sacramento District's workload would have included approximately 3,000 post offices in California, Nevada, Arizona, and Utah, as well as the design and construction of three bulk mail handling facilities along with 20 preferential mail centers.[7] In 1973, the Postal Branch showed $2.8 million in contract earnings and $120 million for design in its last year.[8]

Congress cancelled the Corps' role in the program in February 1973. In its short life, the District remodeled approximately 125 post offices, designed and constructed three bulk mail facilities, and finished 12 of the preferential mail centers. Chief of Engineering Division George Weddell explained why he thinks Congress phased out the program.

> *I think the Sacramento District was too successful with the Postal Program. The District expeditiously awarded architecture and engineering contracts for large bulk postal facilities in Oakland and in Los Angeles quickly and less costly than the Postal Service had previously done. Postal employees, who stayed with the service, brought enough political pressure to get program transferred back to the Postal Service.*[9]

Without the Postal Branch, the Sacramento District still served a large and diverse number of installations. Organizationally, the Military Branch came under the Engineering Division. In 1973, there were many installations where the District oversaw planning, design and construction activities.

Military Branch had six sections: A-E Negotiations, Budget and Reports, Military Design A, Military Design B, Project Engineering, and Technical Review. For all practical purposes, the Military Design Sections (A and B) ran the program. The District kept between 10 to 25 percent of the work as "in-house design." Sometimes the percentage of the work vacillated between 10 and 30 percent. The in-house projects were determined by the capabilities of the District's staff, the complexity of the project, as well as the size and schedule.

In terms of work distribution, the objective in the Military Design sections was to ensure that sufficient expertise in design was maintained in house so that the District engineers in Military Design did not lose touch with the engineering aspects of the work. The Architect and Engineering Negotiating Section dealt with the selections of firms to complete the work as well as their fees for services. The Budget and Reports Section managed allocations of Air Force and Army design funds that were programmed as well as maintained project files. The Project Engineering and Technical Review Section managed projects and

oversaw the technical adequacy and interpretation of project criteria. In 1973, the District established four resident offices located in Utah, the San Francisco area, Monterey, and the Central Valley.

Air Force Projects

The Sacramento District is the chief design and construction agent for the Air Force. The Air Force is and has been an extremely demanding customer presenting interesting and challenging assignments to the District. The Air Force has held the Sacramento District to high standards in terms of meeting tight schedules, budgets, the quality of design, and construction. Air Force programs and projects have been extremely diverse including standard recurring projects such as airman dormitories, test facilities, maintenance facilities, administrative facilities, runways, medical facilities including hospitals, airplane hangars, runways, storage facilities, taxiways, and warehouses among others. The most challenging and work included the Missile X Program (MX Program) (1978-1982), and the Space Transportation System program (1977-1985).

The District supported several Air Force bases in California including McClellan, Mather, Edwards, George, Vandenberg, and Beale. In Nevada, the District supported Nellis, in addition to, Luke, Davis-Monthan, and Williams in Arizona. From 1971 to 1981, the District also supported the Seattle District's Air Force customers through its Northwest Resident Office including installations at McChord, and Fairchild all in Washington; Mountain Home in Idaho; and Malmstrom in Montana. In Utah, the District's through its Utah Resident Office supported more work at Hill than any of the installations in the Northwest.

The Air Force Regional Civil Engineer, Western Region, located in San Francisco was the central liaison for Air Force projects. Their office was one floor above the South Pacific Division's offices.

The Sacramento District interfaced with the Air Force Regional Civil Engineer, Western Region, located in the South Pacific Division headquarters in San Francisco. And they covered all of the Air Force installations on the West Coast.

Air Force Installations in the Northwest: Utah Resident Office

The Utah Resident office of the Sacramento District supported three Air Force installations with a wide variety of work from 1976 to 1985. The three Air Force bases were Mountain Home AFB in Idaho, Malmstrom AFB in Montana, and Hill AFB in Utah.

Mountain Home AFB transitioned from a Strategic Air Command facility to a Tactical Air Command facility. The 366th Tactical Fighter Wing came to Mountain Home AFB in 1972. The Sacramento District constructed almost $5 million worth of work in Idaho at Mountain Home AFB. In 1976, the District completed a heating plant addition and central supervisory control system. In 1979, the District completed a Bachelor Enlisted Quarters.

Malmstrom AFB in Montana was a training command base to prepare the North American Aerospace Defense Command air defense personnel in electronic countermeasures, air surveillance, and control.. The wing's missiles stood on alert throughout the 1970's and 1980's. The Sacramento District provided infrastructure by using an industrial waste treatment and disposal system and insulating buildings. New construction included the construction of a reserve fire team and education center for a total of over $3 million dollars worth of construction.

Hill Air Force Base in Utah was a storage base for hundreds of B-26 and B-29 aircraft. In 1955, the Department of Defense transferred the Ogden Arsenal of the United States Army to the Air Force that became the west area of Hill AFB. Hill also houses the Air Force Munitions Depot that assumed responsibility for the management of the Minuteman Intercontinental Ballistic Missile and subsequently assumed responsibility for the F-16 "Fighting Falcon."

The Sacramento District work at Hill AFB consisted of infrastructure support including the modification and new construction of hangars, landing

gear facilities, taxiways, ballistic missile maintenance and storage facilities as well as flight training and test facilities. A Health Clinic and Bachelor Enlisted Quarters rounded out the categories of facilities built or modified. Some of the facilities were vital to the F-16 fighter aircraft based at Hill AFB. District Commander Donald O'Shei commented on the work at Hill in 1977 as follows:

> *The very important Tactical Air Command (TAC) program at Hill AFB continues to progress very well. We expect to meet all the current Air Force goals for award of the projects and barring unforeseen construction delays we will have the projects completed in time to meet the needs of the using service.*[10]

The Sacramento District's work at Hill AFB progressed at a steady pace. The projects for the F16 aircraft were under strict deadline and had to be completed in a year, necessitating working through the winter. Adverse weather such as prolonged cold and persistent snow negatively impacted the progress of projects. This posed challenges such as having to cover structures with plastic to protect the structures from the weather, and the use of heaters to prevent the concrete from freezing while setting up. One of the largest projects was a 550,000 square feet storage facility consisting of 12 acres of floor space costing $8.6 million.[11]

The District completed more than 38 projects worth over $72 million at Hill AFB between 1976 to 1985.[12] "The District's work at Hill AFB reflected the Sacramento Military Branch as a service business with its satisfaction derived from the customer and end-user commented former Sacramento District's Chief of Air Force Projects Management Section Dick Hill. The Sacramento District enjoyed an excellent relationship and rapport with Hill AFB."[13]

California Air Force Bases: McClellan Air Force Base

The District supported the following Air Force facilities in California: McClellan, Beale, Edwards, George, Vandenberg, and Mather Air Force Bases. The Sacramento District had a long history with McClellan AFB. During World War II, McClellan was the only depot on the West Coast providing air logistics to the Pacific. The Air Force base subsequently took on more technological mission in the 1980's and 1990's. The Sacramento District completed projects at McClellan AFB to modernize the facility for a 30-year period from the 1960's to the 1990's. The District built runways from scratch to handle the B-52's transporting nuclear weapons.[14] Some projects at McClellan AFB were classified such as storage facilities to secure materials.

The Sacramento District completed more than 10 projects worth more than $23,852,950 from 1977 to 1985 at McClellan AFB. Selected projects included the refurbishing of existing facilities such as the Depot Radar and the A/C Facility, in addition to Depot A. System upgrades included an Energy Monitoring and Control System and an Evaporative Cooling System. The District also installed a sanitary sewer. New construction included a Logistical Material Processing Facility, a Weapons System Component Plate Shop, a Logistic Material Facility, and a Non-Destructive Inspection Facility. The latter facility was an innovation. Prior to the construction of the facility, airplanes had to be dismantled to detect erosion. The Non-Destructive Inspection Facility comprised an x-ray bay and the use of nuclear radioactive material to inspect aircraft. It presented many design challenges requiring the proper thickness of concrete among other things.

The work that the District performed at McClellan AFB was often complex and challenging and pointed to the high demands of the Air Force on the District. While most of the working relationship with the Air Force was productive, friction did exist. Long-time Air Force Section Project Manager

Flight Instrument Testing Facility, McClellan AFB, CA - Circa 1990

Milton Lovelace explained the underlying cause for the friction. "To some degree, the Air Force personnel harbored some resentment at not being able to perform their design and construction and therefore, some friction did exist between the Sacramento District and the AFRCE."[15] The Air Force's numerous changes in design criteria coupled with an unfavorable bidding climate throughout most of the District in the late 1970's inevitably hampered the progress of the work.[16]

California Air Force Bases: Beale AFB

Originally an army installation consisting of a bombing and gunnery range, the Air Force took over the facility and renamed the range Beale AFB in April 1951. Since 1976, Beale AFB has been the home of the U-2 and has supported many missions and six different wings. In June 1975, Beale AFB became the site for a new missile warning squadron. The Sacramento District has had a long history of supporting Beale AFB from the rebuilding of runways to handle the B52 bombers to designing and constructing support facilities in 1977 completing the work 6 months ahead of schedule in 1979.

The Sacramento District completed a bachelor-enlisted dormitory at a cost of $3,939,187 and dining facilities at a cost of $2,394,273 at Beale AFB in 1978. The Sea-launched Ballistic Missiles (SLBM) Program that is a part of the Air Force Space Command Radar system was another important project that the District supported. The District completed work on the radar as well as facilities for the radar system. The SLBM program provides warning and attack assessment of missiles and is a vital link to the Air Force's space surveillance network. Beale AFB is one of four Air Force installations where the Air Force Space Command Radar System is housed. Between 1976 and 1980, the District completed four projects: two of the projects were for facilities' support totaling $5,678,647, and two of the projects were for support of the radar system totaling $6,111,804. The work at Beale AFB during this period from 1976 to 1980 was worth a total of $18,123,911.

Additionally, work at Beale involved constructing a new air tower. In 2001, the Sacramento District was commissioned by the Air Combat Command

(ACC) to construct a pour in-place site tower much like previous ones constructed at Altus AFB in Oregon and Tyndall AFB in Florida. The design for the pour in-place structure consisted of an enormous amount of concrete with a braced-steel frame.

Mr. John Neumyer of the Military Design Section in the Sacramento District was the main designer on the project, which at that time coincided with the construction of a major hotel across the street from the District office in downtown Sacramento. Neumyer happened to be looking out the 10th floor window to see something interesting. The hotel was being constructed using large panels, which were essential being placed together to create the outer shell of the building. Neumyer's curiosity got the best of him and he went over to the construction trailer to inquire about the panels and soon learned that the walls were glass fiber reinforced concrete (GFRC). Neumyer contacted the local representative at the facility where GFRC is processed. He among other members of the design team took a tour of the facility to see how these GFRC panels were created. The project-specific panels were created using a rubberized model, which was then textured with rough split-faced rock. Next, the color and texture was sprayed onto the rubber model. For strength, fiber was then added making the total width of 5/8 inches thick and a light steel frame is bolted onto each panel. The end product is easy to work with and much lighter then the traditional cast-in-place concrete walls.

Neumyer took this technology and incorporated it into the design of the tower saving both time and money. The base of the tower was bolted to the bedrock and the panels were then bolted together making the exoskeleton of the tower, which consisted of 13 floors with a total square footage of 9,676. To save time, the cab of the tower was constructed on the ground with lifting points. The untraditional glass within the cab was sloped at 45-degrees with an 85-degree viewing capability for the U-2 flyovers. The total time to construct this project took less then 16 months. The Beale Tower was a shining star for the District and the innovative design won the District the ACC Concept Design Award of 2002.

Mather Air Force Base

The Sacramento District enjoyed a long relationship with Mather AFB. Originally established as an airfield and pilot training school in 1918, Mather AFB from 1958 to 1989 was a Strategic Air Command Center with a B-52 squadron. The Sacramento District supported Mather's housing, training, and commercial facilities in addition to support for a Weapons Systems. In 1978, the Air Force awarded the District a contract to improve a weapons system at a cost of $1,673,345. Other facilities completed included a maintenance shop complex, a squadron operations facility and an operation training facility at a total cost of $3,952,708. In 1978, the Air Force awarded the District a contract to complete a base personnel office at a cost of $2,426,000. Living quarters renovated included a dormitory and a bachelor enlisted quarters for a total cost of $5,351,556.

The Space Transportation System: Introduction

Different from the "brick and mortar" repetitive type design structures found in the usual District military projects like the replacement of World War II barracks or the rehabilitation of existing structures, the Space Transportation System, the Air Force's version of the shuttle at Vandenberg AFB, was a unique, state of the art, high technology program that occupied the Sacramento District from 1974 when an Air Force task force decided on its location to the completion of the facilities in 1985.

The Sacramento and Los Angeles Districts shared approximately half of the Space Transportation System's program budget of approximately $200 million.[17] The Sacramento District designed the ground support facilities and the Los Angeles District constructed them. The Sacramento District contracted the majority of the design work out to architect– engineering firms but the District designed a percentage of the work "in-house," The Sacramento District completed the design part of this challenging and unique program within the need dates of the Air Force. If the shuttle had been launched as scheduled in October 1985, there would have been no delays

Space Launch Complex, Vandenberg AFB, CA

attributable to the Sacramento District's design or Los Angeles District's construction work.[18]

Background

After conducting a number of classified studies in the mid-1960's, the Air Force determined that a partially reusable vehicle with a large drop tank that returned the engines and avionics of the vehicle for reuse was most feasible for its Space Transportation Program (STS). The STS would support projected large military space stations, conduct manned military reconnaissance and strike missions, and reduce the cost of launching military payloads. Subsequent to these studies, the Nixon administration said that there would not be a space shuttle unless the National Aeronautics and Space Administration (NASA) trimmed its budget and sought the cooperation of the U.S. Air Force to participate in the STS program.

Vandenberg AFB

Vandenberg AFB is approximately 150 miles northwest of Los Angeles. In the late 1970's, Vandenberg AFB was remote and not easily accessible, requiring a significant amount of commute time. In addition, housing was a problem, and overall it was difficult to convince construction personnel to relocate to such a remote area.

The STS launch facility was originally built for the Manned Orbiting Laboratory program (MOL) also called Space Launch Complex 6. Construction work for MOL began at Space Launch Complex 6 (SLC-6) in March 1966. The launch facility consisted of a mobile service tower, a concrete launch pad, and a flame duct and launch control center. Three years later, in June 1969, the project was canceled, the victim of cost overruns, completion delays, and emerging new technologies.

In 1971, the Air Force selected Vandenberg as a launch site because its location provided for near-

polar and retrograde azimuth launches not feasible at Kennedy Space Center in Florida. As opposed to Kennedy Space Center, Vandenberg's location with its latitude in the Western Hemisphere meant that for military defense, a shuttle could be launched and in less than two minutes be above the Soviet Union. Edwards AFB provided an emergency runway for landing of the shuttle. The Sacramento District used a copycat design version of the mate and demate facility at Edwards for Vandenberg.[19] Chief of Military Design Lou Santin described Vandenberg in the 1970's seventies as follows:

> *Vandenberg had already been devoted to launching missiles for both research and military purposes. The Air Force could launch from Vandenberg out into the far west Pacific for missile testing. It had a runway, but the runway at that time was perhaps 8,000 feet, relatively short. Basically, Vandenberg was a sleepy installation as far as airplanes were concerned. Nothing much was based there but it was the Air Force's main launch complex.*[20]

In 1974, the Air Force established a special task force to evaluate options of possible launch sites at Vandenberg. After a cost analysis revealed that more than $100 million could be saved using the existing MOL site as opposed to building a new one, the Air Force obtained approval in 1975 for the program. The STS program was under the auspices of the Department of Defense (DOD) with the Space and Missile Systems Organization (SAMSO) of the Air Force acting as the executive agent. In spite of the cost analysis, the reality was that the design and construction turned out to be partly new construction and quite a bit of remodeling which became expensive because of unknowns.

> *Unfortunately, remodeling consisted of totally removing the SLC-6. The SLC-6 required one basic tunnel for the rocket flame to go into for launch whereas the new space shuttle required three tunnels. So all of that concrete for the original SLC-6 – in some cases 15 feet thick – had to be totally removed, as well as all of the power structure.*[21]

The Sacramento District began design work on the STS system in 1977, including the extension and strengthening of the existing runway to 15,000 feet, with a 1,000-foot overrun at each end, the facilities for mating and demating the orbiter from the Boeing 747 aircraft, the tow route for the STS transport from Palmdale, California, to Vandenberg AFB as well as utilities. There were a number of road changes that had to be modified, vehicles had to be brought into Vandenberg and over to the tower among other things. The original intent was that the space shuttle would be recovered at Vandenberg in the same way as it was recovered at Kennedy now, or Edwards AFB.

The STS included an orbiter, the vehicle for transporting the crew and payload; two solid rocket boosters, as well as an external fuel tank. Additional in-house design plans for ground support facilities amounted to $4 million. In 1977, a STS Design Project Office was set up as an adjunct to the Executive Office with Lieutenant Colonel William T. Kirkpatrick as head at the Worldway Postal Center in Los Angeles. The Corps decided that a representative from the Army rather than the civilian staff should be the eyes and ears of the Corps in the Air Force's El Segundo office.

The location of the majority of the ground support facilities for STS were located in South Vandenberg including the Launch Control Center, Payload Preparation Room, Payload Change out Room, Shuttle Assembly Building, Access Tower, Launch Mount, Mobile Service Tower and the three exhaust ducts. Also located in south Vandenberg are the Solid Rocket Booster Refurbishment and Sub-assembly Facility, the External Tank Checkout and Storage facility and a harbor where external tanks were received.[22]

By 1979, when construction began on the STS program, Sacramento District's design responsibilities included 16 separate projects. The Air Force's completion date for the design was spring of 1980. All of the designs were being worked on and approaching design completion. SAMSO had design responsibility for the Launch Facility Complex. SAMSO was extremely anxious to proceed with construction of the projects, but the District anticipated numerous problems during construction because (1) portions

of the design were incomplete and (2) SAMSO had notified the District of pending anticipated changes requiring construction contract modification.[23]

Given Vandenberg's terrain and existing facilities, the approach to vehicle assembly required the "integrate-on-pad" concept. The "integrate-on-pad" concept required the transport of the space shuttle vehicle components piece by piece to the SLC-6 for assembly on a stationary launch mount. Two huge mobile structures would be joined to enclose the mount, providing a protective shelter during assembly. The two buildings remained in their protective positions until the launch countdown cued them to move to their pre-launch positions. Also a majority of the payloads were installed as the shuttle rests on the launch mount, using another mobile structure.[24]

These requirements posed special design solutions. Since the launch mound was fixed, the District designed, according to Special Projects Section Chief Andy Schildt, "the largest (height and magnitude) movable-on-rails buildings in the United States in the early 1980's." The shuttle would come in horizontally on a trailer but had to be lifted into a vertical position. The District had to come up with a concept of how to lift the shuttle into place and subsequently onto the launch mount. While the process of conducting various studies with several architect engineering firms, the District discovered the "two-hook concept." This concept as it was known, entailed one bridge crane each in two buildings with both buildings movable and joined so that the shuttle could be lifted into the vertical position. There was also a third movable building that could pass through the first building housing the payload.[25]

On January 31, 1980, the District received bids for the second package of the Launch Facilities Complex. All bids exceeded the government's estimate. After the District's analysis of the bids and the government's estimate and a discussion of the differences with the Air Force, the architect-engineer firms, and the low bidder, the Air Force accepted the results of the analysis and the Air Force Space Division sought resolution of the cost overrun. The third package of the Launch Facilities Complex neared completion, and the District advertised package four – the Launch Control Center of the Launch Facilities Complex.[26]

Space Shuttle Liftoff

After discussions between NASA and the Air Force, the Air Force realized that the shuttle needed to be sheltered during its assembly. The Air Force added the Shuttle Assembly Building (SAB) to the SLC-6 plan in 1981and assigned it to the Sacramento District for design. The SAB provided additional lifting capacity and weather protection. It was a large empty shell with a huge garage-like door at one end and a 125-ton overhead crane.

Organizationally, the Sacramento District in November 1981 created the Special Projects Section to handle programs with different contract methods, research and development rather than the standard military construction projects. This section was responsible for state of the art high technology such as the STS Program, MX Missile Testing Program, as well as medical buildings such as hospitals.[27] There were 13 major STS project systems assigned to the Sacramento District, broken down into subprojects or stand-alone projects for construction. The following table lists the various subprojects:

Subprojects of the STS Systems[28]	
Project Number	**Project Name**
	Orbiter Processing
V 17	Landing (Corps)
V - 18	Mate/Demate Facility (AF and Corps)
V 19	Orbiter Maintenance and Checkout Facility (Corps)
V 27	Flight Crew Systems Facility (Corps)
V 80	Transportation (Corps)
	Launch Complex
V 23	Launch Complex (AF)
V 28	Launch Control Center (AF)
	Solid Rocket Booster Processing
V - 31	SRB Refurbishment and Subassembly Facility (Corps)
V 32	SRB Retrieval and Disassembly Facility (AF)
	External Tank
V 33	External Tank Processing and Storage Facility (Corps)
	Dock (Corps)
	Support
V - 81	Communications (AF)
V - 86	Utilities (Corps)
V - 88	Logistics (Corps)

One of the major problems that arose in this state-of-the-art, high technology program was the number of Air Force criteria changes. District Commander Paul F. Kavanaugh (1979-1982) pointed out the problem as follows:

> *It has become obvious that original programming of these special facilities did not allow enough contingency for the grey areas of technical criteria. This has caused serious funding problems for the V-19/V-21 project and also for the V-23 Launch Facilities which have undergone many changes and reprogramming actions. We are concerned that this history will be repeated with the Shuttle Assembly Building (SAB) for which we are already experiencing escalation of [costs] during design because of inadequacies of original programming. These special high technology projects must be authorized with sufficient contingency funding to allow for the development of the "state-of-the-art" during design and construction. Otherwise, we will be continually faced with the need to either terminate projects or get multiple reprogramming approved by Congress.*[29]

The V-19 project consisted of a modification of an existing four- story building that had working platforms that needed to fold down around the shuttle. The Air Force's lack of definition of where these platforms needed to go in the design documents posed problems.[30] Essentially, it became much easier to construct new facilities than to modify existing ones

since many unknowns came up in the rehabilitation process. Kavanaugh pointed out that the Air Force needed to program more money for unforeseen situations and that presently there was not enough money programmed for contingencies.

Because of these problems and escalating costs, members of the House Appropriations Committee Investigation Team visited the Sacramento District in late January and again in early February 1982 to discuss the District's involvement in the STS Program at Vandenberg AFB. At the team's request, the District furnished data regarding design schedules for the Shuttle Assembly Building and the V-19 Orbiter Maintenance and Checkout Facility. The team also asked the District to provide data on all the STS projects regarding number and cost of design and construction change orders, amount of lost design effort, slippage due to changes during design, and A-E liability for design errors. The Sacramento District's responses satisfied the team.[31]

As construction neared completion, ground support equipment was installed and thoroughly tested so that it would be ready to support the first launch in October 1985. The facility would allow a maximum of 10 launches per year with an average of four beginning in 1985.[32] Chief of Special Projects Section Andreas Schildt assembled a top-notch group of dedicated Sacramento District personnel to work on the project. They included Johnnie Mack, Richard Vasquez, Thomas Rudd, Bruce Briggs, Major William Ryan, Larry Frierman, Les Turnbeaugh, and Richard Dabrowiak all working under the supervision of Lou Santin, Chief of the Military Design Branch.

On May 13, 1984, a charter bus departed from the District's offices at 650 Capitol Mall, with a contingency of Sacramento District engineers who worked on the shuttle, and their wives for the dedication ceremony. The ceremonies included a lunch, dinner, and tour of the tower and other facilities. Undersecretary of the Air Force, Edward Aldridge, Jr., presided over the dedication.

The Air Force declared the STS as operational, but requested additional work and testing before any launches would take place. After the Challenger accident and explosion on January 28, 1986, where seven crewmembers lost their lives, the Air Force extricated itself from the shuttle program. The Air Force placed the STS Program at Vandenberg into minimum caretaker status. By May 1988, Air Force Secretary Edward C. Aldridge, Jr., directed the Air Force to mothball the space shuttle assets at Vandenberg AFB by September 30, 1989.

Vandenberg was a chapter in the development of the operation of America's space program. The Air Force paid for the construction of the Launch Complex for the STS Shuttle taking a small load off NASA's budget. Assistant Chief of Engineering Richard Vasquez pointed out the irony of the whole process as follows:

> *The irony was that we built upon a facility, the SLC-6 that was never used, a much greater facility, of a magnitude of maybe fifty, that was never used either. It would be like building a baseball diamond and never using it, tearing it apart, building another baseball diamond, and never playing a game there.*[33]

In spite of the facility never having been used, Sacramento District Commander Arthur Williams underscored the important role that the Corps played in completing their part of the work on schedule.

> *During my 3 years, I have seen the designs for the Space Transportation System transformed from criteria to concept plans to designs to reality. The Corps, at large, should take justifiable pride in the fact that this unique program was accomplished within the need dates of the Air Force, and that had the launch been retained on its original schedule, there would have been no delays because of the design and construction efforts of the Corps of Engineers!*[34]

The MX Missile Program

After the Soviet launch of Sputnik in 1960, the military space program escalated. At the same time over the next 11 years, the Soviets developed and fielded nearly 1,500 intercontinental ballistic missiles with nuclear warheads. In addition to fixed mis-

siles for retaliation, the Soviets developed mobile missiles that consisted of wheeled-vehicle and railway launchers to be used as deterrent weapons. In response to the Soviet ballistic missile threat, President Jimmy Carter's plan was to develop a missile system so that if the United States were to be attacked, there would be no more than one or two missiles that were vulnerable. The rest of them would be in mobile shelters. The Carter administration envisioned those multiple protective shelters where a missile could be moved. There would be more shelters for storage and hiding places than there would be missiles. The idea envisioned was that in the arms race, you could beat the odds of multiple warheads by having all these different targets that the Soviets would have to target, and that we'd have missiles that could move around on trucks or railroad, and you'd never know where the missiles were going to be at any given point in time.[35]

The MX shelter concept was an adaptation of the shell game.[36] The Carter administration approved the program in 1979, but earlier studies began in 1977. The Sacramento District designed some of the initial facilities, but they were never constructed. The MX Program lasted from 1977 to 1982, a short-lived history that ended when the Reagan administration cancelled the program in 1982. President Reagan did not agree with President's Carter's concept, and eventually, the MX Missile Program was replaced with the Star Wars Strategic Defense Program.

Background

The concept of the MX Program involved the placement of approximately 200 intercontinental ballistic missiles somewhere under 4,600 shells. Each of the 200 missiles would be located in a separate oval cluster with 23 shelters or shells in which it could be placed by a transporter-erector-launcher (TEL). Each TEL would be covered by a shield to prevent spy satellites from detecting whether it was carrying a missile or a dummy load. Each of the 200 missile clusters would have approximately 10 to 15 miles of roadway. All of the 4,600 nuclear-blast proof shelters will be reinforced concrete tubes 205 feet long, 20 feet in diameter, and have a 2-foot thick walls requiring approximately 6.6 million yards of concrete for construction of the shelters.[37]

In November 1977, the Sacramento District's Real Estate Branch participated in the Air Force's nationwide screening study to determine what areas were best suited as sites for the proposed MX Program. The Sacramento District's area was known as the "Great Basin" Candidate Sitting Province lying principally in southeastern Nevada, but extending slightly into southwestern Utah.[38] The area in Nevada consisted of a series of north to south running mountain ridges with valleys in between that were relatively well protected and in a very remote area. The Sacramento District would have had to build facilities virtually from scratch.[39] Two of four potential sites for the Air Force MX Missile System were the Great Basin, comprising approximately 10,000 square miles that the Air Force assigned to the Sacramento District, and the Sonoran area compromising 6,000 square miles to the Los Angeles District.[40] The Air Force did not furnish funds for the required work until February 1978 and the District completed the report in 1978. The Bureau of Land Management administered most of the land where the MX Program facilities would have been built.

In addition to real estate screening, the Sacramento District participated in additional studies for the MX Missile Program including a management plan, a prototype test facility, and cost estimating. Work on the management plan involved several agencies including the Los Angeles District, the South Pacific Division, the Waterways Experiment Station in Vicksburg, Mississippi, the Huntsville Division, and the Missouri River Division of the U.S. Army Corps of Engineers. This group worked on a management plan for the Corps' role in the design and construction of MX Missile facilities. The group evaluated three management options for the design and construction of the MX Program. One option included using an existing division to do all of the work. The second option involved using an existing division as a lead agency that would apportion the work to other divisions, and the third option was to form a new division. The group chose the second option.

The Sacramento District began coordination with the South Pacific Division and the Air Force for the implementation of a Management Information System (MIS) and Program-Oriented Guide Specifications for the MX Program. The District also participated in an experimental program to utilize and

help develop a modified AMPORS reporting system beginning in November 1980 since the new MIS would not be operational for some time.

The Sacramento District's Military Design Branch took on the responsibility of designing a prototype test facility for the MX Missile facility at Vandenberg AFB. The design, at a cost of $100 million, included missile assembly and component test facilities, launch sties, and shelters.

As was customary when the South Pacific Division had a large program like the MX Missile Program, the Space Transportation System Programs, or the Area Oriented Distribution Centers, it took a much more proactive role in management. Nominally, the South Pacific Division ran the design component of the MX Missile Program. The Corps' Ballistic Missile Construction Office (CEBMCO) was the division office setup for the MX Missile Program.[41]

Cost estimating for the project began in 1979. Chief of Estimating Section Andrew Abrate during the MX Program along with Walter Reuter, the former chief of the Estimating Section, led the team consisting of the Los Angeles and Kansas City Districts and the Office of the Chief of Engineers. Their estimate was that the MX Program would ultimately cost approximately $30 billion requiring a non-Federal workforce of 30,000. The costs consisted of $10 billion alone for construction. The design of the MX Program was scheduled to begin in 1980, with the program scheduled for completion in 1989. The project would require the construction of 2,000 miles of railroad, and approximately 8,000 miles of road.

The Sacramento District management of the MX Missile Program design showed the ingenuity and foresight of the District in avoiding sudden hiring of new employees for a program and subsequently having to institute a tremendous reduction in forces as a result of the program's end. The MX Missile Program, in the Sacramento District's perspective, for all practical purposes was a "paper program." The District organized it quickly on paper, setting it up as a branch. There were no grade changes, and the nucleus of the staff was drawn from a core of individuals from the military program. There was heavy pressure from the Office of the Chief of Engineers, the South Pacific Division, and the Air Force to hire a number of people quickly. As former Chief of the Military Design Branch Lou Santin recalls, "the Sacramento District's many years of experience in dealing with Congress and the District's intuition that the program didn't seem as if it would ever get off the ground, signaled a red flag."[42]

As a result, the District proceeded cautiously in hiring new staff for the project. In case of the need to fire personnel, longevity and veterans preferences would have to be taken into consideration. "The District did not move as swiftly as the Air Force, the Chief of Engineers, and the South Pacific Division would have liked" recalls Santin. "Our response to the question: why are you not hiring? would be 'we're working on it.'" The hiring of new staff for the program was not to be taken lightly since it would have involved 60 to 100 staff, many them from within the Corps and many from outside if the Sacramento District had staffed up as directed by the Division. The new staff would be primarily involved with project management, and interfacing with outside architect-engineers firms and managing more than a hundred design contracts at one time.

The skeleton MX Branch was set up in the Engineering Division. Former Sacramento engineer Charles Luethy served as Acting MX Design Chief. There were no grade changes. Since the program required experienced staff, this core of individuals came mostly from the Military Design Branch. While the MX Program's management began as a branch, the intent was for it to eventually become a Division that would have been on par with the Engineering Division but it never materialized. The Sacramento District developed a plan whereby most of the core staff was shared between Military Design and the new MX Branch. They worked in the MX Branch officially but in the Military Design Branch unofficially. The District continued sharing the core staff. This sharing required counseling for the core staff and an explanation of what was being done. The District developed this plan so that if the MX Program actually died, none of the people who were involved would be at risk of losing their jobs because they never really left their jobs.

To assist the District workforce in acquiring a thorough understanding of the MX Program and its

effect on existing District organizations, the District initiated a continuing publicity campaign. More than 300 District employees were briefed on the MX Program. The District scheduled additional briefings as significant program changes occurred.[43]

Former Chief of Engineering Division George Weddell assigned Charles Luethy to head up the MX Branch. Luethy, Santin, Weddell, and others attended the classified meeting in Washington DC. "Listening to the discussions that were taking place with the various proposals advanced for the program seemed incredulous or something out of a science fiction novel" recalls Santin. The main contention was that the MX Program required too many dollars in one place with an unrealistic schedule.

The Roads and Utilities Project, the integrated Test Facility, Missile Assembly Building, and the Mechanical Maintenance Facility were the MX projects at Vandenberg. In October 1979, the design of the MX Program at Vandenberg AFB progressed well. The first of the four projects which the Air Force hoped to advance to the FY-80 program was ready for announcement for construction in December, with the remaining projects ready for advertising in the early spring of 1980. The District experienced some difficulties with the Roads and Utilities Project because of lack of definitive criteria regarding the missile transporter vehicle, and necessary interfaces with the STS Program projects. The Air Force and the District resolved the problems, and advertisements proceeded in the spring of 1980. The Sacramento District held a conference with the Los Angeles District's Construction Division attended by the South Pacific Division and SAMSO to coordinate construction schedules and other details necessary for preparation of the special provisions for both the STS and MX Programs at Vandenberg AFB.[44]

In early 1981, the MX test facilities at Vandenberg AFB continued on schedule with construction contracts for the Stage Processing Facility and the Stage IV Integrated Checkout Facility awarded. Bids were opened for eight Storage and Rail Transfer facilities, the Test Pads, and the Payload Assembly Building contracts with awards for them scheduled for March 1981.[45]

In February 1981, due to a hiring freeze and delays in obtaining approval to initial design, the District still had not increased its MX staff. The District explained its actions to the South Pacific Division as follows: "...we expect little difficulty in achieving a full strength posture upon notification to proceed with a full design program and receipt of Office of Chief of Engineers approval of our MSX Design Division organization."[46]

By June 1981, the MX design staff attempted to obtain additional office space near the Sacramento District's headquarters (the John E. Moss Building). The Sacramento District space situation was critical at the time. The District was bursting at the seams at 650 Capitol Mall, and the Federal courts that also occupied the building were putting additional pressures on the District for space. To solve the problem, District architect Gordon Perault of the MX Design Section designed a 30,000 square feet modular building complex at Mather Air Force Base. The complex consisted of four modular buildings that could be subsequently moved to another location. The buildings would then be moved to the MX construction sites and used as resident offices.

Since the District still had not hired additional people, it showed it was making progress by creating a space for all the projected new hires.[47] With the consent of the Air Force, the District picked Mather AFB as the site of the new MX Program office.[48] It was a very nice pre-fabricated building type that the District purchased and constructed in a very short time. The dozen or so staff that worked there had relatively palatial surroundings because the building was originally designed for a hundred. Since Perault, also nicknamed "Scotty," had taken such an active role in securing the building, it quickly became known in the District as "Scotty's Castle."

By July 1981, the MX design activities, which continued to be managed by the South Pacific Division, would slow down due to the Secretary of the Air Force's edict to not award new design contracts or exercise options on existing design contracts. It now appeared likely that until the Reagan administration made a decision on the system-basing mode, design contracts continued to be held in abeyance.[49]

In October 1981, President Reagan made the decision to cancel President Jimmy Carter's MX shell game. The MX Program was abolished. Instead, the Reagan administration embarked on a first-strike strategic nuclear policy.

The MX Program demonstrates that the Sacramento District has and continues to be an organization that places its staff and engineers first. By organizing a program by transferring workers from the Military Design Branch, the District was able to satisfy the demands of the program until its eventual end.

Endnotes

[1] Interview Willie Collins with Richard Vasquez, January 23, 2002.
[2] Interview Willie Collins with Lou Santin, January 23, 2002.
[3] Joseph Hagwood, Jr., *Commitment to Excellence: A History of the Sacramento District, US Army Corps of Engineers, 1929-1973*, 1976, p. 106.
[4] http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=DE&pagename=history.
[5] U.S. Army Corps of Engineers, Sacramento District, "Historical Manpower Authorizations," 1977.
[6] Interview Willie Collins with Lou Santin, July 12, 2002.
[7] U.S. Army Corps of Engineers, Sacramento District, "Sacramento District marks 50 years of Service," *Public Affairs Report*, November 16, 1979, p. 5.
[8] U.S. Army Corps of Engineers, Sacramento District, "Public Activities of the Corps of Engineers," Brochure, 1973.
[9] Interview Lee Pendergrass with George Weddell, June 12, 1989.
[10] U.S. Army Corps of Engineers, Sacramento District, Periodic Letter from Donald O'Shei to Brigadier General Richard M. Connell, October 28, 1977.
[11] U.S. Army Corps of Engineers, Sacramento District, *Public Affairs Report*, March 17, 1978.
[12] U.S. Army Corps of Engineers, Sacramento District, Utah Resident Office, Contract Documents, August 5, 2002.
[13] Interview Willie Collins with Dick Hill, September 3, 2002.
[14] Interview Willie Collins with Lou Santin, July 12, 2002.
[15] Interview Willie Collins with Milton Lovelace, September 5, 2002.
[16] U.S. Army Corps of Engineers, Periodic Letter from District Engineer Donald M. O'Shei to South Pacific Division Chief Colonel William E. Vandenberg, February 27, 1978, p. 2.
[17] U.S. Army Corps of Engineers, Sacramento District, Information Bulletin, January 14, 1977, p. 1.
[18] Periodic Letter from Arthur E. Williams to Commander, South Pacific Division, June 13, 1985.
[19] Interview Willie Collins with George Weddell, July 26, 2002.
[20] Interview Willie Collins with Lou Santin and Dick Vasquez, January 23, 2002.
[21] *Ibid.*
[22] U.S. Air Force, Vandenberg Space Shuttle Launch Complex, Fact Sheet, January 1984, p. 2.
[23] Periodic Letter from Paul F. Kavanaugh to Brigadier General N.G. Delbridge, Jr., February 29, 1980.
[24] *Ibid.*
[25] Interview Willie Collins with Andrew Shildt, n.d.
[26] Periodic Letter from Paul F. Kavanaugh to Brigadier General N.G. Delbridge, Jr., February 29, 1980.
[27] U.S. Army Corps of Engineers, Sacramento District, "Engineering's Schildt Saluted for Vandenberg AFB Project," in *PAR*, September 1984, p. 22.
[28] U.S. Army Corps of Engineers, Sacramento District, Fact Sheet, STSLC Resident Office, January 1984.
[29] Periodic Letter from Homer Johnstone, Brigadier General, to Lieutenant General Joseph K. Bratton, July 29, 1982.
[30] Interview Willie Collins with Andy Schildt, August 26, 2002.
[31] Periodic Letter from Lieutenant General Joseph K. Bratton to Brigadier General Homer Johnstone, July 2, 1982.
[32] U.S. Air Force, Vandenberg Space Shuttle Launch Complex, Fact Sheet, January 1984, p. 2.
[33] Interview Willie Collins with Lou Santin and Dick Vasquez, January 23, 2002.
[34] Periodic Letter from Arthur E. Williams to Commander, South Pacific Division, June 13, 1985.
[35] Interview Willie Collins with Brian Doyle, January 23, 2002.
[36] The "shell game," officially referred to as the "hedge" policy, which would allow the U.S. to quickly ramp up its nuclear forces back to Cold War levels.
[37] U.S. Army Corps of Engineers, Sacramento District, "Corps May Build Missile X sites..." in *Public Affairs Report*, October 9, 1979, p. 1.
[38] U.S. Army Corps of Engineers, Sacramento District, Periodic Letter from Donald O'Shei to South Pacific Division Engineer Colonel William E. Vandenberg, February 27, 1978.
[39] Interview Willie Collins with Richard Vasquez and Lou Santin, January 23, 2002.
[40] U.S. Army Corps of Engineers, Sacramento District, Periodic Letter from South Pacific Division William E. Vandenberg to Chief of Engineers Lieutenant General John W. Morris, March 15, 1978.

[41] Interview Willie Collins with Brian Doyle, January 23, 2002.
[42] Interview Willie Collins with Richard Vasquez and Lou Santin, January 23, 2002.
[43]U.S. Army Corps of Engineers, Sacramento District, Periodic Letter from District Commander Paul F. Kavanaugh to South Pacific Division Brigadier General N.G. Delbridge, Jr., June 26, 1980, p. 12.
[44]U.S. Army Corps of Engineers, Sacramento District, Periodic Letter from District Commander Paul F. Kavanaugh to Brigadier General N.G. Delbridge, Jr., October 31, 1979.
[45]U.S. Army Corps of Engineers, Sacramento District, Periodic Letter from Acting District Commander Henry Lee to South Pacific Division Brigadier General Johnstone, February 27, 1981, p. 3.
[46]*Ibid.*
[47] Interview Willie Collins with Richard Vasquez and Lou Santin, January 23, 2002.
[48]U.S. Army Corps of Engineers, Sacramento District, "MX Design Plans Move to Mather AFB" in *Public Affairs Report*, June 1981.
[49]U.S. Army Corps of Engineers, Sacramento District, Periodic Letter from South Pacific Division Homer Johnstone to Chief of Engineers Lieutenant General Joseph K. Bratton, July 20, 1981.

Chapter 12

Sustaining the Army and Support for the Nation:

Sacramento District's Military Branch

The Corps of Engineers is the design and construction agent for the U.S. Army. The Sacramento District designs and constructs projects at more than 25 Army installations in California, Nevada, Utah, and Arizona. These projects are diverse and include family housing, hospitals, warehouses, runways, roadwork, maintenance facilities, medical and recreational facilities, and many basic maintenance and rehabilitation projects.

To support the Army's war fighting mission, the District builds facilities to maintain and repair tanks, helicopters, and training ranges. During the Vietnam and Korean conflicts, the District had the capability to build the facilities on an expedited basis.

California Army Projects

California as a state has always been a desirable area for military training because of favorable weather conditions. The Sacramento District has served a number of Army installations in California including Fort Ord, the Presidio of Monterey, Fort Irwin, Sierra Army Depot, the Presidio of San Francisco, Sacramento Army Depot, Sharpe Army Depot, Tracy Defense Depot, Oakland Army Base, Fort Hunter Liggett, Hamilton Army Airfield, Camp Roberts, and Camp Parks.

Fort Ord

Fort Ord has been one of the District's "bread and butter" installations, having consistently provided a great deal of work over the years. In 1975, the Army converted Fort Ord from a training base to the home of the 7th Infantry Division. With this came a number of changes and requirements for the facilities, especially the need for single soldier and family housing, as well as other living accommodations.

Retired Chief of Military Design Lou Santin recalled what this change meant for the District's Army military construction.

> *The change in mission at Fort Ord meant that the Army would bring a whole bunch of people into Fort Ord with their families – the sergeants and the corporals with all their children. Fort Ord did not have any family housing because there was only the cadre there and it was not required.*[1]

There were few permanently assigned junior enlisted soldiers to the garrison for the 7th Infantry Division. Compounding the problem was the facility's location on northern California's Monterey Peninsula with 28,000 acres of coastal terrain. Additionally, housing has been expensive in the Monterey Peninsula and out of reach for most junior enlisted personnel. There simply was not enough affordable housing for the needs of Fort Ord's soldiers, with a waiting list of more than 2,500, with many of them staff sergeants or below. The District quickly began work in 1975 to solve Fort Ord's chronic housing problem and the conversion of facilities to meet the Fort's new mission.

In civilian real estate, location is all-important, but when it comes to the military, the location also dictates different housing strategies. Head of the Sacramento District Real Estate Division Marvin Fisher recalled:

> *Our innovative leasing was a direct offshoot of where we were located and where these installations were. Innovative leasing works in high cost areas only. We, in California have had to avail ourselves of this strategy and as a result, real estate divisions in New York and Hawaii have looked at Sacramento District's real estate program for potential application to their areas.*[2]

By 1976, construction began to modernize 23 Korean War barracks, changing open bays into two-person rooms and renovating dining rooms, administrative facilities, and classrooms. In 1977, one of the projects that the District completed at Fort Ord was a $16 million, 22 building barracks complex for more than 1,000 soldiers. The Enlisted Men's Barracks Project comprised 50 percent of the District's Military Construction Army budget.

The District encountered some difficulties in resolving the floor plan for the dining facilities, and the cost estimate exceeded both the program and the statutory limitation for barracks by a considerable amount. The District's Value Engineering Program, along with design modifications, reduced the cost to resolve the problem.

In addition to the barracks, the District also completed a dining facility, a post exchange, a chapel, administration buildings, and four recreational rooms.[3] The District also completed military vehicle parking facilities for the barracks at a cost of $1,082,000 and parking facilities for privately owned vehicles in 1978 at a cost of $1,118,836.

From 1975 to 1983, the District built a total of 1,414 units of housing in three phases at a cost of more than $60 million. In 1977, the District began the first phase of housing; that is, a $11.7 million project to build 350 family housing units including apartments, townhouses, and homes for the Fort's two generals. Four homes were built for generals and senior officers at the Fort. This project completed in 1978, signaled a break from traditional military housing since the design was the same as houses in a civilian residential neighborhood. The houses had six floor plans, 22 building types, with each house having a garage and storage area.

The next two phases consisted of family housing. The family housing units used a "turnkey" system whereby the contractor's proposal for the work included the design, landscaping, and other amenities and upon completion, the contractor turned over the houses to the government ready for occupancy. First built were 560 units with solar water heating at a cost of $24,267,000. The third and final phase of family housing cost approximately $25 million and constituted 500 two-bedroom units for junior noncommissioned officers. The District completed another $15.8 million modernization project in 1979, including a face-lift for the exterior of the barracks, new windows, paint, and landscaping.[4]

Still, Fort Ord was in need of housing. In November 1984, Fort Ord's Director of Engineering and Housing Colonel Fred E. Meurer reviewed Fort Ord's critical housing problem with the District. The District's Engineering, Construction-Operations, Procurement and Supply Divisions, Real Estate, and the Office of Counsel departments all brainstormed to arrive at an expedient solution to the housing problem. Also, a Fort Ord Project Office opened.

One solution was to use leasing arrangements that the Corps had used for many years, which offered 60 undeveloped acres of land on the installation for a 20-year lease to a private developer to construct housing. After the circulation of a Request for Proposals, the Brostrom Park Organization proposed a unique community of manufactured housing. Under the leasing arrangement, the Army furnished the land and a connection fee to the installation's water and sewer systems. In exchange, the developer provided expertise, capital investment, management, and maintenance. Families could select from three different floor plans with two, three, and four bedrooms. RINC rented the houses in 1985 at $417 to $572 a month for eligible soldiers, which was an amount close to the military housing allowance. There was also a lease-to-own option to purchase the homes and upon relocation, the owner could take the homes with them, sublet them, or sell them back to the developer.

On May 3, 1985, groundbreaking ceremonies were held at the post and the project proceeded. Four months later, the first 50 residents moved into their new homes. The Army named the new housing community Private Leonard C. Brostrom Housing Area after Private Brostrom who fell in action during World War II. Six months later the developer completed Phase II, with 50 additional homes, and in another 4 months, the District completed the last 100 homes.

South Pacific Division Engineer Brig. Gen. Donald J. Palladino summed up the project as follows: "I can't think of a more innovative and intelligent use of the tax dollar or a more expeditious way of assisting our customer – the Fort Ord community – with its critical housing problem." The project's success was due to its filling an immediate need for housing at Fort Ord using existing Title 10 outleasing authority, as opposed to the traditional, more time-consuming Military Construction Appropriation (MCA) authority.

Former Assistant Chief of the Military Branch Dick Vasquez emphasizes the critical need for family housing and how the District responded:

> *While the District built medical facilities and barracks, the big demand was family housing. The District went through every kind of a gyration to build family housing, building beautiful places with gorgeous views of the Pacific Ocean. We used trailers, trailer camps, we placed trailer pads for those families who had trailers. We also ventured into pre-fabricated housing.*[5]

In addition to family housing, the District supported Fort Ord in designing and constructing a number of maintenance facilities. In 1977, the District completed a direct support maintenance facility, and in 1978 constructed the Tactical Air Command Headquarters, which is a command under the Air Force, at a cost of $5,386,325. The District also completed an aircraft hangar-parking project at a cost of $3,766,397. In 1979, the District completed an aircraft maintenance facility at a cost of $2,850,974.

The District also completed several medical facilities at Fort Ord. Two dental clinics were built, one in 1977 at a cost of $1,231,186 and one in 1980 at a cost of $1,596,841. The $3.5 million, 39,000-square-foot Troop Medical Clinic was a model for a new direction in military care facilities, using the principle of consolidation. Previous to this structure, several medical services were all housed in separate buildings. The Troop Medical Clinic placed the patient clinic, blood bank, preventive medicine wing, and community mental health center operations all under one roof. Three entities made the project a success: the Corps, Fort Ord, and the U.S. Surgeon General. The Surgeon General's staff, knowledgeable on the current complex and specialized medical technology, kept the Corps current so that innovative elements could be included in the design of the structure.

Another innovation at Fort Ord was the job order contracting system that was instituted in 1987. After testing the procedure for 15 months, it proved to be an outstanding success in time and cost to Fort Ord. The Army awarded more than 194 delivery orders totaling $9.6 million using this system.

When the Base Realignment and Closure Act passed in 1988, Fort Ord was declared a "Property In Excess." In September 1994, Fort Ord closed its gates. During its use as the 7th Infantry's home, the Sacramento District designed, constructed, and renovated many buildings, instituting progressive construction and providing an ideal physical plant for its troops.

Presidio of Monterey

In 1963, the Department of Defense established a joint-service Defense Language Institute (DLI) headquartered in Washington, D.C. The Presidio of Monterey became the DLI, West Coast Branch. The Presidio of Monterey, however, kept its name. In 1974, the DLI headquarters moved to the Presidio of Monterey, and in 1976 the DLI, West Coast Branch became the Defense Language Institute Foreign Language Center, the Defense Department's primary center for foreign language instruction.

For much of its history, DLI was primarily a tenant on the Presidio of Monterey. The Presidio itself was a subinstallation of the nearby Fort Ord. On October 1, 1994, this situation changed when Fort Ord closed, and the Presidio of Monterey became a separate installation again. Thus, the DLI became the DLI and Presidio of Monterey Annex.

In the early 1980's, a rise in student input forced the Institute to open two temporary branches: a branch for Air Force enlisted students of Russian at Lackland AFB, Texas (1981-1987), and another for Army enlisted students of Russian, German, Korean, and Spanish at the Presidio of San Francisco (1982-1988). The increase in student input also resulted in an extensive facilities expansion program at the Presidio of Monterey. Between 1982, when the DLI moved to the Presidio of San Francisco and then back to Fort Ord in 1988, the Sacramento District completed more than $34.9 million dollars in projects. Former Chief of Military Construction Ted Jones describes the extent of the facilities that were built:

Presidio of Monterey Dormitories

Literally over the last 5 or 6 years, with the Defense Language Institute, the District built almost a whole new school there. The facilities range from housing to a big recreation center and general instruction facilities. Of course the challenge to that was to sell all that development to the cities of Monterey and Pacific Grove and it was done. A lot of the scenic attributes of that area were saved.[6]

Fort Hunter Liggett

Approximately 86 miles south of old Fort Ord and 25 miles southwest of King City is Fort Hunter Liggett. Fort Hunter Liggett's mission was to maintain and allocate training areas, airspace, facilities, and ranges supporting reserve and active troop field maneuvers, live fire exercises, testing, and institutional training. The District established the Fort Hunter Liggett Project Office in 1983 and completed a Company Administration Building at a cost of $1,348,000, among other projects.

Presidio of San Francisco

The District managed the construction of new barracks at the Letterman Army Medical Center located at the Presidio of San Francisco. The barracks were named after Donald W. Evans and Thomas J. Kelly, two men who earned the Medal of Honor awards for their service in Vietnam and World War II, respectively. While the Army was still deciding Letterman's fate with base realignment and closure, Letterman was receiving patients and training future Army physicians.[7]

Fort Irwin

From 1972 to late 1979, the National Guard and reserve components occupied Fort Irwin as a training area. Fort Irwin is home to soldiers and family members assigned to the National Training Center, or NTC. Fort Irwin is located approximately 37 miles northeast of Barstow, California in the high Mojave Desert midway between Las Vegas, Nevada, and Los

Angeles, California. In 1978, the Sacramento District met with U.S. Army Forces Command, which is the Army component of the U.S. Joint Forces Command (FORSCOM), personnel and the Department of the Army to discuss the requirements for completing an Environmental Impact Statement (EIS) and a Master Plan for Fort Irwin to become the site for the National Training Center. Work on the EIS remained at a standstill for a while because inadequate information was available for its completion.[8] However, on August 9, 1979, the Department of the Army announced that Fort Irwin would become the site for the Center.

Fort Irwin was an ideal training center site since its physical plant encompassed over 1,000 square miles for maneuvers and ranges, an uncluttered electromagnetic spectrum, airspace restricted to military use, and isolation from densely populated areas. Fort Irwin was the place where tanks trained for warfare, including the M1 Abrams tanks and M2 Bradley fighting vehicles, as well as armored cavalry squadrons.

By January 1980, the District completed its selection of architecture and engineering firms for the bulk of the work for the rehabilitation of existing facilities and utilities throughout the installation. The District awarded contracts for the construction of 159 units of family housing rehabilitation, a defluoridation plant, and Phase I of the water and sanitary system.[9]

The Army activated the National Training Center on October 16, 1980, and Fort Irwin returned to active status on July 1, 1981.[10] Permanently assigned soldiers and their families arrived, and by September approximately 2,800 Army personnel were stationed at the Fort. With its activation, Fort Irwin required a great deal of building and renovation of its facilities, which became a major area of attention of the District's military construction program.

In order for the District to be responsive to the tight time constraints imposed for the reactivation, it was necessary to apply intensive management techniques.[11] For example, for urgent work, the District used "open-end" contracting. Ten months after beginning work, in October, the design and construction activities were on schedule, due to a large extent to the high level of communication between the Fort Irwin Facilities Engineer and the construction contractors.

The District had to build a new road into Fort Irwin at the beginning of its work on the facility. The road project was one of the most controversial because it should have been authorized not as a road project but as a drainage project because in the few instances when it rained in the area, the roadways were deluged with water. "Fort Irwin was a really God-forsaken place. There was a small installation there without an airfield. All of the projects were performed under very tight time constraints and difficult field conditions in a remote area," recalled Santin.

Work proceeded at a frantic pace with delays due to change orders and changes in scope, particularly on the defluoridation plant. The Sacramento District designed and built a reverse-osmosis plant to treat the contaminated water and a distribution system. The plant went into operation in April 1981.[12]

Work at Fort Irwin continued into Fiscal Years 1982-1984. The largest dollar-volume design work for military projects during Fiscal Year 1982 was at Fort Irwin. The District awarded contracts totaling $27.8 million for a barracks complex and tactical equipment maintenance shop, rehabilitation of miscellaneous buildings, and 200 units of manufactured housing, among other projects. For Fiscal Years 1984 and 1985, the District signed Sheet DD 1391 for a total of 21 projects.[13]

Following Congress' mandate for the military services to explore alternative construction methods, the Sacramento District in the early 1980's employed the "design-build" construction method which included both designing and constructing a facility under a single contract. The primary advantages included freedom to optimize design and construction methods, complete the facilities faster, work with a single contractor, and integrate the construction professionals into the facility design process.

In 1988-1989, the South Pacific Division requested the Sacramento District to complete a high quality large multi-phase/multi-year housing program for military families using the design-build concept.

The first Phase in Fiscal Year 1988 was for 270 units, and 263 units for officer, senior and junior noncommissioned Officer three and four bedroom homes. Upon completion, the project received accolades from FORSCOM and the Corps of Engineers for its esthetics and adherence to high standards.

In Fiscal Year 1992, the Sacramento District constructed 172 units that followed the prototype in community concept and quality housing with amenities such as jogging paths, large baseball/soccer fields, tot lots, major underground utilities, and the installment of drought tolerant landscaping, which had been accepted by many Army and Air Force facilities in desert climates.

Building continued and in Fiscal Year 1994, the Sacramento District began another major housing project again using the design build construction method. The project was a 220 military family housing community that provided junior and senior noncommissioned officer quarters including garages and supporting structures/facilities.

Sacramento District and Los Angeles District, in coordination with the U.S. Department of Energy and Southern California Edison, joined to build 22 high-tech, cost-effective, and environmentally friendly housing solutions to accommodate the heat of the Mojave Desert. The building system addressed energy conservation using sizeable amounts of solar shading for the hot summers while allowing winter solar access. The Sacramento District employed a closed loop geothermal water source heat pump system that transferred heat between a central water source and each dwelling unit for the cooling or heating of the living spaces. The Department of Defense awarded the project its coveted 1995 Showcase Award. The design-build construction method played an integral part in the District's construction of facilities at Fort Irwin. In addition to military family housing, other facilities included barracks, Weed Hospital, a Post Exchange, transportation facilities; an administration building, and a series of test range facilities.

Some projects like the "tank wash" seemed mundane, but turned out to be rather complex. To wash the tanks that were covered with dirt intermingled with grease and other lubricants, the tanks were driven into a cement-lined reservoir. When the tank came out of the pond-like reservoir, they were hit with a water cannon. The tank wash had to control pollution and recycle the water.

Fort Irwin was a significant project for the Sacramento District, consuming time and resources to complete a facility under very tight and demanding time constraints. The District successfully completed all of the projects, and Fort Irwin expanded to full operation with more than 8,000 soldiers, family members, and civilian employees who occupied the base.

Sierra Army Depot

Sierra Army Depot is located on 36,322 acres adjacent to Honey Lake in Lassen County, California, midway between Reno, Nevada, and Susanville, California. Since World War II, Sierra Army Depot has been an ammunition and combat equipment storage installation. Since the 1970's, Sierra Army Depot has been a site for the disposal and elimination of munitions. The installation has 1,192 structures; most are ammunition storage igloos and warehouses constructed during World War II.

During the 1970's, the Sacramento District rehabilitated the depot's obsolete housing and community facilities. The District built several one-story duplexes in 1975 and an additional 40 units of family housing. A medical facility also was built in 1975, replacing an inadequate World War II hospital complex. In 1976, the District constructed three barracks and an interdenominational Post Chapel Center. In 1977, the District completed three storage facilities: the Impro Ammo Storage Project (Phases I and II), and a Security Measures Weapon Storage Project (Phases I and II). In 1982, a Sierra Project Office opened under the auspices of the Sacramento Resident Office to serve the installation.

Sharpe Army Depot

Sharpe Army Depot is located on 720 acres approximately 10 miles south of Stockton and northeast of Lathrop, California. After June 1990, the installation has been operated by the Defense Logistics

Agency and has been known as the Defense Distribution Region West-Sharpe Depot. Sharpe has been used to receive, store, package, and ship Army supplies since its establishment in 1941. From the late 1940's through 1976, the Army also used Sharpe to maintain heavy equipment and aircraft and to store equipment for the Port of Stockton, an embarkation point. The depot performs extensive storage and distribution operations for supplies destined to installations in eight western states, Hawaii, Alaska, and the entire Pacific Ocean area.[14] The depot was a major supply center for troops in Southeast Asia during the Vietnam War.

In 1981, the Depot Systems Command (DESCOM) reevaluated the overall optimization/standardization program for its three Army Depots: Sharpe Army Depot, Red River Army Depot, and New Cumberland Army Depot. Accordingly, DESCOM decided to upgrade, modernize, and standardize the three depots. The U.S. Army Corps of Engineers assisted in this endeavor by designing, constructing, and delivering automated storage facilities at the three depots. The Commander of the South Pacific Division, Brigadier General Donald J. Palladino, served as the Executive Manager, with the Sacramento District designing all three depots and also constructing Sharpe.[15]

In comparison, the Baltimore and Fort Worth Districts depot's designs were much larger than Sharpe Army Depot. The Baltimore and Fort Worth Districts supervised the construction at their respective facilities. The New Cumberland Depot was 1.8 million square feet and the Red River Depot was 1.2 million square feet. This inter-division and partnership was not without its problems.

The New Cumberland Depot project caused some significant management problems resulting from a district in one division designing the project with a district in another division constructing the project.

Another significant problem was the computer software developed to drive all material handling systems and provide for operations, inventory, and upward reporting from all these depots into what they call a standard depot system that operates it all. It was not what the District had done in the past and management was still adapting to the changes.[16] A letter from South Pacific Division Commander Patrick J. Kelly stated:

> *The AOD [area oriented distribution] program is going to be a tough one to pull together. Over 50 percent of the program is software related and we have a customer (Depot Systems Command (DESCOM) that has an insatiable appetite for changes. I will be working hard to get this highly visible program under control.*[17]

Sharpe Army Depot was one of the most unique Army projects. Former Chief of the Engineering Division Brian Doyle remembers the program for its "firsts."

> *The Area Oriented Distribution Center at Sharpe Army Depot was a one-of-a-kind program. It represented one of our innovative contracting projects for the time in 1986. We used a cost-plus-type construction contract on it. We had an office set up at Sharpe Army Depot. Actually, the Division staffed people down there. Many were District people that were reassigned to this division office. We've never done that before the AOD.*[18]

The facility encompasses 851,208 square feet – a 771,908-square-foot building for the Distribution Center and a 79,208-square-foot building housing the Operations and Support Center – an area equivalent to 20 acres or 20 football fields. Sharpe was programmed for $49 million, plus $82.3 million for equipment, for a total of $131 million. Arguably, this project was the most expensive in the Sacramento District's history since the Los Angeles District awarded the budget for the Space Transportation System.[19] Another distinction was the Sacramento District formation of partnerships with the Baltimore and Fort Worth Districts outside of the South Pacific Division. The project was also unique in that it took 14 years from its initial inception to final construction in 1985.

The Sharpe Army Depot's design and construction was one of the Sacramento's most challenging, complex, and gratifying projects. The Austin Company of Irvine, California, received the design award for the three facilities in November 1981, and

the Sharpe Constructors received the construction award on December 6, 1985. The Unisys Corporation designed the equipment. Construction began in 1986 and the opening took place in September 1989.

In order to prepare the grounds for construction of the massive facility, the contractor pumped the ground water into the San Joaquin River via French Camp Slough. This became controversial because there were low levels of toxins in the water. This problem necessitated a $570,000 purification system that pumped water from contaminated wells into treatment tanks for purification, and then the toxins were pumped into the air in small amounts. To inform the public, Commanding Officer James W. McFarland at Sharpe sent a letter to the editor of the *San Joaquin County Bulletin* stating, "We have (the Army) spent more than $2.5 million in Army-initiated research, planning and construction of a water treatment facility. I hope these facts convince you we have not only been working diligently on the cleanup effort, but are truly concerned with you, our neighbors."[20]

The facility housed the latest in computer technology with sagacious software. The automated distribution facility integrated "state-of-the-art material handling systems, bar code control systems, robotics, and current distribution management control concepts."[21] The equipment's configuration was more complex than the building itself, and therefore required that the design of the building first conform to the equipment. Sharpe Army Depot was successful in modernizing depot operations and consolidating fragmented activities that had been stored in WWII barracks.

Between 1941 and 1975, maintenance of aircraft, vehicles, industrial equipment, and medical equipment resulted in the generation of a variety of chemical wastes produced on site. The Depot disposed of the waste in multiple locations, including the South Balloon Area, the Burning Pits Area, and the North Balloon Area. The wastes included sludge containing phenols, polychlorinated hydrocarbons, and used paints and solvents. Wastes had contaminated both soil and ground water. The Sharpe Army Depot participated in the Installation Restoration Program, a specially funded program established by the Department of Defense (DOD) in 1978 to identify, investigate, and control the migration of hazardous contaminants at military and other DOD facilities. (See Chapter 13 for more details on the District remediation efforts.)

Washington - Fort Lewis

Fort Lewis is an army post east of the Nisqually River in Pierce County, Washington. Established during World War I, Fort Lewis covers about 90,000 acres and is the Army's center of operations for the Pacific Northwest. Fort Lewis was re-designated Headquarters, 9th Infantry Division on April 21, 1972. After reactivation, the 9th Infantry Division was deeply involved in training for future conflicts. The Training Division was outfitted to be light so that it was capable of rapid deployment, but with the firepower and survivability of a heavy division. The change in mission necessitated new construction resulting in the Sacramento District performing more than $46 million worth of construction from 1977 to 1981.

The Sacramento District constructed a $19.5 million 18-building barracks complex in 1978, one of the largest military construction jobs in the District's history. The barracks consisted of six three-story buildings for approximately 1,500 troops, a dining facility, gymnasium, chapel, dispensary, post exchange, administration buildings, classrooms, and storage facilities.[22] The District completed improvements to quarters in 1977 amounting to $1,755,000. In the same year, the District completed another family housing improvement project for $1,407,787. Another project improving family housing in the amount of $3,448,589 was built in 1980.

Other projects followed such as the Tactical Equipment Shop at a cost of $2,254,706 and a new dental clinic at a cost of $1,322,000. In 1979, the District designed a sophisticated and complex Surgical and Obstetrical Suite at Madigan Hospital. Oversight agencies performed four reviews during the development of the final design, approving them all, albeit slowing the design schedules.[23]

Several projects enhanced the mechanical-electrical systems of the installation. In 1980, the District

Army Barracks, Military Housing, Ft. Lewis, WA - Circa 1997

completed an electrical distribution system at a cost of $2,584,900. In 1980, the District installed a pollution control system at a cost of $3,290,000. The District also replaced the heat distribution system, repaired the electrical system of the hospital, and completed the replacement of underground heating lines at a cost of $1,722,000.

Utah Army Projects

The Utah Resident Office had a good workload in the 1970's with a staff of 22 to cover three Army installations, which included Tooele Army Depot Dugway, and Fort Douglas. The Resident Office also provided basic maintenance and rehabilitation work and remodeling at the Army Reserve in Pleasant Grove, Utah. In addition, The District also constructed a new Reserve Center building at the U.S. Army Reserve Center in Twins Falls, Idaho in 1979 at a cost of $893,844.

Tooele Army Depot

In 1962, the Tooele Ordnance Depot located approximately 35 miles from Salt Lake City was redesignated the Tooele Army Depot. It had storage igloos, above-ground magazines, warehouses, and repair shops. The administrative area included a hospital, prisoner of war camp, troop barracks, and a housing project.[24] Since 1962, the Depot has been assigned maintenance mission responsibilities for topographic equipment, troop support items, construction equipment, power generators, and various wheeled vehicles. The Depot retains only the conventional ammunition storage, maintenance, and demilitarization portions of its mission (North Area).

Tooele Army Depot's responsibility was ammunition and chemical munition storage and also maintenance and repair for mostly Army wheeled vehicles in addition to a few track vehicles such as tanks.[25] Despite base realignment and closure, Tooele Army Depot's main depot and headquarters have remained busy.

From 1979 to 1994, several major rehabilitation projects and new construction have taken place at the installation. The Sacramento District, through its Utah Resident Office insulated buildings, installed security fencing and warning signs, installed facility-wide steam controls, and corrected construction deficiencies to 68 storage igloos at a cost of $4,387,901. In 1982, a Tooele Project Office opened as a sub-office of the Utah Resident Office to supervise and manage the construction projects. In 1983, the District built a one-story administration building including offices, storage, and restrooms, built two-story and one-story barracks, and renovated an existing one-story chapel. In 1986, the District constructed a 14,000-square-foot health clinic at a cost of $1,323,733.00.

In 1994 the District constructed a $37 million 378,000-square-foot Consolidated Maintenance Facility, including an automated storage and retrieval system. The facility consolidated processes from 40 separate buildings at the main depot and saved $25 million a year. The suitability and effectiveness of the design made the building a success. Sacramento District was the recipient of the Chief of Engineers Award of Excellence for the project. The building is one of the " most functional and aesthetically pleasing manufacturing facilities in the continental United States" said the plant manager.[26]

Dugway Proving Ground

Western Utah provides a sparsely populated area for research, development, and testing of chemical munitions. Dugway Proving Ground, located 80 miles southwest of Salt Lake City encompasses 840,000 acres.

The United States developed a defensive posture toward biological warfare during the Nixon administration. But in the 1980's, the U.S. became concerned over the Soviet's chemical and biological weapons research as well as the development and the use of toxic agents in Southeast Asia and Afghanistan. Along with the increased need for testing came the need for renovation and new construction to the installation. Dugway Proving Ground is the chosen Major Test Range and defense testing center for chemical and biological warfare under the Reliance Program.

Tooele Army Depot, Consolidated Maintenance Facility - Circa 1995

Testers at Dugway also determine the reliability and survivability of all types of military equipment in chemical or biological warfare.[27] The primary mission is broad, including chemical and biological defense materiel, protective items, and soldier compatibility with protective clothing and equipment. In addition, Dugway has been designated for the testing of military smoke and obscurant systems and illumination systems testing, and it also performs testing and evaluation for artillery, mortar, mines, and a wide variety of special-purpose equipment.

In 1983, the District provided air conditioning evaporative coolers at a cost of $1,008,000. In 1986, the District constructed two one-story buildings to serve as a Technical Processing Facility. In the same year, the District constructed six buildings for a total of 17,000 square feet as a Munitions Support Facility at a cost of $2,313,809. The District also built the Administration Facility, providing 32,000 square feet of space at a cost of $2,498,154.[28] In 1994, the District completed a new $2.9 million fitness center offering physical conditioning and recreational facilities with a seating capacity of 1,000.[29]

The completion in 1995 of the Materiel Test Facility at Dugway Proving Ground was a unique and complex undertaking. The building measures 25,000 square feet, stands two-and-a-half stories high, and includes three test chambers. These chambers are used to test for the safe transfer of chemical agents and to test and evaluate current and proposed military items against chemical agents and stimulants. The facility also tests military vehicles and equipment in an artificially controlled environment to determine their fitness for toxic contamination (chemical agents in concentrations simulate battlefield conditions) and to determine how safe their operators would be. Tests are also done here to quantify the affect of decontaminants used to detoxify the equipment.[30]

The District also constructed a new Life Sciences Test Facility in 1998, replacing the 1940's-vintage Baker Laboratory. The facility has laboratories and chambers enabling testing and aerosolication of simulated and actual agents of biological origin. The facility contains Biosafety Level 2 and 3 laboratories.

Fort Douglas

Formerly headquarters for the 96th Army Reserve Command, the fort was listed in the National Register of Historic Places in 1970 and was designated a National Historic Landmark in 1975.

The District's work at Fort Douglas near Salt Lake City consisted of the renovation of buildings and the modification of Fort Douglas' five permanent historic buildings at a cost of more than $5 million. In 1989, Congress finally approved closure of Fort Douglas as a military facility. By 1998, the Army transferred approximately 63 acres of Fort Douglas to the University of Utah in exchange for state lands.

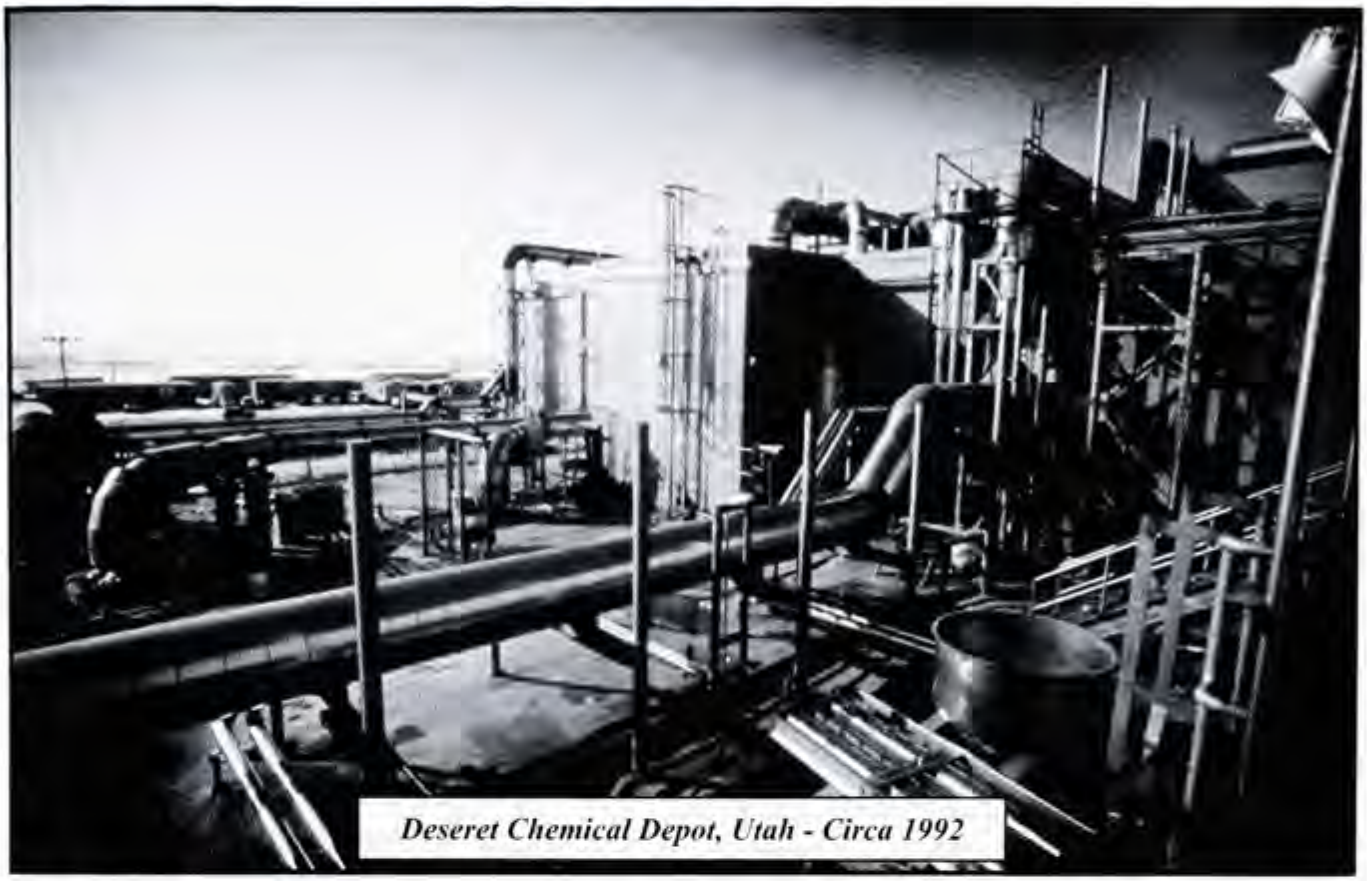
Defense Depot Ogden

The Sacramento District broke ground for the Defense Depot Ogden located in Weber County, Utah, on July 5, 1989, for a new automated data processing facility. The District's Hill AFB Resident Office administered the construction and completed the facility in December 1990, at a cost of $4.6 million.[31]

Deseret Chemical Depot

The Sacramento District supervised construction of the Deseret Chemical Depot (DCD), located approximately 50 miles west of Salt Lake City. It was the first of eight such facilities in the continental United States. The primary mission of the DCD is storage of a large percentage of the U.S. stockpile of chemical munitions. The depot also supports weapons demilitarization, including research and development activities. The Rapid Response System, a mobile system designed to support the non-stockpile program, is also being developed at DCD. As of 2001, the Army had completed two additional chemical munitions storage facilities: one in Anniston, Alabama, (June 2001) and the Umatilla Chemical Depot in Oregon (August 2001).

To circumvent moving the dangerous stockpiles, and the near-certain political upheaval along ship-



Deseret Chemical Depot, Utah - Circa 1992

ping routes, the Army resolved to destroy them at the depots where they resided. The National Research Council's technical experts endorsed the incineration process as being the safest. Therefore, incineration was the process used for the disposal of the chemical agents and munitions as opposed to neutralization, which rendered the weapons harmless with chemical processes but with unsafe aftereffects. The Army coordinated with Federal, state, and local officials to ensure protection of local areas throughout the life cycle of the project.[32]

The disposal of chemical munitions involved the partnering and cooperation of several national government agencies as well as local and state agencies, including the U.S. Army Chemical Material Destruction Agency, the U.S. Army Material Command, the OSC, the U.S. Army Corps of Engineers, and the U.S. Army Engineering and Support Center Huntsville. The unitary weapons[33] and administration of their destruction required complex buildings and construction.

The Office of the Program Manager for Chemical Demilitarization (PMCD) was established in 1985 at the direction of Congress and was given responsibility for disposal of the complete U.S. stockpile of chemical agents and munitions. There were eight facilities that made up the Chemical Demilitarization Facility. The program has achieved significant milestones. The PMCD destroyed the last of the chemical weapons stored at Johnston Island in November 2000. The combined operations of the Johnston Island facility and the Deseret Chemical Depot have safely destroyed more than 15 million pounds of chemical agent (24 percent of the nation's total).

The PMCD, Aberdeen Proving Ground, Maryland, is assigned responsibility for the Chemical Stockpile Disposal Program. The Huntsville Center is responsible (by agreement with the PMCD and the Headquarters, USACE) for being the Life Cycle Project Manager for the design, equipment acquisition, equipment installation, and facility construction of the chemical demilitarization facilities under construction and of those yet to be built.

Since Utah is located in the Sacramento District area, Huntsville awarded the construction contract for Deseret Chemical Depot and transferred it to the Sacramento District. The South Atlantic Division performed the construction overview, and the

South Pacific Division exercised managerial overview. The District began construction on October 30, 1989, and completed the facility in 1993. The plant was completely operational in 1995.

High Cost of Designing for Safety at Tooele

The Army based the design of the Tooele facility on the Johnston Atoll facility, but the weather differences (Johnston Atoll is at sea level and Tooele is at a mile high elevation) between the two sites dictated a complete redesign for the Tooele facility. Parsons Engineering was the designer for this particular project, and the Huntsville office awarded the initial contract to EG&G Defense Systems.[34] The contractor had completed approximately half of the design when the District began construction on the project in 1989.[35] The District projected that there were going to be major cost increases because of the state of the design, but the PMCD failed to consider the District's warning.

Since the award of the Tooele contract, cost estimates for constructing the facility and installing the CSDP equipment increased by 290 percent. The original construction contract included $46 million for military construction and $27 million for PROC funds. In 1990, MCA costs increased to $99 million. A July 1991 review of the cost estimate concluded with an estimate of $177 million MCA and $120 million PROC for a total of $297 million.[36]

Returning to Congress to repeatedly request additional money hampered the project and gave it high visibility. The project became of special interest to the Army, the Department of Defense, and Congress, among other agencies. As a project manager at the Sacramento District, Steven Lightner remembers: "We were visited by everybody – the General Accounting Office, Congress, the Army Audit Agency. A number of governmental agencies were looking at what was going on."[37]

Agencies and the public often unfairly perceive how the District and the Corps manage cost contracts. The issue became the government's inability to accurately project the cost when the scope of services continually changed due to safety concerns. In the case of this project, the changes in scope forced the project costs higher, but did not affect how the District managed the project.

Lightner describes the challenge of this project to the Sacramento District. "The District was given an almost mission impossible. We had to construct a highly critical facility, with a tremendously evolving design and if the quality was not up to snuff, you would kill somebody," Lightner said.[38]

The PMCD undeservedly and severely criticized one of the contractors, Morrison Knudsen, for their cost overruns that were in actuality, cost growth based on scope growth. After a review of what they really did with the number of changes and the outstanding level of quality, it was determined that the contractor produced an outstanding facility.

Construction of Deseret Depot

By February 1991, the Deseret Chemical Depot construction had progressed well. The construction involved several Federal, state, and local agencies, U.S. law, and international treaties. Construction required a crew of up to 1,000 workers around the clock in order to meet the deadline. The site was a controlled area because of the construction site's proximity to where the munitions were stored. All workers were required to carry gas masks. The logistics of just getting the crew in and out of the gate was difficult and affected productivity.

The main part of the facility was the two-story Munitions Demilitarization Building that houses mechanical equipment to disassemble the munitions and prepare them for incineration. There were four incinerators: a liquid incinerator, a metal parts furnace, a deactivation furnace, and the dunnage incinerator that burns the remainder of combustible material. If any abnormality is detected, the system immediately shuts down. Security is extensive and entry into the disposal areas is restricted for all but required staff members.[39] The Chemical Demilitarization, or "Chem DeMil," Resident Office managed the project with Bob Smith as the Resident Engineer

and administration-contracting officer. The office at the Tooele South Area was a stand-alone resident office reporting directly to the Construction-Operations Division at Sacramento District headquarters. An article in the District's *Public Affairs Report* described the facility as follows:

> *The $250 million plant is a complex assemblage that includes 24,000 cubic yards of concrete, 5,600 tons of steel, 162 miles of electrical conduit, 840 miles of electrical wire, 33 miles of pipe, and 16,000 instruments and valves, among other construction items.*[40]

In June 1993, District Commander Larry Sadoff honored the contractors EG&G and Morrison Knudsen at a ceremony at the plant for working two million hours on the facility without a lost-time accident. Four hundred craft workers attended the ceremony. After the District completed construction of the plant, an 18-month-long systemization period was necessary before the beginning of weapon destruction in February 1995.

While the various parties worked together to complete the facility, the management of the project could have been better. PMCD viewed the construction as a minor piece of the puzzle – "just get this thing built" – one the one hand, but on the other hand was the issue of safety, which was of paramount importance. Many design changes and change orders were implemented because of safety considerations.[41] Former District Commander Laurence Sadoff reflected:

> *This was really a project out of control that received a great deal of visibility... I spent a lot of my time as District Commander serving, if you will, as Program Manager of that particular project. Overall, I thought we managed "Chem Demil" quite well. We got the process under control.*[42]

Lightner recalls how important partnering and cooperation was in the completion of the facility:

> *The Sacramento District put together an extremely capable group of people led by Bob Smith, the resident engineer in the field, and worked well with the contractor to manage all of these changes and get this plant built with the required quality at a very reasonable price. The District came together with Huntsville and Headquarters, and because we had these cost overruns, one of the most rewarding things was how the Corps team coalesced to solve these problems, as opposed to pointing fingers at each other.*[43]

Projects such as the Deseret Chemical Depot present a double-edged sword for communities. On the one hand, the community welcomes the project because of the jobs and income that it generates for the community. On the other hand, Utah does not want to become the graveyard or dumping ground for the nation's toxic waste. Fortunately, few and only minor safety problems have arisen at the Tooele facility.

However, there were concerns about safety that needed to be investigated. Steven W. Jones, a former Safety Manager of Tooele, alleged that flawed safety features could result in catastrophic accidents. The allegation prompted a safety team inspection that "found no indication that the facility compromised the health or safety of any person while working with hazardous material or toxic chemical agents."

The oversight for safety, environmental monitoring, and operation is provided by numerous regulatory agencies including the Utah Department of Environmental Quality, the Environmental Protection Agency, and the Department of Health and Human Services, and the independent oversight of the National Research Council according to Army Safety Director Brig. Gen. Thomas W. Garren.

Bob Smith, Utah Resident Manager, who guided the construction, engineering, and supervision of the Tooele plant over a 5-year period, felt that the most difficult challenge was documenting for environmental compliance.

Local Congressman James V. Hansen remarked that, "Unlike other sites where chemical demilitarization facilities are planned, the Tooele public supports the Army and its efforts." In addition, the Utah Citizens' Advisory Commission on Chemical Weapons Demilitarization (Deseret Chemical Depot State Public Law 102-484, which established the Chemical Demilitarization) has input and oversight.

On August 11, 1993, the Army dedicated the nation's first facility to destroy chemical weapons at the remote South Area of the facility. The facility, constructed under the supervision of the Sacramento District, was a major step in implementing a treaty signed in Paris between the U.S. and the then-Soviet Union for each country to destroy chemical weaponry.

Chief of Engineers Lieutenant General Arthur E. Williams stated, "Few projects have been as challenging or rewarding as planning, designing, and building the Tooele Chemical Demilitarization Facility. Williams further praised "the construction management skills of the Corps' Sacramento District Resident Office staff."[44]

Dealing with Base Realignments and Closures

Other District work at installations involved preparing them for closure. (See Chapter 13 for additional information on the types of programs that involve remediation efforts at installations.)

Congress passed two defense realignment laws, the Defense Authorization Amendments and the Defense Base Closure and Realignment Act (BRAC) of 1988, mandating closure, consolidation, and realignment of unspecified defense installations. These two laws established the commission that selected the first round of military installation for closure in 1989. Subsequently, Congress enacted Public Law 100-526, known as BRAC I, and the Defense Base Closure and Realignment Act of 1990, Public Law 101-510, which authorized actions known as BRAC 91, BRAC 93, and BRAC 95. These laws specified procedures for identifying the affected installations and bases and prescribed schedules for implementing the closure and realignment actions.

The basic mission of the BRAC 88 was to shut down or realign installations and transfer property as quickly, cheaply, and safely as possible. The cutting of overhead and the Army's infrastructure came as a result of Congress's realization that the Soviet Union does not present a military threat. There have been five rounds of BRAC: in 1988, 1992, 1993, 1995, and 1998. Approximately 40,000 jobs were jeopardized in California, a state with the nation's largest defense presence.[45]

The work done to support BRAC needs was one of the District's major achievements. The Corps of Engineers has had real estate responsibilities for the conveyance of closing Army and Air Force installations under BRAC. The Corps also had environmental restoration responsibilities during the early BRAC rounds for cleaning hazardous materials from the conveying installations. In 1989, the BRAC program affected 15 of the 39 Army and Air Force installations, for which Sacramento District planned, designed, constructed, and provided real estate actions. Seven bases were slated for closure and five were realigned in the Sacramento District as of August 1989. The District's direct involvement was with the closure of three installations and realignment of a fourth that is located out of the District's post.

Mitigating the Effects with Scoping Meetings

The Sacramento District facilitated public "scoping" meetings to gain input from the public on possible local effects of the closure and transfers. The closure of Fort Ord was a good example of the value and purpose of the meetings. On January 29, 1990, the BRAC Commission proposed the closure of Fort Ord, and on July 1, 1991, the Base Closure Act of 1991 ordered the 7th Infantry Division originally based at Fort Ord to move to Fort Lewis, Washington.

The Fort Ord scoping meeting held in early 1992 drew more than 75 participants, including many local political leaders. The meeting addressed the future of the Fort's three major developed areas with its two garrisons, hospital, airfield, and 28,000 underdeveloped acres. The meeting signified the Army relinquishing control of the post and determining the future use of the land and facilities. Former Sacramento District Commander Laurence R. Sadoff opened the meeting, stating that the meeting's primary purpose was "to solicit comments on how we conduct and execute the Environmental Impact Statement process on disposal and reuse of Fort Ord. This is a public process," said Sadoff.[46]

Lieutenant Colonel Len Cardoza, Deputy District Engineer for Base Realignment and Closure, followed Sadoff and facilitated the meeting. The Sacramento District contracted the firm Jones & Stokes Associates to write the EIS. Jones & Stokes presented the parameters and criteria for consideration. One of the participants stressed environmental issues relevant to the review process. Job losses and gains were also discussed, since there would be a loss of work from the base closure, but a gain in additional work in preparing the installations for realignment and new missions.

The District then prepared an Environmental Impact Statement on the influence of the closures or realignment. In addition to the EIS investigating the social and economic effects, the EIS prepared an environmental contamination assessment and examined the historic and archaeological sites.[47]

The Final Environmental Impact Report (FEIR) and the environmental documentation for the Reuse Plan consisted of the Final Environmental Impact Statement, Fort Ord Disposal and Reuse, in June 1993 and the Draft Supplemental Environmental Impact Statement, Fort Ord Disposal and Reuse, in June 1996.

The recommendations in these reports outlined a number of benefits to the community with the Fort's closure. It would result in the improvement and diversification of the retail and industrial economy that will generate employment and create financial stability. It would also provide moderate and upscale housing and additional tourist support facilities to the communities of Seaside and Marina. Furthermore, it would encourage and prioritize the development of projects that are regional in scale, thereby creating additional destination points, recreational facilities, and open space on the Monterey Peninsula.

Such changes would enhance the quality of life for not only the residents of Seaside and Marina, but for all of the residents of the Peninsula. Enhance-

Hamilton Air Force Base Main Gate - Circa 1995

ments would include attracting a pool of professional workers for the Peninsula; ensuring that the overall economic recovery of the Peninsula benefits the communities of Seaside, Marina, and the unincorporated areas of the County in the vicinity of Fort Ord; and providing needed senior housing opportunities.

The EIR also addressed the need for the communities of Seaside and Marina to change their community images from dependent, military base extensions with transient military personnel to vital, independent, and self-actuated communities populated with permanent residents with long-term interests. Lastly, the EIR encouraged development that will enhance the continued viability of California State University at Monterey Bay and the open space areas retained by the Federal government through the Bureau of Land Management and conveyed to the California Department of Parks and Recreation.[48]

Two other California bases chosen for closure were the Presidio of San Francisco and Hamilton Army Airfield at Novato, California, north of San Francisco. The Presidio included Letterman Army Medical Center (LAMC). LAMC had no capability to expand and the medical center needed major structural repairs. The Presidio itself could not expand since it is a National Historic Landmark with 300 historical structures, although 36.5 acres of the 1,416 acres was sold with the remainder incorporated into the Golden Gate National Recreation Area. The functions for both the Presidio and LAMC were reassigned and relocated. For example, LAMC's medical assets were distributed throughout the Army and its Institute of Research moved to Fort Detrick, Maryland.

Hamilton Army Airfield served as the airstrip for the Presidio and a training center for units of the Army Reserve. Its limited operational ability and low military value guaranteed its closure. The Army sold approximately 695 acres. The District also had to dispose of Fort Douglas in Salt Lake City, Utah, and realign Fort Carson in Colorado. Fort Douglas had served as home to the Army Reserve regional support activities and local recruiting operations. Approximately 45 acres of its central area were designated as a historical landmark. Fort Carson gained new functions with the Sixth Army headquarters, and its mission and operations were consequently realigned.

California-based Air Force Bases Mather, McClellan, Castle, Norton, and George also closed. The Air Force bases realigned included Beale, and March. The Sacramento District performed major design and construction work for Beale AFB, California, for more than $150 million as a part of its realignment. Beale AFB received an active-duty

BRAC Legislation Affecting USAED's Area of Responsibility

BRAC Commission Year	Installation	Legislative Activity
BRAC 88	Hamilton Army Airfield	Public Law 100-526 BRAC 91
	Sacramento Army Depot	Public Law 101-510
BRAC 91	Fort Ord	Public Law 101-510
BRAC 93	Tooele Army Depot	Public Law 101-510
BRAC 95	Oakland Army Base	Public Law 101-510
BRAC 95	Defense Depot - Ogden, Utah	Public Law 101-510
BRAC 95	Sierra Army Depot	Public Law 101-510

flying training wing, including the navigator school from the closure of Mather AFB. The Sacramento District performed approximately $20 million worth of work at McClellan AFB as it received a Reserve Air refueling group from Mather.

Davis-Monthan AFB and Fort Huachaca in Arizona were realigned, and Williams AFB, as well as the Navajo Depot Activity in Arizona were closed. At Fort Huachuca, the Sacramento District performed the second-largest single design and construction program amounting to approximately $130 million. The work primarily consisted of master planning and construction of new facilities.

In the Utah Resident area, Tooele Army Depot assumed the storage mission of Pueblo Army Depot in Colorado, although the Corps Omaha District completed the EIS. Under BRAC, the District has had large programs for homeowner's assistance, environmental cleanup, reuse, and disposal. The environmental work required preliminary studies in advance of Congress' notification of closures.[49]

Real Estate Component of BRAC: The Homeowners Assistance Program

The biggest component of the BRAC program has been real estate because it is the most visible. The Community Environment Response Facilitation Act, Public Law 102-426, established a procedure aimed at expediting the transfer of excess land at military installations for other uses. The Act's intent was to remove needless delays in the transfer of property, while protecting human health and the environment.

An installation closure has to be shown to have caused an average of 5 percent diminution of property values in the area to qualify for financial assistance under the Homeowners Assistance Program. Complicating this formula was that the California real estate market was in a decline with the 1989 round of closures. The program mushroomed in 1989. The District had the difficult task of statistically showing that there was a 5 percent component of the decline specifically attributable to base closures. The Real Estate Division success was in large part due to having done just that. In later BRAC commissions, the District's Real Estate Division had more latitude in dealing with fair market value.

A significant percentage of the property transferred under authority of BRAC involves no-cost economic development conveyance and public benefit conveyance. Each of these transfer programs involves the Army's effort to convey property to the prospective recipient at no cost. The Army does not appropriate large sums of money to conduct formal appraisals in order to assign a fair market value to property transferred gratis as a means of supporting economic recovery within a community affected by BRAC. BRAC 95 ushered in the no-cost economic development conveyance strategy. Depending on the stage in which earlier rounds of BRAC were being planned, affected communities could also be "grandfathered" into the no cost economic development conveyance strategy.

In an attempt to determine the value of a property without expending large sums of money, the Sacramento District's appraisal staff renders estimates of valuations as opposed to determining fair market value. Under the authority of public benefit conveyance, the Sacramento District Appraisal Branch's valuations are rendered solely for the record.

The transfer of government property follows priorities and sequential steps and can be transferred by several means. These methods of transfer include no-cost economic development conveyance, Federal-to-Federal transfer, public benefit conveyance, public sale/negotiated sale, and donation.

When the decision is made that a military property is in excess of the Army's needs, a chain of domain for its acquisition follows. First in line would be other DOD agencies and Federal agencies. Normally, Federal agencies are not sufficiently funded from previous fiscal years to purchase real property. If so, the Army's next step would be to conduct state and local screenings, where a Federal agency can act as a sponsor for a local agency. The local agency is given the opportunity to apply to the Army for prop-

erty required by a local qualified entity for a specific purpose. Once certain regulatory requirements are satisfied, the Army assigns the property to the successful Federal agency sponsor for the subsequent transfer to a qualified applicant. Any property not conveyed or assigned to another Federal agency may be transferred to the Local Redevelopment Agency under the authority of no-cost economic development conveyance.

The "product" is the deed when the property is conveyed. Fort Ord was one of the largest projects. The District's Chief of Management Disposal was the Department of the Army's representative in negotiating with the Fort Ord Reuse Group. The price would have been well over $100 million had not the new legislation provided the base "free" under certain conditions for public non-profit agencies. In California, the University of California and the California State University systems were eligible to obtain property, and in Utah, the University of Utah obtained Fort Douglas at Salt Lake City in 1991. The properties were appraised according to the local community's base reuse plan, which usually has not been fair market value.

The Sacramento District had the largest number of active BRAC projects in the Corps, on the military side, and the largest Homeowner's Assistance Programs. The Sacramento District was not only the largest in numbers, but also was the largest in number of both civil and military projects.

In 1993, the Sacramento District's Real Estate Division opened a BRAC Section to serve the increased workload and fulfill the needs of its military clientele. The BRAC Real Estate area included Army installations in the South Pacific Division area. The new BRAC Section quickly established a Fort Ord Project Office to deal with Fort Ord's closure and disposition of 28,000 acres of Federal land.[50]

In an attempt to provide a safer area at former Fort Ord, Army officials planned to conduct a controlled fire-burn at firing ranges located at the former Fort Ord base. The aim of the controlled fire burn was to burn off thick brush and vegetation that would facilitate the workers' detection and disposal of unexploded ordnance. In November, 2002, Army officials planned the controlled burn. However, shortly before the burn, representatives of the California Air Resources Board anticipated a heavy inversion layer over the Central Coast that could trap smoke from the burn near the ground and cause health problems for people with asthma, emphysema, bronchitis and other respiratory ailments. The Army also planned to pay for the temporary relocation and lodging of residents who possibly could be adversely affected by smoke coming from a controlled burn at former Fort Ord as a part of its desire to protect the health of the community.

The BRAC program in the District's Real Estate Division has achieved notable successes in its disposition of real estate. The first Army's transfer of a military installation under authority of Defense Base Closure and Realignment Act was the Sacramento District transfer of Sierra Army Depot, located in Susanville, California. The District's Real Estate Division meticulously implemented all facets of real estate planning, management, and transfer activities for the Depot.

Tooele Army Depot, located in Tooele, Utah, is a prime example of a successful early transfer of contaminated property, which was conveyed under authority of Section 334, Defense Authorization Act of 1997. This section permitted the transfer of remediation management responsibility at this closed/closing military installation to a non-Federal entity. The Sacramento District skillfully planned, managed, and executed all aspects of this transfer involving approximately 1,621 acres Section 334 involved Toole Army Depot.

The Sacramento District under the Lease in Furtherance of Conveyance placed the property under the direct control of the local redevelopment agency. The local redevelopment agency concentrated on implementing its reuse plan in support of the planned future use of the installation. Use of a Lease in Furtherance of Conveyance instrument has proven beneficial and successful at the former Oakland Army base and former Fort Ord.

Since the late 1960's, the Sacramento District Homeowners Assistance Program (HAP) has helped employee homeowners. HAP[51] is a special relief program designed to provide financial assistance to eligible employee homeowners when the real estate

market is so adversely affected by closure or partial closure of a military installation, or reduction in scope of operations, that the personnel are unable to dispose of their dwellings under reasonable terms and conditions.

The HAP benefits are available in three ways: government acquisition, private sale, and foreclosure. HAP has witnessed a phenomenal growth. The Sacramento District's HAP program understands the dramatic effect that base closures and realignments have on families that are displaced. HAP applications have been processed as expeditiously as possible.

The HAP program was initially administered in the Appraisal Branch of the Real Estate Division. The Sacramento District had been designated as the western regional HAP office for the western portion of the United States, offering assistance to the following states: Alaska, Arizona, California, Nevada, Utah, Washington, Idaho, Oregon, Montana, and Hawaii (including the Pacific Ocean Rim).

In 2000, the Sacramento District worked on the following list of approved programs for HAP: Alameda Naval Air Station, Alameda Naval Aviation Depot, Barbers Point Naval Air Station (Hawaii), Castle AFB, El Toro/Tustin Marine Corps Air Stations, Fort Ord, Long Beach Naval Shipyard, March AFB, Mare Island Naval Shipyard, McClellan AFB, Oakland Naval Hospital, Oakland Public Works/Oakland Army Base, China Lake, and San Diego Naval Facilities, China Lake NWC, Barstow Marine Logistics, March AFB, Travis AFB, Mare Island Naval Shipyard, Oakland Public Works, Point Mugu, Sacramento Army Depot, Oahu Army, Navy, and Air Force (non-BRAC), Agana, Guam.

In order for a program to be approved, an intensive study of the real estate markets in the areas surrounding an installation must be performed. First a determination must be made that the market has declined due to a BRAC announcement. The application has to have supporting documentation and HQUSACE, and the Deputy Assistant Secretary of the Army (Installations and Housing) must approve or deny the application. The following installations are under study for possible program approval: Fort Greely, Fort Hunter Liggett, Moffett AFB, Onizuka Air Force Station, Sierra Army Depot, Defense Depot Ogden, Dugway Proving Grounds, Idaho Falls U.S. Nuclear Power Station, Camp Pendleton, Malmstrom AFB, Williams AFB, Bremerton Naval Shipyard, and Edwards AFB.

Accomplishments of HAP Program

Item	Number
Applications since inception	8,233
Homes acquired	1,619
Homes sold	1,612
Private sale benefits	3,596
Foreclosures	30[52]

The HAP program with a budget in excess of $327 million has made impressive strides as seen in the following table.

Conclusion

The Sacramento District has constructed a number of diverse, complex, and unique projects for the Army installations in its area of responsibility. The work at Fort Irwin and the Area Oriented Depot at Sharpe Army Depot were massive projects under a tight timeline, and so was the work at Sierra Army Depot. The construction of facilities, particularly the demilitarization of chemical weapons projects at Dugway Proving Ground and the Material Test Facility, were extremely complex. The District has also performed since 1973 basic maintenance and rehabilitation of Army facilities.

The Corps' military program has ebbed and flowed since 1973. In the mid-1980's, the District had one of the largest military design and construction budgets (well over $700 million) in the Corps. While the military projects have not received as much visibility as the civil works projects, the military budget brought in more dollars from 1973 to 2000. In the 1980's, the three branches – the Military Projects Branch, the Military Design Branch, and the Technical Support Branch, all in the Engineering Division – were staffed up to over 300. As of the year 2000,

approximately 60 people in the Engineering Division were involved in the military program.

Since California had a large number of military installations, their closure meant a reduction in work for the Construction-Operations Branch and the District. But, to some extent, BRAC has provided new work. Design and construction work is needed for military facilities that have been realigned, and the District also aided communities in its area of responsibility in base reuse and conversion. The District's Real Estate Division handles the disposal and transfer of military property, and is involved with the HAP (the largest in the Corps). The District also is responsible for the clean up of formerly used defense sites and for environmental restoration work. The District continues to support those Army installations that were not closed.

The District has accomplished particularly significant work in the area of BRAC real estate. It has been one of the success stories of the District. The District poised itself to become a Corps-designated hazardous, toxic, and radiological waste District, and its work in this area has achieved significant milestones, which will be discussed in the following chapter. While the workload for military projects has diminished, the District continues to serve its mission well as the design and construction agent for the Army.

Endnotes

[1] Interview Willie Collins with Richard Vasquez and Lou Santin, January 23, 2002.
[2] Interview Lee Pendergrass with Marvin Fisher and Nicole Gauthier, March 17, 1989.
[3] U.S. Army Corps of Engineers, Sacramento District, "Monterey Office Busy with Housing, etc." in *PAR*, May 12, 1978.
[4] U.S. Army Corps of Engineers, Sacramento District, "District Helps Ease Housing Crunch at Fort Ord" in *PAR*, February 1983.
[5] Interview Willie Collins with Richard Vasquez and Lou Santin, January 23, 2002.
[6] Interview Lee F. Pendergrass with Ted Jones, March 17, 1989.
[7] U.S. Army Corps of Engineers, Sacramento District, "Touching Dedication Ceremonies Open Letterman's New Barracks" in *PAR*, November 1989.
[8] Periodic Letter from Acting District Commander Carlos Hickman to Colonel William E. Vandenberg, February 27, 1978.
[9] Periodic Letter from Sacramento District Commander Paul F. Kavanaugh to South Pacific Division Engineer Brigadier General Johnstone, October 31, 1980.
[10] Source: http://www.irwin.army.mil/history/ntchistory.htm.
[11] Periodic letter from Sacramento District Commander Paul F. Kavanaugh to Brigadier General N.G. Delbridge, Jr., February 29, 1980.
[12] U.S. Army Corps of Engineers, Sacramento District, *PAR*, July 1981.
[13] Periodic Letter from Sacramento Acting District Commander Henry Lee to Brigadier General Johnstone, February 27, 1981.
[14] U.S. Army Corps of Engineers, Program, Automated Distribution Facility: Sharpe Army Depot, December 12, 1985.
[15] Letter to South Pacific Division Commander from Major General Mark J. Sisinyak, Acting Commander, U.S. Army, November 6, 1995.
[16] Interview Lee F. Pendergrass with Ted Jones, March 17, 1989.
[17] Letter from South Pacific Division Commander Patrick J. Kelly to Chief of Engineers Lieutenant General E.R. Heiberg, III, August 18, 1986.
[18] Interview Willie Collins with Brian Doyle, January 23, 2002.
[19] U.S. Army Corps of Engineers, Sacramento District, "Fact Sheet," 1985 and "Western Distribution Center: Off the ground and running...," March-April, 1986, p. 4.
[20] Letter to the editor from James W. McFarland, Commanding Officer, Sharpe Army Depot, to the *San Joaquin County Bulletin*, April 20, 1987.
[21] U.S. Army Corps of Engineers, Sacramento District, "Western Distribution Center: Off the ground and running... ",March-April, 1986, p. 8.
[22] U.S. Army Corps of Engineers, Sacramento District, "The Fort Lewis Barracks Complex" in *PAR*, September 9, 1977.
[23] Periodic Letter from Acting District Engineer Carlos W. Hickman to South Pacific Division Engineer Brigadier General N.G. Delbridge, June 29, 1979.
[24] U.S. Army Corps of Engineers, Sacramento District, "Tooele—It's More than it Looks" in *PAR*, July 1990.
[25] Interview Willie Collins with Marcel Lettre, Interview Resident Engineer, Utah Resident Office, July 15, 2002.
[26] U.S. Army Corps of Engineers, Sacramento District, "District Wins Chief's Awards" in *PAR*, April 1994.
[27] U.S. Army Corps of Engineers, Sacramento District, Brochure, "Melvin J. Bushness Test Facility," n.d.
[28] U.S. Army Corps of Engineers, Sacramento District, Utah Resident Office Contract Records, n.d.
[29] U.S. Army Corps of Engineers, Sacramento District, "Dugway Digs for Future" in *PAR*, December 1992.
[30] U.S. Army Corps of Engineers, Sacramento District, "Dugway Proving Ground: High Tech in the Desert" in *PAR*, November 1994.
[31] U.S. Army Corps of Engineers, Sacramento District, "New Construction Starts at Ogden" in *PAR*, October 1989.
[32] U.S. Army Corps of Engineers, Sacramento District, "Chemical Destruction Plant Beginning to Take Shape" in *PAR*, February 1991.

[33] Unitary weapons, representing by far the largest quantity of the stockpile, contain a single lethal chemical in munitions. Other unitary agents are stored in bulk containers. The U.S. stockpile of unitary lethal chemical warfare munitions consists of various rockets, projectiles, mines, and bulk items containing blister agents (mustard H, HD, HT) and nerve agents (VX, GB). About 60 percent of this stockpile is in bulk storage containers, and 40 percent is stored in munitions, many of which are now obsolete. Binary chemical weapons mix two separate, relatively non-toxic chemicals in flight to create a toxic chemical agent.

[34] U.S. Army Corps of Engineers, "The Chemical Stockpile Disposal Program: A Review of the Management of Engineering Services," September 1991.

[35] Interview Willie Collins with Steven Lightner, February 18, 2000.

[36] U.S. Army Corps of Engineers, "The Chemical Stockpile Disposal Program: A Review of the Management of Engineering Services," September 1991.

[37] Interview Willie Collins with Steven Lightner, February 18, 2000.

[38] *Ibid.*

[39] U.S. Army Corps of Engineers, Sacramento District, "Chemical Destruction Plant Beginning to Take Shape" in *PAR*, February 1991.

[40] U.S. Army Corps of Engineers, Sacramento District, "Chem Demil Contractors Honored" in *PAR*, June 1993.

[41] Interview Willie Collins with Steven Lightner, February 18, 2000.

[42] Interview Willie Collins with Laurence Sadoff, October 4, 1999.

[43] Interview Willie Collins with Steven Lightner, February 18, 2000.

[44] U.S. Army Corps of Engineers, Sacramento District, "Ribbon Cut at Chem Demil" in *PAR*, September 1993.

[45] U.S. Army Corps of Engineers, Sacramento District, "DoD Unveils New Base Closure List" in *PAR*, March 1990.

[46] U.S. Army Corps of Engineers, Sacramento District, "Public Talks to Army about Ord" in *PAR*, March 1992.

[47] U.S. Army Corps of Engineers, Sacramento District, "Closure, Realignment Public Meetings Held for Sac Army Depot, Presidio, Ord, Lewis" in *PAR*, August 1990.

[48] U.S. Army Corps of Engineers, Sacramento District, "Final EIS, Fort Ord Disposal and Reuse, vol. 1," June 1993.

[49] U.S. Army Corps of Engineers, Sacramento District, "Cheney Comments On Base Closures" in *PAR*, March 1990.

[50] U.S. Army Corps of Engineers, Sacramento District, "Real Estate Adds a BRAC Section" in *PAR*, December 1993.

[51] HAP is authorized by Public Law 89-754, Section 1013, of the Demonstration Cities and Metropolitan Development Act of 1966, as amended, Regulatory Guidelines: DOD Directive 4165.50, ER 405-1-12.

[52] U.S. Army Corps of Engineers Financial Management System (CEFMS). Homeowners Assistance Program Management Information System (HAPMIS). Also see the following HAP URL site: www.spk.usace.army.mil.

Chapter 13

Sacramento District's Program for Cleaning up Hazardous, Toxic, and Radiological Waste

The closure of military bases in the Sacramento District generated a substantial amount of hazardous waste and cleanup work for the District. Sites and programs such as Formerly Used Defense Sites (FUDS); the Defense Environmental Restoration Program (DERP); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (also known as Superfund sites); and the Base Realignment and Closure (BRAC) program of the Army and Air Force were a dominant force in the District's overall program to clean up hazardous waste (called the Hazardous, Toxic, and Radiological Waste program, or HTRW) along with the civil and military projects.

The Sacramento District was one of only a small number of districts that managed and executed military design; hazardous and toxic waste design; and civil works design and construction.

The history of the District's involvement in toxic waste cleanup was marked by initial reluctance to take on the work, followed by the development of expertise in the toxic cleanup and site remediation. The District eventually set up a branch to deal specifically with this type of work, the Environmental Engineering Branch, but prior to that, had been involved to some extent with environmental cleanup. The District had provided sanitary engineering services, including water quality reports and work at several installations.

Environmental Problems Begin to Emerge

In the early 1980's, there was concern nationally that the past practices and procedures for handling hazardous and toxic waste at military installations did not take long-term environmental effects into account. Particularly in California, but also in Utah, military installations in the Sacramento District's jurisdiction became aware of contamination problems, including polluted groundwater, which were a result of the accepted practice in the 1950's and 1960's of burying toxic chemicals.[1]

Most of the military installations that had heavy maintenance activities had some type of groundwater contamination. Mather, George, Beale, and McClellan Air Force Bases, the Sacramento Army Depot, Sharpe Army Depot, Hamilton Army Airfield, and Fort Ord were installations that had potential contamination problems. These installations had maintained and disposed of fuels and other hazardous materials. In addition, wells in Sacramento serving hundreds of civilians in Rio Linda, a suburb of Sacramento, were found to contain contaminants linked to military operations. The well contamination was so extensive that the Air Force had to provide an alternative source of water for the residents of Rio Linda.[2]

The installations sought assistance from the Sacramento District to clean up the contamination, but at the outset, the District was wary of the work. At the time, there were those in the Corps and in the Sacramento District that believed that environmental work was not a part of the Corps' mission. The Sacramento District staff was also concerned about the liabilities of performing environmental cleanup services. The Sacramento Army Depot forced the issue of the District's involvement when it solicited District services. The District reluctantly agreed to help, but was cautious and mindful of liabilities. The District's management admonished the staff to "stay out of trouble."[3] More work was forthcoming from other sources. The Farmers Home Administration from the late 1980's to the early 1990's also provided the District with cleanup business. When the savings and loan industry collapsed, after the Garn-St. Germain Act significantly reduced the public regulation of savings and loan associations while maintaining public insurance of their depositors' accounts, many farms were foreclosed. A foreclosed farm's fuel dump, pesticide storage, and the resultant contamination problems had to be cleaned up before the Farmers Home Administration could resell them.

The Federal Aviation Agency also provided a substantial amount of work for the District, with a number of control towers and other facilities at Air Force installations that had contamination and needed to be cleaned up.[4]

The District, through its Military Branch in the Installation Support Section, began to develop an expertise in identifying hazardous waste conditions, determining the best type of treatment and cleanup methods, analyzing alternatives, developing plans for cleanup, and remediating cleanups with contractors. This type of work was called "installation restoration," a Department of Defense term that included the identification, assessment, investigation, and cleanup of contamination from hazardous substances, pollutants, and wastes of military sites. Essentially viewed as a technical assistance function, the District's early environmental cleanup work in the mid-1980's primarily used contractors. The District also relied on its Engineering Division's geotechnical capabilities that were needed to do the investigations.

Sacramento District Becomes an HTW Center

Nationally, the Corps began to develop expertise for hazardous waste cleanup and set up a number of design centers around the country to better handle the work. The situation at the Rocky Mountain Arsenal illustrated the need for such centers. Rocky Mountain Arsenal, near the Denver Airport runway, headed the national list of the most polluted 21 square acres in America. In 1984, the Environmental Protection Agency (EPA) deemed Rocky Mountain Arsenal a cleanup priority and placed it on the National Priorities List (NPL).

In the same year, the Department of Defense Appropriations Act of 1984, under the title "Environmental Restoration Defense," set aside $150 million for the cleanup of hazardous waste disposal operations, among other things.

The Corps' Omaha, Huntsville, and Kansas City Districts were the first districts to provide nationwide support in hazard toxic and waste work. But as the demand for cleanup work increased, Corps headquarters began seeking additional districts to provide technical support in this area. In December 1988, the Sacramento District's interest in being assigned a greater role in what was then called the HTW program resulted in a proposal to HQUSACE for designation as a HTW design center. The District cited its HTW investigations, remedial designs, and cleanup at military installations, FUDS, and the three Superfund projects. The proposal also cited the District's efficient management, with one of the lowest dollar workload-to-personnel ratios in the Corps, as well as its core staff's training and involvement in HTW activities.[5]

In 1990, the Sacramento District received its designation as the "Center of Expertise for Hazardous and Toxic Wastes (HTW) for the South Pacific Division,"[6] and became the primary district performing HTRW work in this Division.

Central to the success of the Sacramento District's new center was the training of staff and contractors. Many of the staff positions were filled with internal transfers, but recruitment began for an industrial hygienist and a chemist. The District also spent time and money developing its staff and private contractors by enrolling them in courses at the University of California, Davis, Civil and Environmental Engineering Department.[7]

The fledgling center had two internal organizational units - HTW and Environmental Engineering. In February 1991, the District initially organized the HTW section in the Engineering Division under the Military Projects Branch. HTW managed engineering and design services for hazardous and toxic waste work in the South Pacific Division. The Environmental Engineering unit, under the Geotechnical Branch, was responsible for the technical functions of the HTW program.

In 1992, the District created the Environmental Engineering Branch with four sections: a DERP Section, Support for Others (SFO) Section, and Environmental Engineering Sections A (primarily DERP work) and B (primarily SFO and EPA work). Additionally, an Environmental Design Section was one of the four sections under the Geotechnical Branch that performed HTRW work.

In 1993, the Environmental Engineering Branch directed, supervised, and coordinated Branch activities with Programs and Project Management Division (PPMD), other branches in the South Pacific Division, and with outside agencies. Essentially,

there was a technical side that dealt with review of work plans, health and safety, and chemistry issues; and a project management side that dealt with the clients on a daily basis. The six categories of projects that this branch coordinated were DERP projects (including the Installation Restoration Program of the Army and Air Force); FUDS; HTRW activities associated with BRAC; the Environmental Compliance Audit System program; various military and civil works HTRW projects; and EPA Superfund and other HTRW projects included in the SFO Program.[8]

In the short span of 3 years, between 1990 and 1993, the Sacramento District became one of the premier technical centers in the country. Technical staff included chemists, toxicologists, industrial hygienists, geologists, geophysicists, an ordnance explosive safety specialist, health and safety specialists, and design engineers. The District spearheaded innovative chemistry and quality management practices and has been a forerunner in assembling data management systems.

The Sacramento District continued to fulfill its role as a full service District with the creation of the Environmental Engineering Branch. In February 1999, the District organized HTRW Branch in PPMD to be on par with the Civil Works Branch and Military Branch. The HTRW Branch included four units: the Total Environment Restoration Contract (TERC), FUDS/Projects Review Board, Installation Restoration Program/BRAC Environmental Restoration, and Environmental Quality/ Ordnance and Explosives.

The HTRW workload witnessed a phenomenal growth in the early years from 1990 to 1995. In 1991, the budget grew to $50 million with a staff of 20 people in the DERP and SFO sections. The budget grew from $50 million to between $250 and $300 million by 1995, and the staff increased to approximately 75 by 1995. Chief of Engineering Division Brian Doyle recalls the program's rapid growth:

> *HTRW became second only to our military construction program in total size. It eclipsed our civil works program. It probably brought in more dollars to engineering than the other two programs combined.*[9]

While the Environmental Engineering Branch has accomplished much in its short 17-year history, health and safety has been its outstanding distinction. One of the District's goals for this branch has been to protect human health and to safeguard the natural environment. For example, District Commander Colonel John Reese established an HTRW Safety Action Committee in October 1995, which created a continually updated wallet card listing emergency telephone numbers of the District health and safety specialists, HTRW experts, and appropriate managers.[10]

Although the creation of new HTRW design centers alleviated the increasing workload, this strategy was not without its problems. Conflicts and territorial and proprietary issues among Corps districts came into play in the competition for HTRW work. The Huntsville and Omaha Districts performed work in the Sacramento District's boundaries. However, within 18 months, the District was successful in assuming and performing the work that the Huntsville and Omaha Districts had performed. However, Huntsville performed unexploded ordnance work regardless of where the work occurred. This transfer of work resulted in some animosity, but that was subsequently resolved.[11]

Interagency conflict also surfaced at a higher level between the Army Environmental Center, which was responsible for oversight of the diverse environmental programs throughout the Army, and the Corps. The Army Environmental Center performed HTRW work nationwide, and in the early 1990's attempted to garner all of the HTRW work, including the Corps' portion. The AEC's actions forced the Corps districts to bond and share work, while successfully keeping the AEC out of the program.

Support for Others Program

The Sacramento District established the SFO Section in March 1992 to provide HTRW project management and other engineering and technical support to the section's customers and HTRW support to in-house District Civil Works projects. The District transferred this section to PPMD in 1996.

The District branches and functional elements initially had difficulties recognizing SFO work, identification of which has been better refined through the years. Overall, the program through the outreach efforts of the District at all levels and all divisions/ branches has grown steadily. SFO activity is measured by HQUSACE at the end of each fiscal year by measuring total expenditures for the program:

The program allows the Corps to provide its full range of support to non-military Federal agencies, state and local governments, and Federally recognized Indian tribes. The work must be undertaken through an Interagency Agreement or Memorandum of Agreement, and the work must be totally reimbursable.

The following tables list the various Federal, state, and local government SFO customers. "F" indicates a future customer (in agreement coordination mode), and "P" indicates a past customer. All others listed are current customers.

SFO Section's Non-Military Federal Agency Customers
Bureau of Reclamation - Environmental Restoration monitoring on the Sacramento River delta
Department of Energy - GIS and Master Planning
Bureau of Indian Affairs (F)
Department of Housing and Urban Development - Construction inspection and audits
Department of Veterans Affairs (P)
Environmental Protection Agency Regions 8 and 9 - Superfund (9) and sewer construction inspection and audit (8)
Bureau of Land Management - Landscape planning and HTRW removal
Federal Emergency Management Agency - Above ground storage tank inspections
Immigration and Naturalization Service - Facility design and environmental remediation (related to storage tanks)
National Park Service - Environmental comliance audits, HTRW cleanups
Coast Guard (F)
Fish and Wildlife Services (P)
Forest Service - GIS and master planning
Indian Health Service (F)

SFO Section's State and Local Government Customers
California Department of Water Resources - Environmental monitoring
California Department of Transportation
California State University, Monterey Bay (P)
Sacramento County, California (P)
City of Benecia, California - Ordnance and HTRW oversight

Defense Environmental Restoration Program on FUDS

In 1985, the Sacramento District began investigating hazard toxic waste, debris, and ordnance contamination at former Department of Defense owned or operated sites. The District designed and constructed remedial actions for the sites. The District's area of responsibility for the FUDS program[12] included northern California, Nevada, and Utah. Most of the sites were located in California and included Hamilton AFB in Novato; Fort Hunter Liggett near King City; Fort Ord, Presidio of Monterey, and Fritzsche Army Airfield, all in Monterey; and the Sacramento Army Depot, as well as many other Department of Defense site airports.

Titan Missile Facilities

Beginning in the 1980's, the Sacramento District began managing a series of environmental studies for the Titan Missile Facilities, which are FUDS projects.

The Titan I-A Missile Facility was constructed near Lincoln, California, between 1960 and 1962. It was part of a triad of Department of Defense Intercontinental Ballistic Missile launching facilities in Northern California that included other facilities located in the Sutter Buttes (Titan I-B) and Chico (Titan I-C). The Titan I-A Missile Facility and associated easements originally occupied approximately 275 acres. The facility was constructed as a hardened underground facility that could withstand a nuclear attack. Beale AFB, in Marysville, operated the Northern California Triad from 1962 to 1965 when the DoD phased out the Titan I missiles in favor of Titan II missiles.

The missile facilities were deactivated in 1965. The Titan I-A Missile Facility was then vacated, declared excess by the Department of Defense, and

Titan I-A Missile Silo, Placer County, CA

transferred by quit-claim deed. One such site is the portion containing the underground structures (approximately 30 acres) of the Titan I-A Missile Facility is currently owned by Placer County, which uses the site to store and maintain road maintenance equipment. The rest of the 245 acres is privately owned.

Since the site was deactivated, groundwater had inundated the facility, flooding the underground spaces. Environmental investigations had begun in the 1980's. As of 1995, the Sacramento District has been studying the Northern California triad (Lincoln, Sutter Buttes, and Chico) of Titan I facilities.

The first step in the Corps investigation process was to review archived documents, maps, and photos maintained by the Department of Defense and others to identify potential environmental concerns. This preliminary assessment was documented in the Titan I Records Research Report completed in February 1996. The Records Research Report contained a list of environmental concerns that might be related to Department of Defense activities.

The Corps, working together with the California Department of Toxic Substances Control, the Regional Water Quality Control Board, and Placer County Environmental Health, developed and implemented a series of investigations that involved sampling water from within the flooded facility, soil, and groundwater for potential contaminants. In an early investigation trichloroethylene (TCE), a solvent, was identified in the groundwater. Since TCE was identified, Corps efforts at the Titan I-A facility have been focused on gathering the data necessary to address the TCE remediation.

Streamlining Cleanup with Total Environmental Restoration Contracts

Environmental cleanup work in the early 1990's was a protracted process requiring three phases of work, usually completed by different contractors: (1) site investigation and a feasibility study, (2) a design for the work prior to the actual cleanup, and (3) cleanup. Moreover, environmental contamination usually was concealed underground or in groundwater. The issue of such unknowns was an obstacle when trying to define the scope of work. Therefore, cost reimbursement contracting has been best suited for environmental cleanup projects. Pre-placed Remedial Action Contracts (PRAC) was either firm-fixed-price or cost reimbursement.

The PRAC cost-reimbursement contracts have also been managed in the TERC Section.[13] The TERC program provides program management, cost estimating and negotiations, voucher review and payment, and contract administration for each project. The project managers provide technical direction and cost control for individual projects.

The TERC facilitated the process by allowing one contractor to provide full service hazardous waste cleanup work.[14] TERC, as a contracting tool, has been used for high priority, complex, time sensitive cleanup requirements. There were several factors that determined whether or not the District assigned a TERC to a project, including how easily the scope of the project could be defined, the size of the work, and whether the customer was willing to use cost reimbursement-type contracts.

The TERC was developed within the District (from models developed by the Omaha and Kansas City Districts) after the Fort Ord Command requested to be the "hub" or major sponsor and user of such a contract. The Corps awarded its second TERC to the Sacramento District in 1994[15] for Hamilton Army Airfield (General Services Administration funding), and since then the District has managed a number of significant projects. In 2002, the District's TERC program was composed of a program manager and seven support personnel.

TERC contract obligations and revenue have averaged $47.1 million per year. The largest decrease of approximately $30 million occurred in 2002. With the completion of BRAC and FUDS work, the TERC program's budget is expected to see a further decline in contract revenue. The table below shows the program's funding history and types of projects.[16]

TERC Funding History and Project Types			
Project Name	**Contaminants and Work**	**Status**	**Amount**
Hamilton Army Airfield GSA, California	Trichloroethylene, firing ranges, petroleum products, landfill capping		$47.7 Million
Fort Ord, California	Petroleum products, lead, ground-water contamination pump-and-treat system, landfill capping		$76.7 Million
Stead Air Force Base, Nevada	Petroleum products, 250 underground storage tank removals		$2.1 Million
Presidio of San Francisco, California	Petroleum products, pesticides, inorganics, underground storage tanks, piping removals		$41.1 Million
Hamilton Army Airfield, California (BRAC)	Petroleum products, underground storage tanks, piping removals		$29.9 Million
Oakland Army Base TERC 2, California	Petroleum products, volatile organic compounds	2002 Closed	$16 Million
Dugway Proving Ground, Utah	Chemical warfare material and unexploded ordnance contamination	1997 Open	$35.5 Million
Ogden Nature Center Ogden, Utah	Remediation of a chemical warfare material site. Cleaned up buried drum remnants of buried training kits, creosote, and general construction debris. Revegetated and restord site.	1997 Closed	$9.5 Million
Sulphur Bank Mercury Mine (Herman Pit) Clear Lake, California	Excavated as a large pit of concentrated mercury. Tested releases of water and sediment from former mine.	1998 Closed	$2.2 Million
Sharpe/Tracy Army Depots, California	Chlorinated solvents and pesticides, operating and maintenance of ground-water treatment plants, soil remediation, ground-water monitoring, soil vapor extraction	1998 Open	$8.5 Million
National Park Service	Several site investigations, underground storage tanks removal	1998 Open	$2.7 Million
Fort Ord, California	Continuation of TERC 1 work	1999 Open	$28.7 Million
Motorola	Trichloroethylene groundwater plume, EPA assistance in investigation of the site	1999 Open	$2.4 Million
Hamilton Army Airfield, California (BRAC)	Continuation of TERC 1 work	2001 Open	$4.3 Million

Total Environment Restoration Contract - Fort Ord

The District initiated a landfill study in October 1985 at the request of Fort Ord. The District subsequently performed intermediate remedial measures on a 98-acre landfill and closed 10 abandoned water supply wells located near the city of Marina, California. The wells could potentially act as conduits allowing contamination from the higher aquifer to enter the lower aquifers. The District also discovered and removed four abandoned underground tanks. More than $2.2 million were spent on the remediation.[17]

In 1990, the EPA placed Fort Ord on its NPL due to groundwater contamination linked to the Fort Ord Landfill. In 1991, the BRAC Commission identified Fort Ord as a BRAC installation. During the Fort Ord BRAC period, the District perceived its work as extending beyond the cleanup of a closing installation, and serving as an example for future cleanup projects. Deputy Assistant Secretary of Defense (Environment) Thomas E. Baca challenged the Fort Ord team: "We are not trying to make Fort Ord a model installation. We are trying to make Fort Ord an installation that makes models."[18] With the Fort Ord project, the Sacramento District took the lead in the implementation of innovative strategies for cleanup work.

The District remediated soil using in-situ biodegradation at Operable Unit 1. The site, adjacent to the Army Airfield, was a former burn pit contaminated with fuel hydrocarbons, benzene, toluene, ethyl benzene, xylene, and trichloroethylene. Moisture and nutrients were supplied to the system using groundwater pumped to the surface, cleaned with activated carbon, and sprayed on the soils.

In Operable Unit 2, the District consolidated approximately 500,000 cubic yards of debris from other projects at the primary Fort Ord landfill site, thereby preventing direct exposure of the material, restricting rainfall infiltration, preventing leaching to groundwaters, and controlling migration of methane and semi-volatile organic compounds to the ground surface. The Sacramento District's strategy of long-term maintenance of the landfill, to cap consolidation of waste materials and fewer deed restrictions, resulted in an overall improvement in the project's performance, as well as substantial cost savings.

At the Fort Ord Firing Range, the District's approach eliminated the need to clean and restore several thousand cubic yards of soil from lead contamination. The District estimated the timesavings to be as high as 1 to 2 years off the total program duration, based on the time required to apply soil remediation technologies.

By 1998, the former Fort Ord was again active and supporting the future in a new way. Fort Ord had become a satellite campus for the University of California, Santa Cruz, and a new campus for the California State University, Monterey Bay. The barracks and commissaries have been converted into student housing. The annex is the only remaining part of the former Fort Ord, where the Army Environmental staff carries on the work that has made this installation safe for business, students, and tourists.

The Fort Ord[19] TERC project was significant for its innovative Action Plan (1992) that pointed to the need for a pre-selected quick-reaction contract to get cleanup projects done quickly and efficiently.

The TERC was just one of several innovative contracting processes that the Sacramento District used for Fort Ord and other BRAC installations. The use of ID/IQ and Cost Type contracts greatly enhanced not only the ability to respond to cleanup, but also to perform dynamic investigations that saved time and money. For example, the District developed and awarded a $70 million contract in 30 days.[20]

Fort Ord was the only BRAC site to officially meet the White House Chief of Staff Leon Panetta's schedule.[21] Congressman Sam Farr (D-California) of the 17th District was also a key player in the progress of the cleanup and reuse of the site.

The TERC task order was awarded in March 1995. The District constructed the pump-and-treat facility within 5 months, meeting CERCLA's requirements.

Hamilton Army Airfield - Circa 1994

The pump-and-treat facility processes approximately 1 million gallons of water a day to drinking water standards. The District completed the majority of the work by March 1998, and monitored cost control and technical control, keeping the project on schedule and within budget.

Ordnance was not considered a CERCLA issue during the early removals and property disposals at Fort Ord. The Corps Huntsville and Sacramento Districts combined forces to resolve ordnance and explosive issues, and in 1996 and 1997, completed agreements to dispose of large portions of the former Fort Ord. This resulted in the Sacramento District being designated an ordnance and explosive design district for the West.

Hamilton Army Airfield

Hazardous waste was found on a 480-acre landfill portion of Hamilton Army Airfield in February 1985. The Army auctioned the installation in May 1985 to a private developer. The District completed a feasibility study on the sale portion. The project became highly visible, and required significant cleanup of political issues as well as environmental decontamination.

Contaminants on the airfield included petroleum hydrocarbons and heavy metals. The District removed surface containers in 1985 and 65 tank structures in 1986. Underground storage tanks were also removed. The District also remediated a radiological waste disposal area in 1988. By 1989, the District had spent more than $13 million on the cleanup of Hamilton.

Fort Hunter Liggett

From 1986 to 1988, the District conducted a Solid Waste Assessment Test on Fort Hunter Liggett's landfill, located approximately 22 miles southwest of King City, California, in Monterey County. The landfill occupied approximately 40 acres about 200 feet from the San Antonio River. Waste oils, grease, paints, construction debris, and sanitary trash were stored in the area. The installation also practiced open burning until 1968. Volatile organic chemicals were present in the groundwater, but not at sufficient levels to cause significant water quality problems.

Presidio of Monterey

The District initiated a landfill study at the Presidio of Monterey in October 1985 after discovering contamination while trenching for road construction. Later, in October 1986, the District investigated the extent of lead and other contaminants in another 2.5-acre landfill next to privately owned property in Pacific Grove, California.

The Presidio of Monterey is home to several historic sites and land essential to the preservation of habitat. The Sacramento District assisted with base planning, ranging from the preservation, historic, and cultural aspects of the Presidio to the planning and construction of new facilities. The Sacramento District supervised closure of the landfill by installing an impermeable cap, requiring extensive coordination with the students and adjacent residents in the Pacific Grove community and the Presidio of Monterey. Students use a portion of the landfill nearest to the Institute, and the remaining land serves as grazing areas for deer and seed for local wildlife.

Sacramento Army Depot

The Sacramento Army Ammunition Depot (SAAD) encompassed approximately 485 acres before it closed in 1995. *Using historical data, the* U.S. Army Toxic and Hazardous Materials Agency identified several areas at SAAD where the use, storage, treatment, and disposal of toxic substances may have contributed to contamination of soil and groundwater.

In late 1981, the Central Valley Regional Water Quality Control Board (CVRWQCB) sampled offsite wells near the southwest corner of SAAD. Tests revealed volatile organic compounds in some of the wells closest to the installation, and the Army began working with the CVRWQCB to assess the source and extent of groundwater contamination. The EPA Region 9 and Department of Toxic Substances Control subsequently became involved in the investigation of contamination at SAAD, and the EPA placed the installation on the NPL in August 1987.

In December 1988, the Army, the EPA, and the State of California signed a Federal Facility Agreement in which the Army agreed to address the entire facility, including the contaminated groundwater and several areas of suspected soil contamination. The Army assumed responsibility for implementing interim remedial actions and conducting a remedial investigation and feasibility study. The District initially identified a total of 51 sites as areas of potential contamination. The District assigned priority to investigate eight areas with the greatest potential for releases to the environment. These investigations were originally funded as part of the U.S. Army Installation Restoration Program, and then as part of BRAC.

The installation included multiple areas with soil and groundwater contamination from past operations that involved the use of hazardous substances, including organic solvents, oils and grease, fuels, lubricants, caustic solutions, and metal-plating baths. The District's site investigations indicated that groundwater in the South Post area and at Parking Lot 3 was contaminated with volatile organic chemicals, including carbon tetrachloride, trichloroethene, tetrachloroethene, 1,2-dichlroethand, and cis-1,2-dichloroethene. Metals contamination was also present at four areas. The chemicals of concern included arsenic, cadmium, chromium, and lead. The District removed onsite and offsite groundwater contamination at the South Post area beginning in 1989 and later in 1995. The District completed the work with the cleanup goals being met and approved by the agencies, and as a result, the agencies required no further action for this site.

The District's removal of contaminated soil at the oxidation lagoons began in 1992. The District's initial remedy was onsite washing to remove metals of concern, followed by the placement of clean, washed soil back into the excavation. However, a pilot scale test showed that this was not the most cost-effective technology for protection of human health and the environment. Consequently, the Army changed the remedy from washing to soil stabilization.

The District also assessed Solid Waste Management Units (SWMU) that needed further characterization and cleanup, evaluating 13 additional areas under the (RCRA Facility Assessment) process.

These evaluations included a historical records review, visual site inspection, and sampling. In addition, the District evaluated 29 areas suspected as SWMU's by conducting reviews of historical aerial photographs and records. The District continued to work with the agencies to determine when the groundwater contamination would be cleaned up. The transfer of the remaining Army property (approximately 49 acres) to the City of Sacramento will be forthcoming by 2003.[22]

The District Expands Its Mission: Support for Others

The Outreach Office made a big push on educating the District on all programs, including SFO, and a brochure was developed and distributed throughout the District. The brochure was also shared with customers and potential customers.

In 1998, it appeared as if the Sacramento District would become the designated district for work in Mexico since several agencies of the Mexican government and the Federal Government requested the District's assistance in the area of HTRW contamination and cleanup, as well as with other infrastructure needs.

In October 1998, the Corps South Pacific Division Commander briefed Ambassador Davidow on the Corps' potential support to Mexico and received his endorsement. In May 1999, the U.S. Embassy in Mexico advised that the government of Mexico did not support Corps participation in any type of activities (excluding academic contacts and conferences) in Mexico and as such should not pursue activities in Mexico.

The Mexican government has also requested assistance with several other projects. At the request of the U.S. Commercial Counsel in Guadalajara, a meeting was scheduled with Governor Cardenas of the State of Jalisco at the Inter-American Development Bank for discussions with the District on Lake Chapala's problems including nuisance vegetation and declining lake levels. Another 5-year funded project was being conducted to promote conditions for environmentally sustainable, economically efficient, and equitably allocated use of water resources in Mexico. Mexico also requested assistance in groundwater conservation, restoration of surface water quality, flood control, dam safety, and water resource management.

In 1998, a SFO workgroup consisting of five individuals developed an assessment to the District's Corporate Board that the mission and range of potential customers for SFO consisted of many more customers than just those the District dealt with in the HTRW-oriented section in the Environmental Engineering Branch. The section also had been doing work both for the civil non-military side and the military side. The Corporate Board wanted those HTRW military customers to be supported by the HTRW Branch and proposed that each Branch in PPMD (Civil Works, Military, and HTRW) should pursue SFO work that most related to each Branch's mission. The Corporate Board opted to have an individual accountable for program information within PPMD who would matrix with the appropriate Branch for project accomplishment. In this way, all SFO customer needs would be centrally addressed, followed, and accounted for.

District's Work with the EPA

In addition to the support of military installations, the District became involved in Superfund site cleanups. The EPA administers and is directly responsible for the Superfund program, and the appropriate Corps District or Division oversees the Superfund cleanup projects, according to the EPA and the Corps memorandum of understanding.

Superfund Site Cleanups

The District performed three Superfund cleanups in the mid- to late-1980's: Jibboom Junkyard, Celtor Chemical Works, and Del Norte Pesticide. The District also assisted the EPA with the cleanup of many other sites.

Jibboom Junkyard Superfund Site - Circa 1987

Jibboom Junkyard

The first cleanup was the Jibboom Junkyard in Sacramento in 1987, where the District supervised construction. The Jibboom Junkyard was the site of a salvage metals processing company from 1951 to 1965. The EPA's soil sampling detected elevated concentrations of lead, zinc, copper, and low levels of poly-dichlorobenzene, but no groundwater contamination. The District oversaw a firm contracted to excavate contaminated soil to a depth of 1 foot to 2 1/2 feet and transport it by trucks and railroad boxcars to an approved hazardous waste disposal facility in Clive, Utah. The District closed the project out in August 1988.

Celtor Chemical Works

The 2-acre Celtor Chemical Works site, located in the northern Hoopa Valley Indian Reservation, was a former ore-concentrating facility that processed sulfide ore for copper, zinc, and precious metal extraction. The Hoopa Valley Indian Tribe, the site's owner, leased the land in 1958 to the Celtor Chemical Corporation until 1962. Tailings, along with non-specific releases of processed ore, were thought to be the cause of acidic surface water runoff and elevated metals concentrations in the soils throughout the site. The District provided construction supervision and closed out the project in July 1992.

Del Norte Pesticide Storage

The Del Norte Pesticide Storage site is located 1 mile from Crescent City, California, in Del Norte County. The Pacific Ocean, State-owned land, residences, and farmland border the site. Private wells supply the domestic water to the area, and four wells are located within 2,500 feet of the site. Approximately 250 people live within 1 mile of the site. The Sacramento District provided construction supervision for pesticide, herbicide, and volatile organic compound contamination in the soil and groundwater. The removal of contaminated soils and the installation and operation of the groundwater treatment system reduced the potential for exposure to

contaminated materials.[23] The District closed out the project in 1990.

Operating Industries, Inc.

In September 1996, the EPA issued a Record of Decision on the Operating Industries, Inc. (OII) landfill. The landfill is located approximately 10 miles east of downtown Los Angeles. Over the life of the landfill from 1948 to its closure in 1984, the company disposed of residential and commercial refuse, liquid wastes, and various hazardous wastes. In January 1984, the State of California placed OII on the California Hazardous Waste Priority List. The landfill stopped accepting wastes and was closed in late 1984. The EPA placed OII on the NPL in the same year and began conducting studies and taking actions to protect the local environment and those who lived near the site.

To address the contamination, EPA proposed four long-term remedial phases including leachate management, installation of a gas control, landfill cover, and site control and monitoring. The fencing of the site, removal of leachate, and the other emergency actions to control flammable site gases reduced the potential threats from contaminated materials at the site.

Hassayampa Landfill

The Hassayampa Landfill Superfund site is located approximately 40 miles west of Phoenix and approximately 3 miles north of Arlington, Arizona, in Maricopa County. The Maricopa County used 47 of the 77 landfill acres for the disposal of municipal and domestic solid waste, including a 10-acre former hazardous waste disposal area located in the northeast section of the landfill. Soils beneath the waste pits contain volatile organic compounds, heavy metals, pesticides, and lime wastes. The EPA placed Hassayampa on the Superfund NPL on June 10, 1986. The District provided technical assistance and third party review services.

Nogales Wash Landfill

In January 1996, the United States and Mexico established wells to monitor the groundwater quality and to obtain reliable information on soils and air pollution in the shallow aquifer along the Nogales Wash landfill.[24] The District provided technical assistance, including training, to Mexican environmental firms on landfill closure.

Waste Disposal, Inc.

The Waste Disposal, Inc. (WDI), Superfund site is located in the city of Santa Fe Springs, on approximately 40 acres of land divided into multiple parcels. At its center, the WDI site contains a buried 42-million-gallon capacity, concrete-lined reservoir that was used until the mid-1960's for disposal of a variety of hazardous substances including petroleum-related chemicals, solvents, sludges, construction debris, drilling muds, and other waste materials. The 15,000 residents of Santa Fe Springs obtain drinking water from wells within 3 miles of the site. Metals, polynuclear aromatic hydrocarbons, and volatile organic chemicals contaminated the soil. Fencing the site reduced the potential for exposure to contaminants at the site while groundwater studies and soil cleanup activities were designed.

McCormick and Baxter Creosoting Co.

The McCormick and Baxter Creosoting Company project site was a 29-acre former wood-preserving facility located in an industrial area near the Port of Stockton. From 1942 to 1990, McCormick and Baxter treated utility poles and railroad ties with creosote, pentachlorophenol (PCP), and compounds of arsenic, chromium, and copper. The facility is located adjacent to the river and estuaries that run through Stockton, California. Old Mormon Slough, which is connected to the Stockton Deepwater Channel, borders the site on the north.

The area is a very sensitive environment not only for winter run Chinook salmon, but also for steel-

head trout, bass, migratory birds, and local habitat. Human health could be affected as well by direct contact with soils that are on the site or by the consumption of any fish that spend a significant time in the area.

In 1977, a fish kill in New Mormon Slough and the Stockton Deepwater Channel prompted State agencies to investigate the site. Sampling has shown that soils throughout the site and groundwater in the shallow aquifer beneath the site are contaminated with PCP, various constituents of creosote, dioxin, and metals. The installations of stormwater collection ponds as well as other measures have reduced threats to public health and the environment while site studies are being completed.

Brown and Bryant, Inc. (Arvin Plant)

The Brown and Bryant, Inc., (Arvin Plant) covers about 5 acres in Arvin, located in Kern County, California. The company began operations in 1960 as a formulator of agricultural chemicals including fertilizers, herbicides, insecticides, and fumigants. The company improperly handled and disposed of hazardous wastes. The Arvin-Edison Water District maintains six municipal groundwater wells within 1 mile of the site. The soil contains pesticides such as dinoseb, ethylene dibromide, and other fumigants. The groundwater also is contaminated with pesticides. The EPA began an investigation in 1990 to develop a long-term solution to the groundwater and soil contamination problems. A remedy was selected in 1993 that included consolidation of contaminated soil, installation of a cap over the consolidated soil, and extraction and treatment of water from the first water-bearing unit. Design of the remedies was completed in early 1997.

Sulphur Bank Mercury Mine

The 120-acre Sulphur Bank Mercury Mine site, once one of the largest producers of mercury in California, has been inactive since 1957. Approximately 120 acres of mine tailings and waste rock and an open, unlined mine pit (called the Herman Impoundment) are located on the property. The Sacramento District provided project management for the feasibility study, technical assistance by contract, and in-house interim removal actions. The District also presented the final remedial design and remedial action. The contamination at this site consisted of acid-mine drainage and mercury and arsenic in the soil and in the surface water affecting Clear Lake.

Leviathan Mine

The Leviathan Mine site is an inactive sulfur mine located on the eastern slope of the Sierra Nevada in Alpine County, California. In 1954, the Anaconda Company transformed the underground workings into an open-pit mine to extract the sulfur ore. The company removed approximately 22 million tons of waste rock to extract the ore. Infiltration of precipitation into and through the open pit and overburden piles created acid-mine drainage that discharged directly into Leviathan Creek. The acid mine drainage killed fish in the Carson River. The Sacramento District provided "responsible party oversight" of Atlantic Richfield Company and the Regional Water Quality Control Board.

Roseville Rail Yard

While digging up old train tracks with a backhoe in the Union Pacific's Roseville rail yard 15 miles west of Folsom, California, construction workers discovered a 250-pound Vietnam-era aerial bomb on October 7, 1997. An additional 15 bombs and fragments contaminated with explosive residue have been unearthed on six different occasions. The Sacramento District, along with the Corps' Huntsville Division, offered quality control and quality-assess-

ment oversight and advised Sacramento County on clearance procedures.[25]

Benicia Tourtelot Property (Benicia Arsenal)

The Benicia Tourtelot Property, managed by the Granite Management Corporation, was part of the former Benicia Arsenal in Benicia, California. The arsenal had been used to dispose of ordnance and explosives, inspect and renovate ordnance, test Howitzer barrels produced at the arsenal, and dispose of dynamite and TNT.

The site is slated to be redeveloped as a residential community of about 400 houses, with the remainder left as open space. The primary issues are unexploded ordnance, public safety (including evacuation during remedial activities), heavy metals, and TNT-contaminated soils.

Because the City of Benicia and the developer wanted to move ahead quickly and the FUDS funding of the Tourtelot area would not be available for 10 more years, the City requested the Corps' support under the SFO program. The District and the Huntsville Division advised the City on clearance procedures, provided document review, and quality control and quality-assessment oversight.[26]

Omega Chemical Corporation

A former hazardous waste treatment and storage facility in Whittier, California, in Los Angeles County, the Omega Chemical Corporation conducted a solvent recovery operation using an onsite fractionation and distillation process. Omega also operated as a storage and transfer facility for various hazardous waste from 1976 to 1991 on a 40,000-square-foot property. The District gave technical assistance and contract support for the cleanup.

Jasco Chemical Company

The Jasco Chemical Company located at 1710 Villa Street in Mountain View, California, repackaged and formulated chemical products on the 2.05-acre site from 1976 until December 1995. Tankers

Roseville Rail Yard, Exploded Bomb Fragments - Circa 1997

received bulk solvents used at the site. The company stored the solvents in eight underground storage tanks. A swale area located behind the building contained elevated levels of volatile organic compounds in soils and in the shallow groundwater. The District furnished technical assistance and contract support for the project. This site will be released for residential development by 2004.

Alark Hard Chrome

The Alark Hard Chrome site occupies approximately a quarter of an acre in a light industrial area of the city of Riverside, California. An electroplating shop operated on the site from 1971 to 1985. During a 1982 investigation of the site, personnel from the Riverside County Department of Health observed "pools of chemicals" outside the back door of the shop. In 1990 and 1991, the California EPA, Department of Toxic Substances Control, conducted a subsurface soil investigation at the site. Chrome was found in the groundwater and soils. The District offered technical assistance and contract support to this project.

Stringfellow Facility

From 1956 until 1972, the 17-acre Stringfellow site operated as a hazardous waste disposal facility. The company deposited more than 34 million gallons of industrial waste – primarily from metal finishing, electroplating, and pesticide production – in evaporation ponds. Contaminated groundwater plume could impinge on private drinking water wells with TCE, perchlorate, and ordnance. Because of the contamination potential, the community since 1989 has received its water from public utilities and no longer relies on groundwater. The District provided field and technical oversight as well as contract support.

Selma Treating Company

The Selma Treating Company site covered 12 acres approximately a half mile south of Selma, California, in Fresno County. The company began pressure-treating wood operations in 1965 and discharged process wastes into an offsite drainage ditch, several onsite disposal wells, and an unlined pond. Sampling indicated elevated levels of copper, chromium, arsenic, and pentachlorophenol in soil and groundwater, both onsite and offsite. The EPA issued a Record of Decision in September 1988. The Sacramento District provided technical assistance, construction contract solicitation, and construction supervision for soil remediation.

EPA Site Assessment Program

The EPA's objective is to keep abreast of the ever-changing status of the environment and assign priority to contaminated sites for cleanup based on their severity, and at the same time maintain safe living conditions. The Site Assessment Program assists in this objective.

The EPA chose the Sacramento District to support the EPA Site Assessment Program in Region 9, which includes a number of sites in Arizona, California, Hawaii, the Marianna Islands, and Nevada. The EPA has authorities on private land to conduct assessments for the potential effects to human health and the environment. As such, the sites are often multifaceted and complex, challenge comprehension, and inevitably require time and thought for the best solution. The contaminated sites can range from a single industrial facility to a complex of watersheds with diverse inputs. At times they are in areas in which social justice concerns arise, making the work politically charged. For example, Native American tribal lands are a particular concern for interaction and protection. This particular group of Americans often lives closer to nature and often has greater exposure than residents in urban areas.

The EPA emergency removal, brownfields, and Superfund divisions rely on Site Assessments to focus the scarce resources of the Federal government. With restricted resources, the EPA's focus is on the worst hazards. Often the lesser hazards sites will be deferred to a state's environmental program or to the EPA Brownfield[27] Grants Program.

The District supports the Hawthorne Nevada Brownfield site. The District identified 22 landfill cells and the physical makeup of those cells. Subsequently, after joint discussions with the EPA, the Nevada Department of Public Health, the City of Hawthorne, and others, the District developed an alternate plan that would allow for residential development of the parcels. The District also developed the Quality Management Plan that EPA requires the Corps to maintain in its performance of projects.

Summary of the District's EPA Work

The EPA's interest in using the Corps has not been as strong in California as in other regions of the country. This has been the case because EPA Region 9 has had more capability themselves than other regions throughout the country and because of the strong environmental emphasis and awareness in California. Therefore, the Corps has not provided as much assistance to the EPA in California as it has in other areas.[28] However, with Sacramento District personnel working closely with EPA Region 9 headquarters, the two agencies are learning each other's culture and are progressing toward working cooperatively on projects.

The Sacramento District is capable and adept at quickly responding and reacting to changing environmental conditions. This readiness has enabled the District to achieve excellence in the construction, removal, and remediation of cleanup sites.

The Superfund sites are some of the most dangerous, and at minimum, present a danger to human health and the environment. The District developed a good relationship with the EPA and maintains its dedication and commitment to readiness.

For the Site Assessment Program, the District provided assistance with program and project management, in-house technical assistance, and contracting to more than 100 sites in Region 9.

Restoration of Abandoned Mines Initiative

The end of mining activities left a number of abandoned non-coal mines scattered throughout the western United States. The mines, located on private, state, and public lands, have been besieged with terrestrial and aquatic ecosystem degradation in the form of open shafts and acid rock drainage. Consequently, the mines pose numerous public safety and environmental hazards.

The mining activities and the abandonment of the sites occurred prior to the enactment of environmental regulations in the 1970's. Frequently, new owners of these abandoned sites have been unjustly saddled with the responsibility for cleaning up the environmental damage they inherited.

Section 560 of the Water Resources Development Act of 1999 authorized the Secretary of the Army to provide planning, design, and technical assistance to Federal and non-Federal interests to address water quality problems caused by abandoned and inactive non-coal mine drainage and related issues. A Memorandum of Agreement signed December 3, 1998, between the Northwestern Division, the South Pacific Division, and the Pacific Ocean Division of the U.S. Army Corps of Engineers formed a Western Region Restoration of Abandoned Mine Sites (RAMS) team to ensure a corporate (private industry) approach to customers who have abandoned mine remediation and restoration needs. The SPD Commander, Brigadier General Peter T. Madsen, assumed the role of account executive and accountability for the Western Region RAMS Program.

The Western Region RAMS Center will be responsible for all work in this area. After a preliminary investigation in 1998, RAMS estimated $75 billion in potential work in the identification, assigning priority, remediation, and restoration of non-coal abandoned mines in the western region of the United States – an estimated 300,000 sites.[29] The western region includes Alaska, Arizona, New

Penn Mine Site, Calaveras County, CA

Mexico, Hawaii, Idaho, Oregon, Washington, California, Nevada, Utah, Montana, North Dakota, South Dakota, Colorado, and Wyoming. Approximately 17 Sacramento District staff support the Center and its activities, including the Western Region RAMS Program Coordinator. [30]

Conclusion

The severity of contamination at a large number of military bases particularly in California and to a lesser extent in Utah and Nevada, the Federal Home Loan Administration, the EPA Superfund sites, and the post Cold War base closures under BRAC have provided significant work for the Sacramento District. The District was visionary and became poised to accept the new challenges in environmental cleanup work, creating for itself a new mission and becoming a Hazard Toxic and Radiological Waste design center in 1990.

Environmental cleanup work was sorely needed with the decline of military design and construction in the District. The HTRW in its relatively short 17 years of development has become second to the District's military construction programs and has overshadowed the civil works program. Since its designation as a HTRW design center, the District's HTRW budget has grown from $50 million in the first 3 years of its history (1990-1993) to $137 million in Fiscal Year 2002.

The District has developed an outstanding reputation and expertise in HTRW work as a result of extensive staff training and professional development. The District can quickly respond to HTRW emergencies. It identifies hazardous waste conditions, determines the best type of treatment and cleanup methods, analyzes alternatives, develops plans for cleanup, and remediates cleanups with contractors. The District has also been noted for its emphasis on maintaining high safety standards in its pursuit of the work.

The District's success in undertaking such large projects as Fort Ord and the Sacramento Army Depot has garnered its HTRW Branch many accolades and has contributed significantly to new strategies and technologies in the HTRW field nationally. The District now seeks to document its successes in HTRW work and continues to pursue other resources of work such as the restoration of abandoned mines and its continued relationship with the EPA and superfund sites.

Endnotes

[1] Richard Whitmire, "Sharpe Cleanup Funded" in *Stockton Record*, September 6, 1986.
[2] "Uncle Sam's Hidden Poisons, Series on Toxic Waste" in *Sacramento Bee*, September 30-October 5, 1984.
[3] Interview Willie Collins with Don R. Jones, December 23, 2002.
[4] Interview Willie Collins with Brian Doyle, February 11, 2000.
[5] U.S. Army Corps of Engineers, Sacramento District, "Official Hazardous and Toxic Waste (HTW) Design FOA," Standard Form (SF) 255, November 21, 1988.
[6] U.S. Army Corps of Engineers, Sacramento District, "Sacramento Named Center of Expertise" in *PAR*, July 1990.
[7] Interview Willie Collins with Don R. Jones, December 23, 2002.
[8] U.S. Army Corps of Engineers, Sacramento District, "Organization and Functions," Office Memorandum, Number 10-1-3, February 1, 1993, pp. 13-21.
[9] Interview Willie Collins with Brian Doyle, February 11, 2000.
[10] U.S. Army Corps of Engineers, Sacramento District, "HTRW Committee Moves Ahead on Safety Measures" in *PAR*, October 1995.
[11] Interview Willie Collins with Don R. Jones, December 23, 2002.
[12] FUDS referred to the DoD or its components (the military service branches and the Defense Logistics Agency) formerly owned, leased, or otherwise operated sites.
[13] Interview Willie Collins with Chris Prescott, January 24, 2003.
[14] Interview Willie Collins with Steven M. Lightner, February 18, 2000.
[15] Interview Willie Collins with Harvey D. Jones, January 6, 2003, http://www.environmental.usace.army.mil/info/contract/terc/tercwhat/tercwhat.html
[16] Based on data obtained from TERC Program Manager Chris Prescott, January 24, 2002.
[17] U.S. Army Corps of Engineers, Sacramento District, "DERP Program Review, Army Installation Restoration Program," August 5, 1989.
[18] U.S. Army Corps of Engineers, Briefing by Harvey D. Jones, Support for Others, November 4, 1991.
[19] The Fort Ord site was originally called the Fort Ord Complex and was composed of approximately 43 different sites at Fort Ord, Presidio of Monterey, Fort Hunter Liggett, Camp Roberts, and the 63rd Arcom site and two operable units all included in one National Priorities Site.
[20] Interview Willie Collins with Dan McMindes, January 7, 2003.
[21] This was a regulated schedule to meet the Record of Decision timeline for disposal of BRAC property.
[22] Interview Willie Collins with George Siller, December 26, 2002.
[23] U.S. Army Corps of Engineers, Sacramento District, "District Cleans Up Toxic Waste Site" in *PAR*, January-February 1987.
[24] This project was pursuant to the International Boundary and Water Commission Joint Report of Principal Engineers Relative to the Joint Monitoring of the Quality of the Groundwaters in the Ambos Nogales Area..
[25] Michael Hable, "Explosives, Getting a Bang Out of GC Analysis," Directorate of Laboratory Sciences, USACHPPM, Aberdeen Proving Grounds in *Separation Times*, October 7, 1997, vol. 12, No. 2.
[26] Earth Tech. Tourtelot Investigation and Remediation, 2002, www.earthtech.com/services/environmental_remediation_waste/projects/Tourtelot.htm.
[27] Brownfields are abandoned or idle properties where real or perceived contamination hinders redevelopment. The term "brownfield" is distinguished from "Greenfield," which refers to sites in outlying areas that are undeveloped. Most brownfields have a history of industrial use, and many are found in distressed communities.
[28] Interview Willie Collins with Brian Doyle, February 11, 2000.
[29] Western Governor's Association/National Mining Association, http://www.spk.usace.army.mil/cespk-pao/99sep/sep99-03.htm.
[30] Interview Willie Collins with Mark Cowan, December 29, 2002.

Chapter 14

Sacramento District Studies, 1979 - 2003

The Sacramento District has been involved in many studies and projects past several decades. The District conducted an internal study of the Debris Commission and commissioned a history of the Commission before it ended in 1986. As of July 2003, many studies and reports that will provide significant data for flood control and management are still ongoing. They include the Yuba River Basin Project, the American River and Folsom Dam Modification Study, and the Sacramento and San Joaquin River Basins Comprehensive Study. The District was also involved in Caltrans' proposals to retrofit and replace the San Francisco-Oakland Bay Bridge.

The District's Study of the California Debris Commission

Congress established the California Debris Commission on March 1, 1893, (see "California Debris Commission" in Chapter 1) in order to regulate hydraulic mining in the State of California.[1] The Commission continued its work, but by 1970 the work authorized by the original Acts of 1910 and 1917 was just about complete.

The Commission had been in existence for nearly 100 years and had received some 1,300 applications to mine by the hydraulic method; yet by 1980 there was only one active permit remaining. Therefore, the relevancy of the Commission was being questioned. At that time, Colonel Paul F. Kavanaugh, Commander of the Sacramento District, met with the District staff who had environmental and legal expertise to assist in determining the ongoing work of the Commission. During the examination, the District determined that the Commission controlled three small basins with three small dams: the Yuba River Basin, the Sacramento and San Joaquin River Basins, and the American River and Folsom Dam. In addition, the Commission also had some responsibility for water quality. However, other laws, standards, and agency policies also governed water quality. Next, the District looked at how much the Commission cost and determined that little money was spent on its work. After completing its investigation, Kavanaugh and the District staff concluded that the Commission should be abolished and began notifying various congressional offices of its decision.

Before the abolishing the Commission, Senator S.I. Hayakawa suggested that the history of the Commission work be written and published. Upon this recommendation, the Sacramento District contracted Joseph J. Hagwood, Jr., the author of the first Sacramento District history published in 1976, to write the history. Hagwood's goal was to "illuminate the conditions and events that brought the Commission into being, and...trace the record of achievements...."[2] In 1981, the District published *The California Debris Commission: A History.*

On November 17, 1986, the Commission was finally abolished by Congress, and its authorities, powers, functions, and duties were transferred to the Secretary of the Army. This transfer of control meant that the Sacramento District was now responsible for the Yuba River Basin, the Sacramento and San Joaquin River Basins, and the American River and the Folsom Dam.

Historical Background of the Yuba River Basin

The towns of Marysville, Linda, Olivehurst, and Arboga have relied on levees for flood protection since 1875. Hydraulic mining in the mid-1800's washed immense quantities of sediment into the rivers and streams, and over time the river channels meandered and changed. The effect of sediment transport through the river system has been a key factor in the conveyance capacity of the rivers. The increasing sediment loads choked and reduced the capacity of the Feather and Yuba Rivers. These areas have experienced frequent floods, many occurring before the District could record streamflow data.

To prevent the damage from sediment, the Sacramento River Flood Control Project in 1917 authorized the construction of levees along the Feather and Yuba Rivers. Prior to the completion of the Oroville

1986 Flood - Linda, CA

Dam in 1967, large floods caused levee failure that resulted in severe damage to lands in the surrounding area. The most destructive recorded floods on the Yuba and Feather Rivers occurred in 1950, 1955, 1986, and 1997. These four major storms resulted in record flows, which eroded levee embankments and exceeded design levels.

In the 1986 flood, a section of levee near the community of Linda failed due to unknown structural problems. State agencies and the Corps evacuated approximately 24,000 people. Personal injuries consisted of one fatality and 32 injuries. Property damages included the destruction of more than 895 homes and 150 businesses. The floodwaters damaged more than 3,000 homes and 150 businesses estimated at approximately $95 million (in 1986 dollars) for the Yuba River area.

During the flood of 1997, a levee break on the Feather River occurred approximately 6 miles south of Olivehurst, triggering the evacuation of approximately 15,000 people from Linda and Olivehurst. The Sacramento District provided emergency flood fighting, evacuation, and repair to restore the levee to their original condition in 1986 and 1997.

Flood Control Feasibility Study

The increased risks of flooding prompted the Sacramento District to begin feasibility studies for the area. The study was in response to a request from the Yuba County Water Agency (YCWA). A 1990 reconnaissance study identified a significant flood threat and determined that at least one alternative plan (levee raising) appeared to have Federal interest. The District initiated the 7-year study in 1991 to determine what feasible measures should be taken to reduce the potential for flood damages in the study areas. The cost of the study totaled approximately $3.8 million, divided 50-50 between Federal and non-Federal sponsors. The non-Federal sponsors included the State of California Reclamation Board and the YCWA.

The Yuba River Basin study is located in western Yuba County about 50 miles north of Sacramento. The study area is part of the watersheds of the Yuba and Feather Rivers, which are included in the larger

Sacramento River system in northern, California. These two rivers originate in the Sierra Nevada and generally flow southwest in the mountains and foothills and then south in the Central Valley. The rivers eventually flow into the Sacramento River. The drainage area of the Yuba River is about 1,350 square miles, and the Feather River drains about 3,600 square miles above Oroville Dam and 370 square miles below the dam. The study area focuses on flooding problems in the lower Yuba River basin and part of the Feather River basin below the Oroville Dam.

The Flood Control Act of 1962 (Public Law 87-874) provides the basic authority for the study. The Act directed the District to study flood control problems along northern California waterways including the Sacramento River and its tributaries. In addition, the Water Resources Development Act of 1999 and Section 12670.7 of the California Water Code added in 2000 also provided Federal and State justification to improve the levees in Reclamation District 784.

The findings of the feasibility study indicated that the most viable flood control plan consisted of work in two reaches along sections of levees on the Yuba and Feather Rivers, and a third reach that involved work around the city of Marysville. The local sponsors decided to perform advanced work by modifying the slurry wall. The selected plan had benefit-to-cost ratios of 1:6 for both the Linda and Olivehurst areas, 1:1 for the lower Reclamation District 784, and 4:3 for the city of Marysville. The initial total cost was $25,850,000 with a net benefit of $3.3 million.

The Chief of Engineers submitted a report in November 1998, and in 1999, the Office of Management and Budget concurred with the project's findings. The Assistant Secretary of the Army (Civil Works) submitted a report to Congress in December 1999, and the project was subsequently authorized in the Water Resources Development Act of 1999.

Although best management practices will be in place and avoidance measures taken, construction of the selected plan will affect the area's vegetation and wildlife with temporary and permanent loss of 2.3 acres of riparian habitat, as well as grassland and agricultural lands. A mitigation and monitoring plan will be in place to compensate for the project's effects to the vegetation and wildlife and to the spe-

Levee Repair - Feather River - Olivehurst, CA

cial status species, which include the Giant Garter Snake, Swainson's Hawk, and the Valley Elderberry Longhorn Beetle that resides in the Valley Elderberry Shrub.

To date, geotechnical explorations are being conducted to thoroughly determine under-seepage on several areas of the levees. Costs estimates have exceeded authorized limits; thus construction is now delayed, and further studies are being completed.

American River Watershed Project American River Basin

The American River Basin drains the western slope of the Sierra Nevada in northern California and forms a flood plain covering approximately 110,000 acres. Sacramento is located in a flood plain at the confluence of the Sacramento and American Rivers. The flood plain includes most of the developed portions of the city of Sacramento and virtually all of the 55,000-acre Natomas Basin, which is now considered a high growth area.

Historically, the Sacramento Valley region has had fairly low growth as compared to California's coastal metropolitan area. Yet more recently, the region has emerged as one of the high-growth areas of the State, due primarily to the comparative advantages of good highway access, competitive commercial lease rates and a growing labor force, a large supply of moderately priced housing, and proximity to a wide range of cultural activities and outdoor recreational areas.

Protecting the growing urbanized areas of Sacramento from large floods caused by rare storms events became the flood control planning objective of the American River Watershed Project. Quantifying and forecasting the potential for flooding involved determining what size floods could be expected in the future and how often floods of various sizes were likely. Historical records dating back more than 82 years were used to determine that floodflows in the American River are frequent, but only flood flows resulting from intense winter rainfall over the foothills and the mountains have caused serious flooding. The climate and geography of the Sacramento valley combine to form an area where flooding is not unusual. Indian folklore and newspaper accounts mention at least nine major floods prior to 1890. The losses throughout the valley due to these early floods were large and meant that transportation, farming, and business came to a complete standstill. Financial losses into the millions occurred in both 1907 and 1909, which prompted construction of the current flood control system.

The Sacramento District first worked on an American River Project in 1970 when Sacramento County Department of Public Works requested that the District provide bank restoration and revetment protection to the river. The District entered a cost-sharing agreement with the County. State and County officials praised the completed project.[3] However, it was not until the 1986 storm that the American River took center stage in addressing the need for Sacramento's flood protection.

Learning from the Flood of 1986

The major flood of record as measured in volume was on the American River in 1986. The record rainfall in February 1986 severely challenged the American River's flood control system. The cofferdam built in the mid-1970's at the Auburn Dam site runoff in the American River quickly overflowed in 1986, causing it to break and discharge 100,000 acre-feet of water into the Folsom Reservoir. Releases from the reservoir almost overwhelmed the levee system. Some believe that the cessation of rain in 1986 was the saving grace from a near disaster. The Section Chief of the Sacramento-San Joaquin Comprehensive Study, Merritt Rice, reminds us:

> *Few people realize how close Sacramento came to a major catastrophe in 1986. If the rains had not stopped, more releases would have been necessary at Folsom Reservoir and would have definitely caused levees to fail; much of Sacramento would have been flooded.*[4]

It was the flood of 1986 that drew attention to Sacramento's significant flood risk and incited Federal, State, and local agencies to initiate action to reduce the flood risk.

Several significant Corps studies on the American River have emerged from the floods of 1986.[5] After the flood, Congress directed the Corps to look at the flood problem and devise a solution for the American River. This effort culminated in December 1991 with the "Feasibility Report: American River Watershed Investigation, California." The State of California and the Sacramento Area Flood Control Agency (SAFCA) concurred with the report's recommendations for a "dry dam" (a dam that stores water only during flood events) near Auburn to work in conjunction with the multipurpose Folsom Reservoir. The District Commander and South Pacific Division Commander also endorsed and recommended the report's findings. Congress rejected the selected plan stated in the feasibility study and authorized only certain pieces of the project, including levee and channel improvements around the Natomas area and modifying the existing Folsom Dam. Because of vigorous environmental opposition to a dam upstream, Congress deferred any further action on the American River and instructed the Corps to complete additional studies with SAFCA and the State, exploring alternative ways of increasing flood protection.

Modifying Folsom Dam

Between 1991 and 1996, the Corps reviewed the problems and arrived at three alternatives: a dry dam upstream near Auburn, increasing the flood control space and making other modifications at Folsom Dam, and making some modifications to Folsom, but also strengthening levees along the lower American River.

The Corps published these alternatives in a study in 1996. The study recommended releasing more water out of the Folsom Reservoir during a flood event. The State and SAFCA endorsed the recommended plan: that is, the construction of a flood detention dam near Auburn. By far, the flood detention dam – holding the water upstream and not trying to deal with it when it flows downstream – was the most cost-effective way of providing high levels of flood protection.

Slurry Wall Installation, Feather River - Circa 1997

Congress debated the alternatives of this study and authorized a portion of the recommended work in the Water Resources Development Act of 1996. It advised the Corps to construct features common to all plans as a short-term project to swiftly increase flood protection. Congress authorized 24 miles of 15- to 40-foot-deep slurry walls along the American River, 12 miles of levee work along the Sacramento River, and upstream gages and a flood warning system installation, at a cost of $56.9 million.

However, Congress opposed a detention dam upstream near Auburn because of continued strong environmental resistance to a dam. The construction of the Auburn Dam had been a top priority for U.S. Rep. John T. Doolittle (R-Rocklin) over the previous 15 years. Congressman Doolittle believed that the Federal Government had an obligation to resolve two issues on the American River. One of them was the flood control concern for the Sacramento region, and the other was the ever-increasing water supply needs for El Dorado, South Placer, and San Joaquin Counties. Doolittle supported resolving both problems at the same time.

In late December and early January 1997, unprecedented rainfall and melted snowpack caused severe flooding in 48 California counties. While the storm primarily affected the Sacramento Valley and not the city of Sacramento, invaluable information from this event resulted in a better understanding of the levees and foundations. The information resulted in changes in the design depth of slurry walls from 60 to 80 feet deep and required that bridges and utility crossings have cutoff walls.

In the Water Resource Development Act of 1999, Congress authorized new levee fortification, including 3 miles of American River levee support and 10 miles of Natomas Cross Canal levee work at a cost of $91.9 million. Congress instructed the Corps to look intensively at two alternatives: raising Folsom Dam and shoring up the levee system along the American River and releasing more water. By the year 2001, the Sacramento District had completed 19 miles of slurry wall levees and created detailed designs of new work for levees in the Natomas Basin.

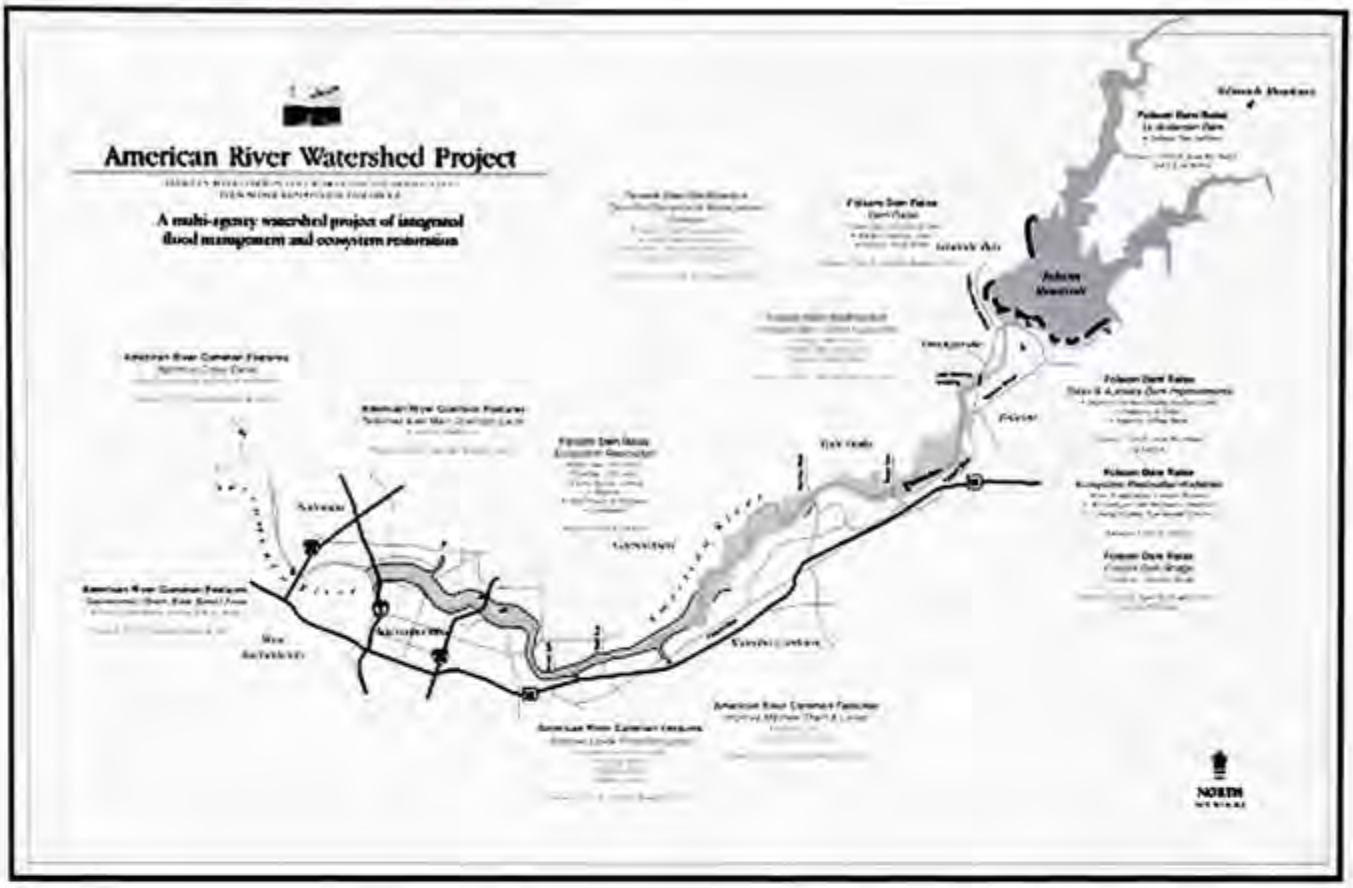
Representative Robert Matsui (D-California) and SAFCA believe that raising Folsom Dam would be the last key piece of a multifaceted system that could protect Sacramento against a major flood. In a draft report in 2001, the Corps made several recommendations with three key themes: increasing the flood storage capacity of Folsom Dam, raising downstream levees, and ecosystem restoration. The recommendations were:

- Raising the height of Folsom Dam by 3.5 feet, lowering the spillway 6 feet, and rais ing dikes around the lake.
- Raising the dam by 7 feet and raising dikes around the lake.
- Raising the dam by 12 feet and raising dikes around the lake.
- Modifying levees along the lower Ameri can River and the Yolo Bypass to accommo date an increase in flood releases from 115,000 to 160,000 cubic feet per second (cfs).
- Modifying levees along the lower Ameri can River and the Yolo Bypass to accommodate an increase in flood releases from 115,000 to 160,000 cfs. Adding a new low-level outlet to Folsom Dam.
- Raising downstream levees along American River an average of 2 feet and strengthen ing levees in the Yolo Bypass to handle in creased flood releases up to 180,000 cfs.
- Raising the dam 7 feet in combination with increasing flood releases to 160,000 cfs.

Raising the dam's dikes 7 feet at a cost of $179 million would give the area 213-year flood protection, the Corps draft report says, meaning that the lower American River would not flood even during the largest storm in known history.[6] Congressman Matsui and Friends of the River supported the plan; Congressman Doolittle derided it.

During the time when the study came out, several meetings to provide a forum for public input were held, and Chief of Public Affairs James Taylor emphasized, "The final plan depends on what the community wants."[7]

Currently, the American River Watershed Project has been updated after public input, and several of the project elements have been started, such as fortifying portions of the levee system along the lower



American River. The project now consists of four main components: the Common Features Project, which has been ongoing, the Folsom Dam Modification Project, and the Folsom Dam Raise Project and the associated Folsom Dam Bridge.

Over the next 15 years, the American River Watershed Project will involve approximately $850 million in improvements and enhancements to Sacramento's flood control system and more than double the amount of flood protection, to one chance in 213 in any flood season.

Ecosystem restoration is also a major component of the American River Watershed Project. The restoration efforts will provide open waters and wetlands along portions of the American River, as well as provide benefits to fisheries by installing water temperature control shutters during the Folsom Dam raise.

Another component of the overall project is the Folsom Dam Modification, which will provide improvements to the Folsom Dam by increasing the existing dam outlets, as well as adding two new outlets. In addition to the outlets, new weather forecasting technology will be installed, thus making the operation of the dam more efficient in providing flood protection for the Sacramento region.

Sacramento and San Joaquin River Basins Comprehensive Study

The Corps and the Reclamation Board are jointly leading the Sacramento and San Joaquin River Basins Comprehensive Study. The $30 million planning study is one of the largest planning studies conducted by the Corps.[8] There are 28 people on study team; 13 of those are Corps employees, and the others are from the Reclamation Board and other State agencies.

The mission statement of the study is to develop a system-wide, comprehensive flood management plan for the Central Valley to reduce flood damage and integrate ecosystem restoration. The authorizing legislation and goal for this study recognized that a durable flood management system that can be ef-

fectively maintained on a long-term basis requires a design to accommodate and respect natural processes, as well as the current benefits and uses offered by the river system. This Federal authorization for the Corps to undertake the Comprehensive Study was provided in House Report 105-190, the Energy and Water Development Appropriations Bill of 1998, as follows:

> *In response to the devastating floods of 1997, the Committee has added funds and directs the Corps of Engineers to conduct a comprehensive assessment of the entire flood control system within the existing study authorizations of the Sacramento River Watershed Management Plan (authorized by the Flood Control Act of 1962) and the San Joaquin River and Tributaries authority (authorized by 1964 Resolution of the House Committee on Public Works). These comprehensive investigations will include: (1) preparation of a comprehensive post-flood assessment for the California Central Valley (Sacramento River Basin and San Joaquin River Basin), (2) development and formulation of comprehensive plans for flood control and environmental restoration purposes, and (3) development of a hydrologic and hydraulic model of the entire system including the operation of the existing reservoirs for evaluation of the current flood control system. Not later than 18 months after the date of enactment of this Act the Secretary shall transmit an interim report describing results of the post-flood assessment and the assessment of the existing flood control system and its deficiencies.*

In response to the floods in January 1997, California Governor, Pete Wilson, convened the Flood Emergency Action Team (FEAT) to provide an immediate assessment of the flooding problems and provide recommendations. In its May 10, 1997, report, FEAT made this recommendation to the California legislature:

> *[The California legislature should] authorize the Reclamation Board to act as the non-Federal sponsor and support the U.S. Army Corps of Engineers, working collaboratively with the Consortium of State and Federal Agencies with Responsibilities in the San Francisco Bay-Sacramento/San Joaquin Delta Bay-Delta Estuary (CALFED) structure to complete comprehensive watershed management studies in the Sacramento and San Joaquin river basins, ensuring that the full range of structural and nonstructural flood-damage reduction measures are considered in developing a new master plan for flood control in the Central Valley.*

The Governor signed this bill on September 22, 1997. The California Water Code, Section 12580, authorizes the State to participate with the Corps in flood damage reduction studies. The Reclamation Board passed Resolution 97-17, which approved its participation in the Sacramento River and San Joaquin River Basins Comprehensive Study.

The study was undertaken in two phases. Phase 1, which was completed in 1999, described the effect of floods in the Central Valley in 1983, 1986, 1995, and 1997 and identified particular areas at risk from flooding. In addition, it also described the development and current operation of flood protection systems in the Central Valley. Phase 2 focused mainly on how to fix the problems in the existing flood management system for the Sacramento region.

Changing Needs in the Central Valley

Since the mid-1800's, agriculture in the Central Valley has played a vital role in California's economy. During the past 150 years, the Sacramento and San Joaquin Rivers were incrementally developed to provide for the basic needs of flood protection, water supply, transportation, and other water-related activities that contributed to the economic growth of California and the Nation. Yet, as seen in the 1997 flood in California, the Central Valley is at risk, and the flood management system no longer meets the needs of this important region.

A comprehensive effort to meet the needs in the Central Valley requires planning for an effective flood management system, which evaluates how

the complete system functions, how its performance could be improved, and how changes to parts of the system affect its overall performance. This comprehensive analysis applies to both flood damage reduction and ecosystem restoration objectives. The capability of analyzing the whole watershed approach for the flood management system replaces past practices of only making incremental changes without fully understanding how it may affect other parts of the system and the performance of the system as a whole.

Study Area

The Comprehensive Study area includes the combined watershed of Sacramento and San Joaquin River basins, which drains a watershed of over 43,000 square miles. The basins of the Sacramento and San Joaquin Rivers comprise one of the world's most diverse regions that is home to more than 4 million people and a wide variety of fish and wildlife, including about 378 special-status plant and animal species. In addition, both river basins provide drinking water to over two-thirds of Californians, and the economy of this region is centered on agricultural industry that provides the Nation and the world with high-quality crops.

The range of the Sacramento River Basin is the Sacramento Valley from above Shasta Dam to the ridge line of the Sierra Nevada to the ridge line of the Coastal Range, and then down to the Delta. The range of the San Joaquin River is comparable to the Sacramento River Basin, extending from the Sierra ridge line down south of Fresno across and up the coast.

The existing levee system of the San Joaquin Basin is a very old system. Many of these levees were built with dredged sand that is very pervious, and as a result, is weak and in need of reconstruction. According to Project Manager Michael Bonner, "You could probably take two-thirds of the San Joaquin system and rebuild it."

While the study will address the effects of runoff throughout these watersheds, it will focus on the flood plain areas of the Sacramento and San Joaquin Rivers and their major tributaries. Major cities in the study area include Sacramento, Stockton, Modesto, Fresno, Merced, Redding, Yuba City, Marysville, Colusa, Red Bluff, and Manteca.

The completion of the post-flood assessment ended Phase 1 of the study. The assessment guided the study into Phase 2 and the making of the interim report, the document that was transmitted to Congress. The study team produced three documents in 18 months and sent them to Washington on March 29, 1999. This first phase of the report was well received.

Phase 2: Fixing the Problems

The next phase of the study addressed the question of how to proceed to fix the San Joaquin and the Sacramento River system. The team looked at three ways to handle floodwaters: hold the water back somewhere, pass it through rapidly, or hold it inside the system by raising or widening the levees. The team had to resolve how to work the three methods of handling floodwaters together while also protecting the environment.

The Reclamation Board has State legal authority to regulate the use of lands within a floodway. A floodway is smaller than a flood plain. The study is concerned about the use of lands in a flood plain because of its exposure of flood risks to people and dwellings.

One of the big issues that the study is dealing with is an attempt to influence how local zoning ordinances are enacted to regulate use of a flood plain without trying to establish some Federal or State program. The study sees it as important that flood plain management is exercised at the local level because local decisions to minimize flood damage are more likely to be publicly acceptable.

Another related policy issue is one of coordination and consistency among agency information. The Reclamation Board manages the floodways. The Corps develops flood plain maps. FEMA develops flood plain maps. However, Corps maps differ from the FEMA maps because each agency uses different

criteria to build their maps. FEMA develops maps to delineate areas of inundation associated with the 100-year flood plain for flood insurance purposes. The Corps develops flood plain maps to show what the flood plain might look like during a major flood and perhaps levee failure.

Traditionally, the Corps does not consider secondary economic effects as a result of flood damage. Usually the Corps looks only at the national effect and assumes that any loss would be made up someplace else in the economy in the development of the national economic development plan. However, under this study, these local effects would be considered. For example, a secondary local economic effect might be flood damage to an agricultural area where crops are lost. The employees that work with that crop and the people who sell the crop locally lose their jobs. The study will draw from the Corps prior studies using the output data from the American River Study and the Yuba Basin Investigation.

Restoring Ecosystems

Section 1135 of the Water Resource Development Act of 1986 included provisions for the Corps, and subsequent legislation has expanded that authority. In the authority for the Comprehensive Study, Congress used specific language that enables the Corps to look at the system for improved flood management and restoration of the ecosystem.

Much of the vegetation has been removed over time to provide clear and clean channels for floodflow conveyance. As a result, the study is looking at the opportunity to setting levees back, moving them back away from the river a little, and reestablishing plantings and forests within the river environment in the floodway, yet still be able to carry the floodflows.

The Corps is working very closely with special programs such as the SB-1086 program. (The State of California Senate Bill 1086 established the Sacramento River Management Plan.) The function of that program is to look at opportunities for restoration of riparian habitat along the Sacramento River from Red Bluff (basically Shasta Dam) to the confluence of the Feather River and the Sacramento River near Sacramento. Its goals are to preserve remaining riparian habitat and to reestablish a continuous riparian ecosystem along the river.

Public Outreach

A study of this magnitude necessitates that the outreach efforts be extensive. The study team has conducted many public meetings and workshops with stakeholders and special interest groups throughout the San Joaquin and the Sacramento Valleys. Technical support group meetings solicited data from special interest groups to establish what the problems were and what the objectives ought to be. The bi-policy focus group meetings addressed policy issues with special interest groups. The Corps' project manager and the Reclamation Board project manager have also held numerous briefings to special interest groups, boards of supervisors, and State and county government agencies.

Conclusion

The December 2002 Interim Report summarizes the findings of the "Comprehensive Plan for Flood Damage Reduction and Ecosystem Restoration within the Flood Management System," and proposes a strategy for implementation. This report replaces the July 22, 2002, Draft Interim Report.

Once completed, the study will develop and begin to implement master plans that will increase flood protection and improve the ecosystem on major rivers and tributaries in the Central Valley. Future updates to the report will be prepared as projects are planned and constructed.

Sacramento District's Evaluation of Proposals to Retrofit and Replace the San Francisco-Oakland Bay Bridge

In 1989, the Loma Prieta earthquake caused damage to the San Francisco-Oakland Bay Bridge, prompting the State Department of Transportation (Caltrans), to initiate a program to retrofit all bridges in California, including the damaged east span of the bridge. As planning for the retrofit ensued, cost considerations forced Caltrans to begin plans to replace the structure rather than retrofit it. After consideration of several designs, Caltrans decided on a "skyway" design as the best alternative. The Metropolitan Transportation Commission, representing nine Bay Area counties and acting under authority granted by the California Legislature, resolved to add a signature span and "amenities" to the bridge, including a bicycle/pedestrian path and the self-anchored suspension (SAS) signature span deemed more distinguished than the "skyway" design.

The City and County of San Francisco and Caltrans solicited the U.S. Army Corps of Engineers as a body of independent experts to evaluate Caltrans' key technical decisions that served as a basis for its decision to build a replacement bridge. The Federal Highway Administration, in cooperation with the U.S. Navy, facilitated the Corp's communication with appropriate Federal, State, and local agencies and their consultation. The U.S. Coast Guard also participated.

Not all of the required technical expertise, including structural, seismic, and geotechnical knowledge, was available in the South Pacific Division. Sacramento District Engineer Colonel Michael Walsh recalls the assembling of technical experts for the project:

Bay Bridge Evaluation Team - Circa 2003

We assembled a team of 20 engineers and technical experts from across the Corps. They came from the St. Paul, St. Louis, Philadelphia, Louisville, Tulsa, and Sacramento Districts and the South Pacific Division office. Three architect-engineer firms also helped the Corps with the analysis. They were HDR, Inc., Quest Structures, and GEI Consultants, Inc.[9]

The three architect-engineer firms supplemented the Corps' expertise in the areas of bridge design, seismology, geotechnical, and technical writing.

The Corps team examined the City of San Francisco's two broad areas of concern: whether it was more preferable to retrofit the east span or replace it, and the seismic safety of the SAS signature span.

Phase 1: Collecting Data

The Corps team conducted an evaluation in two phases. The first consisted of the acquisition and cataloging of 400 documents containing approximately 75,000 pages. The Corps also evaluated the comprehensiveness and quality of the reports, data, and analyses. The Corps team visited the east span of the bridge, including the Oakland Mole, Yerba Buena Island, the cantilever section, the failure span at E9, and the pile cap at E3. The Corps team also viewed the bridge from a boat.

Using information from the site visits and review of the documents, the Corps team produced an interim report in July 2000 that evaluated and assessed the alternatives to retrofit or replace the east span. Under the terms of the agreement, the Corps team did not generate any new data or conduct additional analyses.

Phase 2: Addressing the Major Issues

The second phase of the evaluation provided answers to questions related to how Caltrans arrived at the proposed plan for addressing the earthquake safety issues of the bridge. The Corps presented their findings in two more letter reports.[10]

Was Caltrans' selection of the proposed retrofit alternative reasonable; was it based on appropriate criteria and sound analysis, including consideration of realistic, accurate, and complete cost figures? The Corps team found that the selected retrofit strategy did not appear reasonable due to concerns regarding the isolation strategy, incompleteness of design, and definition of performance criteria.

Did Caltrans adequately consider and evaluate other retrofit alternatives, including a west span-type retrofit and other steel retrofits, and did this evaluation include consideration of realistic, accurate, and complete cost figures? Although the Corps team questioned the reasonableness of Caltrans' selected retrofit alternative, they did not disagree with the decision process that led to that selection.

Did Caltrans adequately consider and evaluate the ability of other retrofit alternatives, including a west span-type retrofit and other steel retrofit, to meet lifeline criteria? Which (if any) retrofit alternatives meet lifeline criteria? The Corps team found that the data did not support that any retrofit alternative met lifeline criteria.

Did Caltrans adequately consider and evaluate the costs of retrofitting the span to meet lifeline criteria? The Corps team's review of the data clearly revealed that Caltrans did not have a reliable retrofit solution.

Was Caltrans' cost-benefit analysis comparing the originally proposed replacement alternative and the proposed retrofit alternative reasonable; that is, was it based on appropriate criteria and sound analysis, including consideration of realistic, accurate, and complete cost figures? The Corps team found that Caltrans' procedures to form the cost-benefit analyses were reasonable and that Caltrans used sound judgment and estimating procedures, including the use of appropriate cost items.

How does the currently proposed replacement alternative, including any work in progress, compare to various retrofit alternatives in terms of cost and seismic reliability (including ability to meet life-

line criteria)? The cost of the SAS alternative is approximately $565 million higher than the cost of the proposed retrofit. The cost of the SAS alternative is approximately $405 million higher than the cost of the Skyway alternative due to the addition of the signature span and amenities such as a bikeway-pedestrian path and lighting.

Is the currently proposed replacement alternative seismically safe? The Corps team concluded that the Caltrans' design team is moving along a path to design a bridge that meets the seismic performance criteria established by the Caltrans Seismic Advisory Board[11] and the Engineering and Design Advisory Panel.[12]

How will this replacement alternative perform in a maximum credible earthquake (MCE)? The SAS replacement alternative is designed for Safety Evaluation Earthquake (SEE) ground motions based on the 1,500-year standard. It was not evaluated for MCE ground motions.

Does the currently proposed replacement alternative meet lifeline criteria? Since the bridge was not evaluated using MCE criteria, this question cannot be answered.

To what extent and how quickly could it accommodate passenger vehicles? The Corps team has found no information to indicate how quickly passenger vehicles can be accommodated.

Conclusion

The Corps team found that the replacement alternative, although $565 million more costly than the proposed retrofit, was preferable to the retrofit alternative in that it resolved the exposure of the public to the seismic vulnerabilities of the existing structure. The two types of criteria to judge the performance of the bridge were the SEE performance criteria and the MCE criteria. The team evaluated the bridge according to the SEE criteria.

Basing their findings on the documentation, the Corps team reached the following conclusions: no retrofit alternative met lifeline criteria; Caltrans' proposed retrofit strategy is not reasonable; a replacement alternative is preferable to a retrofit alternative; costs for the replacement alternative are $565 million higher than for the proposed retrofit; and the performance of the replacement bridge during an MCE, which is larger than a SEE event, cannot be determined. The team concluded that the selected retrofit strategy does not appear to be reasonable due to concerns regarding the isolation strategy, incompleteness of design, and definition of performance criteria.

The Corps team paid particular attention to Caltrans' use of an isolation strategy in the retrofit approach. Team project manager Jerry Gianelli elaborated:

> *There was no supporting documentation on why a flexible structure such as the east span with low seismic force demands should be stiffened by concrete encasement and then softened back to its original condition using isolation bearings. In addition, none of the data provided for analysis demonstrated after analysis that any retrofit alternative could meet the required level of earthquake safety needed for the bridge.*[13]

The Corps team found this study to be demanding. Yet in the conclusion of the study, they noted, "We are confident that our work will help Caltrans provide the people of the San Francisco Bay Area with a safe bridge."

Endnotes

[1] Public Law 99-662, Title XI, Sec. 1106, Nov. 17, 1986, 100 Stat. 4229. Legal Information Institute, U.S. Code Collection.

[2] Hagwood, Joseph J., Jr., *The California Debris Commission: A History: Sacramento District*, U.S. Army Corps of Engineers, 1981.

[3] U.S. Army Corps of Engineers, Sacramento District, Press Release, Public Affairs Office, December 22, 1970.

[4] Interview Willie Collins with Merritt Rice, February 3, 2000.

[5] U.S. Army Corps of Engineers, Sacramento District, "Feasibility Report: American River Watershed Investigation, California," December 1991; "Supplemental Information Report, American River Watershed Project, California," 1996; "Information Paper: American River Watershed California," 1999; and "Additional Information – Folsom Dam Flood Control Storage and Downstream Levees, American River Watershed, California," 2000.

[6] Bizjak, Tony, "200-year flood protection in reach: Raising Folsom Dam 7 feet is among options listed by the Corps of Engineers" in *Sacramento Bee*, September 19, 2001.

[7] *Ibid.*

[8] Interview Willie Collins with Michael J. Walsh, June 27, 2001.

[9] U.S. Army Corps of Engineers, Sacramento District, Public Affairs Office, "Corps of Engineers Evaluates Seismic Safety Options for the East Span of the San Francisco-Oakland Bay Bridge," Press Release, November 2000.

[10] U.S. Army Corps of Engineers, "Interim Final Report, USACE Evaluation and Assessment of Proposed Alternatives to Retrofit/Replace the East Span of the San Francisco-Oakland Bay Bridge, September 22, 2000, and "Final Report, USACE Evaluation and Assessment of Proposed Alternatives to Retrofit/Replace the East Span of the San Francisco-Oakland Bay Bridge."

[11] Established in the summer of 1990 by Governor Gray Davis' Executive Order D-86-90.

[12] The Metropolitan Transportation Commission, the regional transportation planning agency for the Bay Area, established the MTC Task Force in 1997.

[13] U.S. Army Corps of Engineers, Sacramento District, Public Affairs Office, "Corps of Engineers Evaluates Seismic Safety Options for the East Span of the San Francisco-Oakland Bay Bridge." Press Release, November 2000.

Sacramento District History

Documenting the past 75 years of the U.S. Army Corps of Engineers, Sacramento District

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