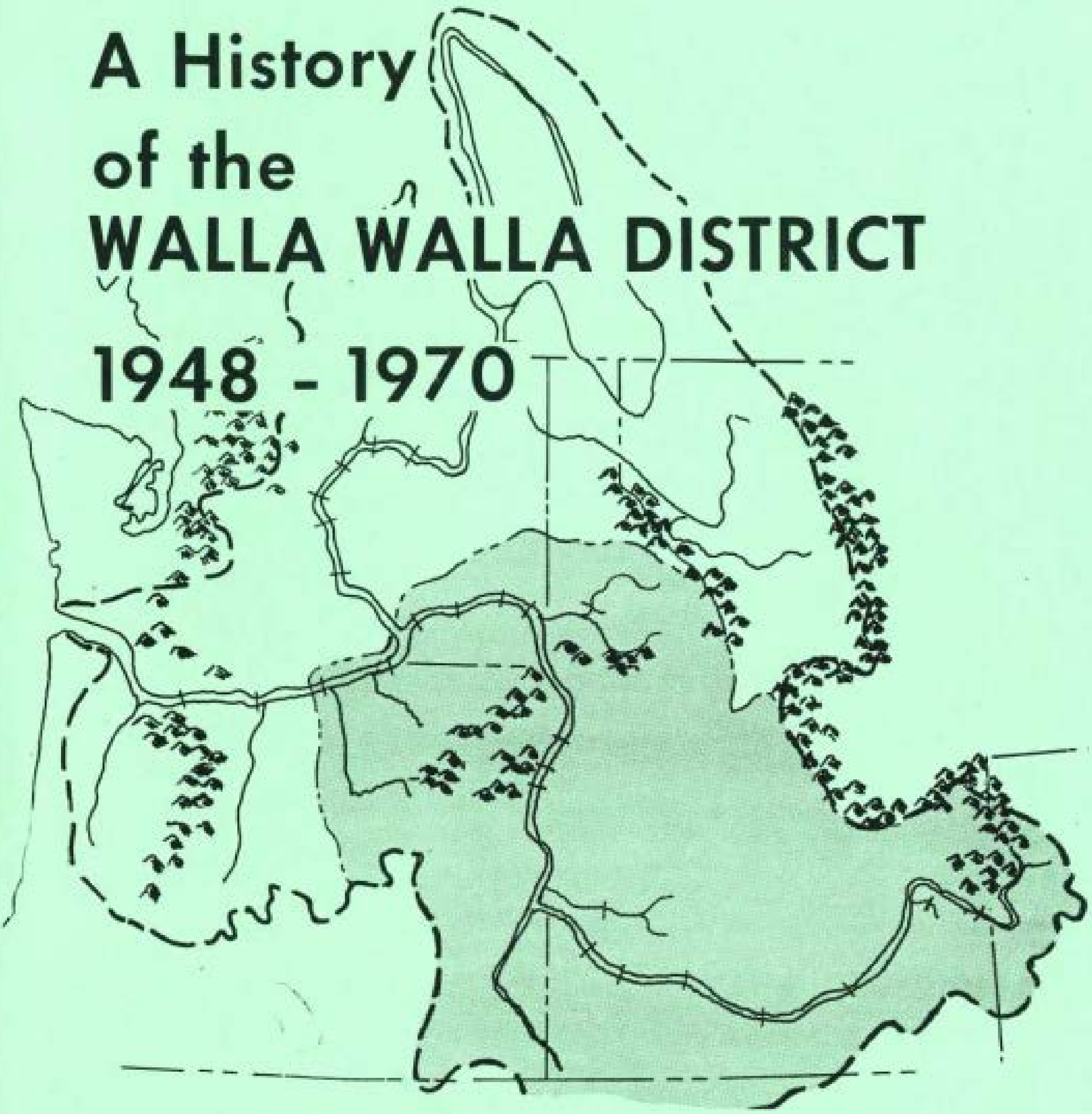
A History of the WALLA WALLA DISTRICT

1948 - 1970



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FOREWORD

"History" is usually viewed from the position of decades of "aging" and experience. The U.S. Army Corps of Engineers is approaching its two hundredth anniversary, and its work in the Pacific Northwest covers the past 120 years. The economic expansion of this inland portion of the United States in the 1940's dictated attention to the water resource needs and potentials, with the Corps directed to oversee much of its development and control of its streams' wild gyrations. Thus was born the youngest District in the Corps.

The Walla Walla District portion of the Inland Empire and upper Snake Basin is rich in its own history, which in many ways forecasts the advent of the District and its task. Established in 1948, these have been eventful years for the District, and a period of marked expansion and development for the region it serves.

The author of this history has been an integral part of the entire 22 years of the District's life. His knowledge of the region and the many events, as well as his active part in the realization of many of the projects, has given a little different flavor to this recounting of history. Howard A. Preston, a Michigander with two engineering degrees from Michigan State University, started to work with the Corps on the Great Lakes in 1930. His Federal service in several responsible positions reaches over the ensuing 40 years to his retirement in 1970. His work here was first in the Planning Branch on project development studies. He then spent four years as Assistant Chief, Engineering Division, and finally as Chief of Planning Branch from 1964 to 1970. He has been a real student of the region he has served and a public servant in his community.

Although here during but a very small segment of the time of this history, I feel fortunate in being the link with the future and having a part in continuing much of the work initiated in that first 22 years. Thus, much that is recounted here is contemporary rather than aged. Nevertheless, the accomplishments of those years will have a long-range influence upon western United States, as reading of this story of people and their work will attest. I commend this recounting of resource development and the practical problems of its realization to your reading.

Richard M. Connell

RICHARD M. CONNELL
Colonel, CE
District Engineer

PREFACE

Part I of this history is the story of the first 22 years of the life of the Walla Walla District. It is designed to present a narrative type epistle, generally in chronological sequence, citing some of the major or interesting events occurring along the way. It grew from many personal interviews, searching of public documents found in the District library and files, the annual reports of the Chief of Engineers, Congressional Record, reading of old official files of local newspapers, and intimate studies of personal papers. To do justice to all of the people who have given so much toward making this District an outstanding institution would be almost impossible; hence, we have not stressed this facet. Furthermore, this document makes reference to many studies, actions, and events that took place before the District was formed. To evaluate fully the history of the Corps in the Inland Empire and upper Snake River Basin, it is imperative that one also study portions of the Portland District History, for much of the pioneering work that preceded this District is only mentioned as background material herein. Parts II and III discuss in more detail the major water resource projects realized for the region, together with some basic data on the District, including its District Engineers.

Gibbon has said, "History is little more than the register of the crimes, follies, and misfortunes of mankind." This history recounts a number of major accomplishments in water resource development, and helping of mankind in his troubles. Le Bon, on the other hand, observed that histories "are fanciful accounts of ill-observed facts accompanied by explanations, the result of reflections," and that the writing "of such books is a most absolute waste of time."

There were still enough factual records available that this account should have some authenticity, supported by the "reflections" of several persons, both present and retired, who have had a key role in making it function. We trust that the true history of time will prove that the accomplishments cited here, and many not recounted, will be long-lived to the benefit of mankind rather than "misfortunes," and that the District will add to them in the next decades. We also trust that browsing through these pages will, in spite of Le Bon, be fruitful.

THE AUTHOR

P A R T   I

"T H E   S T O R Y"

CLEARWATER BASIN FOREST - Lewis & Clark Traversed this Region

SOUTHERN IDAHO - TYPICAL DESERT REACH OF "OLD OREGON TRAIL"

THE OPENING OF THE INLAND EMPIRE OF THE COLUMBIA RIVER BASIN

DISCOVERY

The Walla Walla District, conceived as an instrument for management of some of the extensive water resources of this segment of the "Inland Empire," operates in an area steeped in the proud records of individual achievements as well as the trials and tribulations of its economic development. Robert Gray, an American sea captain, was interested in commerce between China, Europe, and the United States, including fur trading. Gray, the first to enter the Columbia estuary, sailed 15 miles up the river near the close of the eighteenth century and gave it the name of his ship, claiming the region for the United States. He dreamed of a rich fur trade for the future when he bartered with the Indians that day, 11 May 1792, rather than of explorations and land claims.

As a quirk of fate, Captain George Vancouver of the Royal Navy was along the Pacific Coast and met Gray before the Columbia River discovery. Vancouver was skeptical of Gray's report of the likelihood of a large river and sailed on to Vancouver Island according to his orders. After Gray left the Columbia River he sailed to Nootka Sound on Vancouver Island, where he met the Spanish Captain Quadra and told him of his discovery, giving him a sketch of the river entrance. Later Quadra told Vancouver of Gray's finding and gave him the sketch. Learning of the river, Vancouver sent Lieutenant William Broughton in H.M.S. CHATHAM to the Columbia. He entered it, using the rough chart Gray had made. Broughton sailed 119 miles up the Columbia, claiming the region for Great Britain in spite of Gray's prior finding.

The land between the Pacific and the Missouri River was a great unknown, with only smatterings of information about it from tales of trappers who had ventured into the edges of the vast area and the legends of the Indians. It was virtually a no-man's land claimed by Spain, Russia, Great Britain, and the United States.

President Jefferson, by his foresight in negotiating with France in 1803 to buy the Louisiana Territory east of the Rockies for $15 million, increased the land area of the United States about 140 percent. This whetted the spirit and imagination of the American people for development and exploration of the land to the west, including a trade route to China. The President, who had previously planned an expedition to the Northwest and obtained an appropriation from Congress for it, appointed two Army captains, Meriwether Lewis and William Clark, to lead an expedition to the mouth of the Columbia to find "the most direct and practicable water communication across the continent for the purposes of commerce." President Jefferson also desired to open to trade and frontier expansion the unexplored territory stretching from the upper reaches of the Missouri River across the Rockies to the Pacific Coast.

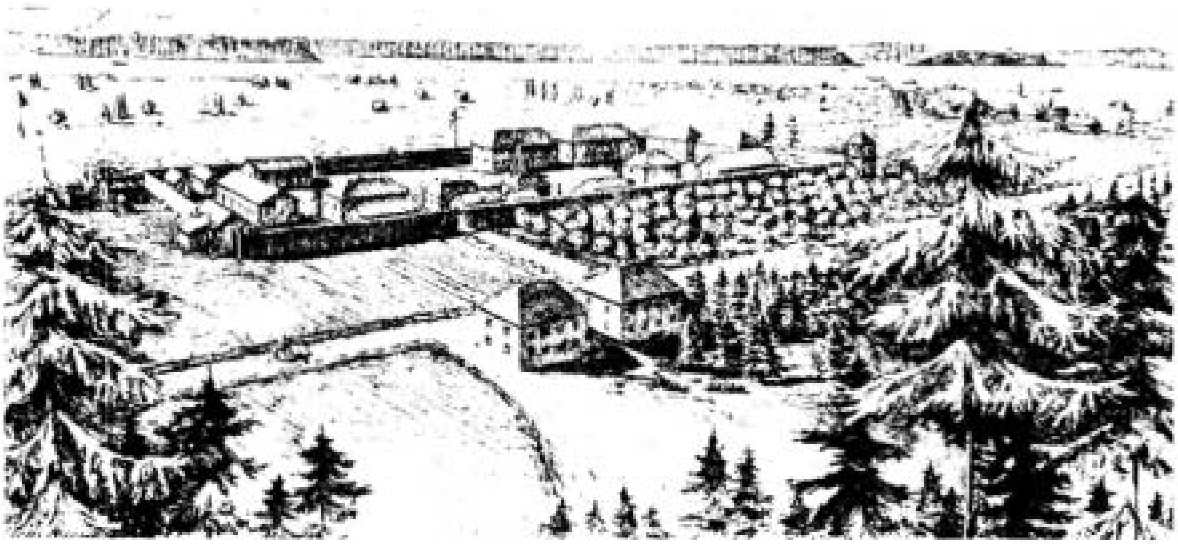
The Lewis and Clark Expedition of 1804-1806 was brilliantly successful. They mapped and described a territory that has since become ten states, and opened the way for the tide of settlement that came pouring after them. This expedition also strengthened the claim of the United States on the Oregon country by focusing the nation's attention upon it. That their route turned out to be not a very good trade route is hardly their fault, since they were not free to investigate others. As a result of experience, far better routes and better passes through the Rockies were later to be discovered by other travelers, and this was to be expected.

EXPLORATION

After Lewis and Clark came the fur traders of three rival companies. The Pacific Fur Company of John Jacob Astor established Astoria in 1811. The North West Company sent David Thompson down the Columbia River, also in 1811, "to open out a passage for the interior trade with the Pacific Ocean." When he stopped at the mouth of the Snake he set up a pole bearing a piece of paper on which he laid claim to the land for Great Britain. On the notice he added a statement that the N. W. Company of Merchants of Canada planned to "erect a Factory at this Place for the Commerce of the Country around." Did he envision the complex of the atomic era which would develop a century and a half later around the mouth of the Snake with waterborne shipments routinely from California and Alaska?

When Thompson came to the mouth of the Walla Walla, he was shown the American Flag and Jefferson Medal given to Chief Yellepit by Lewis and Clark. By the time he reached The Dalles he realized his claims were shaded by the earlier expedition. Thompson proceeded on to Astoria to make contact with Astor's Company. In 1813, because of the War of 1812, Astoria was sold for about one-third its value to the North West Company and renamed Fort George, just weeks before a British ship sailed into the Columbia to attack her in the name of the king.

In 1811 John Jacob Astor sent a United States expedition overland to the Columbia River, headed by Wilson Price Hunt, a partner in the Pacific Fur Company. One destination enroute was to Fort Henry, which had been established by Andrew Henry the previous year on the Snake River near the mouth of Henry's Fork. The Hunt expedition of 56 men and Madam Dorion, wife of Pierre Dorion, guide and interpreter, pioneered in a route across the country as possibly the world's greatest trail blazers. They arrived at Astoria in January and February of 1812. The route was more definitely established as the famous "Oregon Trail," particularly through the country east of the Snake River Valley, by the returning Robert Stuart expedition of 1812 which arrived in St. Louis in May 1813, via South Pass, the Sweetwater, and the Platte. Thus, was the Oregon territory and the upper Snake River country opened up.



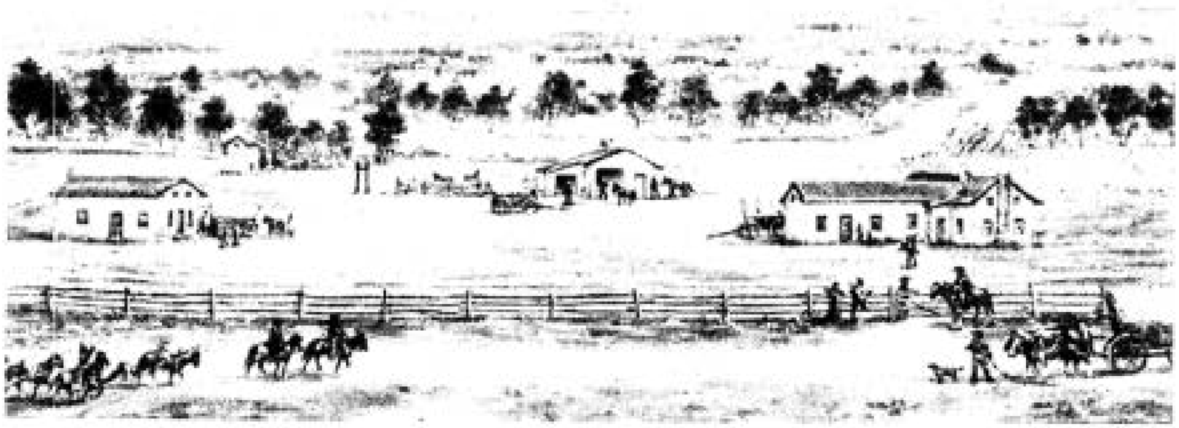
HUDSON'S BAY COMPANY POST - FORT VANCOUVER, OREGON TERRITORY (1845)
(National Park Service)

The third fur trader to enter the area right after Thompson was Hudson's Bay Company, an organization chartered by King Charles in 1670. Open warfare broke out between the two companies during the teens for the rich fur trade of the region. Finally, in 1821 the two companies merged with Hudson's Bay the successor. Then began the two decades of the "McLoughlin Era" (1825-1846) when the Factor of Hudson's Bay Company was Dr. John McLoughlin. His headcuarters was Fort Vancouver with strong allegiance to Great Britain.

SETTLEMENT

During this period, Hudson's Bay strengthened the Company position in the interior by establishing posts at Colville and the mouth of the Walla Walla River, with others in the Pend Oreille and Flathead country. Later they moved into the upper Snake at Boise and Fort Hall. The Americans ran the Hudson's Bay Company competition with the Rocky Mountain Fur Company which worked around the fringes of the Hudson's Bay territory. With the decline of the beaver fur, and the desire to become more self-sufficient, Hudson's Bay and the Oregon Territory turned to sawed lumber, salted salmon, hay, grain, and other agricultural products for trade with other parts of the world, including Russia's Alaska.

With the fevers of exploration and civilization coming to the Northwest came the need for religious guidance that was to express itself in the missionary crusades of the thirties and after. First came Jason Lee and his nephew, Daniel, in 1834. They came across the plains into the Snake River country, over the Blue Mountains to the Columbia, and into the Willamette Valley. The following year came the Rev. Samuel Parker for only a brief stay. The young Dr. Marcus Whitman, a physician, came with him that year as far as Green River, Wyoming. Dr. Whitman was impressed with the need and returned east to obtain help for an organized mission project. In 1836, after marrying Narcissa Prentiss, he collected a party, including Henry Spalding, and came west to Fort Walla Walla, then at the mouth of the Walla Walla River, The Whitmans were to settle at Waiilatpu, "The place of rye grass," that fall, 25 miles east of the Fort. The Spaldings went on, late that fall, to establish a mission at Lapwai on the Clearwater.



WHITMAN MISSION - NEAR WALLA WALLA, WASH. (1845)
(National Park Service)

In 1838 Rev. F. N. Blanchet and Rev. Modest Demers were sent to the Northwest by the Catholic Bishop at Red River, Canada. They arrived at Fort Walla Walla on Sunday, 18 November and held the first Mass celebrated in this section of the country. The Indians had heard of the "Blackgowns" and came to see them, attending the Mass. The two priests then continued on to the Willamette Valley for their permanent assignment. It wasn't until 1847 that Catholic clerics were assigned to the Inland Empire area, one arriving in the Walla Walla Valley a very few months before the Whitman Massacre. The Rev. Cushing Eells and Rev. Elkanah Walker came west through Fort Walla Walla in 1838 enroute to the Spokane country to establish a mission there, and others were to follow. The Anglican Church was represented at Fort Vancouver by Mr. Beaver, who stayed only two years and served mostly Catholics in that area.

During this period the Hudson's Bay Company, with ties to England, essentially controlled the Oregon Territory from the 42nd parallel to the 54th parallel. They welcomed settlers but made sure their work was not contrary to the best interests of Hudson's Bay. The settlers were not in accord with this. Jason Lee went east in 1838 with a petition to Congress for Oregon's admission to the Union. Dr. Marcus Whitman made a very difficult winter ride east, across the continent, in 1842, not only to enlist home seekers and on missionary matters, but to seek governmental aid in the settlement of the Oregon country and to assert its ownership of the territory. He returned in the summer of 1843, leading the first large wagon caravan. One historian states, "...nor can there be doubt that the arrival of that great company of over 800 patriotic Americans, 200 wagons, and 2,000 horses and oxen marked the turning point in the destiny of Oregon." (Americans were in the overwhelming majority.)

These and other efforts, as well as the rapid influx of settlers, resulted in a boundary settlement with Great Britain in 1846 and an act by Congress on 14 August 1848, admitting Oregon to the United States as a territory with officers appointed by President Polk. The Whitman Massacre in 1847--the single most important immediate cause--other threats, boundary disputes, and need for a governmental body other than Hudson's Bay dictated the decision. The territory of Oregon embraced all of the original Oregon country between the 42nd and 49th parallels from the Rockies to the Pacific. Thus, the United States extended on west from the Louisiana Territory to the Pacific. The "Inland Empire," with soon-to-be discovered natural resources and development potentials, was an integral part of it.

Also an integral part of the Oregon Territory and its economic potentials for the white man was the native Indian. Distributed throughout the Columbia Basin and along the coastal area mostly in small tribes, they lived off the land, fished the streams, and stalked the wildlife. Early Spanish explorers from the south brought to the great plains the horse, which the Indians adapted to their use and took over the Rockies to the Columbia Basin before the time of Lewis and Clark. Early history contains the names of over 60 tribes dealing with the white immigrants and there were, no doubt, many more. However, the total population was not great because of the hardships and basic problems of living. The white man with his increasing numbers was, of course, an anathema to the Indian, but the Indian and his presence in the region shaped much of the white man's development pattern. The white man's influence over the Indian's culture was very much stronger.

GOLD! AND TRANSPORTATION

To illustrate the transportation problems, the immigrants such as Marcus Whitman and others when coming west at first abandoned their wagons at Fort Hall or Fort Boise in Idaho, packing the rest of the way because of the heavy sagebrush. In 1841 one pioneer group (The Newell Party) coming west were the first ever to take wagons west of Fort Boise. Because of the heavy sagebrush they were forced to abandon the wagon beds and came on with the running gear only. One historical account states: "In the fall of 1842 Dr. Elijah White arrived at the Whitman Mission with 114 persons, but they left their 19 wagons at Fort Hall...Thus we see that the Newell party of 1841 brought the first vehicles, and that the Whitman-led train of 1843 was the first to bring through its complete wagons, nearly 200 in all."

Gold was discovered in California in 1848 and the mad rush to the gold fields, wherever it was found in the entire west, caused many migrations and emphasis on land settlement during the next five decades. The miners required food, lumber, and other supplies and the Pacific Northwest was a good source of supply. The area prospered and developed fast. In Oregon alone, the population grew from 13,294 in 1850 to 413,526 in 1900.

The territory of Oregon was carved out of the larger territory in 1853 and the remainder became the territory of Washington. From the latter, the eastern portion was detached in 1863 to form the territory of Idaho. Oregon became a state in 1859, Washington in 1889, and Idaho in 1890. Development continued for the area east of the Cascades. In 1857 gold was discovered in the Colville area of the upper Columbia River; in 1860 in Idaho; and in 1861 in eastern Oregon. In 1863 the first wheat was grown in the vicinity of Umatilla. By 1875 Dr. Dorsey Baker had built the Walla Walla & Columbia River Railroad to transport the wheat and other products of the Walla Walla Valley to the Columbia for movement downstream by means of steamboats on the "majestic broad highway to the mighty Pacific." In the early '60s the Columbia River became a travel bonanza and there was gold in the travel business, too. Says a report of those times: "When the gold rush began in 1861 the demand for transportation was so great that the Oregon Steam Navigation Company, which monopolized the traffic on the Columbia River to The Dalles and Umatilla, had to build new steamboats and improve the road from The Dalles to Celilo. In 1864, 22,000 were transported on the Columbia River and from 1861-64 nearly 100,000 passengers were recorded by the company. Between 1861 and 1866 the Oregon Steam Navigation Company paid itself $332,750 in dividends."

The economic expansion of the area was marked, but there was still a strong urge for a transportation route from the Midwest to the

Pacific for trade with China. The railroad era was, of course, inevitable, and after Dr. Baker's short line came the rail lines from the east in the early '80s. The Oregon Steam Navigation Company became the Oregon Railway and Navigation Co. (OR&N), which later became a part of the Union Pacific. About the same time the Northern Pacific (NP) started to build from Lake Superior to Puget Sound. Their first connection with Puget Sound was via Villard's OR&N line down the south bank of the Columbia River. The combination of the two roads was completed in 1883. The Cascade route of the NP was completed in 1887. The construction of the NP started from both ends and Yakima, Pasco, Spokane, and other communities became important supply centers for the gold mining in the adjacent Idaho country of the Coeur d'Alenes.

Gold was first discovered east of Lewiston in 1860 and during the next 20 years navigation up the Columbia was the primary transportation route from Portland to Wallula. The Snake was used during high water periods to Lewiston, which at this time was the capital of the territory of Idaho.

LOWER COLUMBIA AND SNAKE RIVERS REGION

River traffic on the Snake was intermittent, but colorful, as the following report description from H. Doc. 190, 73d Congress, 2d Session, dated 3 January 1934, attests.

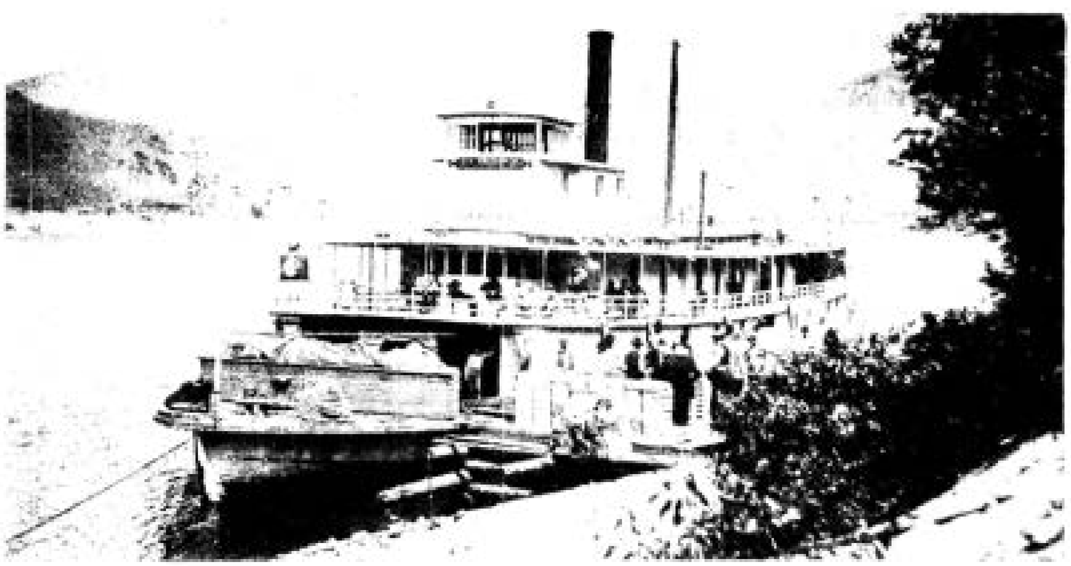
> "Early navigation on Snake River, during the fur-trading days, was by bateaux and sailboats which were drifted downstream and sailed or lined up. In 1858 the steamboat Colonel Wright was built at Celilo, on Columbia River, for navigation of the upper Columbia. In 1861, with the gold rush to the Idaho mines increasing, an experimental trip was made up Snake and Clearwater Rivers by the Colonel Wright. The boat ascended some distance up the Clearwater and discharged her passengers bound for the mines, but it was decided in the future to discharge them at the junction of the Clearwater with the Snake. Lewiston (Mile 141) was founded the same year at this point.
>
> "In 1862, when the gold rush was at its height, 4 additional boats were built to operate between Celilo and Lewiston. By 1864, there were 10 or 12 steamboats which in that year carried 36,000 passengers. As the mining rush died down the boats were transferred to the lower Columbia, so that by 1870 most of them were gone from the Snake...
>
> "In 1888, the Oregon Railroad & Navigation Co. completed a rail line along Snake River upstream to Riparia, crossing the river at that point to continue on to Spokane. Navigation between Riparia (Mile 68) and Lewiston continued, but practically ceased below Riparia after the construction of the railroad. In 1891, the steamboat Norma operated between Ballards Landing (mile 265) and Huntington (mile 329), serving the Seven Devils mining region, but made only a few trips. The Imnaha, a small steamboat, was built in 1903 to operate between Lewiston and the mines near the mouth of Imnaha River (mile 194). She was wrecked, however, after a few trips and was replaced by the Mountain Gem. The Gem was in service until the mines closed down about a year later. When the Oregon State Portage Railroad between The Dalles and Celilo was completed, in 1905, navigation between Celilo and Lewiston revived. In 1912, navigation of this stretch was discontinued, due to lack of patronage.

"The opening of The Dalles-Celilo Canal, in 1915, saw the beginning of steamboat service between Portland and Lewiston. Lack of proper terminal facilities and consequent lack of tonnage sufficient to pay expenses forced the service to discontinue, in 1920. Since that time, the only steamboat service has been the operation of one railroad-owned boat, which picks up wheat at river warehouses on both banks, between Lewiston and Couse Creek (mile 159), and on the left bank, between Lewiston ard Riparia, and delivers the wheat to the railroad at and below Lewiston... (Discontinued in 1940.)

"In 1915, regular launch service from Lewiston upstream was begun. This service still continues, the launches running as far upstream as Johnsons Bar, about 91 miles above Lewiston during favorable stages. The launches carry mail, passengers, and supplies for ranches along the river.

* * * * * *

"Clearwater River is the only tributary which has been navigated to any extent. From 1861 until the railroad from Lewiston to Spokane was completed, steamboats used the river occasionally, but there was never any scheduled service. There are annual barge trips down Salmon River by parties bent on adventure, but otherwise the river has never been navigated. These are the only tributaries of Snake River on which boats have ever been used."



STEAMBOAT "ALMOTA" LOADING FRUIT ON SNAKE RIVER

Other steamers made records, both as opportunists and long service. In 1863 the NEZ PERCE CHIEF carried the richest cargo ever taken downstream from Lewiston--$382,000 in gold dust. The ALMOTA, built in 1876, paid for herself in one trip to Lewiston by carrying troops upriver for General Howard's fight with Chief Joseph and the Nez Perce Indians. The ANNIE PAXTON, the pride of the river, built in 1877, was first operated between Celilo and Lewiston. After ten years she was rebuilt to run from Lewiston to the Union Pacific Railroad terminal at Riparia. The LEWISTON, built in 1894 and equipped to carry 250 tons of freight and with 14 staterooms, was assigned to the Snake River with headquarters at Lewiston. After several accidents and rebuildings, she had the dubious honor of making the final steamboat trip down the Snake River on 29 February 1940, proceeding on to Portland; the end of steamboating on the Snake River which started 80 eventful years before. An interesting and more complete story of the early navigation saga of the Snake River, and cargoes handled, is recounted in Chapters 7 and 8 of the history of steamboating in "Stern-Wheelers up Columbia," A Century of Steamboating in the Oregon Country, by Randall V. Mills.

ROADS

With the trek to the west, roads became a vital necessity, together with the waterways and later the railroads. The Army Engineers and an offshoot of the Engineers, the "Corps of Topographical Engineers," which had independent status from 1838 to 1863, were given the task of opening the vast territory west of the Mississippi with "Military" roads which could, of course, be used for commerce and travel. There was the road to California built by CPT Philip St. George Cooke; the route of CPT Amiel W. Whipple west along the 35th parallel; the Simpson route across western Utah; and the road of CPT John Mullan who was commissioned to develop a route from the head of navigation on the Missouri River at Fort Benton to the head of navigation on the Columbia. This route followed the Clark Fork into the Spokane area, then south to the Snake in the Tucannon-Lyons Ferry area. After crossing the Snake the road continued south to Prescott and Walla Walla, where an established road led to Wallula and the steamboats. The road was 624 miles in length and a difficult feat of engineering for those times. It was accomplished through a great deal of hard work involving 120 miles of difficult timber cutting 25 feet wide and 30 measured miles of excavation 15 to 20 feet wide.

The Mullan Road, completed in 1862, turned out to be a fortuitous undertaking. It was not actually used by the military to any extent but did provide a good route for the heavy migration that came with the discovery of gold at that same time. By the 1870s a network covered most of the west through the territories of Minnesota, Oregon, Washington, Utah, and the southern area. It has been said that by the end of the nineteenth century the engineers and explorers of the Army Corps of Engineers had probably done more than any other single group toward opening up the west. The transcontinental railroads might dispute that broad statement since they, too, "opened up the west," as population figures for the region suggest.

INLAND EMPIRE STREAMS AND MAN

EARLY EVOLVEMENT

The development experienced during the century from the time of the Hudson's Bay reign to end of the expansion era of the 1920s indicates that one of the strong motives was reaching the Pacific Ocean west of the Cascades. Railroads and highways all led to Portland and Seattle, the seaports for the Pacific trade routes. However, in the process of accomplishing it, the inland areas became an essential and integral part of that development. In addition, many of those with visions of the broad Pacific in their mind at the start found a strong affinity for the interesting country of the Snake River Basin and upper Columbia and the opportunities that abounded there. One Idaho historical writer, however, makes this statement about settling in that portion of the Oregon Territory:

> "In twenty years, between 1842 and 1862, it is estimated that at least 300,000 people dragged their weary way across the sun-blistered sagebrush plains of the Snake River country on their way to the rain-soaked hills and valleys of the Pacific Slope. Of all those eager, determined, emigrants, not one stopped to take up land, nor tried to make a home under Idaho's blue skies. At old Fort Boise, they enjoyed Francois Payette's crisp vegetables and luscious melons, his hospitality and butter, but only one, David Bivens, diverted from the regular route in 1861 by tales of the gold strike at Auburn, Oregon..."

Minerals, of course, furnished much of the incentive for early development in the Inland Empire and upper Snake River area. Deposits of gold were found in many of the stream basins--Coeur d'Alene; the Clearwater; the Snake canyon; the Salmon River country; the John Day, Grande Ronde, Powder, Burnt, Malheur, and Owyhee basins; the upper Boise; the Wood River Basin; and other valleys to the east. Other minerals followed and still provide a strong base of the local economy. (Idaho now produces one-half of the nation s silver.)

Early establishments in the region were strictly for the migrant and fur trader. Fort Hall, Fort Boise, Fort Walla Walla, Pendleton, and The Dalles all served the Oregon Trail traveler. When the idea for agriculture, cattle, and exploiting the local resources became feasible, as the result of better protection from the Indian, communities sprang up around and between the Posts and the "sod busters" took over. Even though the markets for food were erratic, irrigation of bottom lands in the Snake Basin developed with the in-migration. The soil is rich and water has been plentiful. Irrigation for commercial crops began in the Boise and Grande Ronde Basins in the 1860s. It spread upstream into the Twin Falls, Pocatello, and Idaho Falls area during the period of 1880 to 1905. Now it is general throughout the Inland Empire and upper Snake River area with about 3,500,000 acres under irrigation in the Snake Basin alone, mostly in Idaho, which boasts that in a single year they had six of the "top 10" of the 25 leading crops for the nation. Three-quarters of all employment in the Columbia Basin is traced directly or indirectly to agriculture.

WATER

As has been the history for settlements throughout the United States, when people settled in the Inland Empire they gathered along the streams, at the mouths of canyons, and on or below the debris cones or outwashes from mountain streams. Water quality was good, the supply plentiful, and the ground slope gentle and very suitable for gravity irrigation. The transportation routes, roads and railroads, of necessity followed the streams in order to hold down grades and bypass the rolling hills and mountains. In addition, the valley bottoms were where the gold was, both the highly prized mineral and the black kind in the form of very productive soil.

In his single-minded objective of development, and support of his family, man encroached on the streambeds, dammed the streams for irrigation diversions, diverted them for placer mining, and tore them all apart with dredges seeking gold. In many instances streams were also his household water supply, either directly or through shallow wells. With much of the Inland Empire area a near desert climate, water is its lifeblood, and also one of its major liabilities. All of its streams are subject to wild fluctuations and the control of them is difficult. They inflict heavy damages on man and his frail facilities, later to be the foundation of his very existence.

FLOODS AND DROUGHTS

Major flooding is infrequent on the Columbia River proper and many of its tributaries since, in general, there are high banks and an adequate channel. Some tributaries, however, such as the upper Snake River streams, the Clearwater, Yakima, and other tributaries throughout the southern part of the Inland Empire experience frequent but irregular floods. The largest known flood of general occurrence was that of June 1894. It was severe in most of the basin east of the Cascades with a peak Columbia River flow at The Dalles of 1,240,000 second feet. The second largest was that of June 1876 with a comparable discharge of 1,020,000 second feet. The third largest was that of May 1948 with a discharge of 1,010,000 second feet. (The low flow of record is 30,500 second feet and the mean annual discharge is 188,500 second feet.)

VANPORT AREA - PORTLAND, OREGON - COLUMBIA RIVER - MAY 1948

These floods caused widespread damage throughout the basin, as can be readily realized when summer and fall flows are only about one-tenth this amount. From this it can be seen that floods are not the making of mankind exploiting the area, but he can contribute to it. Major floods are of spring snowmelt origin, aggravated by excess precipitation or warm weather, and are usually broad crested. Tributary streams, particularly in the Snake River Basin, experience frequent, if not annual, floods from the same cause as well as from unseasonable winter snowmelts with rain. The development of the valley bottom and adjacent plains, as well as settlements near the mouths of mountainous sections of streams, have aggravated flood actions with serious results and many calls for help.

Droughts in the Inland Empire and upper Snake area are also a serious matter to the settler and developer of the basin lands. Dryland farming for small grains has been hazardous, as has been overdevelopment of local irrigation projects, only to experience the summer and fall loss of an adequate water supply. During a 60-year period from 1886, the basin has experienced 18 years in which deficiency of spring and summer rain caused critical crop conditions. As a result of these wide variations in precipitation and streamflow, there has been, from the earliest time, emphasis on storage and stream regulation.

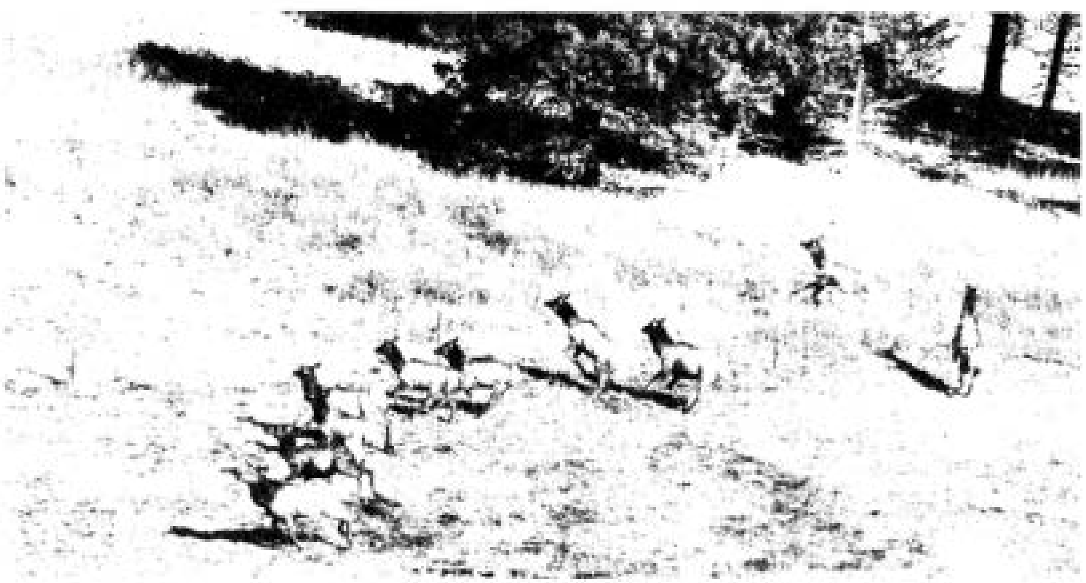
In an effort to control the streams throughout the basin, man has resorted to major storage projects as well as many types of channel control structures. From the standpoint of optimum use, storage of snowmelt and spring flood flows has been a big objective. The water is later used for supplementing low summer flows for irrigation, power, recreation, navigation, and more uniform aesthetic stream conditions.

The first storage project of any size was Milner Dam on Snake River in central Idaho, built about 1905 with 80,000 acre-feet of storage. The Columbia River and its tributaries is now controlled by an aggregate of close to 21 million acre-feet of storage, including Canadian projects, with an additional 13.5 million acre-feet to be added by 1973. Maximum utilization of the streams for all purposes, including hydroelectric power and irrigation of another 4-6 million acres of dry land, would dictate more than doubling that storage figure. Some of it is under development at the present time.

FISH AND WILDLIFE

The Inland Empire of the Columbia Basin, owing to its great variation in and exceptionally favorable environmental conditions, has been, and still is, one of the nation's most prolific producers of fish and wildlife. One of the staple foods of the Indians was the Pacific salmon which abounds in the Columbia and its tributaries. It was also a boon to the white man. Several species use the basin streams for spawning so the migrating fish are available during much of the spring to fall season. Records indicate that the salmon was exported as a food as early as 1830. The first salmon cannery was established in 1866 and by 1883 the record commercial catch of salmon was estimated at 43 million pounds, which was much more than a sustained fishery could support. Regulatory legislation was enacted in Washington State in 1890.

INDIANS FISHING FOR SALMON AT CELILO FALLS



Other species of wildlife were present also, including, of course, the fur bearers which were extensively hunted by the early trappers. Big game, deer, antelope, elk, bear, and the predators roamed the area even though the journals of Lewis and Clark indicate they found none in the Clearwater and Snake River area. As a result, the Expedition had very meager fare on this leg of their trip. (On October 14, 1805, while on Snake River, Captain Clark noted, "Here we dined, and for the first time for three weeks past I had a good dinner - of blue winged teal.") The arid Snake River plains along the Oregon Trail were also quite barren of big game.

Many wildlife species were gradually restricted and forced to modify their natural habitat by the appropriation of the bottom lands and breeding grounds for agricultural and community uses. Reclamation of marshlands resulted in the loss of resting and breeding grounds for waterfowl, with some substitutions of small reservoir areas. Irrigation of semi-arid lands reduced the habitat of some native game birds but benefited other upland game species and waterfowl. Big game animals were forced higher into the foothills and mountainous areas from much of their native rangelands and have acclimated to it. Throughout the development period of the territories and early statehood, the fisheries of the Inland Empire and its wildlife provided major items in the diet of both the migrant and the settler. Of course, the fish and game were the principal source of food for the Indian, as supplemented by natural growth of roots and berries.

This early period of settlement was essentially a period of exploitation of the natural food resources of the region with little or no attempt at sustaining it or replenishing it. Not until the start of the 20th century was conservation and planned replenishment of our fish and wildlife resources undertaken--and then very limited until the second quarter. One exception was Robert Hume, an Oregon pioneer fish packer, who established a fish hatchery on the Rogue River in 1877. He operated it into the 20th century.

Up to the time of the second world war probably 300 dams were built in the Columbia Basin, varying in size from small diversion structures up to major storage projects, but all, nevertheless, barriers to fish movement. Yet in only a few instances was much collective thought given to the effect these developments would have on fish and wildlife resources. They were plentiful and there for the taking, along with all other depletible, exhaustible, destructible, and non-replenishable natural resources. The national attitude, earlier for survival, then later toward seeking the "good life," was transitional. It had not yet come to the realization that "Spaceship Earth" just might not be limitless in its ability to cope with the ingenious and often destructive endeavors of man.

FOREST PRODUCTS

The first part of the century saw a major expansion of lumbering in the Inland Empire with large mills at such locations as Burns, Baker, La Grande, Lewiston, Payette, and Boise. This expansion came to a halt with the depression years of the 1930s. After that, as the market recovered, considerable of it was satisfied by lumber processed through small, independent, inexpensive mills located strategically close to the supply with the products handled by truck. As with agriculture, the war demands of the 1940s put unprecedented requirements on the industry, again dictating larger mills with more complete processing capabilities, with continued promising outlook. Paper products, containers, plywood, and prefabricated structures are factors in continued expansion of the industry and emphasis on the region's economic importance.

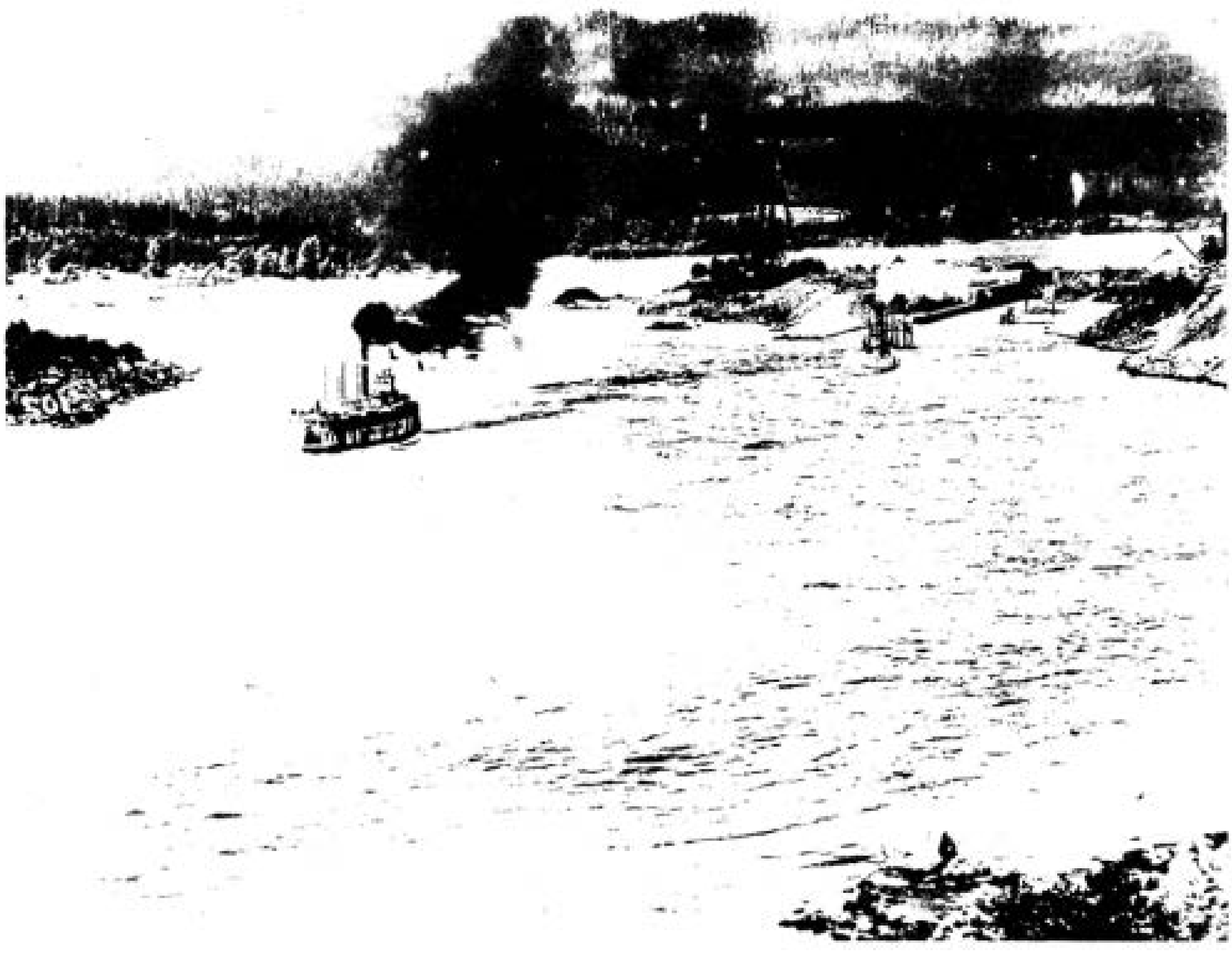
POWER

The utilization of water for power came west with the immigrants. Marcus Whitman set up a water power sawmill during the winter of 1844-45 as one of his projects, and as soon as the inland area began to grow wheat, flour mills became prevalent. The falls of Willamette River at Oregon City were used for power development for a sawmill as early as 1842 by Dr. John McLoughlin of the Hudson's Bay Company. In 1889, the Willamette Falls Electric Company built one of the early commercial hydroelectric powerplants in the United States at the same site. It had a capacity of 1,000 kilowatts divided between 19 machines and the power was transmitted to Portland at 4,000 volts. The first hydroelectric plant in Idaho was at Ketchum in 1881 to furnish light and operate smelter machinery. The first installation for public use was at Hailey on the Big Wood River in 1885. The third was the Swan Falls Dam south of Boise, built in 1901. Installations at natural falls proliferated to serve the population and industrial centers until by 1930 the installed capacity of hydroelectric plants in the Columbia Basin was over 1,000,000 kilowatts. The Pacific Northwest, with very little fossil fuel deposits, relies almost entirely on water power. In 1948 with the advent of this District, about 86 percent of the existing power supply in the Pacific Northwest was generated at hydro plants. In the Columbia River Basin, 91 percent was hydrogeneration with an installed capacity of 5,077,000 kilowatts.

TRANSPORTATION

The main rail transportation east-west routes through the Inland Empire were constructed well before the turn of the century; the Union Pacific and Northern Pacific into Portland and Puget Sound in the 1880s; the Great Northern to Puget Sound by 1893; the Milwaukee Line to Puget Sound by 1909; the Spokane, Portland and Seattle (SP&S) into Portland in 1908; and Union Pacific into Puget Sound by 1909. These railroads all had one aim, that of connecting the mid-continent with the Pacific Coast for the export business. As the inland area developed, branch lines were extended up some valleys to serve local communities and move out the local agricultural and timber products. The Union Pacific completed its north-south line from Wallula to Spokane in 1888 and from Pocatello to Butte, Montana, in the teens. It was not until 1911 that central Oregon rated a rail line, and Burns, the center of Oregon's cattle country, had to wait until 1924 for the rails. The Camas Prairie Railroad was run from Riparia to Lewiston and thence eastward into the Clearwater country in 1909.

Highways have always been the major means of transportation starting with the Mullan Road through the northern part, and Oregon Trail through southern Idaho into Oregon. North-south routes are difficult due to mountainous country and canyons, which also limit rail lines. A major network of highways developed throughout the Inland Empire during the expansion period of the 1920s to 1940s. Interstate highways and truck routes now lace the region, serving the many communities for major interstate traffic. Through routes to the coast are few because of the Cascade Mountain range.



COLUMBIA RIVER AT CASCADE RAPIDS

Water has been a prime means for transporting freight between cities and nations since earliest days. While the development of the railroad, the motor vehicle, the airplane, and, finally, pipeline transportation have all helped to decrease dependence on navigable waters during the past century, regions around major cities still grow and prosper if access to waterways is available as a means of moving freight.

The fact that 96 of the 107 cities in the United States with a population of more than 100,000 are located either on one of the nation's coastlines or on a navigable waterway exemplifies this principle. Stated another way, only 11 cities in this country with a population of over 100,000 do not have direct access to some form of water transportation. The Inland Empire and its communities are influenced in the same way by the Columbia and lower Snake navigation potentials, with Portland and the adjacent tidewater ports as a Pacific terminus rating third largest on the West Coast.

DEVELOPMENT TRENDS

This portion of the Columbia River Basin is natural-resources oriented and, no doubt, will remain that way for its overall economy. Agriculture, minerals, and forest products, including their processing, predominate. Exploiting of the minerals, sustained production and wise use of the forests, and optimum utilization of the soils and water resources dictate careful evaluation, planning, and development for their best use. They form an important segment of the national well being and growth. As is said for Idaho, the real treasure of the Columbia Basin is not its gold--or minerals--but its soil.

The years of the first world war brought unprecedented prosperity and expansion of agriculture because of food shortage. In many areas of the nation over-expansion resulted and the collapse after the war brought on the national "farm problem" of over-production which has persisted. The Inland Empire and upper Snake region, which had experienced surplus crop supplies even during the 19th century, shared in this "problem" which was acute through the 1930s with its depression. The availability of good lands and water and development of some big irrigation and reclamation projects, however, helped it to move forward and carried it proportionately ahead of many less favorably endowed sections of the nation. This region, spared severe dust bowl experiences, attracted some of the people who had abandoned land in the Great Plains of the Midwest. In Idaho alone, as people returned to the farm and small towns, the state showed a 10-year increase of 17.9 percent for the 1930s, and this general trend was experienced also in the remainder of this inland region.

The second war in Europe and its demands made additional major changes and extensive development in the inland region, not in war industries or shipyards, but in the support factors--airbases, training camps, ordnance plants, demand for minerals, and even Japanese relocation and prisoner of war camps. The demand for food and fibre was, of course, a major factor in its expansion and food processing became an important adjunct. The demand on Idaho's minerals was such that during the period 1938 to 1960, the state's output equaled in value that produced from its inception in 1860 up to 1938.

Such expansion and development of its natural resources, even during the depressing 1920s and 1930s coupled with the acceleration of the 10 years of military conflict in the world, has made a marked change in the Columbia Basin's population, economy, land use pattern, need for control of its water resources, and economic demands. For just the war years period of, roughly, 1938 to 1948 it is estimated that the cash receipts for farm marketing for this general area increased well over 300 percent; some, of course, due to inflation, but much due to development.

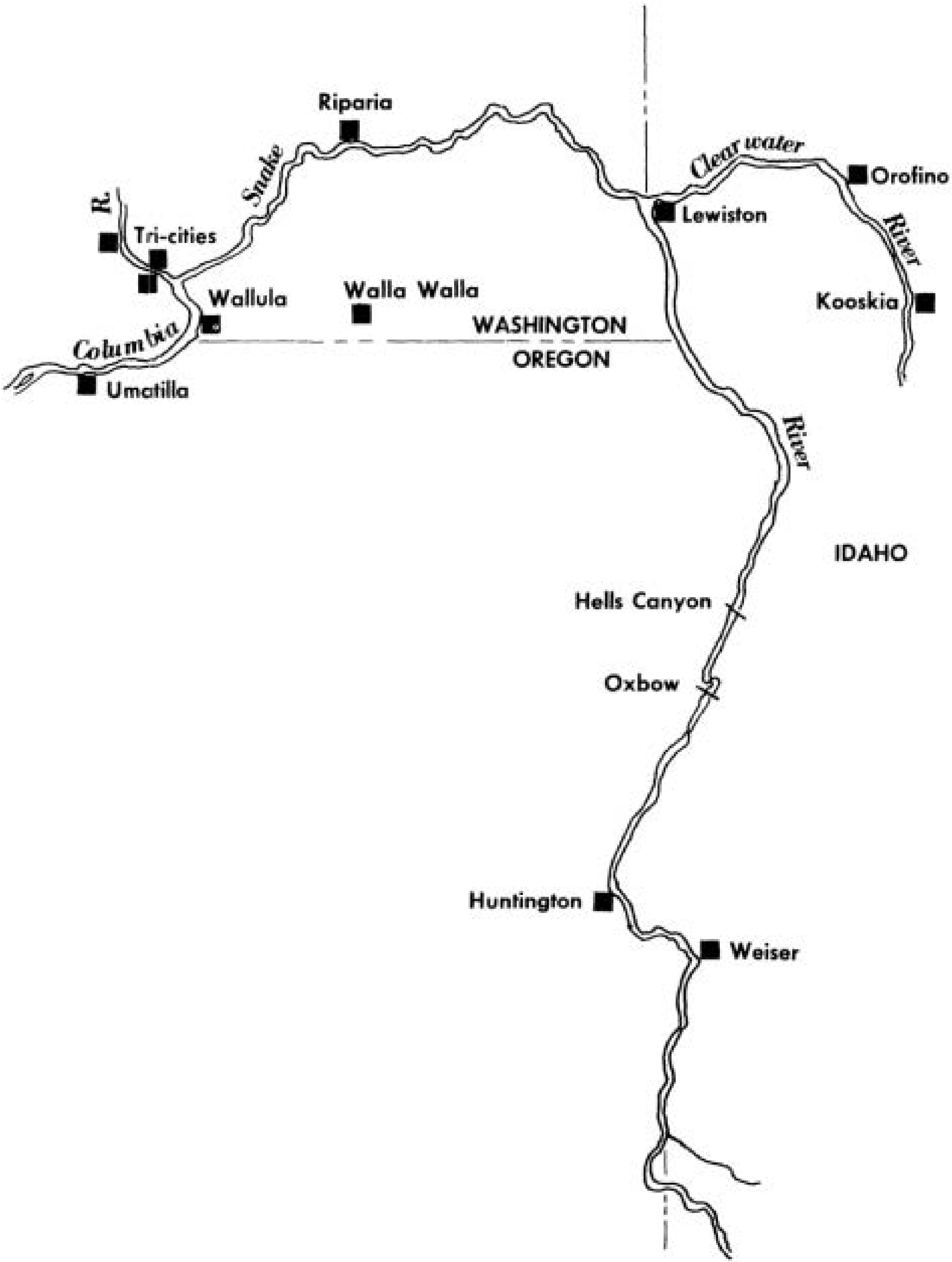
EARLY RIVER IMPROVEMENTS UNDERTAKEN

UPPER AND MIDDLE SNAKE

The waterways of the middle and upper Snake region were never utilized to any extent for movement of people or goods because of their hazardous conditions. In 1866, prior to the railroad in southwestern Idaho, the 136-foot steamboat SHOSHONE was built on Snake River at the mouth of Boise River. It made trips between Olds Ferry at Farewell Bend to Swan Falls upstream, a distance of about 120 miles. The venture proved unprofitable and in 1869-70 the vessel was taken downstream through Hells Canyon to the lower Columbia--a trip that must have been a real thrill.

A Preliminary Examination Report on Snake River, Idaho and Washington, with a view to its canalization to Shoshone Falls near Twin Falls, Idaho, was submitted 12 January 1926. The report was unfavorable and is unpublished.

Early mining in the Seven Devils or Hells Canyon reach of the Snake River below Oxbow and around Homestead, Oregon, and Cuprum, Idaho, influenced attempts to navigate the river up to Huntington, Oregon, a distance of about 65 miles, to connect with the railroad. A Federal project to improve this stretch of the Snake River by removal of rocks and the placing of ring bolts and iron posts was adopted in 1892. The project was abandoned in 1896 after spending $40,500. House Document 127, 56th Congress, 2d Session, dated 6 December 1900 states in part, "...The Government spent a considerable sum of money from 1891 to 1896 in improving Snake River in the vicinity of Huntington. This was of no avail, however, as the only boat ever built for this section of the river, the NORMA, gave up trying to run after the difficulties of navigation." Idaho history recounts that the steamboat NORMA was also taken to the lower Columbia by way of Hells Canyon in 1895, a most perilous and uncertain adventure. There are other records of boats on the Snake River in this general reach so it must be assumed there was actually considerable traffic in the 1890s, or period of the project, to serve the mines which, through the second world war, produced copper.



Riparia
Snake
R.
Tri-cities
Wallula
Walla Walla
Columbia
Umatilla
WASHINGTON
OREGON
Clearwater
Orofino
Lewiston
River
Kooskia
River
IDAHO
Hells Canyon
Oxbow
Huntington
Weiser

CLEARWATER RIVER

Records indicate steamboat navigation on the lower Snake River made runs occasionally up the Clearwater River to the vicinity of Orofino, Idaho, to serve the gold mining rush. As a result, a study was made and work authorized for the Clearwater River navigation. The original project for the Clearwater was adopted in 1879. It provided for a channel 4½ feet deep to the North Fork near Orofino and three feet from the North Fork to the South Fork at Kooskia, Idaho. In 1896 this project was dropped and a project for high water navigation substituted. By the River and Harbor Act of 1902 the river was declared unworthy of further improvement by the Federal Government at that time. The expenditures under the two projects were $37,705.54. As requested in the River and Harbor Act of 1916, a preliminary examination report was prepared for the Clearwater River from its mouth to Orofino with a view to construction of locks and dams for navigation. The report was submitted on 29 November 1922. The Board of Engineers for Rivers and Harbors recommended no improvement. The report is unpublished. (The Potlatch Dam on the lower Clearwater was licensed by the Federal Power Commission in 1926 soon after that report was completed. The license provides for the installation of a lock for boats up to 10 tons if a need ever develops.)

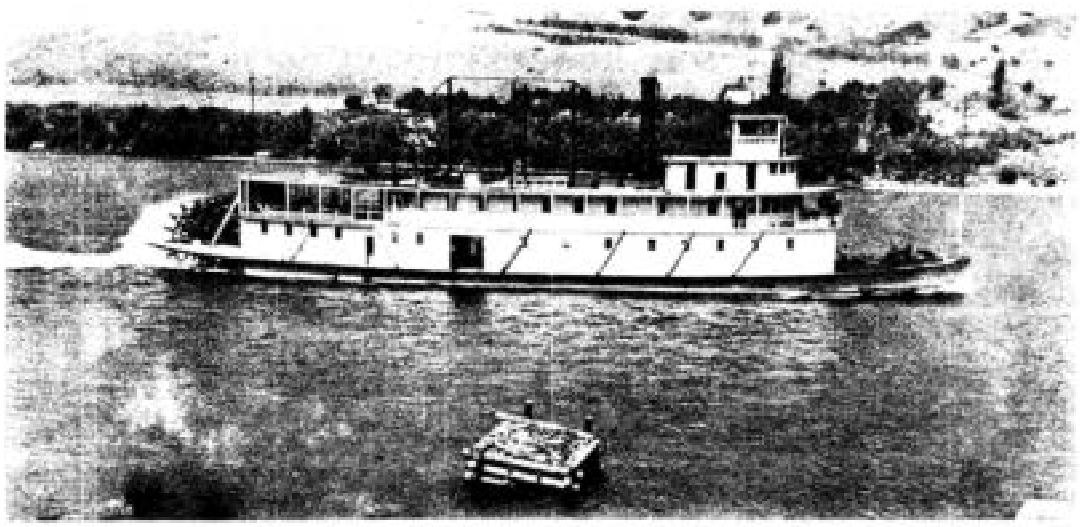
SNAKE RIVER BELOW HELLS CANYON

The Snake River from Johnson's Bar in the Hells Canyon section downstream past the Imnaha, Salmon, Grande Ronde and Clearwater Rivers at Lewiston, past Riparia at the Union Pacific Railroad crossing to the mouth at Pasco, Washington, has had a colorful and checkered history. Use of this reach of river for navigation really blossomed when gold was discovered in Idaho, with the use of the river increasing and decreasing as the temperature of the gold fever fluctuated.

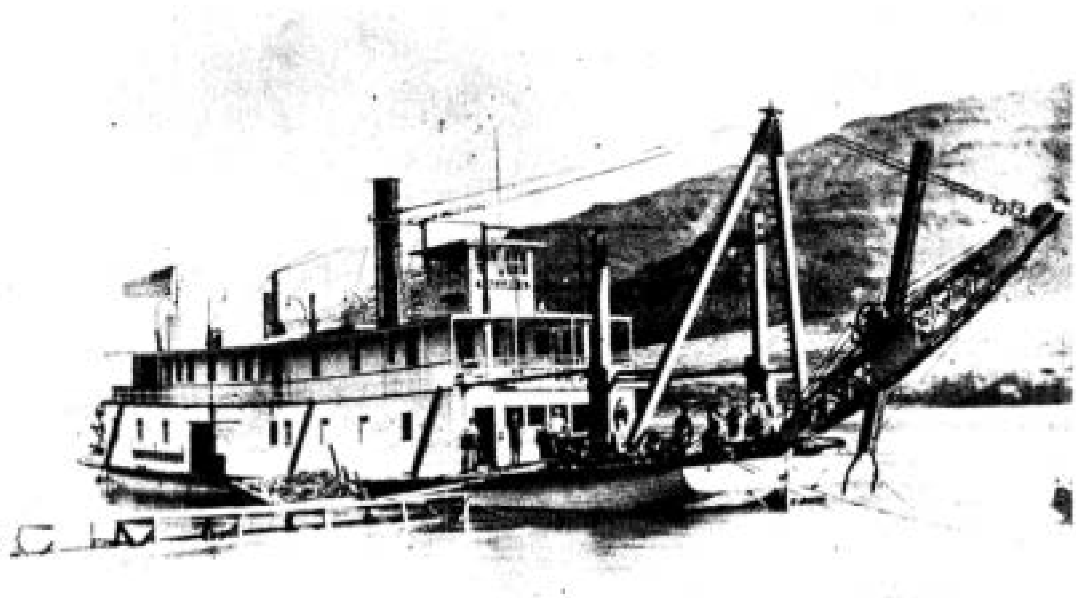
In the early 1860s steamers on the "upper river" Columbia above Celilo at most favorable stages, which was usually for more than half of each year, could ascend up the Columbia into the Snake and on up to Lewiston. Locks at the Cascades, built in 1896, made transportation from Portland more feasible with only one portage at Celilo.

As early as 1876 the Congress made appropriations to improve the Snake River. The method of improvement consisted mainly in blasting out obstructing boulders, constructing dikes to close side channels and concentrate flows, removing dangerous ledges, and scraping sand and gravel bars, thus trying to secure a navigable depth of 4½ feet at low water for a width of about 60 feet. Up to the turn of the century records indicate $117,850.57 spent on the Snake River, primarily below Riparia, and mainly before 1888 when the railroad was completed that far. One record indicates that Congress provided funds for dredging critical reaches of the river channel every two years starting in 1882 through 1891, and then intermittently until 1942. As a measure of accomplishment, "The improved channel allowed the steamer ANNIE PAXTON to haul more than double her grain load capacity of 600 sacks of grain."

Many studies have been made for improvement of Snake River from below Hells Canyon to the mouth over the past century. The initial one was made in 1866 for dredging at selected locations. No formal projects for the Snake River were adopted by Congress before 1902; however, as indicated above, considerable funds were expended for intermittent open channel work. Records indicate Congressional direction to make 14 different investigations over a 70-year period on this reach, for improvements to the open river. (See H. Doc. 25, 72d Congress, 1st Session, dated 22 April 1932.)



THE "SPOKANE" - SNAKE RIVER AT KELLEYS BAR
(WSU Library)



U.S. ENGINEER DEPT. DREDGE "WALLOWA" IN SNAKE RIVER AT KELLEYS BAR
(WSU Library)

Through a series of authorizations between 1902 and 1935 a continuous channel was authorized from the mouth to Johnson's Bar, a distance of 232 miles. These provided for a channel depth of five feet at low water to Lewiston with varying widths from 60 to 150 feet. Above Lewiston the authorizations were for removal of boulders and rock points. Specific authorizations by Congress for open river work are shown in the following tabulation:

River and Harbor Act	Reach of River	Description
1902	Riparia to Lewiston River mile 68 to 141	Removal of shoals and rocks with some contraction works 5-foot depth - 60-foot width
1902	Lewiston to Pittsburg Landing River mile 141 to 218	Removal of rocks and reefs. (No deepening but attempt to secure a navigable channel at a 3-foot stage at Lewiston.)
1910	Mouth to Riparia River mile 0 to 68	Removal of shoals and rocks with some contraction works. 5-foot depth - 150-foot width
1935	Pittsburg Landing to Johnson's Bar River mile 218 to 232	Removal of boulders and rock at 11 shoals.

Open river navigation of the Snake River from its mouth to Lewiston virtually ceased when the Union Pacific Railroad removed its steamer "LEWISTON" from the Riparia-Lewiston run in 1940. The steamer was taken to Portland for service in the lower Columbia and later was sent to Alaska for use there. As of 1945, the Federal Government had spent $400,000 for new work and $187,000 for maintenance. In addition, the State of Washington had contributed $85,000 for the work.

Records of waterborne traffic on Snake River indicate the wide variation in traffic, depending upon activities in Idaho. People were an important commodity being transported in the early days but records are scarce concerning them. One note states that 36,000 people traveled to and from the Idaho gold fields by steamer during 1864. During 1920 to 1935 passenger traffic ranged between 350 and 2,000 people per year.

The total tonnage carried on Snake River by representative years is shown in the following tabulation.

Year	Tons
1875	18,230
1879	65,975
1884	30,260

Year	Tons
1891	31,400
1894	9,902
1899	45,654
1903	
1906	
1910	
1915	
1920	29,868
1925	11,954
1930	19,823
1935	8,895
1940	1,361
1943	629
1945	370
1948	210
1950	53

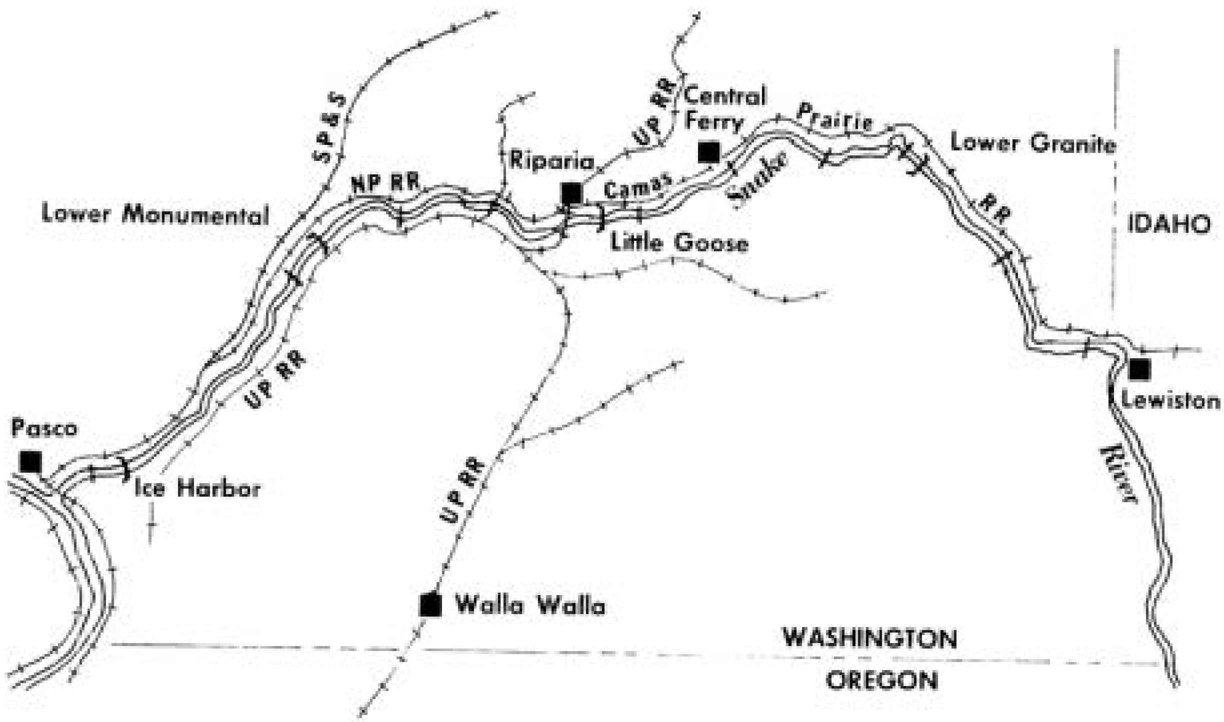
Note: Traffic - Lewiston to Johnson's Bar generally 500 tons or less of the above.

LOWER SNAKE RIVER DAMS

The first apparent concerted effort to examine the lower Snake River for a series of locks and dams for navigation, as well as incidental hydroelectric power was directed by the River and Harbor Act of 27 July 1916. This request for a preliminary examination report also included the Columbia River, Celilo Falls to the mouth of Snake River, and Clearwater River from the mouth to Orofino. The Snake River study extended to Pittsburg Landing, Idaho. The directive was for a study with a view to the construction of locks and dams for navigation, including any proposition by local interests for participation in the expense of the project in connection with the development of hydroelectric power. The initial report was submitted 6 April 1917 with a subsequent survey report submitted 29 November 1922. The reports are unpublished and their recommendations unknown, but the Board of Engineers subsequent recommendation was that no change be made in the existing projects.

The next study to be made for the region was the general, basinwide analysis of the Columbia River, the initial "308" Report. This review is contained in H. Doc. 103, 73d Congress, 1st Session, dated 10 June 1933, covering the Columbia Basin, including the Snake Basin.

In 1936 the Senate requested a review of H. Doc. 127, 56th Congress, 2d Session, dated 6 December 1900, for lower Snake River which provided for the open river improvements authorized in 1902. As a result of this review, H. Doc. 704, 75th Congress, 3d Session, dated 13 June 1938 reported on a proposal for 10 dams on the lower Snake, primarily for navigation. These dams would provide for a nine-foot draft channel to Lewiston. The dam heights were carefully chosen to minimize damage to the parallel railroad lines.



That report, actually completed early in 1937, was just too early to foresee the surge of development to come to the region, and the impact of the then under construction Bonneville and Grand Coulee projects. In the report the Division Engineer found that the irrigation and navigation benefits were insufficient to justify the projects but that possibly sufficient power from the dams could be sold in the next 50 years to make the improvements economically sound. The report continues, "It is not safe to assume now, however, that this can be done, on account of uncertainty as to how long it will take the market to absorb the very large blocks of power which the Grand Coulee and Bonneville projects are capable of producing." (With the advent of war and upturn in the economy, the region was to experience "brown-outs" within three years.) The Chief of Engineers essentially concurred in these findings, recommending, however, that the report findings be accepted by the Congress "as a general guide for future development - and that the Congress authorize from time to time such portions of the plan as it wishes...." The River and Harbor Act of 2 March 1945 authorized the construction of such dams as are necessary, and open-channel improvements for the purpose of providing slackwater navigation between the mouth of Snake River and Lewiston, Idaho, as generally described in H. Doc. 704.

Subsequent to the preparation of the report for H. Doc. 103 and during the preparation of H. Doc. 704, development of the Columbia Basin streams took a decided upturn with construction of Rock Island, Bonneville, and Grand Coulee Dams and the economic pressure on the region due to the second world war. In 1942 the Portland District was directed to review previous plans for the lower Snake River as generally outlined in H. Doc. 704. A report which was later used as the basis for more specific project identification and funding was submitted in November 1942, titled "Snake River, Lewiston to Pasco." The report found that in comparison with the benefits of a series of low dams, primarily for navigation but with some power facilities as previously contemplated in H. Doc. 704, a fewer number of high dams with power revenues paying a larger percentage of the annual cost was much better. That study, which was not printed as a Congressional document, recommended a comprehensive plan involving four major structures of 57- to 100-foot hydraulic heights with a fifth dam near the present Ice Harbor site with a height of 35 feet, assuming a pool elevation for the McNary project of 340 feet. Detailed site selection studies subsequently modified the dam locations, number, and pool heights to the four now under construction, each with a hydraulic height of about 100 feet.

LOWER COLUMBIA RIVER TO SNAKE RIVER

The Columbia River has, of course, always been a primary route of travel. Between 1850 and 1880 the river steamboats and stagecoaches had full sway. Portages at Cascades and Celilo Falls were improved and upriver steamers then had a busy time--until the railroads came in the 1880s and 1890s. During the gold rush steamers plied from The Dalles to Lewiston on Snake River and to White Bluffs on the Columbia, about 45 miles above the mouth of Snake River. Construction records indicate that over a period of 100 years--1850 to 1950--more than 100 steamboats of various sizes and capacities were built for the upper river runs, or made trips to that region from the lower river. Records also indicate that other steamers plied the Columbia River from the vicinity of Kettle Falls into Canada all the way to Revelstoke,B.C.

Business to Wallula and the mouth of the Snake River was thriving for the gold rush period. However, like the Snake, traffic on the Columbia withered after the turn of the century. Records at The Dalles-Celilo Canal for the decade of the 1920s show little or no traffic passing that point. Above Celilo Falls to Snake River records show no commerce for the years 1921 to 1929. There was good access to the railroads on both banks of the river and good farm-to-market feeder roads from the interior.

The advent of Bonneville Dam with its large lock and good river conditions to the foot of The Dalles-Celilo Canal in 1938 changed conditions and barge traffic returned to the river. By 1940 the reach of river from Celilo Falls to Pasco and Kennewick had generated 322,691 tons of waterborne freight, primarily small grains and petroleum products. This traffic grew gradually and in a relatively uniform manner until in 1947 it amounted to 820,072 tons. The flood of 1948 reduced traffic that year and the construction of McNary Dam in the ensuing five years had some effect on movement on this reach of river.

Utilization of Columbia River water resources for navigation, power, irrigation, and other uses by the introduction of structures was initiated by the building of the locks around Cascade Rapids in 1896. This was followed by construction of The Dalles-Celilo Canal and Locks in 1915. Bonneville Dam, which was reported upon in H. Doc. 103, 73d Congress, 1st Session, dated 10 June 1933, was completed in 1938 as a public works project during the depression years. The Grand Coulee project was also reported upon in that document, along with four others in the reach above the Snake, all of which have now been built by various interests. The same document proposed a dam at The Dalles about 300 feet high which would have a reservoir reaching to the mouth of the Snake River and be a major structure with 40 feet of reservoir capacity for storage and stream control. That report recommended that a comprehensive plan of eight dams on the Columbia River in the United States be adopted as a guide in controlling and supervising the development of the stream.

House Document 704, 75th Congress, 3d Session, dated 13 June 1938, reanalyzed the reach of Columbia River below the Snake River for feasibility of development, due, no doubt, in some degree to objections to a 300-foot-high structure at The Dalles and the advent of construction at Bonneville. (An alternate proposal for a dam at The Dalles, and reported upon in this document, discusses a dam 680 feet high with a pool elevation of 540 feet creating a lake up to the Rock Island Dam on the Columbia, and Riparia on the Snake; a veritable inland sea.) After reviewing the alternate proposals for the Columbia River below the Snake River, the report recommended a series of five dams between tidewater above Vancouver, Washington, and the Snake, including the Bonneville project which was under construction at that time. The other four dams would be located at The Dalles, the mouth of the John Day River, above Arlington, and at Umatilla Rapids.

The upper project was titled "Umatilla Dam." In H. Doc. 704 it was stated that construction of the several projects should be in that order which would best meet the most pressing needs of waterborne commerce. Accordingly, the Umatilla Dam was indicated as of high priority. The report stipulated a dam 2.5 miles above Umatilla, Oregon, with a normal pool elevation of 310.5 feet. In an unpublished report of the Portland District of February 1942 titled, "Proposed Power Projects" the pool level was raised to elevation 330. Studies made between 1942 and 1944 revised this pool elevation to 340. The project was subsequently authorized by the River and Harbor Act of 1945 generally in accordance with H. Doc. 704 but with a pool elevation of 340 feet. The Act also specified that the name of the dam should be "McNary Dam" in honor of the late Senator from Oregon, Charles L. McNary.

1948 COMPREHENSIVE BASIN REVIEW

The increasing tempo of water resource development in the Inland Empire and the demand for hydroelectric power spawned by the second world war dictated the need for a re-examination of the proposals which were described in the original "308" Report of 1933 - H. Doc. 103. The Senate requested the review by a resolution in 1943, and the study was five years in the making with the Division Engineer's report dated 1 October 1948. The resulting published report, H. Doc. 531, 81st Congress, 2d Session, dated 20 March 1950, was comprehensive, covering the entire Columbia Basin with major implications for storage in Canada, as well as an all-U.S. plan involving major storage projects for rather complete control of the streamflows, both for flood control and power.

For the reach of Columbia River below the Snake, this report modified the plan adopted in H. Doc. 704 by reducing the number of dams to four. (The Bonneville project had been built and the Umatilla Dam had been authorized with subsequent studies determining the optimum pool elevation at 340 feet.) The remaining question was the best plan of development for the reach from The Dalles to Umatilla. The review found that two dams, rather than the three previously recommended, would be best; the two to be The Dalles Dam as originally proposed with a pool height at elevation 160 and a major structure at the mouth of the John Day River, with a pool elevation of 255 extending to the Umatilla Dam site. This dam would replace the previously recommended John Day and Arlington dams. In addition, the report recommended superimposing about 2 million acre-feet of "last chance" flood control storage at this site for protection of the lower river's extensive developments against rare but devastating major floods. The two projects were authorized essentially as described in H. Doc. 531 by the Flood Control Act of 1950, approved 17 May 1950.

LOCAL FLOOD CONTROL

With the settlement of the inland region and development by man of the bottom lands in our many stream valleys, floods were found to be particularly contentious for the land's use. Furthermore, with the streams of the Columbia Basin all originating in mountainous areas, annual heavy spring freshets are to be expected. The discharge of the Columbia at The Dalles has ranged from 30,500 cfs to 1,240,000 cfs, while the Snake River at Riparia has ranged from 10,600 cfs to 409,000 cfs. The maximum flood of record for both streams was in 1894. Other major floods have occurred in 1859, 1862, 1866, 1871, 1876, 1880, 1882, 1887, 1948, and 1956, with their discharges at The Dalles decreasing from the maximum cited above to 800,000 cfs. The 1948 flood, the maximum flood of this century, was 1,010,000 cfs. In the Snake River asin there have been 11 floods during this century of major proportions ranging from 250,000 cfs to 369,000 cfs. In addition, tributaries can have very damaging floods to lands along those streams. Very few years pass but that one or more of the tributary streams create local and main-stem flood problems that demand Federal attention.

On 22 June 1936, the Congress passed the first "Flood Control" Act (Public Law No. 738, 74th Congress), another major milestone marking the growth of the Corps. This flood control act declared flood control to be a proper activity of the Federal Government to be carried out in cooperation with the states; that improvement of river and other waterways and the watersheds thereof, for flood control, was in the interest of the general welfare; that such improvements should be carried out if the benefits, to whomsoever they accrued, were in excess of the costs, and if the lives and security of the people were otherwise adversely affected.

Prior to 1949 flood control levee and channel works had been authorized for the Heise-Roberts area above Idaho Falls and the Lucky Peak flood control storage reservoir had been approved, with design or work started on both of them. In the Palouse Basin, tributary to the lower Snake, levee and channel work was approved in 1944, with no work accomplished. A similar situation prevailed at Lewiston and Clarkston on the Snake, where levee works were authorized in 1945. In the Walla Walla River Basin, channel work through Milton-Freewater had been authorized, as well as both a storage dam and channel works on Mill Creek at Walla Walla. The later works were both completed during the 1940s.

A levee and channel project at Dayton on the Touchet River was authorized in 1941 but no work accomplished.

In the 1948 "308" Report - H. Doc. 531 and subsequent authorization by P. L. 516, 81st Congress, dated 17 May 1950, a total of 23 other local flood protection projects (18 of them in the Snake Basin) were authorized, some on a conditional basis subject to further economic justification.

The marked growth, both urban and rural, in this portion of the Inland Empire during the second quarter of this century has placed major emphasis on control of all tributary streams to the Snake and Columbia for flood control, making such control multipurpose wherever possible. Federal involvement is almost mandatory because of the volume of water requiring control and the scope of the projects necessary.

A REVIEW OF PLANS IN RETROSPECT

The extent to which needs and plans for the development of the water resources of the inland basin changed during the 20-year period between the preparation of H. Doc. 103, starting in about 1930, and completion of H. Doc. 531 in 1948 is of interest and illustrates the rapid growth of the region. H. Doc. 103, which is the granddaddy of Columbia Basin development for multipurpose uses, indicates that the District Engineers of those times, and Division Engineers, too, were of a very conservative nature on future development potentials. That document cites that local interests felt with improvement in conditions of the Columbia River, waterborne traffic would expand to as much as 300,000 to 400,000 tons annually. The Division Engineer questioned this, estimating 100,000 to 200,000 tons with the qualification that if, in the long range, slack water to the Pasco-Kennewick area were realized, the traffic might even go to 600,000 tons annually. As with navigation, power was a big unknown at that time. The report states, "Estimates of the future always involve many uncertainties. In the electric industry five years ahead is as far as plans can usually be prepared with any definite uses. A 10-year estimate is hazarded only with reservations." A report on the Snake River prepared in 1933 (H. Doc. 190) cites an inventory of 29 existing and potential hydroelectric plants from Jackson Lake to the mouth with a total installed capacity of 113,900 kw (less than one generating unit of the lower Snake projects now being built.) The report states that the distances from power sites--including the lower Snake River--to large markets are so great and the local market so limited that it cannot yet be foreseen when an extensive development of hydroelectric power in the Snake River Basin will be justified. "Development of water power is so far in the future that it is not a factor in the solution of other problems." The report, in commenting on flood control, states, "Flood control in Snake Basin is a matter of no special Federal concern. Two areas are threatened, but local interests and the State of Idaho are awake to the situation and Federal participation is believed not warranted." As for additional development of irrigated lands, the

Secretary of Agriculture in connection with H. Doc. 103, stated in very positive terms his opinion that "the Federal Government should not now undertake to further enlarge the areas devoted to agriculture in this country."

Contrariwise, by 1950 H. Doc. 531 found the need for a series of large, multiple-purpose dams and reservoirs to be operated as a coordinated system which, in conjunction with lower Columbia River levees, will control main river floods, improve inland navigation and furnish the major part of the power requirements of the region, together with 13 irrigation projects in various sections of the basin. Dams and reservoirs in the proposed plan would provide for an additional 24 million acre-feet of usable storage (5 million at Grand Coulee by modification of the outlet works) and an additional 7-1/3 million kilowatts of installed capacity. Many major local flood control projects were also recommended. In addition, the Bureau of Reclamation cited the need for 10 new irrigation projects involving about 370,000 acres of land. The Director of the Bureau of the Budget, in commenting on the report, stated, "The works projected by the Bureau of Reclamation and the Corps of Engineers represent a construction program which will extend over a period of about 20 years. When completed they will make the Columbia River system the greatest source of hydroelectric power in the world and will yield additional benefits in terms of flood control, navigation, reclamation, and other beneficial uses of water...We are only at the beginning of a tremendous development program in the Pacific Northwest." It was in this later atmosphere that the Walla Walla District was conceived, to accomplish a major segment of the development envisioned, as well as to make adequate plans for then undesignated future projects to meet the many needs of the people of the Inland Empire, the upper Snake River Basin, and Pacific Northwest.

History should not be critical of the apparent conservative efforts of early planners. Rather, it should realize that even the long-range thinking of that time could not envision a second world war, a population explosion for the Northwest, atomic energy, nor Sputnik. Rather, it should heed the words of COL Wm. Whipple, our first District Engineer,--"make no small plans"--particularly ones which will preclude optimum development of our water resources for future mankind.

THE INLAND EMPIRE

In these recountings of historical events and development trends in the foregoing material, we have alluded many times to early navigation activities. These efforts were trying to improve stream conditions, and the money was spent to open up and maintain a channel for the early steamers. In addition, authorizations made for structures and control works resulted from much pioneering effort by communities, individuals, and investigating teams. Some of these efforts, and results, are recounted in a most interesting narrative style in the History of the Portland District. The early work by the Portland District in the

Inland Empire, for almost 80 years prior to 1949, as described in many places throughout that volume, forms necessary supplemental reading to this record to better understand all of the early efforts toward development of the region.

Some may feel that the Portland District history dwells too much on the tidal reach of the Columbia, the coastal areas, and the Willamette basin, because that is where their hearts and interests lie. A study of the development of the Oregon Territory and the coastal states, the objectives, and economic impact, of course, indicates that the region west of the Cascades "is where the action is." However, the growing feeling by the Inland Empire people and institutions that they were being slighted; that they were an important cog in the growth of the west side; and that the "web feet" on the other side of the mountain were using them without proper compensation and share in the growth factors led to independence of thought and action. To some indeterminate extent that demand for recognition is one reason for establishing a Corps of Engineers District in the Inland Empire. The area east of the mountains feels quite strongly that in no way should it be exploited for the benefit of the west siders.

The Inland Empire and southern Idaho people are somewhat more independent, conservative, and more oriented to individual endeavor than the later migrants to the coastal area. They gambled much for the early settling and developing of the region. They pioneered in its individual enterprises and "sod busting" efforts. Their traits are most evident in the local requests for help in controlling streams and evaluation of levee and channel or storage plans prepared by the District to provide stream control.

All of the foregoing is a prologue to the actual history of the Walla Walla District. The development that has taken place, the land resources coupled with the tremendous water resources of the upper Snake Basin and southern part of the "Inland Empire", and their relationship to the needs and support of the growth of the entire nation form a potent reason for the District.


COLUMBIA RIVER BASIN
CANADA
River
Spokane
Ocean
Pacific
WASH.
Snake
Walla
Walla
Lewiston
Columbia
Portland
ORIGINAL WALLA WALLA
DISTRICT BOUNDARY
IDA.
WYO.
Boise
River
ORE.
CALIF.
NEV.
UTAH

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CHAPTER 4

THE NEW DISTRICT'S FORMATIVE YEARS

PRELUDE

The preceding review of the sequence of studies and subsequent authorization of projects for the Columbia River below the Snake and in the Snake River Basin outlines the projects that were on the books at the time of conception of the Walla Walla District; i.e., Umatilla (McNary) Dam, the four lower Snake dams, navigation from Lewiston to Johnson's Bar, Lucky Peak Dam at Boise, and a handful of local protection projects in the Snake Basin. Activities were underway in 1947 on a dam at Umatilla Rapids, renamed McNary after the illustrious Oregon Senator, Charles McNary. The Senator had much to do with efforts in its behalf as early as in the 1920s. Construction plans for the lower Snake River projects had jelled and design of the first unit at Ice Harbor had been funded, starting in 1946. In addition, preliminary design funds for the Lucky Peak Dam at Boise had been appropriated in FY 1948. Local flood protection works were also underway at Walla Walla and at the Heise-Roberts location on Snake River above Idaho Falls. All of these activities, plus the future work that was envisioned, prompted the Division Engineer in 1947 to initiate a survey of several towns, including Pendleton, Tri-Cities (Pasco, Kennewick, Richland), Spokane, Boise, and Walla Walla for the best location of a possible District office. COL Whipple, Division Executive Officer, was given the task of working out the details and organizing the new District. He was then named as the first District Engineer.

THE OFFICE

The City of Walla Walla won the nod for the location of the District office, probably for several reasons. It was the largest community in the general area of the anticipated action at McNary and the lower Snake; away from the boom development of the Tri-Cities; Spokane was away from the action scene; and Boise, already the home of other Federal offices, was not warm to more "federalists" who were sort of relegated to "second class people" in spite of the possible economic advantages. In addition, Walla Walla had one of the major airports in the Inland Empire and a prior Air Force training center which had considerable available space since the airbase had been closed in 1946.

Probably one of the compelling arguments for settling in Walla Walla, other factors being equal, was the presence there of the Inland Empire Waterways Association with an Executive Vice President who was a real activist for the development of the water resources of the Inland Empire. Herbert G. West, a far-sighted individual with a vision of major developments for the Columbia Basin water resources, was an able promoter and had the knack of being able to sell his ideas to others--local, state and nationwide. The early emphasis of IEWA was on inland waterway navigation serving as a feeder to ocean shipping at tidewater; hence, the strong emphasis in the 1940s on the Umatilla (McNary) and lower Snake projects. The 1948 flood, and review of the Columbia basin "308" Report, in 1948-50, broadened the objectives of IEWA. They realized that storage and stream regulation not only for navigation, but for the generation of hydroelectric power, flood control, and major source of irrigation water were essential.

Routine correspondence and memos relating to early evaluations and decisions concerning the location for an Inland Empire District are scarce. Evidence indicates that while there certainly were discussions with people of the three or four communities, the decision was essentially made within the Corps and the local authorities in Walla Walla were then made aware of the decision, with qualifications. An inquiry to Portland late in 1946 by IEWA concerning a rumor that the Corps of Engineers would need "considerable office space" brought a categorical answer--no space required. In a similar vein, an inquiry in January 1948 by IEWA to LTC Wm. J. Ellison, Jr., then Portland District Executive Assistant for McNary Dam, brought an answer that "COL Walsh is contemplating the organization of a McNary Division some time this spring...." (The McNary project office had been established the fall before.)

From the memory of local citizens who were charting the course of Walla Walla at the time--Roland Miller, Clarence Braden, Herb West, Al McVay, Parker Barrett, Don Sherwood, and others, including Jim Schick, reporter for the Union-Bulletin--the Division Engineer indicated early in 1948 that Walla Walla and Pendleton were in competition, but that to win about 50 homes would have to be provided as a starter. Walla Wallans were the activists. They promptly formed the Blue Mountain Housing Corporation, and started building homes. Others followed. It appears that this action had some influence, and on 7 September 1948 a formal announcement was made in the Walla Walla Union-Bulletin that an interior district office was being established. After that announcement IEWA sent letters to every organization in the community urging full cooperation and an all-out effort to make housing available.

The decisions concerning office space evidently received considerable discussion with proposals made to several downtown building owners.

The amount of space needed and the size of the District staff was continually escalated. The first plans appear to be formulated around space in town with firm commitments for the second floor of the Union-Bulletin building and overflow in the vicinity in a relatively modest amount. Records of the Airport Board show that the first informal proposal for use of airport buildings was on 3 September 1948 with the Corps requesting information on possible space available. On 10 September NPD returned with specific requests but still not ready for final agreement. Negotiations and agreements were numerous after that with several changes of mind. Two of the administrative buildings, a warehouse, a garage, as well as a messhall, were agreed upon and a lease entered into on 24 September 1948.

The Office, Chief of Engineers cut General Order No. 9 on 10 September 1948 officially establishing the District as of 1 November 1948. It was a "going concern" when set up, with a heavy workload, strong funding, and good potentials for the future. The 1948 flood, third largest of record, emphasized the need for stream control throughout the basin. The 1948 "308" Review Report, with its comprehensive evaluation of needs and water resource potentials, set the stage for development which is exceeding even the scope envisioned by the Director of the Bureau of the Budget in his forecast in 1950 "...We are only at the beginning of a tremendous development program in the Pacific Northwest." The future for the District was not to be without its ups and downs for workload, but it was well conceived, with a very competent staff recruited quite meticulously by COL Whipple from all over the nation. Furthermore, the staff and office being new, without historic preconceived ideas and entrenched positions, was a viable group easily molded into an organization full of enthusiasm with "new worlds to conquer." Thus began, in a quite modest way, the Walla Walla District.

THE STAFF

As indicated previously, COL Whipple was the first District Engineer with LTC Vincent "Tex" Frisby as Executive Officer. In staffing the new District, notices were broadcast nationwide inviting adventurous souls to apply but carefully avoiding any indication of pressure, even on the three Districts in North Pacific Division. COL Whipple, who had previously drawn Corps assignments to civil works, had had contact with highly competent engineers and administrators in the organization and used this knowledge well. He recruited Jim Reeves, then in Greece on rehabilitation work by the Corps trying to keep that nation allied with western Europe, to head up the engineering staff. Reeves had an outstanding record with the Corps and from Walla Walla was destined to go on to the Atomic Energy Commission for a yet more important role. Reeves had full confidence in another outstanding engineer with whom he had worked in earlier days, which directly or indirectly influenced his selection from the Tulsa District as Chief of Engineering Design, Edwin C. "Fritz" Franzen. Because Reeves was in Greece during the District's critical organizational days of the last quarter of 1948, he delegated this responsibility for all of engineering to Franzen. Franzen introduced some innovative organizational structures throughout engineering, such as the Project Coordinator for each major structure, working directly with composite Design Sections within Engineering (as against the task force concept) and other units throughout the District.

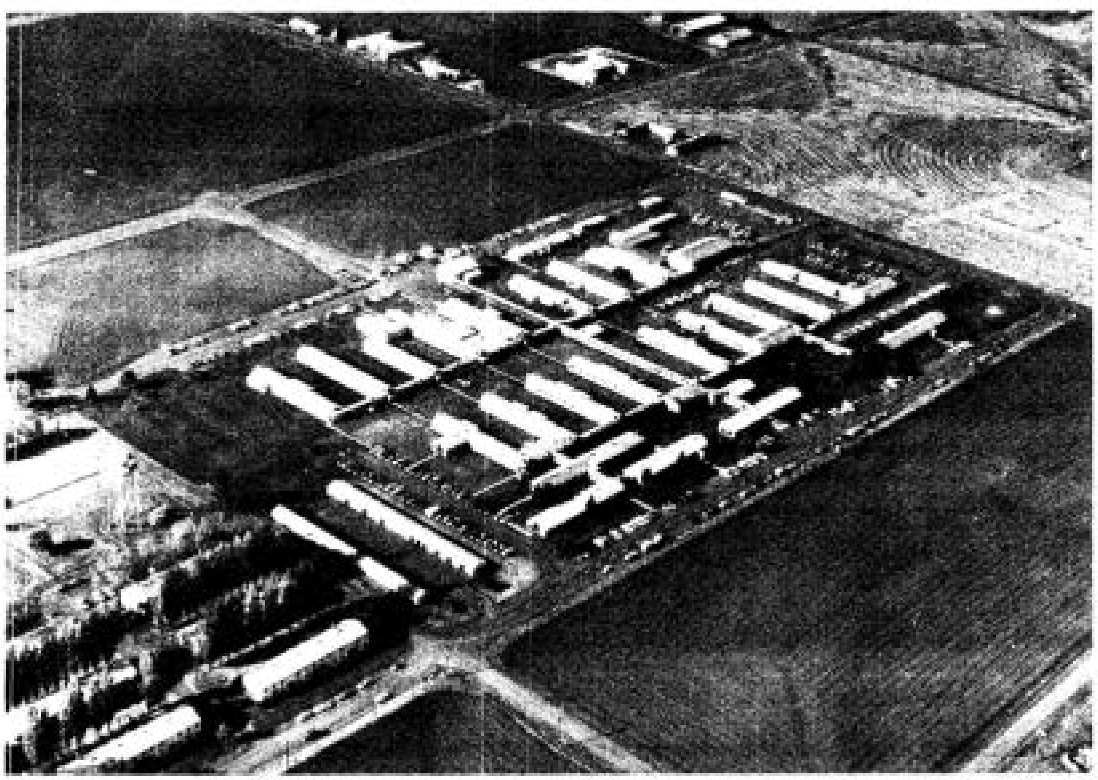
COL Whipple went to the Western Ocean Division in Sausalito, California, to tap a very knowledgeable man, Leo Buhr, to head up the Construction Division. In addition, he had a going field organization at McNary headed by LTC Wm. J. Ellison, Jr., and W. B. "Bill" Watson. The Construction Division was a critical unit to staff because McNary was very active, Lucky Peak was on the drawing board, and Ice Harbor was imminent.

To illustrate the cosmopolitan aspect of the District organization, other units of the District staff, administrative and technical, were comprised of top men gathered from many Corps sources: Russell D. Whelan from the Seattle District, as Chief Administrative Assistant; Merle E. Lietzke, a real estate expert from the Tulsa District; William E. Sanderson from North Pacific Division to head up Personnel; Francis E. Casey for Fiscal Officer from the Buffalo District; Bart Long, an eccentric but very knowledgeable concrete specialist of national reputation from the Division Laboratory; Ed Wainwright and Chester Hansen came from Western Ocean Division for Management and Office Services. The Portland District furnished such men as Claude Waggoner, an expert in all phases of surveying and mapping; Clyde Walker, attorney and legal counsel; and Louis Rydell to head up all phases of engineering planning, who had an intimate and highly professional knowledge of the Columbia Basin. The organization of the all-important Supply Division fell to VanNatta Baldwin, who had been in many phases of the Corps program from Ft. Peck and Bonneville to the military effort, and at this time was working at the McNary project. The original organization chart anticipated approximately 400 to 500 employees for the District Office and, needless to say, these men selected from a wide geographic area influenced others to come, such as Joe Monahan, Harry Drake, Melvin Ord, Sam Guess, Orville Murray, and August Niemi, all destined for responsible future supervisory positions.

REAR ECHELON

Another very important segment of the District staff at the time of its advent was the "Rear Echelon" in the Portland District Engineering Division. This unit was comprised of about 80 people, not only those in the Portland District who were working on design of the funded projects assigned to the new District, but also some who were to later come to Walla Walla with the physical transfer of the design effort. This was a very trying experience of divided responsibilities, divided allegiance, divided professional judgment on project features, and personal desire to work but not wanting to leave the "west side" to come to the very different "east side."

Since the McNary project was under construction and it was vital to keep the work on schedule, design for the second-step cofferdam and powerhouse was critical. This was underway in the Portland office and needed to continue. The new District principals, with some different approaches to design features and problems, were responsible for the execution of the project and assuring the progress of contract documents, without having full control of some of the attendant responsibilities. The Engineering staff did much coordination between the two offices and Otto R. Lunn was the McNary Design Chief for the District. He was a veteran of Bonneville days, as well as Mud Mountain Dam and City of Tacoma projects, a doughty engineer and an activist. Lunn did yeoman service in keeping production lines open, yet injecting into the design some of the professional knowledge and thinking of the District staff fresh from several other projects in the country. The job was accomplished, and in the summer of 1949 the rear echelon was disbanded and all functions moved to Walla Walla along with some of the people.



ORIGINAL OFFICE BUILDINGS AND MESSHALL--Top of Picture
CONVERTED HOSPITAL AREA--Center of Picture
BOQ BUILDINGS--Lower Left

THE ESTABLISHMENT

In addition to staffing, the District experienced physical growing pains for quarters. There was an initial strong feeling that at least the executive and construction people should be in town in order to relate to the community. Since space was not available for all echelons, engineering and most segments of administration were located at the airport, including, as well, a motor pool and warehouse storage. Office space was secured in two prior headquarters buildings in the center of the base, engineering to use one and administration the other. Each building had an actual capacity of 50 to 75 people. As soon as the "clan began to gather" it was realized that additional space was necessary and negotiations were started in November 1948 for the "hospital area", the best maintained and only coordinated group of buildings available.

The Airport Board, which had just been given the surplus former Walla Walla Army Airbase from the Government, deeded the "hospital area" back to the Corps without cost. After several shifts and intermediate moves the District rehabilitated and occupied the hospital complex during the summer of 1949, except for the forty or so people still in town. The separation of the executive offices, key administrative, and construction people by five miles from the remaining functions proved highly unsatisfactory and, accordingly, all phases of the District were assembled at the Airbase complex by the summer of 1951. At that time the District staff, including many who spent most of their time in the field, was well over 500 people.

Another transient phase of the District's early growth was the establishment of a formal messhall operation, coupled with several BOQ barracks operated to house employees while hunting for homes for their families or on temporary assignment. These housing arrangements lasted for about a year until conditions stabilized in town. Because of the continuing need for readily available low-cost housing for family use, the District obtained permission in January 1949 to remodel six of the two-story BOQ buildings adjacent to the office complex to provide 48 apartment units for District personnel on a rental basis. After operating them until August 1957, ownership and operation was transferred to the City-County Airport Board which now makes them available to all comers, regardless of occupation in the community. In the mid-1960s, the ownership and operation of the office complex was transferred to the General Services Administration.

Districts are not established very frequently, but when they are the paperwork is the first and fastest growing part of it. A part of the problem of implementing the flow is to find the paper and machines to produce it. This District was not immune, and when a routine request for a large number of typewriters was given to the General Services Administration, they disclaimed any responsibility since the District was a unit of the U.S. Army and advised going to the Quartermaster for equipment. The Quartermaster quickly abnegated any responsibility and advised going to GSA since the District was a civil function. Luckily, the Atomic Energy Commission at Hanford had a warehouse full of surplus typewriters and other items, so the District broke the stalemate by producing its first flood of paperwork on AEC generously donated equipment. (The records are incomplete as to how the standoff was actually resolved.)

THE DISTRICT'S INHERITANCE

McNary Dam

A prime reason for the creation of a District in this inland region was the inventory of work underway, as well as that in advance planning for which construction funds were imminent. The running start for the District is well illustrated by statements made in December 1948 regarding additional office space (two months after formation). "The ceiling requirement for the District Office at Walla Walla for 15 January 1949 will be 456 employees and the anticipated future peak requirement to be reached when construction starts on Ice Harbor, as well as McNary, is 694 employees in Walla Walla. If supplemental allotments of funds are made for Ice Harbor and McNary, it will be necessary to provide greatly expanded office facilities within this next few months." The Ice Harbor funds were not forthcoming as soon as anticipated; regardless, the work-load mushroomed so the District Office had 584 employees in FY 1950.

NORTH SHORE--FIRST STEP COFFERDAM--FALL 1948

The McNary project was, of course, under "full steam" at the inception of the District. The first construction contract awarded for McNary Dam was made by the Portland District in April 1947 with the Guy F. Atkinson Company, San Francisco, for rough excavation along the Washington shore for the navigation lock, all without need of a formal cofferdam. A subsequent contract provided for the first-step cofferdam in the northern half of the river channel and included the navigation lock area. Design had been completed for structures within this cofferdam and the first contract awarded by the new District was for the northern portion of the dam consisting of the navigation lock, fishway, and 13-1/2 bays of spillway. The remainder of the project structures were under design by the "rear echelon" in Portland for later contracts.

Lower Snake Dams

The lower Snake River four-dam complex had been planned and the approximate location of the structures determined by Portland District studies made between 1942 and 1946. Advance engineering and design studies for Ice Harbor were initiated in FY 1947 by the Portland District. Foundation explorations had been made and structural features were being established at the time the new District was formed, in anticipation of construction funds in FY 1950. Basic design studies for the lower Snake River projects were assumed by the new District staff when they assembled in November 1948. In the meantime, with the economic lull and budgetary problems after the Pacific military conflict termination, an executive decision was made in 1949 that FY 1950 would contain no new starts. As a result, the construction schedule for Ice Harbor was put in escrow, not to be resumed until 1955. In the interim, however, the new District analyses were destined to result in extensive restudies and project modifications.

Lucky Peak

The Lucky Peak project on Boise River, Idaho, had also been planned by the Portland District and Congressionally authorized in 1946. Advance engineering studies were funded in FY 1948 for the Portland District, including a start on design details. Continued design of this project was one of the initial efforts undertaken by the Engineering Division of the new District.

Levee and Channel Work

In addition to these three major structures on the drawing boards of the new Engineering staff, with McNary construction assumed by the then Operations Division of the District, levee and channel works at three locations (Walla Walla, Milton-Freewater, Oregon, and Heise-Roberts, Idaho) were in varying stages of construction and were taken over for supervision. The Portland District had also submitted investigation or survey reports on other needed flood control works, some authorized and others to be included in the 1948 "308" Report with subsequent conditional authorizations.

Such was the "running start" of the Walla Walla District: a good workload; a good staff recruited; and an outstanding bevy of District Engineers and Executive Officers (now Deputy DEs) over the ensuing years. A portentous beginning for a continuing illustrious career.

THE EARLY YEARS

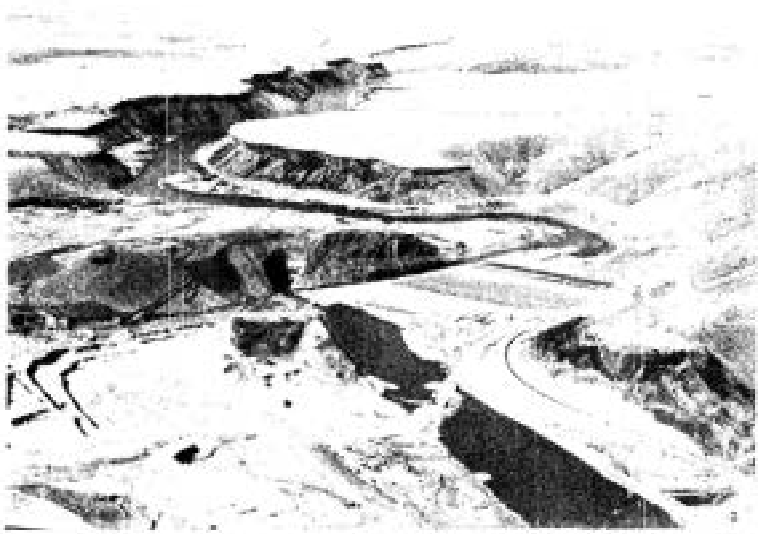
In spite of the new-start moratorium of 1949 extending into the early 1950s, the District continued its active construction program. In addition, engineering design continued on the Ice Harbor project resulting in a summary report issued 31 October 1952 with a supplement thereto dated 5 August 1955. The 1948 major flood and resultant findings in the "308" Report (H. Doc. 531) prompted a series of flood control studies throughout the Snake River Basin, as well as for the Walla Walla and Umatilla Rivers. Coupled with those analytical studies of a more comprehensive nature, emergency repair work at critical locations on existing levee and channel works was undertaken in 1949 and 1950 at many points along the Clearwater, Salmon, Grande Ronde, Weiser, Payette, Boise, Portneuf, upper Snake River above Idaho Falls, and in Jackson Hole, as well as in the Walla Walla River Basin. These emergency repair efforts, coupled with flood-fight operations as tributary floods occurred, were destined to be an important segment of the District's efforts toward stream control and have proven to be well-received assistance to the local people. While not spectacular from the standpoint of total funds expended in comparison to the major project construction effort, the local assistance through these emergency measures continues to highlight one of the District responsibilities and personnel effort and performs a critically needed and much appreciated service.

First District Engineer

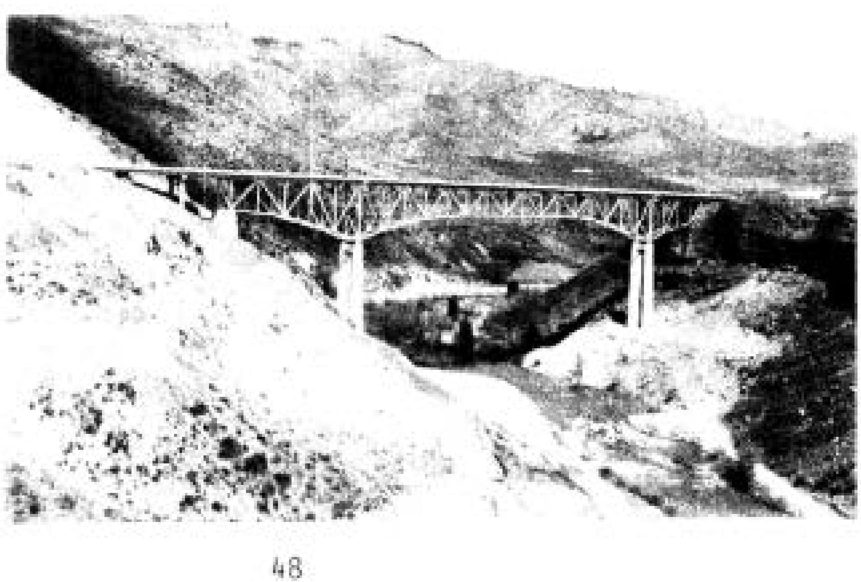
As the running start for the District would indicate, together with the "work on the books", COL Whipple had an active tour of duty with the District. The aggravating local flood problems throughout the Snake Basin; coordination efforts with the Bureau of Reclamation in whose "territory" the District was becoming active; the not complete acceptance of the Lucky Peak project in Boise; the ever-present basic objections of the anadromous fishery interests to any development; delays in the lower Snake work; and the many construction problems at McNary coupled with the Umatilla Indian protests made for no lack of challenge during his two-year assignment. COL Whipple left the District as a going concern in August 1950 with a record of increasing appropriations for the work undertaken. The partial fiscal year of 1949 resulted in an expenditure of practically $19 million. (The next fiscal year expenditures doubled to $39 million), and in FY 1951 they increased further to nearly $45 million for civil works. LTC Vincent "Tex" Frisby did yeoman service as Executive Officer for one year with COL Whipple (1948 to December 1949) trying to meet and assuage the birth pangs of the District. He was succeeded by LTC W. P. Leber who also stayed only one year, being transferred in September 1950, almost the same time as COL Whipple. He spent his time smoothing out the District's procedures and path of operations. He found sufficient time during the hectic pace and "birddogging" for COL Whipple to gain the acquaintance and interest of one of the more prominent young ladies and successful merchants of Walla Walla (Bernice Humphrey) who decided to go with him on his next assignment.

Construction

The next two or three years for the Civil Works Program of the District (1950-53) were ones of essentially carrying on under the impetus gained from the initial two years. McNary construction proceeded rapidly within the south shore second-step cofferdam, as well as for relocation and levee work upstream. This breather time for Ice Harbor permitted a review of the scope of the project and some desirable modifications. Lucky Peak construction moved ahead with several facets of the job requiring special attention, including More's Creek Bridge, the "million dollar bridge to nowhere," according to the Boise Statesman; modifications to Arrowrock Dam; county road relocations; operational procedures to obtain optimum use of Lucky Peak storage in combination with two U.S. Bureau of Reclamation storage units upstream; and plowing new ground with the Federal and state fish and game agencies on mitigation needs as a result of the project.



LUCKY PEAK DAM CONSTRUCTION
OCT 1951
LOOKING DOWNSTREAM--BOISE
IN UPPER RIGHT



MORES CREEK BRIDGE
1954
LOOKING UPSTREAM
BEFORE POOL RAISING

The levee and channel works for Milton-Freewater and Heise-Roberts area of the upper Snake were completed, as well as some remedial measures of trying to better seal the Mill Creek Reservoir above Walla Walla and make it a more viable unit in the control system for Mill Creek. In addition, the investigation for new and needed flood control works as well as emergency repair and flood fight operations was carried out.

Middle Snake Study

One important study was conceived during this period that was to be the forerunner of many long negotiations, regional debates, changes in local objectives, and the advent of prime storage in the middle Snake area and Clearwater Basin. The three-dam plan of Idaho Power Company for development of the Hells Canyon reach of Snake River versus a single Federally constructed high dam at the Hells Canyon site was being heatedly argued, with a safe assumption that this reach of river would be developed by one means or the other. A logical question then arose as to the best method of developing the remainder of the reach to the mouth of the Clearwater River, including the Clearwater Basin.

SNAKE RIVER
HELLS CANYON
REACH ABOVE
SALMON RIVER

(Pleasant
Valley in
top center)

Some local interests were not particularly warm to the plans presented in the 1948 "308" Report for the reach from Lewiston to Hells Canyon, including the Clearwater Basin, but realized further development was needed. As a result they obtained a resolution by the Public Works Committee of the U.S. Senate for a review of proposed plans and advisability for some modifications. The resolution for the "Middle Snake Study" was adopted 5 October 1951. Funds for such studies were not plentiful during the next two years. In addition, the Administration was not a strong advocate of Federally constructed power projects, and the Hells Canyon controversy kept the situation unsettled. Finally, through the dint of considerable promotional effort by Bert Curtis, Mayor of Orofino, Idaho, and others, sufficient support was generated behind Idaho Senator Dworshak to secure an allotment of funds in the summer of 1953.

Enter COL Mills

COL William H. "Bill" Mills presided over the District during this period (August 1950 to March 1953). Being conservative in nature he ran a tight shop, keeping things moving relatively smoothly. He had a good Executive Officer in LTC Robert N. Anderson, who kept control of the District's formation and helped greatly in a transition that was to take place by assumption of military construction. COL Bill grew fond enough of the community "they liked so well they named it twice" that after serving three more years with the Corps he retired and returned to Walla Walla to live, assuming the position of Manager of the City-County Airport.

THE MILITARY PROGRAM

Almost as soon as COL Mills assumed his position here the needs for military construction throughout the Northwest began to multiply. This involved both personnel and construction capability. Tightening world tensions, including the invasion of South Korea in June 1950, dictated major expansion of some military facilities. The Seattle District was then charged with all military effort and the Walla Walla District's initial participation was to furnish personnel to Seattle as a supplemental force. The workload expanded rapidly and on 31 March 1951 the Chief of Engineers made the Walla Walla District responsible for all military construction east of the Cascades in Washington and Oregon, together with Idaho and Montana. This special military effort was destined to run for ten years, accomplishing a wide gamut of military objectives ranging from routine building construction and rehabilitation; enlarged airfields; a completely new major airbase; anti-aircraft installations; Nike-Ajax-and Hercules complexes; to two Titan I Intercontinental Ballistics Missile installations. An extensive real estate acquisition program was involved for all of these activities.

The initial effort in military was primarily to rehabilitate and expand existing airfields at Fairchild and Geiger Fields at Spokane, Larson Airbase at Moses Lake, Mountain Home base in Idaho, and Malmstrom Airbase at Great Falls, Montana. In addition, Army installations for protection of the Hanford project were updated and strengthened, including anti-aircraft equipment. The impact of this workload on the District is well illustrated by funds allocation. Fiscal year 1951 military allotment was for $4,500,000; FY 1952 escalated to almost $37 million which was the maximum for an 8-year period. This military function was assumed at the same time that civil works appropriations were in the neighborhood of $50 million, so COL Bill had a real active tour with the District.

COL TANDY AND THE MIDDLE SNAKE INVESTIGATION

In the midst of the active civil works construction program and the ever changing military activities, the District was assigned a new District Engineer, COL F. S. "Tom" Tandy (1 April 1953 to 31 July 1954). COL Tandy came to the District direct from a high-pressure engineer assignment in Korea rebuilding roads and supporting combat troops. His penchant for action was not abated by the reassignment, and his year and a half in the District witnessed some interesting developments. "Terrible Tom" was a very capable engineer, a good manager, politically astute, and every day a pusher, not only of his staff but of himself. In spite of a 12-hour schedule, COL Tandy undertook to repaper a relatively old house he had rented, to better suit his wife. He appeared one morning stiff and sore with a bruised forehead and black and blue nose as the result of trying to reach too far on top of a stepladder. It has been said that the District realized more progress in his year and a half than most other three-year periods; and more staff action. COL Alex H. Miller was destined to be his Executive Officer (February 1953 to July 1954) and subsequent District Engineer for a year (August 1954 to August 1955).

The Middle Snake Study previously described proved to be of great personal interest to COL Tandy, particularly after reviewing the Clearwater Basin with Bert Curtis and other local interests. When the question of implementing the review study was examined by the District staff, it was considered that a year or more would be required for an adequate analysis. This was considered too long by many. As a result, while considering FY 1954 appropriations during the summer of 1953, the Committee on Appropriations of the U.S. Senate, with some attention by Senator Dworshak, expressed the desire that the Corps of Engineers submit by January 1954 a report on the most feasible storage sites in this area for consideration of the Congress. The report was assigned to the District on 18 August 1953. TheDistrict report is dated 22 December 1953 with an interesting history of production. Careful field investigations were made of major alternate sites, several in very remote locations and difficult of access. Office analyses of alternate site capabilities and adaptability to the overall Columbia Basin plan were also carefully evaluated, even though on an accelerated schedule. Funds were exhausted before the report could be all written and several staff members interested in seeing the final result, and believing in it, donated annual leave time during the Thanksgiving-Christmas period to insure its completion.

MIDDLE SNAKE RIVER DEVELOPMENT STUDY--1953

TYPICAL VIEW--CLEARWATER RIVER BASIN

This Middle Snake Report also pioneered another cooperative effort by dividing the responsibility for the investigation and assumed future construction authorization with the Bureau of Reclamation. An agreement between the Department of the Army and the Department of the Interior provided that the part of the report concerning Snake River upstream from Salmon River, including possible diversion of waters from Salmon River, would be undertaken by the Bureau of Reclamation for incorporation with the report of the Corps. The Bureau could sense the possible loss of the Hells Canyon development as a support of the irrigation basin account, and felt an alternate highly desirable. The reach of stream between Hells Canyon and mouth of the Salmon appeared to be a good substitute--and proved to be as controversial in other ways as the reach upstream.

The report opted for a two-dam plan on Snake River above the Salmon and two dams in the Clearwater Basin as alternates to the controversial single Kooskia project in the 1948 "308" Report. As with the reach of the Snake River, the Clearwater projects proved to be highly controversial also, but by subsequent legislation one was authorized and is now being built: the Bruces Eddy (Dworshak) Dam. The two-dam complex on Snake River consisted of a low dam at the Mountain Sheep site above the mouth of the Imnaha River and the Pleasant Valley dam further upstream, with no diversion from the Salmon River. In the Clearwater Basin the recommendation was for two major structures, one on the North Fork at its mouth (Bruces Eddy) and the other at the Penny Cliffs site on the Middle Fork just upstream from Kooskia. The Middle Snake Report was subsequently printed as Senate Document 51, 84th Congress, 1st Session, in June 1955. Legislation was considered in the next session of the Congress for authorization but the tenor of Congress was for no new projects at that time and no action resulted. (Specific action, with some re-examination for this portion of the Snake Basin was destined to await the subsequent comprehensive review of the 1948 "308" Report published as H. Doc. 403, 87th Congress, 2d Session, in May 1962.)

One of the more interesting public hearings held by the Walla Walla District occurred at Orofino, Idaho, on 20 November 1953, concerning all four of the projects found feasible in the Middle Snake Report. As would be expected, the hearing was much more vocal on the Clearwater plans than those of the Snake River. Interest in development of the Clearwater Basin was strong at the time and a full house resulted. Local organizations were well prepared to express their views, even at the state level. COL Tandy masterminded the meeting, scheduling the sequence of testimony which was voluminous and opinionated. The study was to also draw a large volume of correspondence, even at the Washington level, on one aspect. This related to construction of major storage projects in relatively remote and undisturbed areas, substituting a major lake area for a fast-flowing stream (one of the earlier ecological altercations).

One other evaluation this report had the temerity to make, in order to present a fairly comprehensive water resource analysis for the entire region under study, was a review of the development potentials of the Salmon River Basin. Even though they were objective in nature, the fact that the engineers had again bothered to make such an analysis indicated a covetous intent to those who zealously guard its primitive nature. (The report found that storage in the Salmon River Basin "is not presently" feasible.)

THE DISTRICT SLUMP AND REVISIONS

One other variegation of the District life in which COL Tandy was destined to have a major part was the result of the recessive trend of the overall national Civil Works Program, the Korean conflict, and military exigencies. Although factual documentation is not available, statements made by several indicate that higher echelons had virtually decreed that the Walla Walla District was not necessary and should be disbanded. Presumably COL Tandy, in his initial briefing, was advised of this and that he should anticipate supervising the demise of the establishment. As indicated previously, COL Tandy was an activist, not an undertaker, and after a careful look around, and at the workload potential, concluded the position taken by his superiors was wrong. Being the astute politician then, instead of the sometime "bull in the china shop," his counterproposal was that the District should be expanded. The John Day Dam project on the Columbia River was then being seriously considered and was logically a project that should be supervised by this Inland Empire District. In addition, the John Day River Basin ecologically was an integral part of eastern Oregon and logically belonged in the Walla Walla District. COL Tandy organized his plans well and probably had the sympathetic ear of COL Wm. Whipple, our first District Engineer, who was then Executive Assistant for Civil Works in the Office, Chief of Engineers. Decisions were reversed and the District boundaries changed by General Order No. 15, 12 July 1955, to include the John Day Basin. This was several months after COL Tandy left the District. The completion of the negotiations and details of the project transfer fell upon COL Alex Miller, and he experienced a particularly active year as District Engineer before he, too, resigned to return to the lumber business--the industry he was brought up in. With the assumption of work on the John Day project, the District then embarked on one of the most active decades, and more, of any District in the nation, particularly as a result of the almost concurrent resumption of activities in the lower Snake River.

During the time that the administrative proposals were being considered, a letter was written to COL Whipple--by whom is not indicated on the copy available, but a portion of it is worth preserving as background for the District's position in the Inland Empire and its history.

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"As a good soldier I have no quarrel with higher authority or its decisions, - or its right and responsibility to make them, - but it appears to me that it is high time for the Corps to take a second, and perhaps a more detailed look, at the Northwest's Inland Empire, and its most, 'its only', representative district there. Certainly this was done when the decision to activate the Walla Walla District was made, and certainly the considerations that prompted that decision are as important now as they were at any time in the past.

"Traditionally and economically, the Inland Empire, or more specifically the high plateau in the Pacific Northwest that stretches from the Rocky Mountains westward to the Cascades, has always been an economic, if not governmental entity. Even the original Indian tribes were different ethnologically and culturally, from those on the Pacific slope or those east of the Rocky Mountains. To the earliest white settlers of the Pacific Northwest, the area was considered to be a high desert, worthless for their purposes and one of the major obstacles on the long westward trail. Later all of its produce, like its waters, drained out through the Columbia River gorge. And it still does, except for the addition of the transcontinental roads and railroads which, by the way, do not lead into or out of the Inland Empire; they stretch across it.

"With these things in mind, I would like to suggest that the Corps of Engineer discard all of the artificial boundaries which prevent the Walla Walla District from being an area completely synonymous with the Inland Empire and adopt those boundaries which have historically made the area an economic unit. The boundaries of the Walla Walla District on the southwest, west and northwest present an artificial division of an area which is so similar in flood control, power development, economics and watersheds that the work of the Corps of Engineers could best be administered under a single district. On the north, of course, the international boundary establishes the northern limits of control but does not limit the necessity for future planning."

* * * * * * *

"The Portland and Seattle Districts have entirely different problems; are geographically located on a coast which, except for its proximity to the Inland Empire, could, so far as problems in administrative control are concerned, be the width of the country removed from the Inland Empire except for the one fact which is that the Columbia River bisects the land area of those districts to reach the Pacific....

"In presenting this suggestion to you, I have been most urgently influenced by:

* * * * * * *

"the fact that most other governmental agencies have already recognized the unity of the area described and moved in on a regional basis,

"because industry recognizes and has adapted its operations to the concept of regional divisions and regional similarities,

and

"because I believe that the work of the Corps of Engineers in the Inland Empire can be accomplished much more efficiently under the direction of a single district office than will ever be possible under the present division of responsibilities."

The area to the north of the Snake River drainage was not given serious consideration for annexation, but the John Day Basin was, along with the navigation project on the Columbia River. The development of the Inland Empire in the two-decade span of this history has been phenomenal and future demands are growing. The force of argument of this letter and water-related needs of the Inland Empire, though changing, are still valid and cogent as a service to the people.

COL Tandy, in spite of changing the complexion of the District to a more rosy hue, was destined to implement a marked reduction in the total staff of the District from 1,070 in 1952 to 760 in 1954. This was because of reduced workload in military and at McNary Dam. The staff in Walla Walla reduced from 614 in 1953 to 433 in 1954, and to 414 in 1955, only to rebound to 529 in 1956. This was a painful slump in the District. It was a relatively young organization with a young and virile staff. To some extent the reduction here forced some good men into jobs in other parts of the country which developed very advantageously for them.

The seniority system for professionals, while advantageous to some, works hardships on organizations at times. In retrospect, four or five men who later proved to be outstanding key thinkers and professionals were tagged to go on to other points by the reduction. Through concerted effort of a couple of principals and a fortuitous current need for a particular job to be done, a small group was set aside on a special assignment. The trend turned and the men stayed to do yeoman service for the District--a couple to even receive a Presidential citation for their professional work.

FLOOD CONTROL

The formative years for the District, the first seven years of its existence, involved, in addition to the major navigation and power projects and the Middle Snake Investigation, a myriad of local flood problem investigations and an active program of protective operations. Typical of mountain streams, the spring runoff or midwinter storms consisting of a wholesale invasion of a warm westerly air mass with rain, usually on frozen ground, cause floods which are a common occurrence in local areas, not necessarily related to major regional flood patterns. The 1948 "308" Report cited 22 localities in the District that justified careful examination for needed flood protection by means of levee and channel works. These were principally as a result of the major 1948 flood which was basinwide. In addition, there were known problems at an equal number of local communities, some authorized for corrective works, some not.

With 1,000 miles of the Snake River Valley plus all of its tributaries, the tasks of flood fights, emergency repairs to existing works, and formal levee and channel construction are important and a continuing phase of the District's life. The annual reports for these formative years list the emergency activities. It is estimated that these operations aggregated more than $2 million in the first seven years of District life. Neither the figures nor the enumeration of the locations give credit to the yeoman service of the District staff, working in most adverse weather conditions, and without thought of the time involved. Neither do the figures represent the true savings to the local people and communities with the floods up to the front door or an uninvited guest inside. The expressions of thanks and commendations augurs well for the accomplishments, with damages prevented estimated as multiples of the cost.

Of course, coupled with the host of emergency flood situations is the more routine but varied work of careful examination, project planning, design, and ultimate construction of formal levee and channel works at several locations with major flood problems. At others, even though the threat is ever present, local participation is a problem; the environmentalists question the approach to the solution; some segments of the population disagree with others; or they are willing to wait for possible upstream storage to remove the threat.

As indicated in the discussion of the initial workload of the District, levee and channel work was underway at Milton-Freewater, Oregon, and Walla Walla, Washington, in the Walla Walla Basin and in the Heise-Roberts area of upper Snake above Idaho Falls, Idaho. These works were completed.

PALOUSE RIVER - COLFAX, WASH.

EMERGENCY WORK - UMATILLA RIVER

UPPER SNAKE RIVER - HEISE-ROBERTS AREA

PORTNEUF RIVER THRU POCATELLO, IDAHO

Other projects during the ensuing seven years involved the Grande Ronde Basin at La Grande, Oregon; Umatilla River at Pendleton, Oregon; Palouse River at Colfax, Washington; Potlatch River at Kendrick, Idaho; Weiser River above Weiser, Idaho; the lower Payette River in Idaho; Malheur River at Vale, Oregon; Portneuf River at Pocatello, Idaho; Willow Creek and Sand Creek at Idaho Falls, Idaho; and Snake River through Jackson Hole, Wyoming. The road to realization of a local project is rough with many detours. During these seven years few of these projects were implemented, as can be seen by a review of the annual reports. However, several were destined to succeed in later years to furnish a very creditable record of damages prevented as the flood experience persisted.

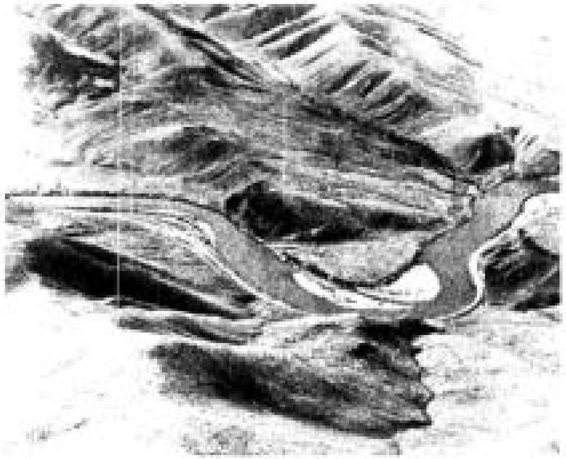
LUCKY PEAK DAM REALIZED

A major construction effort which moved through the formative years on a relatively consistent schedule without major "incidents" was the Lucky Peak storage project on Boise River authorized in 1946. The need for flood protective storage in the Boise Basin was recognized during the 1940s and efforts started toward its realization, only to be emphasized by the 1948 regionwide flood.

Design of the project was one of the initial efforts of the District, with construction to start in 1950 under COL Mills. The pool raising was initiated in March 1955 with a full reservoir resulting on 25 June 1955 during the last days of COL Alex Miller, who officiated over the dedication of two major projects in the District--McNary and Lucky Peak.

The Boise Chamber of Commerce, a good supporter of the project, acted as the sponsor for a very colorful dedication ceremony on 23 June 1955 with Assistant Secretary of the Army, The Honorable George J. Roderick, officiating. The placing of the project into operation was evidenced by opening the outlet gates for a spectacular display of the flip bucket action creating the "rooster tail" water jet to dissipate the energy of the releases--a wonderful air-conditioner on a hot, dry day.

The Lucky Peak project, by its existence with 307,000 acre-feet of space as a last resort storage unit in the river system, provides flexibility and insurance for the upstream irrigation storage, which in turn permits that space to be operated for joint-use flood control. As a result, the Boise River is one of the better, or more adequately, controlled streams of the Pacific Northwest. In spite of this regulation, the Lucky Peak project has not been universally hailed as a most desired structure. The Boise Statesman, the major news media of southwestern Idaho, has never been one of its ardent supporters. During construction in 1953 a lead article in the Statesman headlined, "Aimed at Flood Control, Cost of Lucky Peak Dam Could be Biggest Hoax, When Were the Floods?"

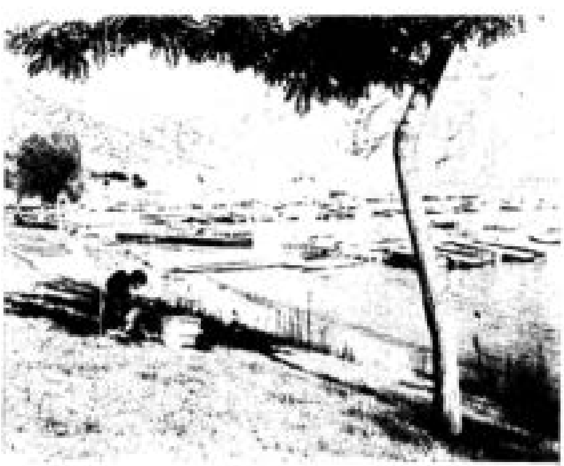


DAMSITE LOOKING UPSTREAM - 1949

COMPLETED DAM - 1955

OUTLET WORKS IN OPERATION

DAM DEDICATION - JUNE 1955



RESERVOIR RECREATION

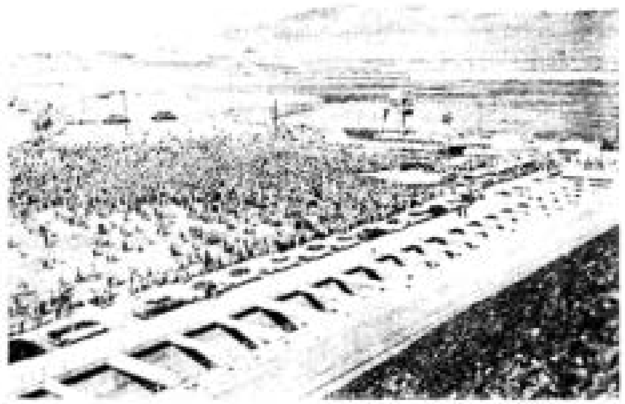
The Boise River canyon below Arrowrock Dam had been the favorite haunt for a few ardent stream fishermen and hunters, and also was the location for a few practically worthless mining claims. Some big game wintered in the relatively remote canyon area above Mores Creek. Coupled with this, the upper area was used as a big game migration route and one or two local ranchers trailed sheep across the canyon to summer range in the foothills. In an attempt to solve the livestock movement it was even considered at one time to build a light suspension bridge. (The final solution was to move them across Arrowrock Dam and clean up after them.)

The fish and game enthusiasts, as well as the naturalists who enjoyed the interesting canyon section, were reticent to see the project take shape. As a mitigation measure the state game officials requested that the 5,000 acres of reservoir area be replaced with a state game refuge of 15,000 acres. This was one of the earlier requests for replacement in kind or even some enhancement where possible, and considerable discussion and policy examination took place. When the idea of acquiring three times the land area was broached locally, all from adjacent private lands, there was considerable repercussion and the idea was not looked upon favorably by the majority. (The final decision was: no additional lands, but set aside project lands for big game management; the Idaho Fish and Game utilize monies paid them for some inundated lands to purchase others; and some fencing would be installed against domestic livestock.)

The recreation resources of the Lucky Peak project were also some of the pioneering efforts for Federal involvement. The authorizing document of 1946 had essentially no firm commitments. The Flood Control Act of 1944 specifying public use facilities was being implemented by the time of the 1950 General Design Memorandum and the scope of public use justified for Federal participation was being explored. The original plans developed by the initial studies were modest in scope and bear little resemblance to present development, nor was the public use now enjoyed envisioned at that time. These observations are relevant to early studies for McNary and the lower Snake projects as well. History has not negated the very serious but conservative studies for these early projects, but has proven they were much too small in scope. Expansion has been the order of the day for public use, and extensive mitigation measures have become the accepted practice.

One other facet of the Lucky Peak project, which was to some degree a pioneering effort, is unique in ways, and evidence of coordinated effort between agencies in the interest of people is the "troika" between the District, Bureau of Reclamation, and the Boise River Board of Control (Watermaster) for scheduling all facets of use for the 1,000,000 acre-feet of storage space in the river system, optimum releases for irrigation use, and stream and storage regulation during times of flood. A carefully prepared multiple-use reservoir regulation manual was produced early in the project life. This requires frequent consultations between all three parties during critical storage or release times, with agreement on the action required. During the irrigation season the Watermaster dictates releases from Lucky Peak to insure optimum utilization of all available water supply. Recreation in Lucky Peak receives careful consideration by keeping the reservoir as full as practical during the summer season with exchange of water from upstream storage. Similarly, the overall operation recognizes the need to optimize the power production at the Anderson Ranch Reservoir. The "troika" has produced a good record for water conservation and utilization in the Boise valley.

McNARY DAM - LOOKING SOUTH



DEDICATION ASSEMBLY

DEDICATION SPEAKERS

PRESIDENT EISENHOWER AT FISH LADDER

McNARY DAM DEDICATED

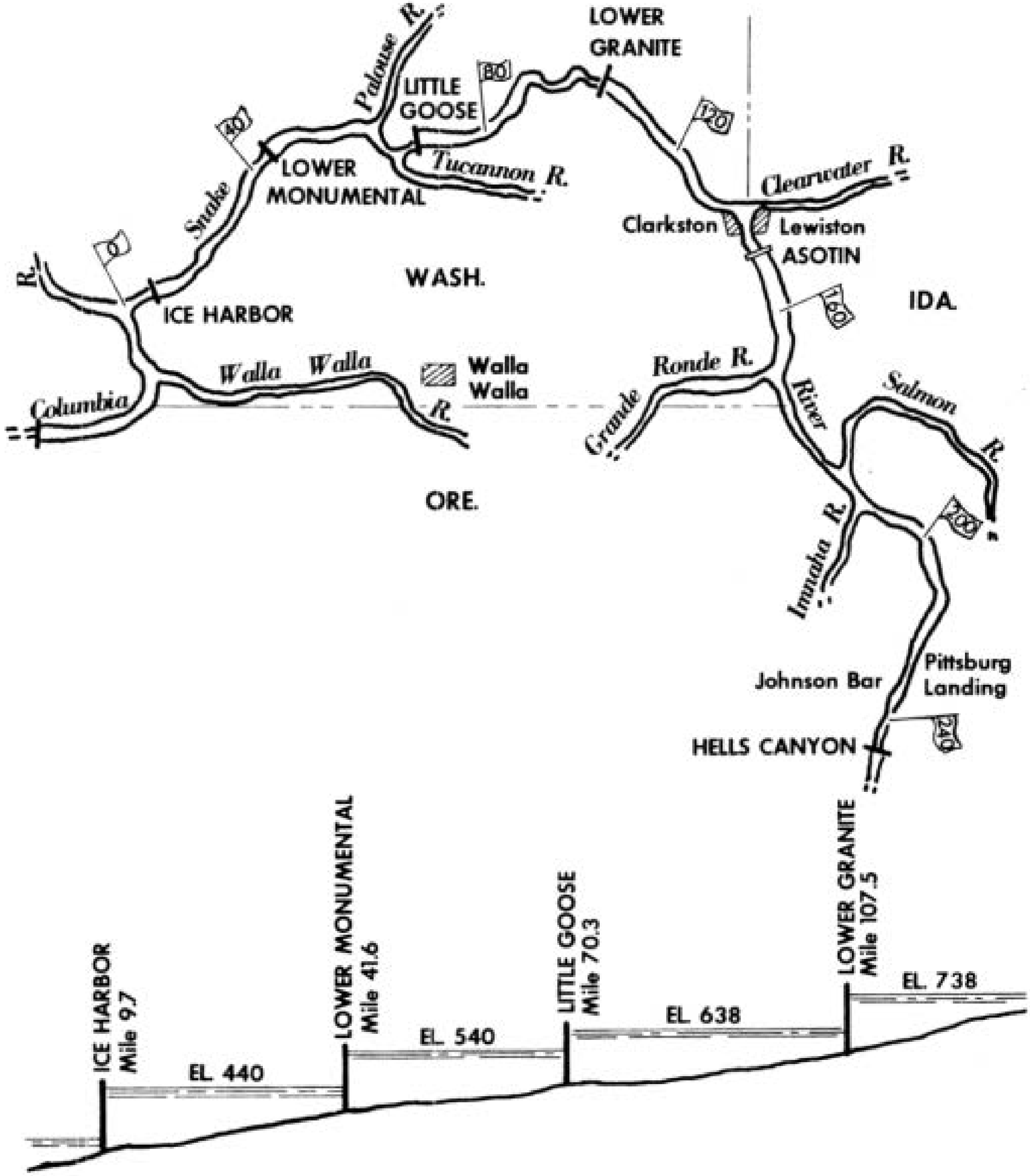
COL A. H. "Alex" Miller took over the reins of the District in August 1954 when COL Tandy left and shortly thereafter retired from the Corps. COL Miller spent a year as District Engineer. The McNary project was approaching completion and in 1953 the last cofferdam was removed, the pool behind the dam raised, and in November the first power was delivered to the Northwest Power Pool. Installation of generators and work in the reservoir area was to continue three more years. Local interests in 1953 determined that a first-class dedication ceremony was in order and a coalition of many groups, sparked by the Inland Empire Waterways Association, invited President Dwight D. Eisenhower to perform the dedication ceremony on 23 September 1954. This he agreed to do, and the McNary project received its share of attention that summer.

THE DENOUEMENT OF THE LOWER SNAKE PLAN

The long history of attempts to utilize the lower 150 miles of the Snake River as a transportation route has been recounted in prior sections of this history. These insistent attempts and difficulties led to the authorization in 1945 for such channel work and dams as necessary to provide slackwater navigation to Lewiston--"Idaho's Picture Window to the Sea." Irrigation of adjacent lands from the slackwater pools was also envisioned in the plan, probably partially as a result of the then active development of the Columbia Basin project to the north. As described, studies prior to 1949 determined that four dams with no open-river channel work was the best plan and this finding had been accepted by the Congress, with design study monies made available initially in 1946 for the lower dam.

The location and general features for the Ice Harbor project had been firmed up with the advent of this District and monies received for preparation of plans and specifications leading to a construction contract envisioned for the fall of 1949. Thus were the expectations of the new District staff. However, clouds were on the horizon even then, and a major appropriation of FY 1950 funds for construction was not forthcoming. That the continued activity toward construction was very tenuous is illustrated by a letter from the Division Engineer to OCE on 25 May 1949 concerning another report prepared in 1948.

> "The subject report was prepared for consideration in case a moratorium was declared on construction of multi-purpose dams on Snake River between Lewiston and the mouth, and on Columbia River below McNary Dam; also in case no obstructions were to be made to salmon migration into and on Salmon River. Since the report was undertaken, decision has been made against a moratorium on construction of Snake River dams. It appears therefore that need for the report is no longer apparent...."



LOWER SNAKE RIVER

Planning and design funds were made available for FY 1950 and a minimal amount again appropriated for 1951. Late in 1950 the District was advised that a "hold" had been placed on expenditure of funds for Ice Harbor. A year later, October 1951, the District was advised that no planning funds would be appropriated and to cease all work. During that fiscal year excess funds were withdrawn. This very drastic retrenchment in the program for the Lower Snake development cannot be credited to any one finite factor. True, the Korean conflict prompted President Truman to make a decision late in 1950 that there would be no new starts. However, other circumstances augured against the project. Fish and wildlife interests had always opposed the projects with several attempts made to eliminate appropriations. In addition, costs were rising rapidly, with little change in benefits, until the benefit-to-cost ratio was essentially unity. The value of power and alternative costs, geared to an all hydro system, was a major factor, and this concept was destined to be revised markedly in the ensuing few years. All these factors worked against a strong position before Congress by local interests to start construction. The tenor changed, however, with cessation of the Korean conflict in 1953. With a considerably modified outlook for hydroelectric power demands, construction funds were appropriated in the summer of 1955.

These were not idle years, though, for the lower Snake development objectives. COL Whipple, in 1949, had some reservations as to how the lower Snake four-dam plan for run-of-river structures fitted into the recently completed "308" Report review. He was concerned particularly with some of the criticism that had been expressed at public hearings toward major storage projects in the Columbia system. These included not only such dams as Glacier View on the Flathead River and Kooskia project in the Clearwater Basin, but also the major storage concept at the John Day Dam on lower Columbia.

The lower Snake River canyon held potentials for a major storage unit which, if operated in conjunction with upstream and even other units in the upper Columbia, could provide important "last chance" flood control and reregulating capabilities. For this reason, coupled with questioned potentials for other storage projects, COL Whipple proposed an office study to re-evaluate the four-dam system of the lower Snake. A brief intra-office analysis was prepared in August 1949 proposing more consideration for: a low Ice Harbor Dam to elevation 425 and movement of Lower Monumental Dam downstream possibly as much as 20 miles. The study considered a pool elevation of 725 at the new Lower Monumental site, resulting in a dam about 300 feet high. This unit could then provide about 3,000,000 acre-feet of storage by a drawdown of 65 feet; however, multiple-step navigation locks would be required along with multiple-step powerhouses to facilitate the passage of anadromous fish. A third dam, Upper Granite, would be about 10 miles upstream from the established site. This dam would be only to insure a stable pool level in the vicinity of Lewiston when the Monumental pool was drawn down for flood control or power.

The three-dam plan had potentials for greater multipurpose use, increased power production, and real potentials for savings in irrigation of adjacent lands. There were several drawbacks, however, including flowage and railroad relocation costs, navigating a 300-foot high structure, and many unknowns in the movement of anadromous fish, both upstream and downstream past the Monumental Dam and reservoir.

Later studies modified the plan to hold to the original Ice Harbor concept, move the Monumental site back upstream, and limit the amount of storage. Decisions concerning more detailed studies and the relative merits of the three-dam plan were debated for possibly two years. A final decision was made that with the problems of the anadromous fishery, operational problems with drawdown, and unknowns of upstream storage, the subject would be pursued no further. Copies of the report were furnished NPD and OCE for reference purposes only.

In spite of the limitation on funds for the lower Snake projects during the early 1950s, project design studies for Ice Harbor Dam were carried on to a limited extent with a report (Design Memorandum 1) submitted in November 1952 modifying project details. Comments on that study in March 1953 directed further investigations and a subsequent report. These were essentially office studies over the ensuing two years, done with limited allocations, but they resulted in some major revisions to the project. The major ones were: increasing the power unit capacity from 65,000 kw to 90,000 kw; holding to three units initially and five ultimately (to be later increased to six); utilization of pumps for fish attraction water rather than turbines; radial spillway gates rather than vertical lift; and deeper excavation of the four-mile-long navigation approach channel below the dam.

This report revision was completed 5 August 1955 at a very propitious moment, since it came almost simultaneously with a decision by the Congress to authorize construction of the Ice Harbor project with an appropriation of $1 million. The five-year moratorium was broken. The start of action on Ice Harbor, coupled with the almost simultaneous start of the John Day project, signalled the end of the 1954-55 slump for the District and an upward trend for the next decade in civil works. It also signalled the end of the "formative years" and moved into the "action years," both in construction and engineering phases. Also, as a signal for change, COL Alex Miller signed out on 31 August 1955 and COL Myron E. "Mike" Page, Jr., took over the reins on 1 September.

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CHAPTER 5

THE CHANGING PROGRAM

JOHN DAY DAM DEVELOPMENT STUDIES

After the assumption of responsibilities for the John Day project in 1955, studies were completed on pool characteristics and optimum storage for the project. This study, initiated by the Portland District in 1953, was assumed by Walla Walla and a report completed in November 1955. Concurrently, in 1954, site selection studies and other design criteria were initiated and completed in June 1956. The Congress again deemed that water resource development was needed and major design funds were appropriated for the John Day project during the summer of 1956. Construction funds were made available in 1958 for FY 1959.

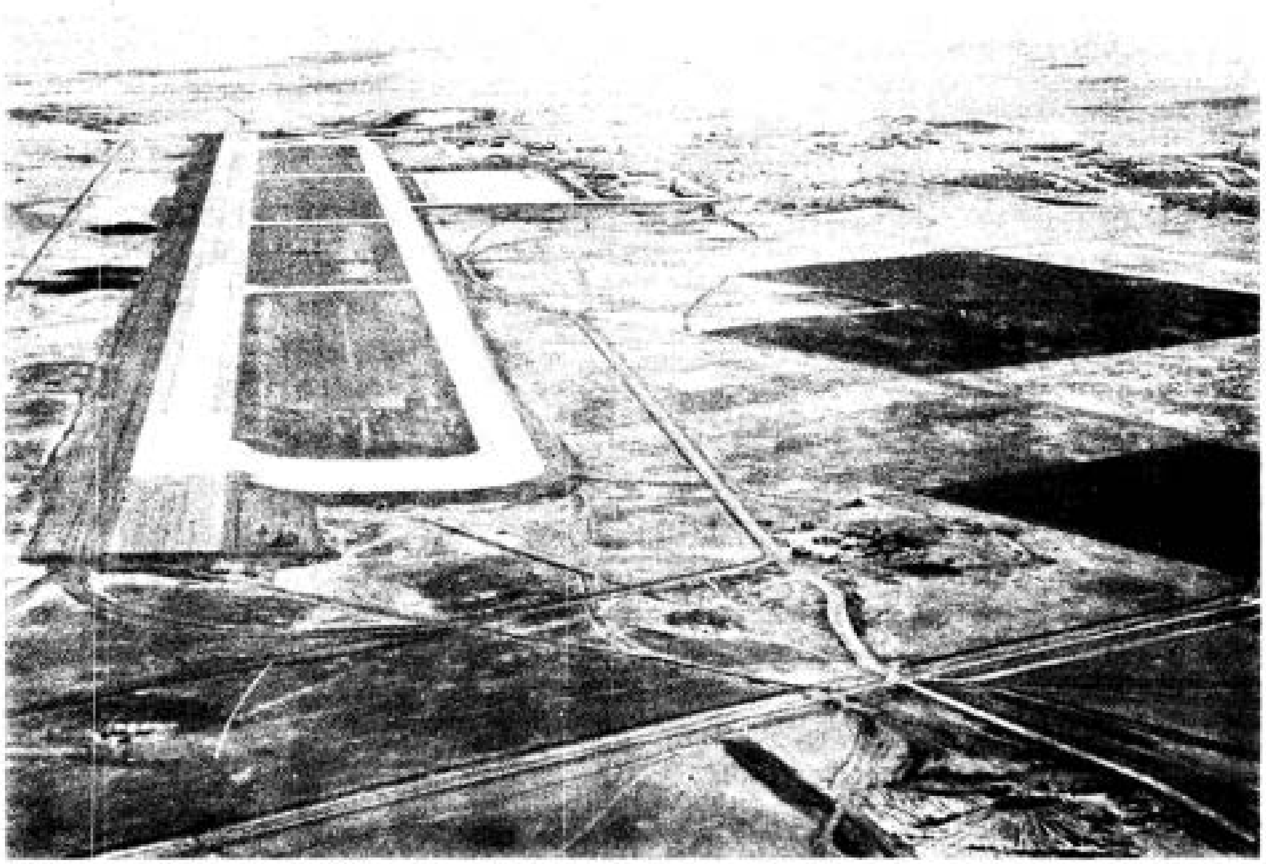
COLUMBIA RIVER GORGE

During the mid-1950s and the term of office of President Eisenhower, serious consideration was given by the Administration to partnership development of water resource projects with private or non-Federal power interests assuming the responsibility for hydroelectric power installation at Federal multipurpose dams. The idea was examined for several projects throughout the country and a resolution was introduced in the House of Representatives in 1955 (H. Res. 5789) which would have authorized such partnerships. The John Day project was one given consideration by a consortium of Washington Water Power, Pacific Power and Light, and Portland General Electric, with an alternate proposal being filed by the Klickitat County Public Utility District. This resolution created considerable interest, some study, and some sparring for position on policy. At the same time a proposal was being considered for the Washington Water Power Company to join forces at the Bruces Eddy project in the Clearwater Basin. In addition, the Washington Public Power Supply System, an association of public utility districts and municipalities, seriously considered assuming the responsibility for the power features on at least three of the lower Snake River projects. The resolution was not enacted by the Congress and the partnership idea "died aborning."

The advent of John Day project activity sparked, or gave impetus to a deep-seated professional opinion among the District staff working on hydroelectric power production that the Northwest's need for peaking capability or generating capacity, and the current method of analyzing the potentials for a site to optimize its capacities, resulted in gross underestimates for installed capacity. Working carefully with the Federal Power Commission and Bonneville Power Administration, these analyses were initiated in basic Ice Harbor studies. They are also reflected to some extent in the number of units provided in The Dalles project, for which a few of our staff assisted Portland District in the evaluation. The John Day design studies afforded an excellent opportunity to further test the principles. The original authorization for the project provided for 13 generating units of 85,000 kw each, with a total installec capacity of 1,105,000 kw. A review and modification to the project, as reported in a study dated June 1956, provided for 12 units initially, each with a capacity of 100,000 kw each. Space for an additional 8 units would be provided, to be installed later, making a total installed capacity of 2,000,000 kw. Further review during FY 1959 changed the capacity of each unit to 108,700 kw. Finally, in FY 1960 conclusions from completed power studies indicated that the unit capacity should be 135,000 kw with 8 units initially and 20 units ultimately for a total capacity of 2,700,000 kw. (Incidentally, the initial installation of units had been doubled to 16 by dedication time.) The studies leading to this final solution and the philosophies to be changed, together with the concepts of the position of hydroelectric power in the total power system, resulted in kudos being given to four very erudite, high-caliber members of the District staff in 1965, as described later.

THE MILITARY PROGRAM'S LATER YEARS

The Korean conflict ended in an armistice in July 1953 and de-escalation of those activities commenced immediately. This changed the complexion somewhat of the Military Construction Program within the District. The enlargement and modernization of airbases was well in hand, and the pressure was off from this phase. In fact, during 1954 and 1955, airbases in Washington and Montana reverted to the Seattle District for all military structural effort. A part of this reassignment proved to be of short duration and in 1957, with workload shifts, Montana bases were again assigned to this District. The Army Nike anti-aircraft missile program was phasing out. The Air Force Intercontinental Ballistic Missile Program using first Atlas and then Titan I missiles was undertaken. Titan complexes were constructed at Mountain Home base in Idaho and Larson base in Washington during 1959 and 1960 by the Walla Walla District, until the Corps established the Ballistic Missile Construction Office at Los Angeles for all such work late in 1961.



GLASGOW AFB, MONTANA, DURING CONSTRUCTION

During the 1957 to 1959 period a complete airbase was pioneered and constructed north of Glasgow, Montana, with all the attendant problems of real estate acquisition, foundations, water supply, sanitary facilities, protective measures and others typical of a SAC base. The airfield work in Montana and part of Washington again reverted to the Seattle District in June 1959 and with the transfer of the missile work late in 1960 the military work of the District ceased with FY 1961, except for a limited amount of fallout shelter work which continued to 1968. As with Engineers--and musicians--there were differences between what the headquarters, the base commander, and the professional airman felt was needed. Directives for the base work were hotly contested in some instances. These expedited airbase jobs required, along with construction capability, extreme tact, patience, and open communication lines, with a top echelon on both sides willing to make decisions.

The decade of military corstruction for the District (1951-61) executed under five District Engineers was a checkered one, but one which fitted in well with a slack period in the Civil Works Program and left together a highly capable organization. It was extremely demanding in time and personnel at critical times, with wide fluctuations in workload ranging in expenditures during 1952 of almost $37 million, down to $9 million the next year, and building back to $42 million in 1959. In the ten-year period the District placed over $225 million in military construction. The prosecution of such a varied program, both in extent and content, required a dedicated, professionally and administratively capable staff, with the ability to make sound judgment decisions to keep the design and construction effort in high gear. This document can well note that the District won several accolades for its work and discharged its duties admirably. The decade of intensive development and construction of military installations in the Pacific Northwest by the Corps of Engineers for the various services might well be documented by a separate historical volume.

CHANGING POWER CONCEPTS

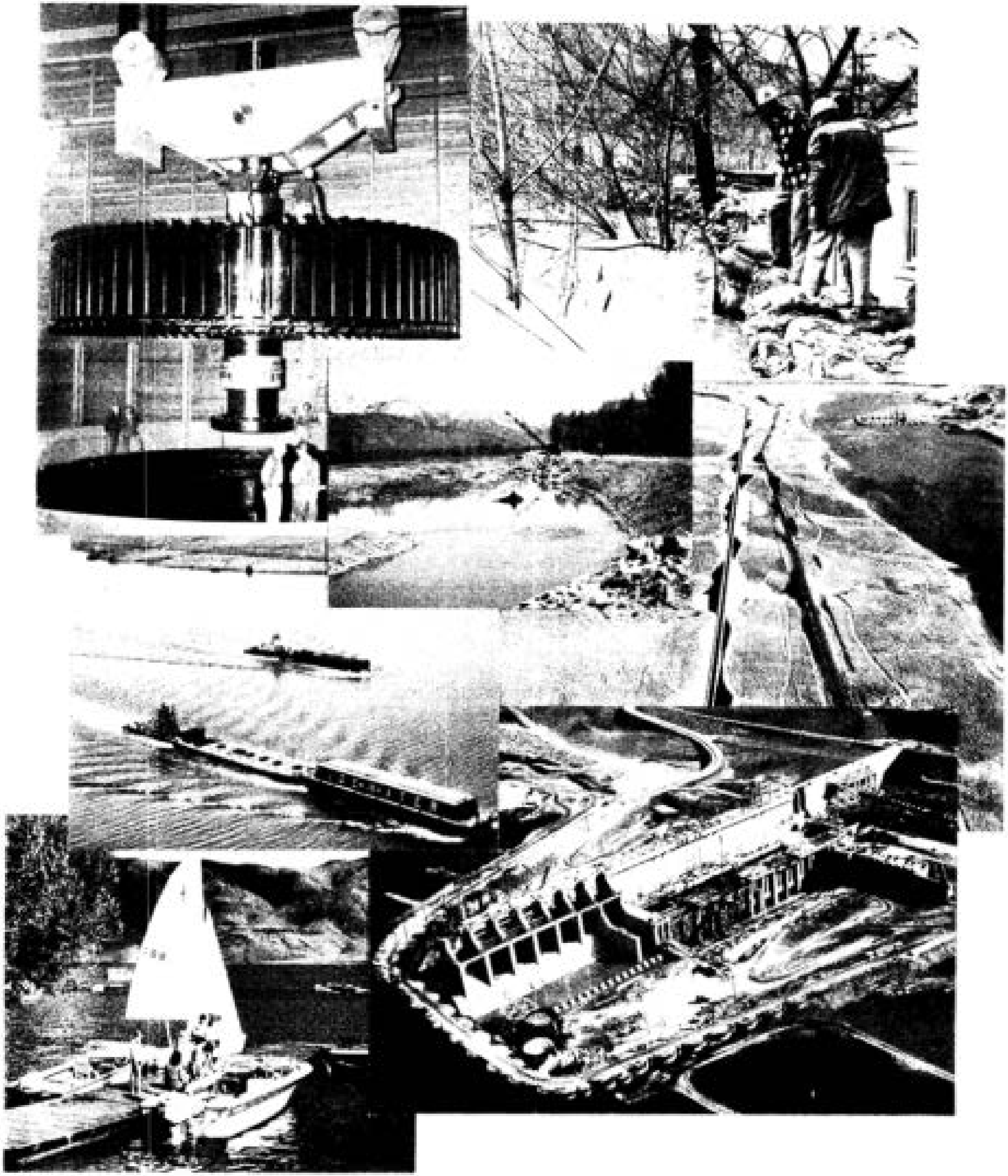
One less finite, broad, policy-type analysis which received extensive study and impetus by a small group of professionals doing applied research within the District was the definition of factors which affect the relative value of hydroelectric power. This study was sparked by factors inimical to Ice Harbor Dam and lower Snake projects. The 1948 "308" Report basic method of project evaluation for power was on the concept of adequate hydro sites for many years to come. Hence the maximum value of power for the system was the least costly alternate hydroelectric damsite that was considered available. This approach was developed and accepted for several basic reasons and within the concept of the 1940s and early '50s was defensible.

The District clan, gathered from other parts and economic climes, questioned the validity of the ability of an all hydro system to satisfy all power demands. Rather, they envisioned an economic development that had a recognized limit to the hydro system, and of necessity, must include more costly steam generation essentially for the continuous firm loads, with very extensive hydro installations for peaking capability when power demands are high. Using the lower Snake complex as a basis for analysis, together with the scope of stream re-regulation as envisioned by future upstream storage, a proposal was developed by District power experts in conjunction with the Federal Power Commission, Bonneville Power Administration, and the Division staff for a considerably modified concept of the alternate cost of power generation. This concept placed a quite different evaluation on the economic feasibility of more and larger generating units at hydro projects in place of building steam plants to satisfy the demand.

The analysis, which was developed during the first half of the '50s, provided that the cheapest alternate for hydro power would be a system of publicly financed steam generation plants. This evaluation, which has proven to be economically sound by the development that has taken place within the past decade, when applied to the power potentials of the lower Snake River complex showed them to be very favorable and economically sound projects. Consequently, while there was still opposition to the construction of these projects by several factions, the desirability of opening up the lower Snake River to slackwater navigation, the demand for hydroelectric power, and the impetus of economic development of the region influenced the Congress to appropriate development funds for the Ice Harbor project as a starter in 1956.

This changed concept of the position of hydro generated power in the total system power needs of the region modified the economic analyses involved, particularly in relation to the concept of total installed capacity as well as the size of individual generating units. The method became the basis of power analyses in the review of the 1948 "308" Report by the North Pacific Division during the latter half of the '50s. To illustrate the changing concept, the power generating capacity for each of the four lower Snake River dams in the late '40s was for three units initially and five units ultimately of 65,000 kw capacity each. The upper three dams are being built with three units initially at 135,000 kw capacity each and six units ultimately at that capacity. The change will increase the peaking capability of each dam from 325,000 kw to 810,000 kw.

The scope of this changed concept was such that four District professional people received Presidential citations in 1965 for their accomplishments. They were: E. C. Franzen, Chief, Engineering Division; Glenn Von Gunten, Assistant Chief, Engineering Division; Parker Grimes, Chief, Power Section of Planning Branch; and Benjamin Smith, also of the Power Section. The recognition was for the "...development and application of methods and procedures for a detailed study and analysis of proposed power plants to determine optimum plant capabilities. The ultimate estimated savings upon completion of the projects involved will be $107 million." (The "projects involved" are nearing completion.) The District's contribution, in part, to the regional re-evaluation and changing plans for meeting the total power requirements is one for which it can be justly proud. It also illustrates the pioneering outlook and professional integrity for zealous study and research of its staff.



A FULL PROGRAM

The District's program after 1955, with the involvement in both the Columbia and lower Snake Rivers, was not heralded by a great renaissance or revolutionary activity, but rather by a full slate of investigations and preparation for action that augured well for a long period of construction work. The Military Construction Program proceeded at a relatively uniform expenditure rate with ideas brewing for the ballistic missile program as well as plans well underway for the all new SAC base at Glasgow, Montana. John Day and Ice Harbor dams were put on the books for advance planning and construction, as well as several local channel works.

Several review studies were scheduled which had longer range implications. One of these studies was for the comprehensive review of the Columbia Basin "308" Report of 1948 by the Division Office, with this District contributing to the analyses for updating navigation potentials, flood control needs, and changes in the aspect of hydroelectric power in the Pacific Northwest system power demands. Another study which made a major contribution to the understanding and future programming for the area was the Upper Snake River Basin Report requiring about seven years to assemble. The report, prepared as a joint venture with the Bureau of Reclamation, presented the first comprehensive inventory of water resource development and potentials for southern Idaho.

Independent of this, specific studies were underway for the Jackson Hole levee system; channel works through Pocatello for the Portneuf River; the abortive and intricate levee and channel system for the Grande Ronde Valley at La Grande and Union in Oregon; the major channel change for the Palouse River at Colfax, Washington; and the modification of the levee and channel system on Umatilla River at Pendleton, Oregon. These were all destined for construction except the Grande Ronde levee plan. This levee system extending from Elgin to La Grande and Union, because of the very flat valley bottom, required about 80 miles of levee and channel work to protect the 50,000 acres of agricultural lands and urban areas. Because of its valley-wide extent to do any good, lands required, and cost of over $8 million, it was unpopular with the local residents and never received their approval as a complete project. It did, however, spark the more comprehensive basinwide study for upstream storage. In the meantime the farmers, individually, with some help from Soil Conservation Service funds are implementing sections of the levee plan to supplement the future storage.

COL Myron E. Page, Jr., was selected as District Engineer in September 1955 after the die had been cast for some of the future events by FY 1956 appropriations. He was to serve his full three-year assignment, the first to do so, and direct the programming and initiation of major civil and military works, even though only modest appropriations were forthcoming during those three years ($30 million to $50 million per year).

Ice Harbor, with a construction start in 1956 moved rapidly, receiving $38 million, and was ready to move into the second phase of the work on the north shore. John Day Dam location was finally settled, the delineation of all major features set, and the first-step cofferdam ready for construction. Some hard decisions were required on this project: the site, the size and number of power units, and relocation facets. In addition to getting these two works underway, general design studies were initiated on Lower Monumental Dam, which also involved determining the site for Little Goose Dam. Other interesting projects also saw considerable activity for COL Page--start of the building of the major levee system for Jackson Hole; many discussions with the City and county at Pocatello on details and sponsorship of the formal channel works there, including returning to the state legislature for enabling legislation; and some relocation and cleanup details at Lucky Peak Dam at Boise with a major slide on the relocated Idaho City road. In between times there were spring floods, fish, and the two major survey reports.

During the last of the 1950s and first of the '60s, in addition to the heavy military work, the Civil Works Program was increasing momentum with the John Day project getting into high gear. Expenditures doubled during these years from $30 million to $62 million. The Ice Harbor project was nearing its final phases; Lower Monumental Dam construction got underway in 1961; and design studies for Little Goose Dam were well along. The Lucky Peak project was declared complete; and work was accomplished on several levee and channel projects.

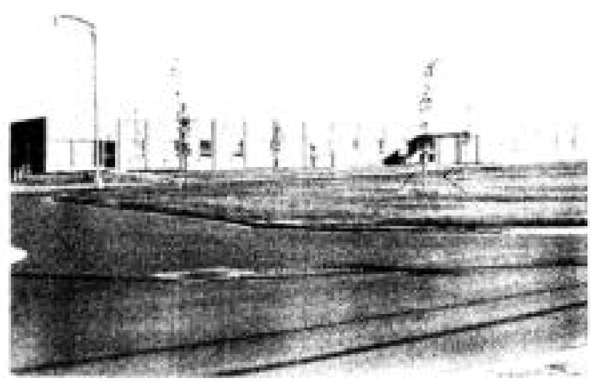
EXIT THE MILITARY PROGRAM

The military program in 1955 to 1958 centered primarily around the construction of the large SAC base at Glasgow, Montana. This was a major undertaking in itself with all the physical problems--water supply, sanitation, construction materials, and the coordination difficulties of just putting the place together for the Air Force. At the end of this period the military work for airbase construction reverted to the Seattle District, except for the missile program on Nike and Titan units.

In all these programs, civil and military, COL "Mike" Page saw action. He earned the reputation as a good administrator and had the support of his crew. After a good staff review, he had the courage of his convictions to see through to completion the major project problems.

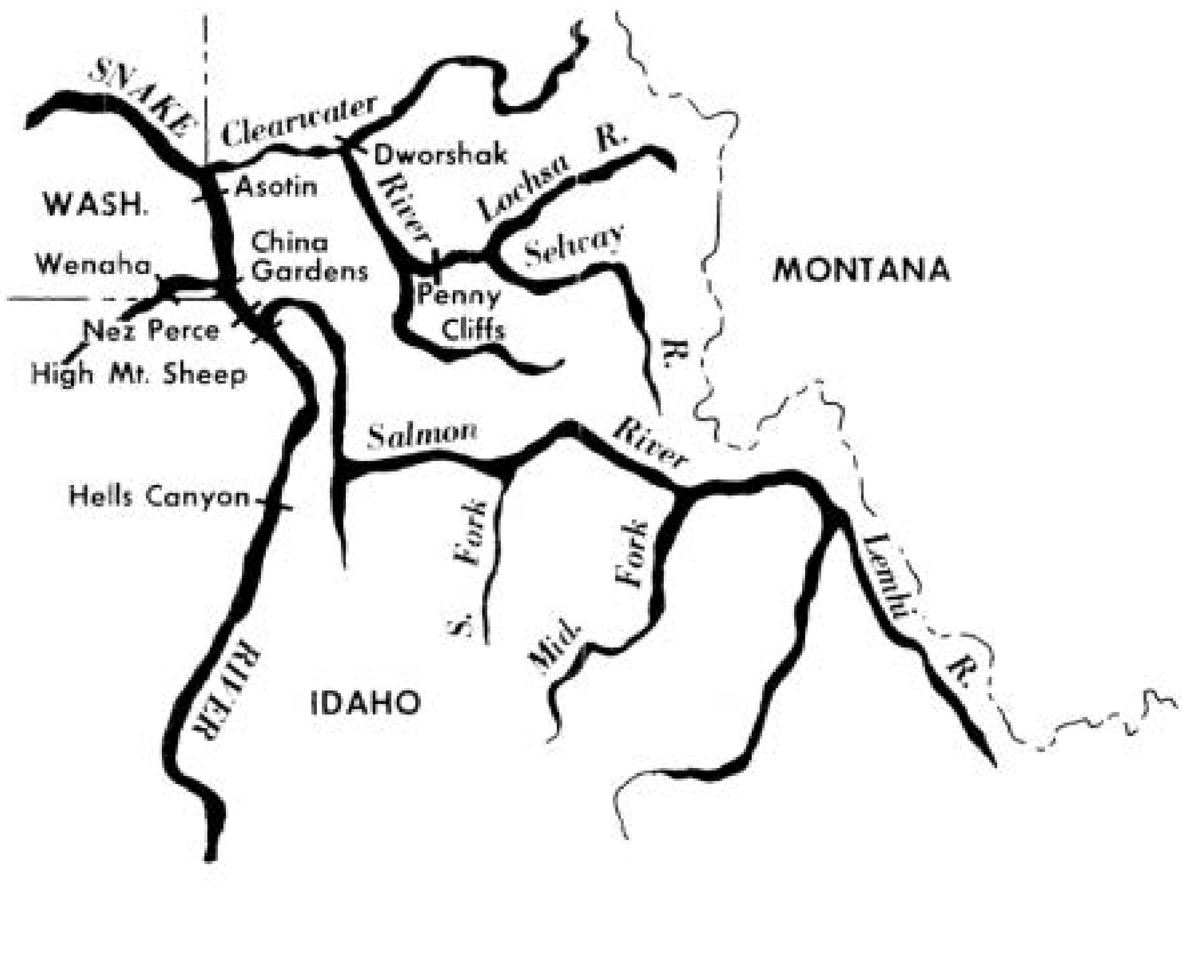
The Titan program for the Larson Base at Moses Lake, Washington, and Mountain Home Base, Idaho, which got underway in 1958, remained with the District until 1961 when all military work was phased out except for civilian shelters.

It was left to COL Paul H. Symbol (August 1958 to March 1961) to oversee the closing out of the military program after a real push on the Titan program in 1959 when over $42 million was spent for military works ($31 million in 1960 and $21 million the last year, 1961). The turbulent District military program, to meet the changing emphases of the decade, has been characterized as "a juggling of three balls, a watermelon, and two grand pianos all at once." About 400 District employees took part in the task, some part-time, some as their full job, with much of the work done by contract.



1958 - "308" REVIEW REPORT

Another major step in the District's history was taken in the late '50s; the decisions and first steps toward realization of the Bruces Eddy (Dworshak) Dam and Reservoir on the North Fork Clearwater River, Idaho. That project was first conceived through S. Doc. 51, 84th Congress, 1st Session, in 1955, as cited previously. Through insistent local support and pressure, the project was authorized for detailed planning, but not construction, by the Flood Control Act of 1958. Study funds were made available immediately and planning advanced steadily. The project was fully authorized for construction by Public Law 87-874 dated 23 October 1962 through the medium of the 1958 Columbia River Review Report published as H. Doc. 403, 87th Congress, 2d Session, in 1962.



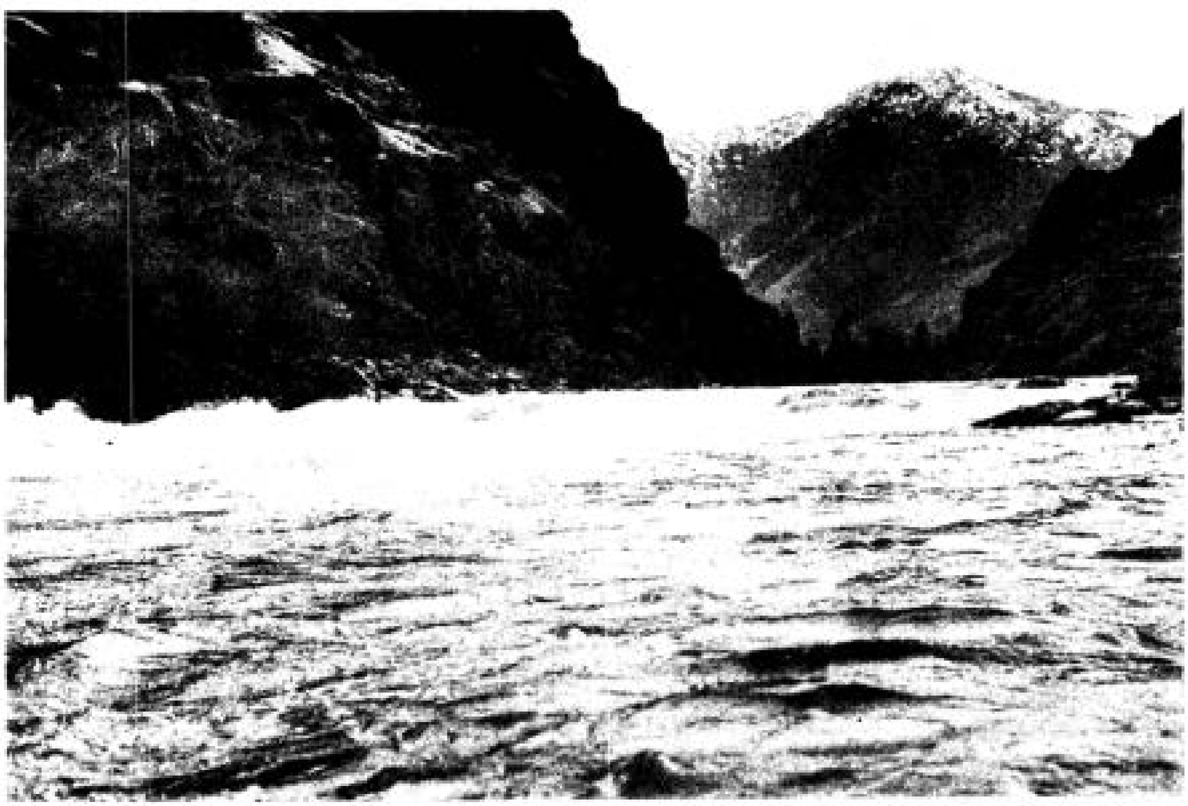
H. Doc. 403 constituted primarily a reanalysis of the main control plan as proposed in the comprehensive Columbia Basin Review Report of 1948 ("308" Report), printed as H. Doc. 531, 81st Congress. Recommendations by the Division Engineer in 1958 for authorization of projects in the Walla Walla District included High Mountain Sheep Dam on Snake River just upstream of the mouth of Salmon River; Wenaha Dam in the lower reaches of Grande Ronde River; Asotin Dam on Snake River at the head of the Lower Granite Dam pool just above Asotin, Washington; and the Bruces Eddy and Penny Cliffs projects in the Clearwater Basin. After almost three years of review and intensive evaluation by other agencies, states, and higher Corps echelon, the Chief of Engineers in March 1961 recommended High Mountain Sheep Dam; the China Gardens run-of-river dam on the middle Snake just upstream of the mouth of Grande Ronde River, which was included as a result of subsequent study; Asotin Dam without a navigation lock; and the Bruces Eddy and Penny Cliffs Dams in the Clearwater Basin. The Secretary of the Army submitted the report to Congress 25 April 1962, recommending deferral of authorization for the Mountain Sheep and Penny Cliffs Dams and approval of the Bruces Eddy and Asotin projects. The China Gardens Dam was eliminated in the authorizing act. Congress acted accordingly.

The basic studies for these projects were undertaken by the District staff and, as the reports will reveal, required extensive field and office ingenuity and analyses. The High Mountain Sheep study evolved from a careful review of investigations made for S. Doc. 51 in 1953, as well as the 1948 "308" Report. The review report objective was to determine the most effective means of controlling and developing the resources of Snake River above Lewiston, Idaho. The Nez Perce Dam had long been recognized as the unit most economically feasible, but unacceptable because of the Salmon River anadromous fishery resource. The objective was then to examine carefully all alternatives. The District studies outlined six possibilities--five combinations of alternative projects, with Nez Perce Dam as the sixth. The studies were most intriguing in their potentials; that they were objective and conclusive is evidenced by the fact that the finding of the High Mountain Sheep site as the most practical initial unit for development was adopted practically verbatim by private power interests even before the reports had been printed. The relative merits of developing this reach of Snake River between the Salmon and Hells Canyon by the High Mountain Sheep project, some alternate, or none, was destined to be argued before the Federal Power Commission and the Congress for the entire decade of the 1960s. With the competition for the site and alternatives developing into a three-way tussle, coupled with a fourth way of no development at all proposed by naturalists, the Corps modestly withdrew from advocacy of any plan. Possibly a solution will evolve in the next decade. The China Gardens project on Snake River above the Grande Ronde as noted above in the findings for H. Doc. 403 was first reported upon in S. Doc. 51 in 1953 essentially as a reregulating project for all upstream power fluctuations and to develop the remaining power head to the mouth of the Salmon.

It would be essentially the same as the lower Snake dams without a navigation lock. Some subsequent review studies to re-define its potentials were made for Division consideration, but authorization has not been sought since it was deleted from consideration in 1962.

SNAKE RIVER - LOWER HELLS CANYON AREA

This 100-mile reach of Snake River upstream of Lewiston, very scenic in nature and quite inaccessible by land, constitutes one of the major remaining sources in the entire Columbia River system of hydroelectric power and potential for other water resource development. Contrariwise, it is also an internationally known reach for white-water boatmen as well as the outdoorsman for sightseeing, hunting, fishing, and weekend retreats, with access primarily by high-powered watercraft and skilled navigators working their way upstream from Lewiston, Idaho.



SNAKE RIVER - HELLS CANYON AREA - WHITE WATER NAVIGATION

The 1955 Federal Power Commission license for the Hells Canyon project, built by the Idaho Power Company, prescribes minimum releases and storage parameters for regulation of Snake River flows, partly in the interest of navigation in this reach of river. Use of the river by recreationists multipled during the '60s with the advent of jet propulsion, to where it is estimated that 1,200 boats navigated this reach in 1968. This use, coupled with demanding utilization of Snake River for irrigation and power production has resulted in strong controversy over the adequacy of regulated flows and limits on fluctuations between Hells Canyon and Lewiston.

The District tried several emergency measures to remove navigation hazards, concentrate streamflows at critical rapids, and install navigation ranges to make boating more safe and the upper reaches more accessible. The advent of considerations for Wilderness and Wild River legislation raises other ideological concepts for optimum utilization of this 100 miles of stream. This has resulted in a second three-way tussle between the naturalist who would set it aside, together with adjacent lands, to preserve its wild and primitive state; the recreationist who would exploit the canyon for maximum utilization by people; and the economic resource developer who would make multiple use of all water and land resources, power, flood control, slackwater recreation, navigation, and adjacent land utilization. At this writing, legislation is pending for all three types of use.

Fortunately this writer is not commissioned to forecast the outcome, but the District has been deeply involved, with its professional staff of many disciplines making careful objective evaluations of these alternate uses and reviewing them with all those directly affected. The question of the regulated flows as released by the Hells Canyon Dam, and their adequacy for downstream pleasure boat use is still unfinished business. This must be ultimately decided by the Federal Power Commission with Corps, state, people, and Idaho Power Company involvement. Objectivity, personal bias, deepseated convictions, and politics all come into play whenever the middle Snake controversy comes up for consideration.

UPPER SNAKE RIVER BASIN STUDY

In addition to the District's participation in the "308" Report review studies, a comprehensive basinwide analysis and report to be finalized by COL Symbol was the aforementioned Upper Snake River Basin Report. Editing and printing of the document extended into the summer of 1961 and, consequently, the report was signed by COL Beddow. It should be noted that the embryo for this study resulted from an abiding interest and the convictions of Oliver Lewis, who had a strong faith in southern Idaho. In the early 1950s Oliver had much to do with emergency flood fight and levee and channel work for the Snake River Basin, and realized that a broad and comprehensive evaluation should be made of the water resources of southern Idaho. None was in existence, yet in some areas consumptive uses were more highly developed than in any other location in the Inland Empire. By Congressional resolution in 1954 a review of the 1948 "308" Report for the Snake River Basin above Weiser, Idaho, was directed. Initial funds were allocated in FY 1955.

Since the Bureau of Reclamation was heavily involved in irrigation development in the same region, a joint study was agreed to in 1956, rather than asking the Bureau for its contribution through the routine procedures governing coordination with other agencies. Specific analyses were financed through each agency and a joint coordinating committee scheduled and supervised the separate studies of both agencies. The seven-year effort, costing about $500,000 for the Corps' share, resulted in a comprehensive inventory of land and water resources; runoff characteristics; water actions; existing control and utilization; future irrigation potentials related to water sources; water problems and potential solutions; a water resource development program; and resultant streamflow condition and runoff to be expected if all developments were realized. The Bureau spent between three quarters and a million dollars on its share because of the fieldwork involved.

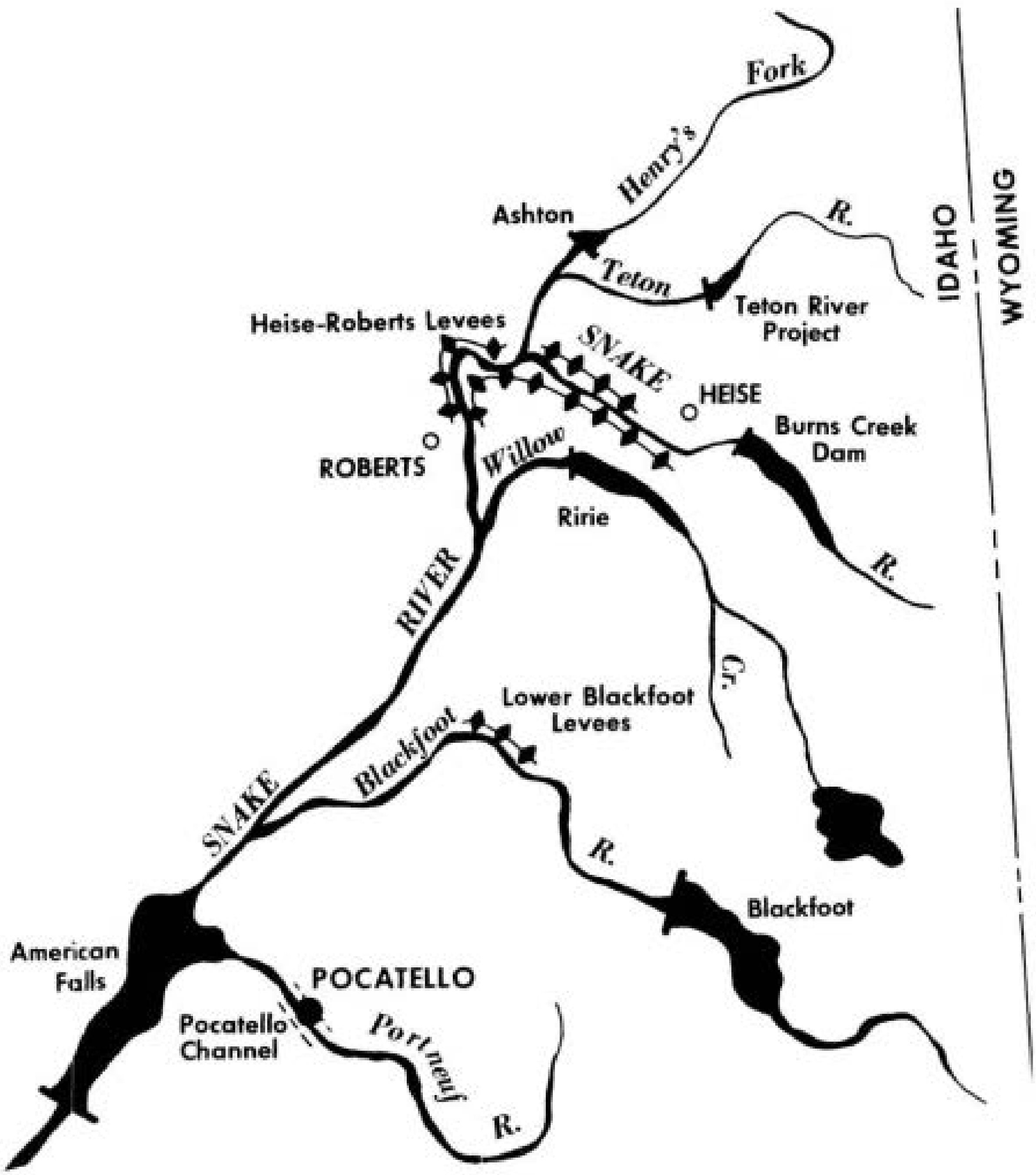
The report, in which COL Symbol took a special interest and which was made available to many groups and agencies by both the Bureau and the Corps, gave the State of Idaho and other organizations a very necessary and useful tool for future planning. The report, submitted to the Chief of Engineers, rests there, and was never printed as an official Congressional document in reply to the resolution. It is assembled in four volumes and constitutes a miniature encyclopedia used by the state and both federal agencies. Several separate interim reports based upon the findings of the master report have subsequently been prepared for justification and authorization of specific projects. This route has been utilized by both agencies. The wide use of the report by all local, state, and federal units engrossed in water resource development attests to the professional evaluation, judgment, and foresight of the District effort, while at the same time plowing new ground in interagency cooperation for a joint production.

UPPER SNAKE RIVER REPORT SUPPLEMENTS

After completion of the joint comprehensive report in 1961, the decision was made to transmit the report, and to seek authorization of individual projects found favorable in it, by means of separate "Interim Reports." As a result, five supplemental reports were prepared in March 1962 in anticipation of an Omnibus River and Harbor Bill that year, which subsequently was enacted. The Interim Reports submitted were:

Interim Report No. 1. This report was the vehicle for submittal of the comprehensive joint report recommending that it be used as the basis for future specific analyses on individual development proposals.

Interim Report No. 2. Blackfoot Dam and Reservoir, Blackfoot River, Idaho. This report recommended the modification of the existing Blackfoot Reservoir project to provide greater flexibility in its operation and thus obtain more adequate flood control for the downstream areas. The report was accepted and the project authorized by the Flood Control Act of 1962.



Interim Report No. 3. Ririe Dam and Reservoir, Willow Creek, Idaho, above Idaho Falls. This report recommended construction of the Ririe project as a multipurpose dam and reservoir with flood control as its major function. It, too, was accepted and the project authorized by the Flood Control Act of 1962.

Interim Report No. 4. Burns Creek Dam and Reservoir, Snake River, Idaho, a major multipurpose project on Snake River about 40 miles above Idaho Falls. This project had been investigated by the Bureau of Reclamation, was considered an essential unit in the full water resource development of the upper Snake, and the Corps recommended its authorization with construction by the Bureau. The Rivers and Harbors Committee of the House of Representatives upon review of the report decided it was more logically within the purview of the Interior and Insular Affairs Committee and returned it for submittal through that route. The Bureau of Reclamation assumed responsibility for numerous subsequent actions, but no authorization as yet.

Interim Report No. 5. Lower Teton Project, Teton River, Idaho, above Rexburg. This March 1962 report recommended additional storage and modifications in the Teton Basin. The project is multipurpose in scope with both irrigation and flood control as important facets. The Bureau of Reclamation felt the dam and reservoir to be a strong basic unit for a very desirable irrigation project, so moved in, pre-empted the study, obtained authorization, and the project is now under design with construction imminent. The Board of Engineers accordingly returned the report for record purposes.

Interim Report No. 6. In addition to the above five reports prepared in 1962, a sixth was submitted in March 1968 recommending authorization for installation of hydroelectric power in the Lucky Peak Dam and construction of a dam and reservoir at the Twin Springs site on Boise River. As of the terminal date for this historical review, that report had passed through higher echelon review and had been submitted to other agencies and the Governor of Idaho for comment. The report has received mixed blessings with irrigation developers and power users, together with those needing protection, being favorable to the report. Some local power interests have raised eyebrows concerning a large block of Federally developed power generation in the area. Outdoor enthusiasts, environmentalists, and ecologists would take the eyebrows and scalps of both parties.

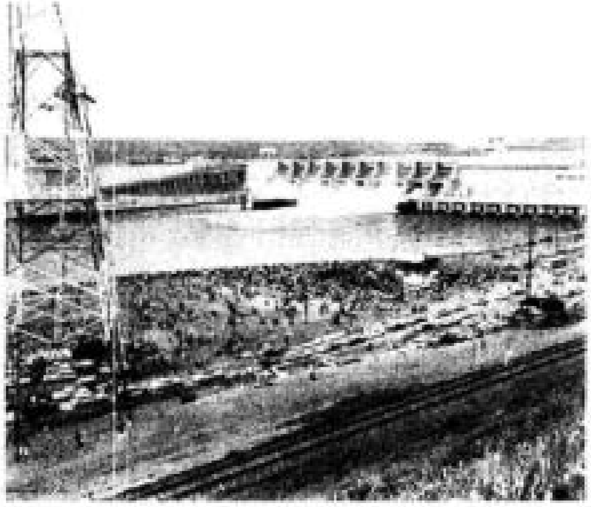
The six supplemental reports and field investigations needed for them were made at an additional cost of about $300,000. The total cost for the entire study was $800,000. As of this writing there are other items of unfinished business relating to the findings in the upper Snake joint report. These include additional levee and channel work in Jackson Hole, Wyoming; modifications to strengthen the Heise-Roberts project; review of the development potentials for Henrys Fork Basin above Rexburg, Idaho; additional development in the Portneuf Basin; and review of the stream control needs in the Mud Lake, Big Wood, Payette, and Weiser Basins.

THE EARLY 1960s - COLUMBIA AND SNAKE RIVER WORKS

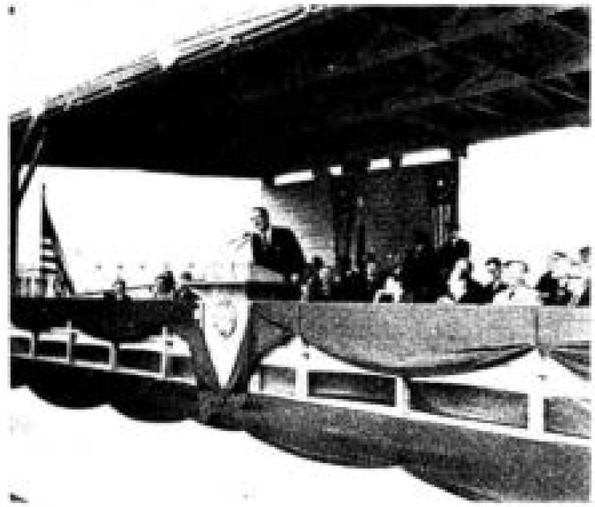
As the District proceeded into the '60s, COL James H. Beddow took the helm in June 1961 to remain as District Engineer for three full years (June 1964). The John Day project, with very active construction effort at the site, had moved into the relocation phase for all facilities located in the 76-mile-long reservoir area. This included all or parts of four communities, 140 miles of railroad, and 80 miles of highways. Negotiations were continuous, reticence by landowners to move was very evident, proposals and counterproposals were the order of the day, and often, time was needed to cool off. Patient dealings and the Courts accomplished the land acquisition phase, including the precedent "Rands Case" in the Supreme Court which held that the Corps did not have to pay port site values attributable to the natural flow of the river. (Congress later negated the ruling by a new law.) Design, redesign, a myriad of subsurface explorations, negotiations, compromises, and continual push were the order of the day for the construction phase.

The McNary project, essentially complete, except for navigation improvements to two railroad bridges, since 1957 when the 14th power unit was installed, provided stable production in this period, with its operating procedures and reservoir use continually being improved. The early '60s saw considerable industrial development around the reservoir in the Wallula to Tri-Cities section, particularly in the petro-chemical field. The Corps participated by making shoreline property available for public port and industrial development by sale to public bodies under a general act of Congress.

ICE HARBOR DAM - 1962



DEDICATION CROWD



VICE PRESIDENT JOHNSON

Ice Harbor Dam Dedicated

COL Beddow presided over the dedication of Ice Harbor Dam on 9 May 1962. The weather, the river, the project, and the people cooperated nicely to have a gala affair for Vice President Lyndon B.Johnson; Chief of Engineers, LTG Walter K. Wilson, Jr.; Senator Warren G. Magnuson; and Governor Albert D. Rosellini. All were in a jovial mood for the special luncheon at Pasco and blue ribbon entertainment at the dam--with Senator Magnuson and the Vice President exchanging political repartee upon occasion. Vice President Johnson pushed the button that officially put Ice Harbor into operation.

Lower Monumental Dam

The District had just gotten Ice Harbor Dam into the operational phase in the spring of 1962 when it "gave away" the construction of Lower Monumental project, including relocations. Construction work had been initiated in FY 1961 for the south shore cofferdam, river diversion, and railroad shoofly. The first phase of actual dam construction on the south shore was awarded in the spring of 1962. The Walla Walla District was enjoying a good construction and engineering program with an increase in sight for the near future. The Seattle District on the other hand had a paucity of jobs. Accordingly, the decision was made to transfer responsibility of Lower Monumental project to Seattle District as of 1 July 1962. The basic structural decisions had been made, several supply contracts awarded, and design for relocations and the powerhouse initiated. These were turned over to the Seattle District. Walla Walla District still did the real estate work and some design work, primarily for relocations, at the request of Seattle, throughout the life of the construction work. The basic structure was completed and the pool raised in 1969, three generators were on the line by January 1970. The completed project is now 'back home" in Walla Walla District for operation.

SNAKE RIVER AT LOWER MONUMENTAL SITE

LITTLE GOOSE DAMSITE

LOWER GRANITE SITE AT LOG CABIN ISLAND

LEWISTON-CLARKSTON AT MOUTH OF CLEARWATER RIVER

Little Goose and Lower Granite Dams

Concurrent with the transfer of Lower Monumental project, the District effort on Little Goose Dam increased and a construction start was made on that job in June 1963. In the process of making decisions on Little Goose Dam and getting it underway, the die was cast also for the location and general features of Lower Granite Dam at river mile 107.5, at the lower end of Log Cabin Island. Design studies for Lower Granite in 1963 also determined the pool level and general conditions around the Lewiston-Clarkston area, initiating serious discussions on land use and protective measures around those communities. In addition, as a chain reaction, the determination of the pool height and physical features of Lower Granite made it necessary to investigate and set the location for the Asotin Dam, next upstream, which was authorized in 1962 as a result of the 1958 "308" Report review. This determination and field investigation added impetus to the serious discussions in the area concerning the overall plan of development, if any, for the middle Snake area.

THE MID-1960s - A CHANGE IN COMMAND

COL Jim Beddow grew fond of this territory with its good golf environment and not too hectic pace. Upon leaving the District in June 1964 and serving one more assignment with the Continental Army Command at Fort Monroe, Virginia, he decided to retire 1 August 1966 and returned to Walla Walla to live. He ultimately became Manager of the Port of Walla Walla, a job his experience with the Corps well fitted him for.

The mid-'60s of the District were managed by COL Frank D. McElwee, an activist who found plenty to keep him occupied. As with COL Beddow, he had the opportunity to serve out the full three-year assignment (August 1964 to July 1967) with the heaviest workload, moneywise, of the District's 20-year experience. Four major projects were underway, with the John Day unit using three quarters of the funds. However, diversity was the order of the day with 15 different items in some form of activity from design studies to operation. In addition, the disastrous floods of December 1964 and January 1965, with their aftermath of work, demanded much of him and his time.

ACTION - DWORSHAK DAM

The flood control and water resource project that is the crowning star in the District's development program is the previously described Bruces Eddy project, renamed after Idaho's white-maned, illustrious Senator Henry C. Dworshak. It fell to COL Beddow's lot in the early '60s to nurture the growing pains for this quarter billion dollar project. These pains, a few of which had been assuaged before he came, included the exact location, type and height of dam (October 1960), amount of storage (September 1961), and resizing of the power installations (November 1964). These design memorandum studies all involved many different professional and expert opinions, as well as counterproposals.

NORTH FORK, CLEARWATER RIVER - DWORSHAK DAMSITE AT UPPER BEND IN RIVER (BRUCES EDDY)

The problems of rights-of-way for flowage with forests, roads, wildlife, Federal lands, log drives, public access, and fire protection were all involved and are still being debated and struggled with almost continuously. We trust these problems will be settled when the pool is raised in 1972. In spite of the size and complexity, COL Beddow in the spring of 1963 signalled the start of the project by building a right-bank access road up the side of an unstable hillside from Ahsahka to the damsite. COL McElwee picked up the action with the driving of a temporary river diversion tunnel, started in 1964, heralding the actual work at the damsite, and the project was off to a good start only ten years after its conception in S. Doc. 51. (Completion will require another decade.)

Specific design memoranda and contract specifications were then in order for the main structure and a target date of February 1966 was set for advertising. In the meantime access roads, clearing contracts and the large river diversion tunnel were underway. The increase in tempo on the construction of the project is well illustrated by the appropriation record.

1964	\$3½ million
1965	\$5¼ million
1966	\$10 million
1967	\$20 million
1968	\$25 million
1969	\$38½ million
1970	\$38 million

Even though the main features of the project had been settled upon there were many additional facets that deeply involved COL McElwee and his staff. These included such items as impact of the project upon the local school system and critical housing situation; status of roads, and the problems of relocation of roads and new bridges in the reservoir area; details and new concepts for the largest steelhead fish hatchery in the world; disposition of salable timber in the reservoir area; and locale of elk browse in the reservoir area during the winter, how many elk there are, whether the reservoir will have a significant impact upon them, and if so, what to do about it. This latter problem, with all its claims and counterclaims, negotiations and renegotiations, investigations and extrapolation of answers, as well as general public interest (much of which was based upon little factual data), essentially made the Clearwater elk herd an endangered species.

ACTION - JOHN DAY DAM

While the tempo of the Dworshak project was picking up in the mid-60s, the John Day Dam project had matured into a high tempo of construction activity. This was both for the dam structure and extensive relocations involving towns, schools, cemeteries, highways, railroads, and utilities, with expenditures of up to \$75 million per year. The day-to-day decisions on construction activities, coupled with moving pains of all those affected by the relocations involved and the temporary setbacks caused by the 1964-65 flash floods, gave the District Engineer and his staff action plus, particularly since this was only one of about ten projects underway.

THE LOWER SNAKE RELOCATIONS

The Little Goose project relocations, while not involving the trauma of moving people, did involve two major considerations in the mid-60s, one with respect to the Central Ferry bridge and the adjacent land areas, and the other, what to do about the Camas Prairie Railroad.

The Central Ferry highway crossing of Snake River is an important link connecting north and south segments of southeastern Washington. Built in 1923, it has served as the only fixed highway connection across the river in the 140-mile reach of the lower Snake River from Pasco to

Lewiston. The route, as a primary state highway, has been upgraded and many sections of the road rebuilt in recent years. All these factors emphasized the need for a modern, more adequate river crossing when the Little Goose reservoir became a reality.

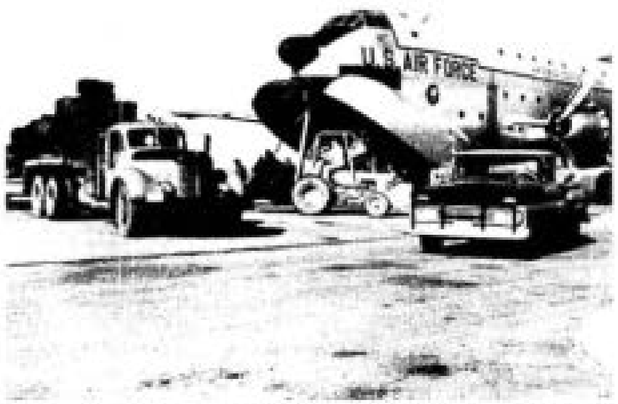
Coupled with the very strategic highway crossing at Central Ferry was the fact that this location boasts one of the very few good access points to the river canyon bottom and parcels of relatively flat land suitable for landside development. Railroad, highway, recreation, industrial, and port development potentials all competed for the limited space available, and necessitated some careful adjudication by the District Engineer. The Whitman County Port Commission had definite ideas on the way the adjacent shorelands should be used, as did the State Parks Department, with the Camas Prairie Railroad and the highway exercising their prerogatives for relocation of their facilities. Ideas were being formulated by 1961 when design studies began in earnest and negotiations started. Decisions were being debated and land uses adjusted during the mid-60s and up until 1968 when construction pressures finalized the physical condition.

SNAKE RIVER CANYON AND CAMAS PRAIRIE RAILROAD

One of the more spectacular internal studies which developed into some soul searching by various interests as to the impact upon the economy of the region, was the question of what should be done with the Camas Prairie Railroad. This section of railroad extends from the historic Union Pacific river crossing from the south to the north side of Snake River at Riparia, Washington, just below Little Goose Dam, to Lewiston, a distance of 72 miles. The railroad is a joint operation. The line was built in 1907 by the Northern Pacific Railway as a portion of a proposed transcontinental route which was never completed. It is now owned by Union Pacific, but leased to Camas Prairie Railroad, an operating entity jointly owned by the U.P. and N.P. railroads. The line carries a limited amount of freight for both railroads. It runs along the river through a very difficult canyon section with inherent problems of relocation. Design analyses were made in 1965 detailing plans for relocation of the roadbed within the canyon. In a search for alternates, the potentials for abandoning the existing route and reaching Lewiston over other present trackage of the Union Pacific and Northern Pacific railroads were evaluated and appeared to have merits.

COL McElwee felt strongly enough about the potentials for such an alternate that the decision was made to employ an independent consulting firm of railroad experts, Coverdale and Colpitts of New York, to make a careful physical and economic analysis. This the firm did, submitting the report in the fall of 1965, recommending abandonment and rerouting of the traffic with considerable savings. Realizing the political as well as economic implications of such a decision, together with the legal problems of effecting such an agreement, the Colonel and his staff made several checks and counterchecks. Internal discussions with the City of Lewiston and State of Idaho interests produced two countereconomic analyses supporting the need for maintaining the rail line up the Snake River canyon. These analyses and conferences with the Division and Office, Chief of Engineers continued over the next year.

The alternate studies, entered into by the University of Idaho academic staff, state economists, and Lewiston businessmen, pointed out competitive influences, needs of people, importance of outlets for goods, and developed multiplier factors for other facets. All this input by external forces was then re-evaluated and graded, for economic versus political effort, by the District with a position paper prepared for the record. Through all this, soul searching was the order of the day, with the Colonel turning up new detailed questions at every turn. By late 1966 the majority opinion pointed toward straight relocation of the river level route. The rationale for this decision was not easily accepted, if it was, by the consulting firm participants. It was accepted, however, by the Office, Chief of Engineers on 1 November 1966. The decision to relocate rather than abandon was personally approved by LTG Wm. Cassidy, then Chief of Engineers. It was also presented for concurrence of a Committee of the Congress which had an interest in the solution to the problem. Bids for the initial railroad relocation were opened in January 1967.

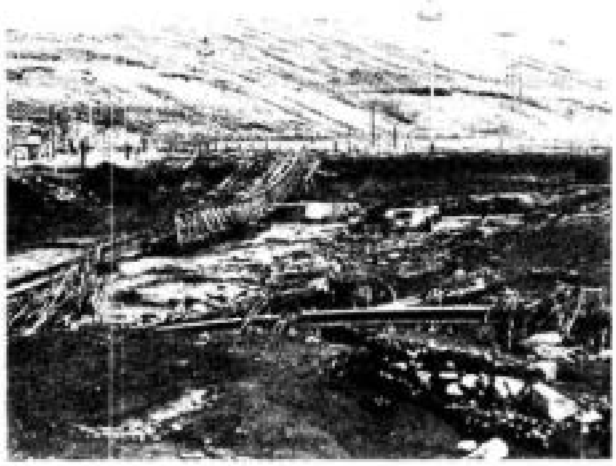


SAND BAGS FOR EMERGENCIES

SAND BAGS AND MEN

COLFAX AND PALOUSE RIVER

OROFINO AND OROFINO CREEK



RESULTS ON UMATILLA RIVER

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FLOOD CONTROL IN THE 1960s

While navigation facilities on the lower Columbia and Snake Rivers were receiving prime attention during the first half of the '60s, there was also action in the flood control phases. The District's recurring flood fight and channel and levee repair work, together with the local flood protection projects and water resource studies, require constant attention and resourceful planning.

JACKSON HOLE, WYOMING

May 1964 saw the completion of the extensive levee and channel works started in November 1951 through the center of Jackson Hole. This work extended for a distance of 13.5 miles and cost about $2¼ million. The work of the District in Jackson Hole has been a lifesaver for several ranches and, no doubt, some of the scenic beauty of the river bottom area, in spite of the presence of the rock-faced, artifically high channel banks. The valley bottom of glacial gravels is very flat and especially vulnerable to the strong and widely fluctuating streams with their meandering tendencies. It is a beautiful valley, 6,000 feet in elevation, highly productive for hay and natural meadow, supporting some of the real old-time cattle operations which are as picturesque and romantic as the natural beauty of brushy bottom lands, open plains, and extensive wildlife. Even some of the naturalists grudgingly admit the levee system has its plus factors and benefits. The lower part of the valley needs the same kind of protection to prevent the river from creating a wide, sterile gravel desert usable by neither man nor beast.

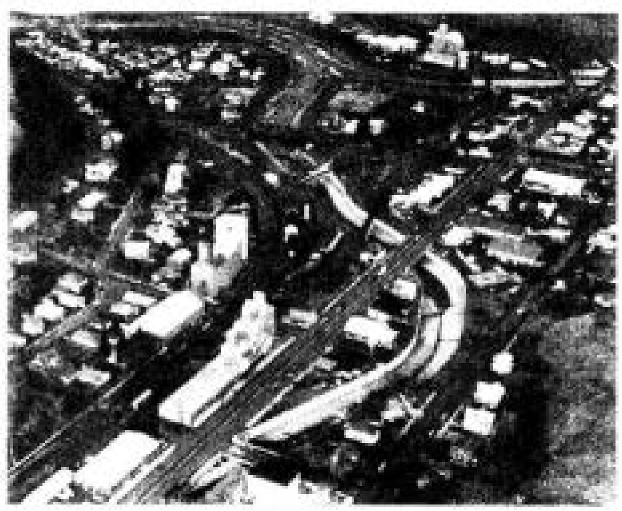
BLACKFOOT, IDAHO

In the Blackfoot River Basin at Blackfoot, Idaho, the Flood Control Act of 1950 authorized channel works to protect the town of Blackfoot and the lower 16 miles of the valley. This is in addition to the authorization cited previously under the Upper Snake Basin Report for modifications to the Blackfoot Reservoir project of the Bureau of Indian Affairs. This channel project passed through the study and design stages during the 1950s. Its construction took place during FY 1964 at a cost of about $400,000, stopping a long history of inundation by both winter and spring floods. The levee and channel works, coupled with storage control upstream at the Ririe project on Willow Creek and modification to the Blackfoot reservoir, both scheduled for completion in the 1970s, should make considerable difference in the overall economy of this entire irrigated valley front in the vicinity of Blackfoot, not only for the white man, but for extensive Indian holdings in the Fort Hall Reservation along the south bank.

MALHEUR RIVER AT VALE, OREGON

Another small local project that means much to the community and its economy was constructed in 1960 and 1961 at Vale, Oregon, on the Malheur River. The town, lying at the confluence of Bully Creek and Malheur River, was at the mercy of winter and spring floods from both streams. After two or three particularly disastrous floods in the preceding decade, it was agreed locally that the project authorized in 1950 should be implemented. The project, completed in March 1961 at a cost of about $1/3 million, has already saved the community from some critical flood conditions. In addition to the levee and channel works at Vale, the Bureau of Reclamation has constructed (1963) the Hendricks Dam and Reservoir on Bully Creek for irrigation and flood control as planned in the Upper Snake Basin Study. This storage, working in conjunction with Agency Valley and Warm Springs Reservoirs on Malheur River, and operating under flood control criteria developed by this District, affords considerable protection to bottom lands around Vale and on downstream to the Snake River.

NORTH FORK PALOUSE RIVER
COLFAX



PALOUSE RIVER - COLFAX
THROUGH BUSINESS DISTRICT

PALOUSE RIVER AT COLFAX, WASHINGTON

A major channel works in the lower Snake River area was destined to require considerable special attention--the Palouse River through Colfax, Washington. Lying at the confluence of two branches, Colfax is vulnerable from both winter and spring floods originating in either tributary or both. The problems of realization were so great that a special write-up of this work is included in the last chapter of Part II of this history.

The Colfax local protection project was authorized in 1944 but lay dormant for several years. Flood experience prompted attention, with the result that construction of a formal, concrete-lined channel was started along the main Palouse River in January 1962. This unit was completec in the summer of 1963 and the second unit along the south fork was started in December 1963. It was completed in December 1965. This was an exacting job, restricted by extensive development through the heart of the community. The securing of the necessary rights-of-way by the community was difficult, even after careful design adjustments to minimize the impact of the channel work upon the area. The project cost the local community about $300,000 for lands, relocations, and adjustments plus considerable more in inconvenience to the individual businesses and people. The Federal cost was $5½ million. The project started earning its keep immediately by controlling a major flood in the main Palouse River which taxed the first unit to its capacity in the spring of 1963, even before the south fork work could be started.

TOUCHET AND YAKIMA RIVERS, WASHINGTON

Two other small formal flood control projects were also realized in the early '60s--those of Dayton on the Touchet River and the West Richland levee on the lower Yakima River. Both areas had a history of flooding. The Dayton work had been authorized by the Flood Control Act of 1941. The West Richland work, authorized by the Chief of Engineers under P.L. 685 in 1962, was built during the fall and winter of 1962-63 at a cost of $1/4 million. Because of inability of the sponsor to acquire certain parcels of right-of-way, the District, for the first and only time, had to resort to condemnation on a reimbursable basis for the sponsor. The Dayton work, after considerable negotiations on rights-of-way and differences of opinion on levee alignments, was started in April 1964 and completed in March 1965 at a cost of $380,000. Both communities have already had occasion to be thankful for the protective works more than once.

FLOOD FIGHTS

The early '60s with COL Beddow were active for construction of the formal, more permanent levee and channel works throughout the District. Another facet of the flood control activities, however, was the less formal emergency repair and restoration work at a multitude of locations, as well as the actual flood-fight work, both of which mean so much to the local people and communities. Practically every tributary of Snake River is subject to local floods, depending upon the idiosyncrasies of the weather and the local snowpack. Flood conditions can be widespread, almost basinwide, or strictly localized. Nominal expenditures for the ordinary conditions would possibly average about $150,000 a year for repair and restoration or channel clearing in a half dozen tributaries. Widespread flooding, such as occurred at Christmas 1964 and January 1965, would involve many streams and cost over a million dollars in immediate work effort as well as incurring a host of cooperative encounters with state and local units.

THE 1964-1965 FLOODS

The District--in fact, the West--was to experience a most unusual and serious flood action, that of Christmas 1964. The December floods were severe in a host of tributary basins of both the Snake River and the Columbia, with record or near-record peaks at many locations. A wet and warm weather pattern in early December saturated the ground, with a subsequent cold period of heavy ground freezing and later snows. On 21 December 1964 temperatures again soared into the 50- and 60-degree range with freezing levels at 10,000 feet elevation or more, and moderate to heavy rains fell. With the frozen ground underneath, runoff was rapid with a widespread flood pattern. The same sequence of weather followed in late January 1965 with freezing, subsequent snows, and later heavy rains the last five days of January. Flood fight operations were extensive in three basins in December and seven basins in January. A third "normal" flood in the spring also did some damage.

JOHN DAY RIVER MOUTH AT COLUMBIA RIVER
INTERSTATE 80 HIGHWAY BRIDGE

GRANDE RONDE RIVER
BELOW LA GRANDE, OREGON

LOWER MONUMENTAL DAM
NORTH SHORE COFFERDAM FAILURE

LAPWAI CREEK
CULDESAC, IDAHO

Repair and restoration work required considerable attention the rest of the winter and spring in over two dozen streams throughout the District. Flood fight operations cost about a quarter million dollars and repair and restoration of existing works another half million dollars. Stream repairs and cleanout, under Public Law 875 administered by the Office of Emergency Planning with work by the Corps, cost over a million dollars. The local effort must have been equal to these, and damage estimates were many times these figures.

Two dam structures under construction were dealt severe blows by the December flood; Hells Canyon Dam of the Idaho Power Company, and the Lower Monumental Dam on lower Snake River. The cofferdam for Hells Canyon Dam was flooded and sections destroyed, with a resulting damage of about $400,000. At Lower Monumental Dam the cofferdam was similarly flooded and some cells destroyed. The three floods that season caused an estimated loss of $6,000,000 at the Lower Monumental project.

Other than for human despair, probably the most spectacular results of these floods were caused by almost flash flows from some of the steep mountain canyons and streams. The greatest and most important single concentrated source of damage was the failure of the new Interstate 80N bridge over the John Day River at its mouth. This major high-level bridge, built as a part of the John Day reservoir relocation program, had just been completed and four-lane highway traffic routed over it. Unanticipated high velocity and record flood flows in the John Day River undermined a pier, causing two spans of the bridge to drop.

One man was killed when his car went down with the bridge and later a car with two other men ran the highway barricade and disappeared in the flood below. The loss of the bridge, built by the Oregon State Highway Commission under Corps agreement, sent several disciplines of engineers back to the drawing boards. Subsequent discussions expounded varying views on causes and responsibilities for the failure. Fortunately, there were still ways for traffic to get around this gap in the canyon section of Interstate 80N while the spans were replaced by the highway department. With extensive railroad and highway relocations for the John Day project well underway on both sides of the 70-mile reach of the Columbia River Canyon, and the pool level not up to design height, several other local problem areas were created which required some extraordinary activities for the project, and for Colonel McElwee, a newly assigned District Engineer. This, coupled with the myriad of flood-fight and restoration activities throughout the Snake Basin, caused the Colonel to get well acquainted with all the "nooks and crannies" of his District and the people therein in short order, which he did with gusto.

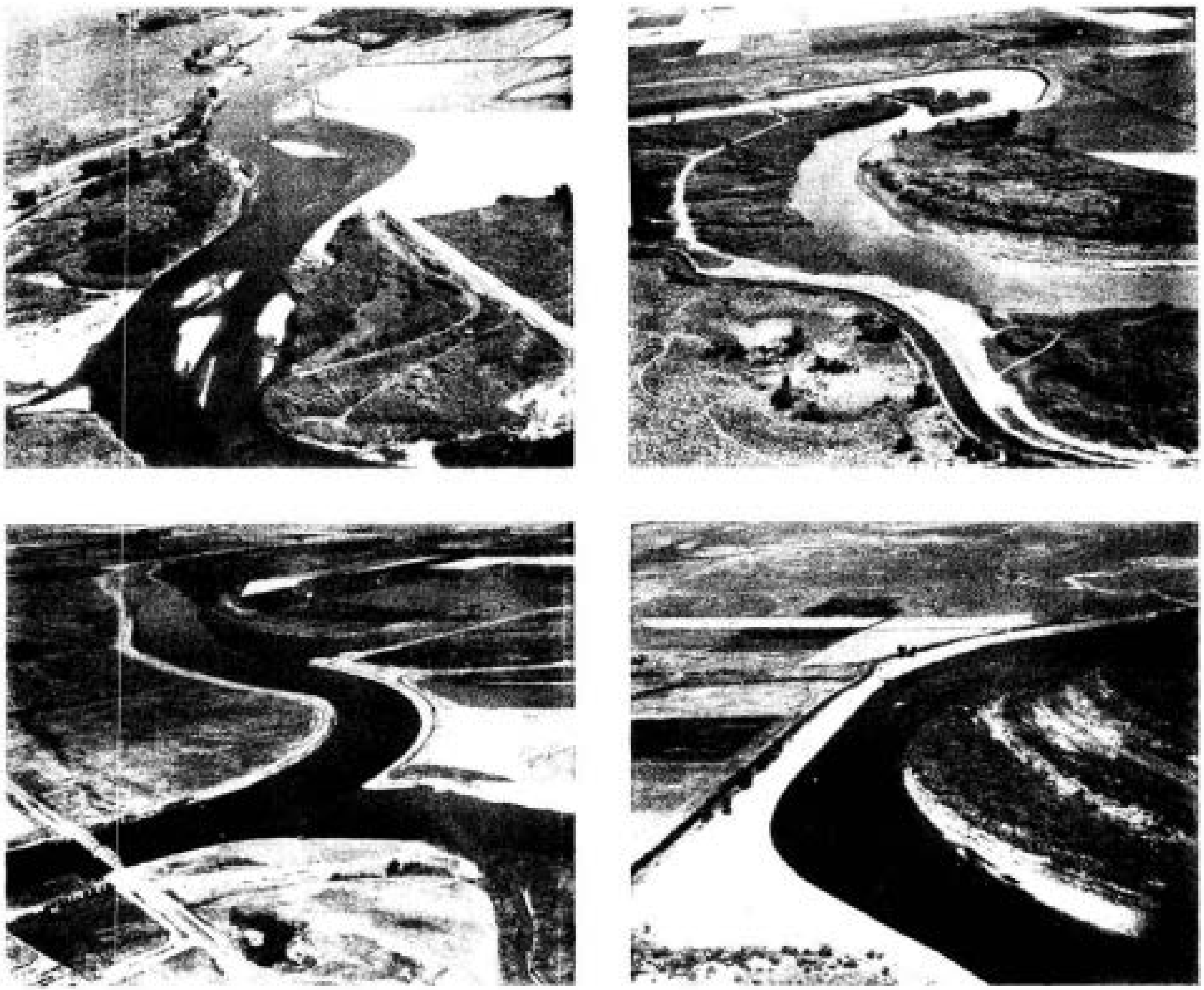
Knowing that there was still a good potential for a late spring flood, restoration to insure adequate channels and to do some advance flood-fight work in anticipation was important. This required considerable input by the District staff, as well as the men on the job with hastily assembled contractor equipment, for about six months. Fortunately, nature cooperated rather well in the spring of 1965 except for a few local areas in central Idaho which still needed special attention.

SNAKE RIVER, WYOMING - REANALYSIS

The mid-1960s were active, not only for emergency stream control measures but also for individual basin and project studies attempting to find proper solutions to water resource utilization and control. The Jackson Hole, Wyoming, levee system was completed in the spring of 1964 and was considered to be of very adequate design and construction. The river proved master in the spring of 1965, attacking the levee system with concentrated flows at three locations and resulting in serious threats of avulsions. The points were held, but the experience prompted an analysis of the adequacy of the levee system. In addition, flood experience has demonstrated the need for further control on downstream of the project and an extension study under the upper Snake Basin authority was also made for about a ten-mile reach. The analyses for both have been under question and no final decisions made as yet. In the meantime, extensive emergency channel stabilization, bank protection, and reinforcement of the existing system have been effected.

Heise-Roberts-Shelley and Ririe, Idaho Studies

Moving farther downstream into Idaho, a very similar problem area exists in the reach of Snake River from Heise to Roberts, just upstream of Idaho Falls which is the recipient of much of the benefits from these works. The original 20-mile system of levees was started in 1948 and completed in 1954. At its inception, COL Whipple recognized the paucity of knowledge that would assure its adequacy. As with Jackson Hole, this has proven true and adequacy studies to analyze the deficiencies have been underway for 15 years. Regardless of this, it was recognized in 1950 that an extension was needed of the original system on downstream for about 17 miles. Design studies, involving almost continuous dickering with property owners and other interests, were carried on from 1963 to the start of construction late in 1966. The extension work was completed in May 1968, and the 40-mile-long levee system, costing close to $5 million, has made a good segment of eastern Idaho thankful for its presence several times already, even though those farmers in the path of the levee had some vocal opinions about its alignment.



SNAKE RIVER ABOVE IDAHO FALLS - HEISE-ROBERTS PROJECT

This levee system, like Jackson Hole levees and others, needs more muscle to stand up to flood currents. To keep them effective will require constant vigilance and monetary assistance until a comprehensive adequacy design can be agreed upon and implemented. This is a highly developed reach of the Snake River with the stream perched upon the ridge of a mammoth alluvial fan as the river leaves the mountains, and tries to slide off the fan both ways every time flood flows are present. Flood Control District No. 1, one of the few fully operable units in the State of Idaho and a very active and progressive organization, is doing "heads-up" service for a large integral geographic area from Heise to Shelley. The District has acted as a very effective intermediary and catalyst, primarily because of a Rigby, Idaho, lawyer, T. Harold Lee, who has dedicated much of his energy and time over the past twenty-some years to the objective of control of the Snake River and Willow Creek for the economic betterment of this segment of Idaho. Harold has acted as Secretary of the Flood Control District throughout the period. Several other dedicated citizens have also striven with him to make the Flood Control District a strong force in the region, not only sponsoring Corps work but doing extensive flood control work on their own.

Flood Control District No. 1 with its multiple water control interests, along with the City of Idaho Falls, were the catalysts again for control of Willow Creek and Sand Creek easterly of the city. The Ririe project, noted previously as one of the storage projects resulting from the Upper Snake Basin Study, is designed to give adequate control for a complicated drainage system north, east, and south of Idaho Falls. The efficacy of the two local political entities (the City and Flood Control District) is evidenced by the fact that through careful maneuvering and steering in Washington, D. C., they were successful in getting the Walla Walla District to produce its fastest report of record (prepared in less than 10 days time in March 1962) with subsequent expedited review; securing authorization for the project in the Flood Control Act of 1962; and obtaining an allotment of funds for FY 1963 to start design studies in the fall of 1962. Like the military "difficult" and "impossible" missions, the authorization was done "today." The task of getting the project actually under full construction "took a little longer"--ten years, still with good assistance from the Flood Control District.

COL McElwee was destined to administer to the growing pains for the Ririe project, including multiple-use facets, such as irrigation for the stored water, under changing plans of the Bureau of Reclamation. In addition, there were problems with big game and migratory bird habitat, fish, recreationists, cattlemen, and farmers. The many meetings and studies finally resulted in a construction start in June 1967 for clearing and stripping. Funding difficulties were destined to stymie actual building steps for four years or more.

PORTNEUF RIVER THROUGH POCATELLO, IDAHO

POCATELLO, IDAHO

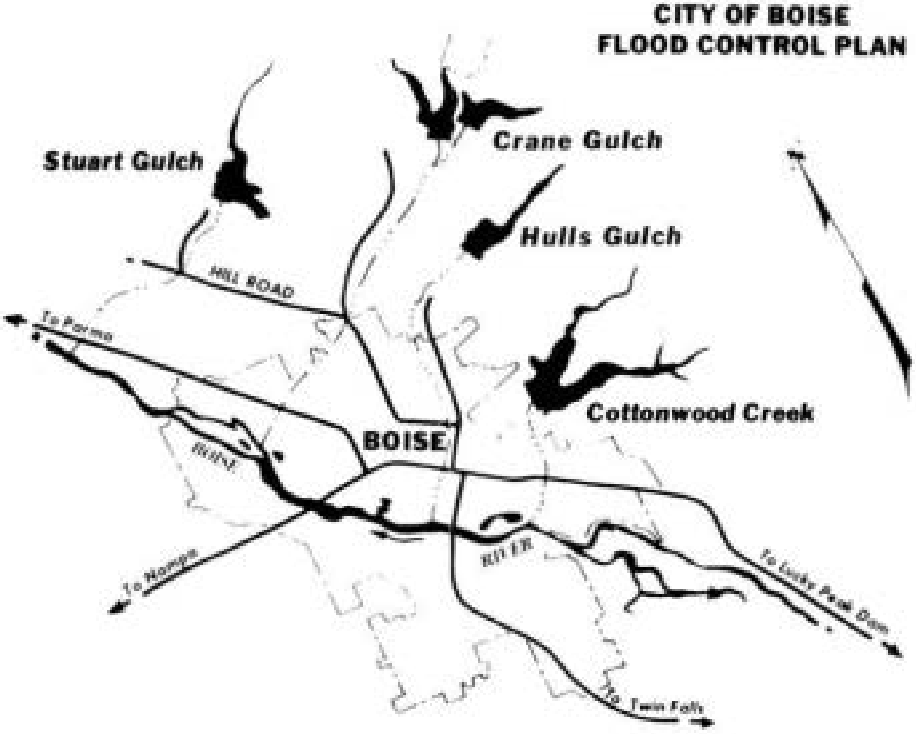
Another very active unit in the District's flood control program in eastern Idaho during the mid-1960s was the formal channel through the City of Pocatello. Like the Colfax project, it wound through the heart of the community where construction space is at a premium but flood flows know little bounds. As with the Colfax project, the Pocatello unit deserves special mention in the last chapter of Part II of this history because of the inherent urban problems of flood control.

The project had been authorized in 1950 and the size of the channel set, only to have the floods of 1962 and 1963 exceed the anticipated channel capacity; so the project went back to the drawing boards. In addition, during the 1950s the City, with growing pains, could not finance its share of the sponsorship costs for land acquisition and structural modifications necessary, so the project lay dormant for ten years or more. The new flood experiences prompted the City to stir, promote, and successfully pass a bond issue for the cooperative requirements. As a result, design funds were forthcoming in FY 1964. Like other projects through congested areas, every turn in the channel evoked comment, heated discussions, environmental questions, and efficacy of the Corps of Engineers. COL McElwee and the design staff were well known in the area. The construction of the project got underway in July 1966 and was completed in November 1968. This is the first project in Walla Walla District where project funds were expended for environmental purposes along a channel rectification structure. After submitting a definite landscaping plan for tree and shrub planting, an agreement was reached on a cooperative effort with local people for the planting and maintaining of the plants. This was a major effort at healing of construction scars and beautification of the seven-mile-long channel of concrete and riprap costing about $7 million. It was undertaken with success.

SOUTHERN IDAHO RESIDENT OFFICE

The activities in eastern Idaho, including not only contracted capital works but repair and restoration and some flood fights, were of sufficient intensity by mid-1960 that COL McElwee found need to establish a Southern Idaho Resident Office in Pocatello. This was done on 1 April 1966 in anticipation of the start of the Pocatello channel work in May. In addition, the Heise-Roberts extension was programmed to start that fall and it was anticipated the Ririe Dam and Reservoir would soon start. The residency did a real service in eastern Idaho for two and one-half years, investigating problems and discussing them with all concerned, supervising special jobs as they arose, and being an "Ambassador" of the Corps. The staff, including those necessary for the individual contracts, was composed of seven persons in 1966, seven to twelve in 1967, and eight persons in 1968, until the office was closed in November of that year due to completion of the contract work. Reactivation will probably depend upon a major effort at the Ririe project.

CITY OF BOISE FLOOD CONTROL PLAN

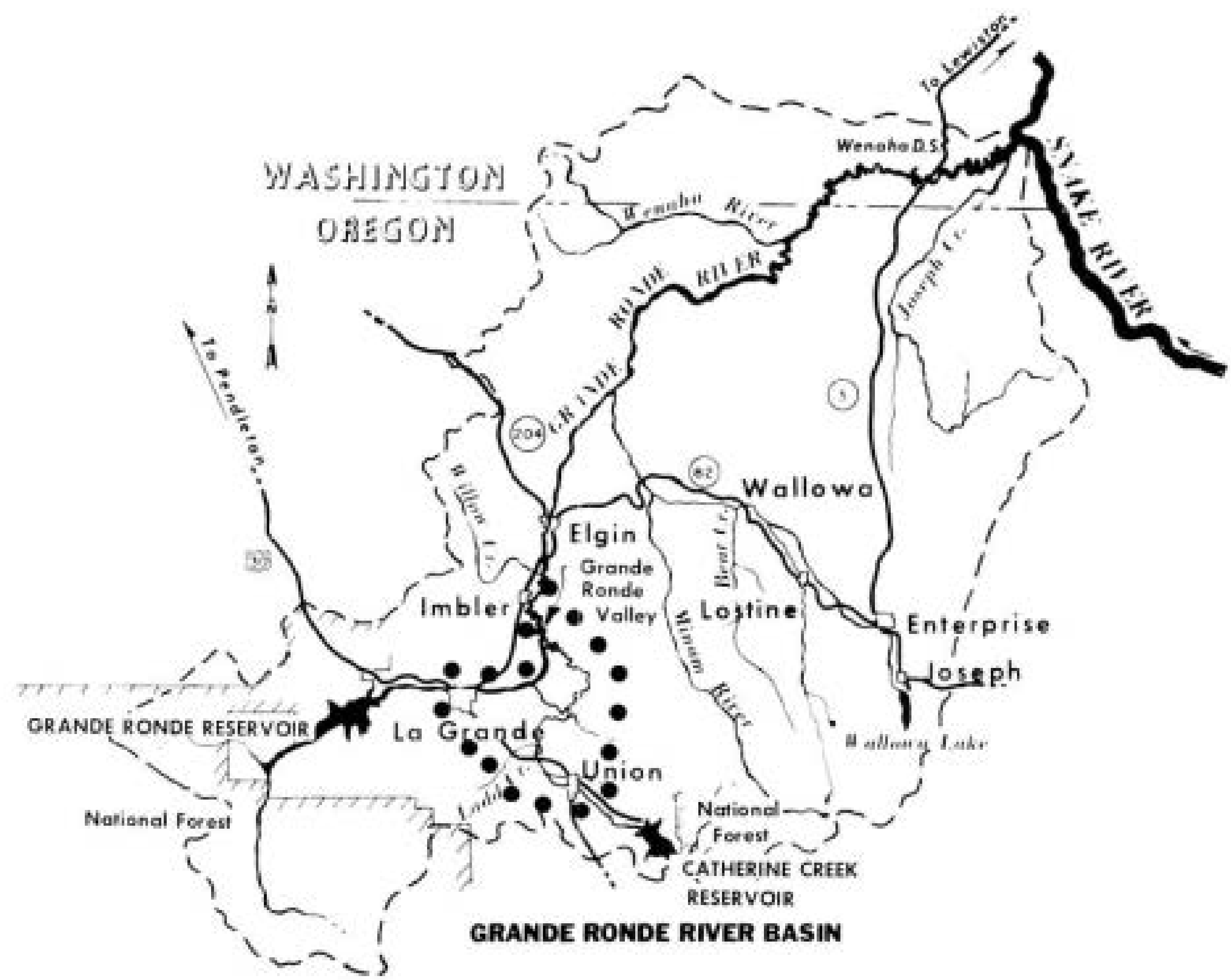


THE BOISE FRONT

Two other studies undertaken by the District during the mid-60s resulted in two quite different authorizations. The so-called "Boise Front" study resulted from frequent flood threats by the numerous intermittent mountain streams in the vicinity of Boise, Idaho, which pass through the urban area on their way to the Boise River. As with most steep but small streams through a community, the flood plain has been preempted by people and, because of overgrazing and general urbanization, runoff patterns have become more extreme. Four drainages in particular were cited as being in need of analysis; Cottonwood Creek, Hulls Gulch, Crane Gulch, and Stuart Gulch. As the result of three particularly troublesome floods in 1959 and a Congressional resolution in 1960, study funds were made available in FY 1962. A report was finalized in March 1965 recommending small detention reservoirs in two streams. They were subsequently authorized by the Flood Control Act of 1966 (Cottonwood Creek and Stuart Gulch). As with most plans for urban and suburban development, the relative merits of the storage proposals were debated freely and the problems of the local entities making lands available were carefully pondered. To complicate the process after authorization, the sizes and details of the two projects were modified considerably by the Corps' changing of hydrologic criteria. Funds for design memoranda were made available in FY 1968 and the effort initiated to resolve the problems and give the community some protection that is becoming more critical as development lags. Studies were consummated in October 1969 but realization is apparently destined to be at least three or four years away. It should be noted that a third waterway, Crane Gulch, in which extensive development has taken place, was considered very critical and studied carefully, but remedial works were not found feasible. Developers with extensive plans were unwilling to give up the necessary bottom lands for the practical location of a detention reservoir. With a changing economy, experience, and demands, an alternate solution may be found in the future.

THE GRANDE RONDE RIVER BASIN, OREGON

The second study, more comprehensive in nature and with a long history of analyses and ideas for solution, is the Grande Ronde River Report of February 1964. This report culminated plans for protecting the La Grande-Union-Imbler Valley in Oregon and on downstream, as well as making available a large amount of water for irrigation development. Previous studies for the 1958 "308" Report evaluated the storage potentials for the lower Grande Ronde Basin below Elgin as a part of the downstream flood control and power needs. Alternate major storage sites were investigated at Rondowa near the mouth of the Wallowa River; at Troy at Ray's Ferry; and at the Wenaha site just upstream of the north-south highway from Clarkston to Enterprise. The Wenaha Dam, as a storage and power unit in the Columbia River System, was reported upon favorably but not recommended for authorization in the final action.



GRANDE RONDE RIVER BASIN

The Flood Control Act of 1950 authorized local flood protection in the Grande Ronde Valley by means of levee, channel, and drainage works. Design studies to protect the urban areas and some 50,000 acres of agricultural land proposed approximately 70 miles of levee and channel work at a cost of over $5 million. Storage projects on both the Grande Ronde River and Catherine Creek were studied but found infeasible because there was little interest at that time--mid-1950s--for putting more land under irrigation. Single-purpose reservoirs of the capacity needed to control flood flows were not practical. The proposed channel works incurred high local expenses for rights-of-way, removed many acres from production, and found some skeptics concerning their efficacy. As a result, the study was put on the shelf after submittal of a design memorandum in 1957. While this study did not lead to a constructed project, the design presented in it is being used extensively by the Soil Conservation Service as an approved plan for granting aid funds to individual ranchers for protecting their lands on a cooperative basis.

An indicated change in interest of the local citizens early in the 1960s prompted the resumption of storage studies, with the Bureau of Reclamation providing data on potential irrigation. The study made a comprehensive review of the Grande Ronde Basin's water resources and potentials for development. The resulting report of February 1964 proposed two major multiple-purpose storage projects, one on Catherine Creek above Union with 61,000 acre-feet of storage, and the lower Grande Ronde site on the main stream above La Grande with 160,000 acre-feet of storage. The two reservoirs, authorized by the Flood Control Act of 1965, would provide a high degree of flood protection to the valley, irrigation water supply for about 60,000 acres of land, municipal and industrial water supply, recreation, and water quality control.

The two storage projects have active support from local interests and there has been continued activity since authorization to firm up the irrigation phases and other facets which require local participation. Repeated appeals have been made to the Congress for design funds, using Catherine Creek reservoir as the initial action unit. As a result, advance engineering monies were made available in July 1968 and the Bureau of Reclamation initiated more detailed irrigation analyses.

THE WALLA WALLA RIVER BASIN

A flooding mountain stream's actions are difficult to predict and control was again proven at Milton-Freewater, Oregon, on the Walla Walla River. This community was protected by a revetted levee built from 1947 to 1953, which was giving adequate service. Then came the December 1964-January 1965 floods, both of which required emergency measures in the upper reaches to save the community. The December flood was greater than the project design, which was considered conservative. The lower 2½ miles of the 5-mile levee system failed, with little opportunity to hold it. The pattern of stream action in this reach, with its attack on the straight levee system and the flow concentrations, has been cited frequently by mathematicians and hydraulic engineers as a classic example of stream hydrology under flood conditions. The original cost of the project was $950,000. Essentially complete reconstruction was required with a higher design flow. The work was completed in October 1967 at a cost of $1¼ million. In addition, about $100,000 were expended on all types of emergency measures.

In general, upstream storage has proven to be a better answer to flood threats such as these. For Milton-Freewater, the Bureau of Reclamation has been actively investigating a multiple-purpose storage dam about 1½ miles above town, which, if it had been in being, would have offered considerable protection. As a secondary line of defense now, and with a relatively expensive irrigation system, economic justification and acceptance of the storage project is proving difficult.

The District and the Bureau are coordinating on a comprehensive study of development for the entire Walla Walla River Basin, one unit being the Upper Walla Walla Study in the vicinity of Milton-Freewater. Another unit is the Touchet River Study by the Bureau with a major storage reservoir above the town of Dayton, Washington. This would be a multiple-purpose dam for irrigation and flood control. The study was completed in 1964, and the project authorized in 1970.

WALLA WALLA RIVER BELOW MILTON-FREEWATER, OREGON

WALLA WALLA RIVER BASIN

The third unit relates to Mill Creek through Walla Walla. The District has directed this study which has been active, reviewed, and re-reviewed during most of the 1960s. The study found that a multiple-purpose dam on Mill Creek at the mouth of Blue Creek (about 8 miles above Walla Walla) was desirable and economically feasible. Changes in project design, scope of irrigation water use, and environmental considerations have dictated extensive review of the original report of January 1964. Better control of Mill Creek flood flows, even with the existing off-stream storage reservoir and formal channel through Walla Walla, is very desirable. In addition, irrigation interests in the lower valley need a better water supply and control; however, with the indicated modifications, economic justification is difficult to show - and local residents and fishermen prefer the upper valley of Mill Creek in the Blue Mountain foothills as it is. The relative merits of these alternate water uses for the Mill Creek Basin were actively debated during the mid-'60s after submittal of the 1964 report and, as yet, have not been resolved.

HEPPNER - WILLOW CREEK, OREGON

A third study, which received attention all through the '60s, but must await further the will of Congress, is Willow Creek, Oregon. Willow Creek in Morrow County, Oregon, has a long history of flood action, including the famous June 1903 cloudburst-type flood originating just above Heppner. The destruction was almost complete to about one-third the town of Heppner, and 247 people were drowned. The creek was out of its banks through town less than two hours. In this basin, general winter and spring rainstorms and snowmelt seldom cause serious flooding. Thunderstorms are the ones to be watched.

HEPPNER, OREGON, AND WILLOW CREEK DAMSITE

As a result of its storm record, several investigations have been made for retention reservoirs; one in August 1936, a second in December 1937, and a third in December 1945. After that, the problem was presented in the 1948 "308" Report (H. Doc. 531, 81st Congress) but on all of them no further action was taken because of marginal feasibility for a single-purpose reservoir.

Local people again urged in the late '50s that a reanalysis be made of the basin, and study funds were allocated in FY 1960. A complete water resource report for the basin was prepared and a report submitted in November 1963. It was found that water is critical for this basin and storage, in addition to flood control, could be used for a municipal and industrial supply, water quality control, irrigation below Heppner, and local recreation uses. With these multiple uses, a storage project of 11,500 acre-feet immediately above Heppner was found feasible and the project was authorized by the Flood Control Act of 1965. Since that time the people of Morrow County have urged further action by the Corps and the Congress leading to construction, and have worked with the Bureau of Reclamation on details for the use of stored water for irrigation. Pre-construction design funds have not been made available as yet, even though budgetary data have been presented. Heppner should hold off having another cloudburst until at least late in the '70s.

CHAPTER 7

THE DISTRICT INVOLVED

ACTION CONTINUED

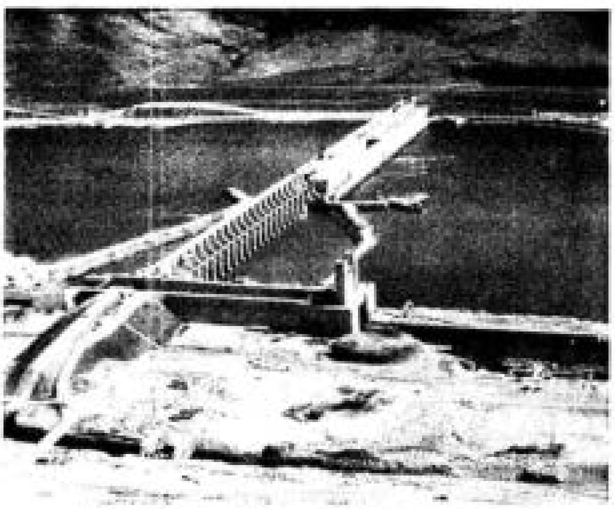
COL McElwee, at the completion of his three-year tour of duty with the District, felt that fields were greener in the sphere of civilian life and retired from the Corps on 31 July 1967. As with other District Engineers, he had established an enviable record with the Corps and went on to become Senior Staff Engineer and partner with consulting engineers in New York, and later as Construction Manager on the nuclear plant at Tongue Point, New York, for Consolidated Edison, that beleaguered public utility trying to serve metropolitan New York.

COL Robert J. Giesen, assigned to the District on 1 August 1967, topped off the period of this history and, as with the previous two District Engineers, remained with the District his full three-year assignment. What can be recorded as one of his earliest actions after getting settled was his observations on the whereabouts and abundance, or lack thereof, of chukkars, ducks, pheasants, quail, and deer, as well as trout and salmon. He checked out these observations well during his tenure with his pickup camper and wife. He is a "crack shot" and his locker, as well as those of his "pardners," was always full. COL Giesen, with his interest in natural history, farming practices, and geography made sure he was familiar first-hand with the features of every major stream basin in the District for which there were studies underway or water resource problems. These weekend "field trips" into the back country with his pickup, and explorations in Idaho stood him in good stead during the myriad of discussions and hearings with local people on physical conditions and impact of projects upon the landscape and ecology.

In COL Giesen's tour of duty the construction emphasis remained on moving along the major work on the John Day project, Little Goose Dam and Dworshak Dam. However, the levee and channel project as an extension of the Heise-Roberts levee system, which was started in November 1966, was finished in May 1968 at a cost of $3½ million. This 20-mile extension completed a 40-mile levee system and provided fairly effective control of a critical section of Snake River, giving good protection to a large and important agricultural and urban area to the south.

The Lower Granite project, which had progressed to the point of diverting the stream and construction of the first-step cofferdam during 1966 and 1967, lay practically dormant in FY 1968 and 1969 except for a limited amount of railroad relocation work, real estate acquisition, and design effort. Dictated budgetary savings and lack of appropriations deferred construction these two years, and extended through FY 1970. The delay ended by the award of the main dam contract on 13 May 1970 for $105 million.

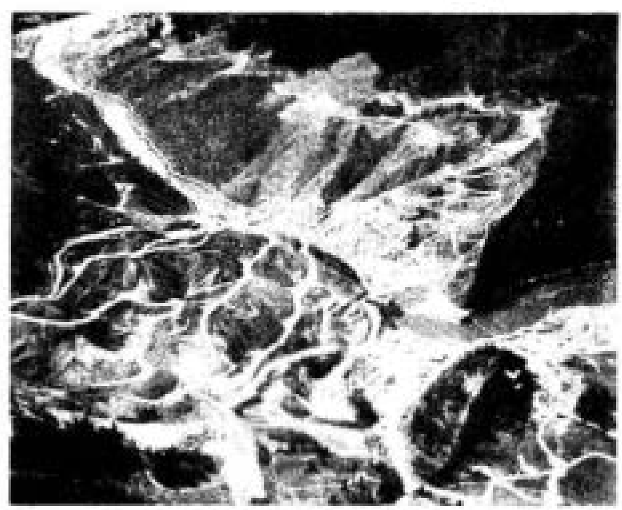
This same limited activity also applied to the Ririe project in eastern Idaho above Idaho Falls. The project site had been prepared in 1967 in anticipation of building the diversion works and dam structure. Fund limitations precluded this in both FY 1968 and 1969. The next step, that of construction of the outlet works through the dam, to be used also as a diversion tunnel during the erection of the dam, was advertised in 1970. A contract was awarded 21 May 1970 for over $2 million, to be completed in 1971. This may signal completion of the project early in the '70s.



JOHN DAY DAM - SEPTEMBER 1967

LOWER GRANITE DAM - 1967

RIRIE DAMSITE - SEPTEMBER 1967

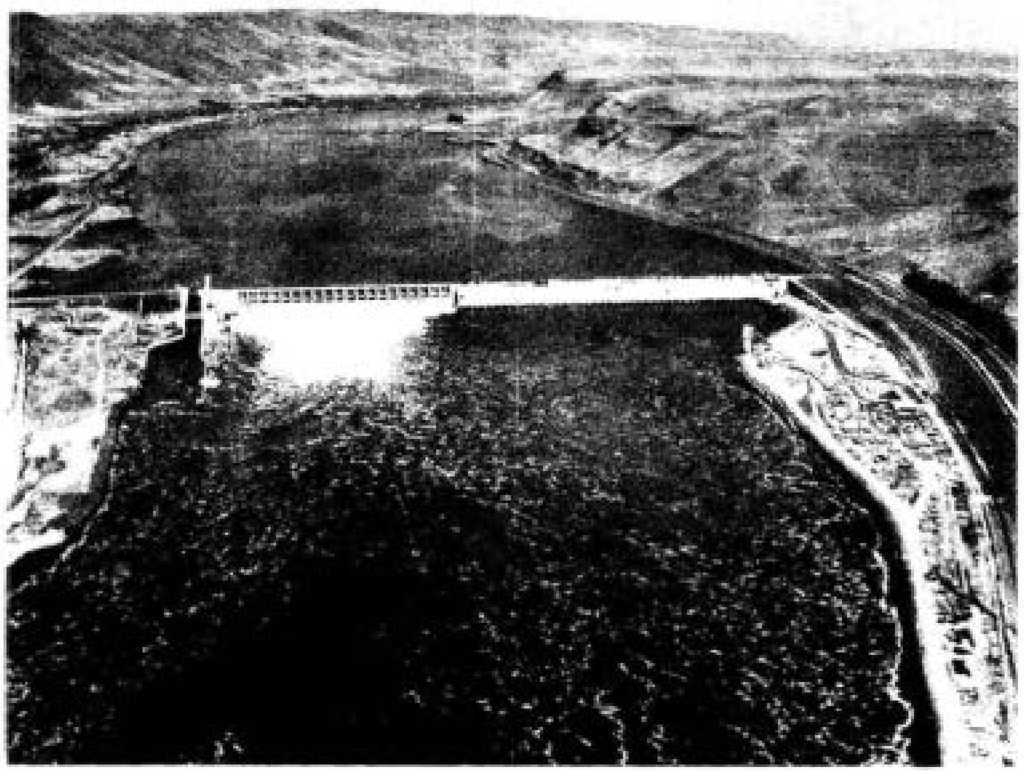


DWORSHAK DAM - APRIL 1967

In addition to resumption of work on those two projects, construction work was active from 1968 to 1970 on power installations at John Day Dam, as well as for a fish hatchery. The raising of the pool at Little Goose Dam started 16 February 1970, with the first power on the line 26 March 1970, and the navigation lock open 15 May. At Dworshak the reservoir clearing was underway; the powerhouse, Dent Bridge, and Grandad Creek Bridge were placed under contract; the steelhead hatchery was completed; and concrete placement continued.

JOHN DAY DAM DEDICATED

These last years of the history period were not void of very complicated, frustrating, and interesting problems, however, as the construction work proceeded. An interesting and satisfying event was the completion of the John Day project, both at the dam and in the reservoir area to the extent that the pool behind the dam was raised and the navigation lock placed in operation in April 1968. The first power unit was placed on the line that summer, adding its capacity to the capabilities of the Northwest Power Pool. By December 1968 three more units were in service with eight completed by June of 1969. The initial 14 units were all installed and operating by December 1970. Coupled with the project



JOHN DAY DAM - JUNE 1968

going into operation, which made slackwater navigation a reality from the ocean 340 miles inland on Columbia River to the Tri-Cities as well as the lower 40 miles of Snake River, the event which had been anticipated during 10 years of construction was the formal dedication. As the closing unit in the Columbia River system, the event demanded proper attention. It was decided that the celebration should be in the fall because of details that needed attending to, rather than do it as soon as the pool was raised and the first unit of power ready. The selected date was 28 September 1968--a warm, sunny Saturday. Vice President Hubert H. Humphrey was the keynote speaker with GEN Cassidy, Senator Magnuson, and other dignitaries sharing the spotlight. There were many events to round out the celebration, as described in more detail in Part II, and the project hosted a large and responsive crowd.

DEDICATION CEREMONY
VICE PRESIDENT HUMPHREY, SENATORS, GOVERNORS, CORPS OFFICIALS
AND OTHER DIGNITARIES

FLOODS REVISITED

The period of August 1968 through January 1969 was virtually an unbroken pattern of above-normal precipitation and below-normal temperatures, not only in this District but throughout the Northwest and other sections of the country. By the end of 1968, with recollections of the 1964-65 flood experience still fresh in the District mind, as well as the uneasiness of the local people, the Corps and other governmental agencies became concerned. Some emergency operations were undertaken in the Blue Mountain area in January, and the President in late February 1969 directed the Office of Emergency Preparedness to act, with all Federal agencies alerted to prepare against the threatened floods. Operation Foresight was initiated and this District, with COL Giesen taking a direct interest, proceeded to strengthen levees, clean out critical locations in channels, and take relief measures where necessary. All types of emergency local protection flood prevention work were undertaken in nine major drainage areas of the District during the first five months of 1969. Approximately $1 million were spent that winter and spring in the four states in about 30 separate locations, the Mud Lake area in eastern Idaho again being a particularly critical area since it is a closed basin with no outlet for relief. One quarter of the funds were expended in this area, with a novel and effective solution undertaken, diverting excess flows into the adjacent extensively porous lava beds to find their way into the big underground north-side storage area south and west of Mud Lake and the Lost River area. Fortunately, nature cooperated with man that winter and spring, and partly as a result of the work that had been done, no serious flooding resulted.

FLOOD PLAIN INFORMATION SERVICES

An integral part of the District's responsibilities for flood control during the later part of the 1960s is the preparation of flood plain delineation and information on floods for utilization by local governmental units, such as land use planners for zoning and subdivision regulations. The emphasis is on nonstructural measures such as preservation of flood-prone lands for open space recreation, wildlife, and water-related activities. A parallel service is the investigation of developed areas for possibility of floodproofing of buildings.

This type of service was authorized by the 1960 Flood Control Act. A limited amount of work was done along the lower Yakima River at Richland, Washington, for that community early in 1963. The organized program with continuing staff for implementing a series of studies was set up in the District Office late in 1966. The three states within the District boundary were all interested in receiving help and requested that specific studies be made.

In Oregon, studies were undertaken for the Canyon City-John Day area along 2.3 miles of Canyon Creek, along with a seven-mile reach of Umatilla River above Pendleton. These studies were completed in 1969.

In Washington, in addition to the previously completed Yakima River study, one was published in 1968 on Mill Creek, Yellowhawk Creek, and Russell Creek in the urban Walla Walla area. Work was also completed on a report in 1969 on the south fork of the Palouse River at Pullman.

Four studies were accomplished for Idaho: at Boise for a 26-mile reach of Ada County along Boise River, completed in October 1967; at Orofino for a six-mile reach of Clearwater River, completed in May 1968; and at Payette for an eight-mile reach of the lower Payette River, completed in September 1968. A study was also made for Bannock County in the vicinity of Pocatello for about 5.5 miles of the Portneuf River which was completed in 1970.

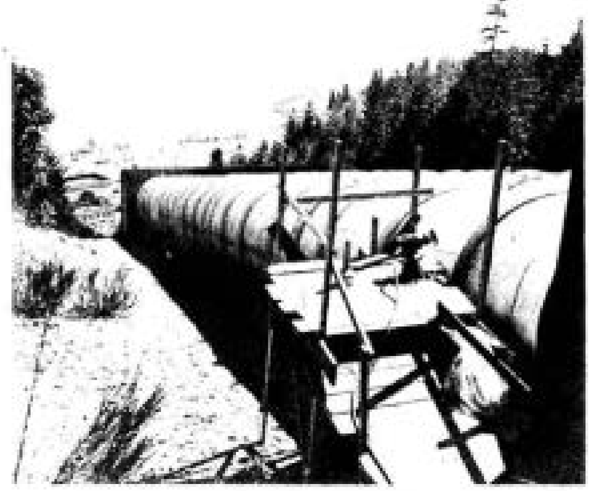
SPECIAL NATURAL RESOURCES ACTIVITIES

Any program of adapting natural resources for the benefit of man results in some minuses as well as pluses. The minuses dictate an effort to minimize them, even turning them to pluses if possible. To effect this the District has on its staff hydrologists, meteorologists, biologists, landscape architects, ecologists, and other engineer specialists attempting to meet these challenges. A few of the activities warrant recording here. These are in addition to other major accomplishments of the lower Columbia River fishery plan implemented by the 1948 "308" Report (H. Doc. 531, 81st Congress) at a cost of several million dollars in which this District contributed considerable expertise.

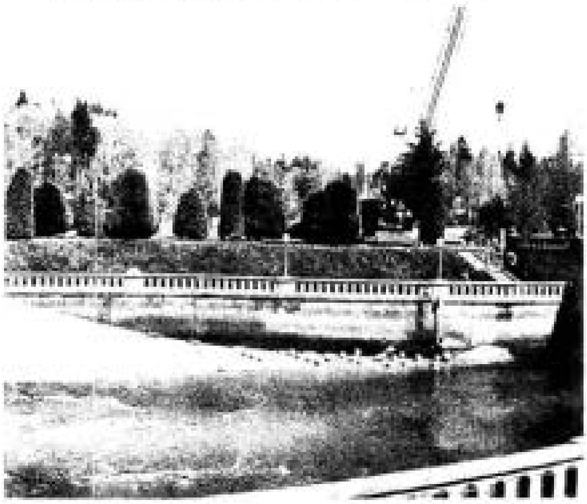
The Fishery

Anadromous fish (salmon and steelhead trout) are a very important resource of the Columbia River Basin which has been extensively utilized since before the white man came. It is a hardy resource, persisting in spite of man's exploitation. One area of concern as man has placed structures in the stream is the safety of the young fish as they migrate outbound to the sea. As development continues, larger numbers pass through the large hydraulic openings of the electric turbines. Recognizing the need for more knowledge of this process and the reaction of the fingerling to such passage, the District's biology staff initiated a research program in 1959 by passing marked fish through test turbines at the Allis-Chalmers' hydraulic laboratory in York, Pennsylvania. Subsequent research over the next six years saw thousands of marked fish exposed to a wide range of controlled operating conditions at representative projects, both high head and ones similar to the lower Columbia-Snake River system. Extensive tests were run for three periods at the City of Tacoma Cushman Dam in the Puget Sound area; at Shasta Dam on the Sacramento River for two seasons; and then at Big Cliff and Foster Dams on North Santiam River in Oregon. These eleven tests, with costs aggregating about $600,000, have afforded valuable data on operating parameters, turbine design criteria, and actions of the fingerlings.

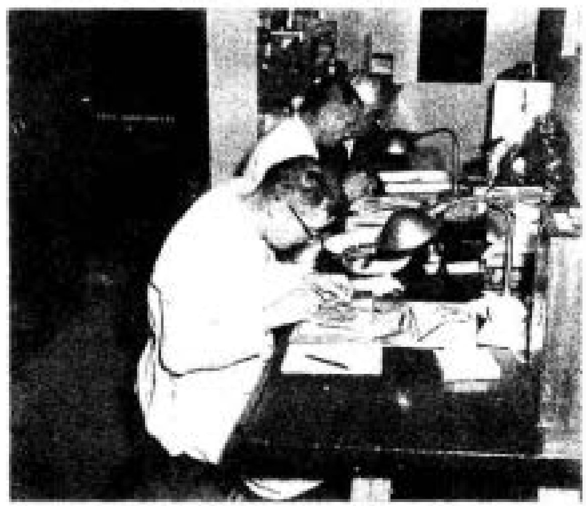
MARKING FINGERLING FOR TESTS



INPUT INTO PENSTOCK INTAKE



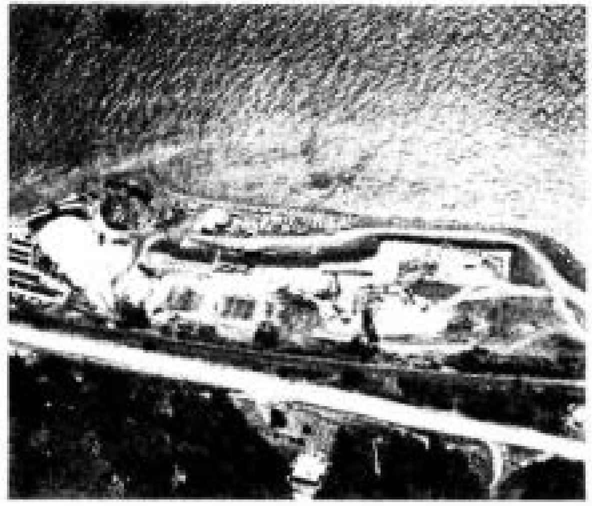
RECOVERY NET IN TAILRACE



EXAMINING THOSE INJURED

Lower Columbia River Hatcheries

It should also be recorded that the Corps and the Walla Walla District's professional staff recognized the potential impact of the John Day reservoir on capability of this reach of river to provide spawning grounds for the fall run of Chinook salmon. With many unknowns involvec, it was agreed that supplemental spawning and hatching capability shoulc be provided at project expense to insure maintaining this run of fish. Accordingly, after evaluating several alternates, two existing hatcheries below The Dalles were selected to be enlarged, Spring Creek near White Salmon, Washington, and the Bonneville Hatchery at Bonneville Dam. The capacity of both is to be more than doubled at a cost of about $15 million. The District staff, with their expertise from the Dworshak Steelhead Hatchery, was designated to do the planning and detail design work for these two, and were well on their way when the John Day Dam went into operation in 1968.



ORIGINAL PLANT EXPANSION AREA

SPRING CREEK HATCHERY, WASHINGTON

BONNEVILLE FISH HATCHERY (EXPANSION TO THE LEFT)

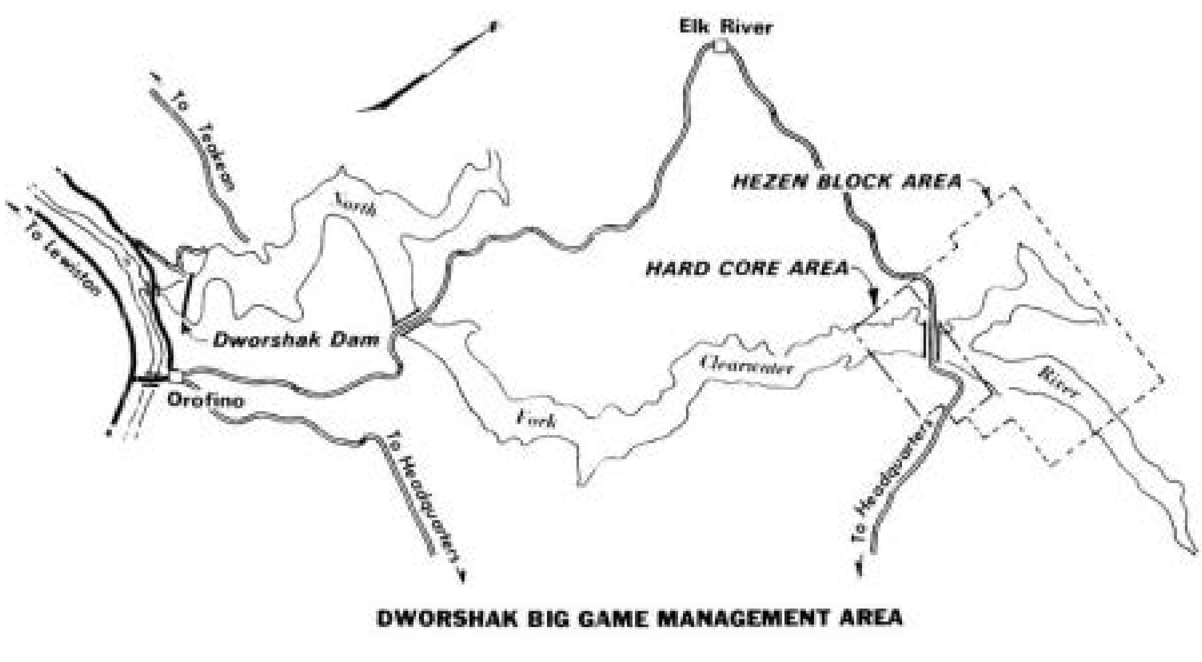
Dworshak Hatchery

At Dworshak 1968 was also a milestone for trapping and holding of some of the fall run of steelhead in the nearly completed fish hatchery at the mouth of the North Fork. This hatchery, the largest steelhead trout hatchery in the world, was built by the Corps as a mitigation measure to replace the anadromous fish runs using the North Fork. The hatchery, completely automated, will rear 6,600,000 fish annually for the fishery. The real production cycle for the hatchery was initiated in the spring of 1969 when the fish that were held over the winter, together with the incoming spring run, were "ripe" and ready to spawn. Eggs were taken and incubation, hatching, and rearing was underway. Formal dedication of the hatchery was deferred until 22 August 1969 when it was in full operation and all phases could be observed. The hatchery contains a number of "firsts" in fish rearing and is a monument to professional capabilities, both in the Corps staff and the fishery agencies for innovative methods utilizing the latest in structural features and operating techniques.

DWORSHAK FISH HATCHERY ON POINT OF LAND AT JUNCTION OF NORTH FORK (LEFT SIDE OF PICTURE) AND CLEARWATER RIVER

Dworshak Big Game

With the Dworshak Dam construction proceeding on a round-the-clock schedule and the reservoir clearing contracts very active, COL Giesen had to pick up the almost continuous negotiations undertaken by COL McElwee on the problems of the North Fork Clearwater River elk herd. Between state, Congressional, corporations, Federal and local entities, wildlife associations, and just people, and amid invectives from both sides, a definite plan began to take shape. Those directly involved were the Idaho State Land Board (as represented by its forestry department), the U.S. Bureau of Land Management, U.S. Forest Service, Clearwater County, Potlatch Forests, Inc., two railroad landholders (Milwaukee and Northern Pacific), a single small landowner and, of course, the Corps of Engineers. Wildlife interests decreed that a 50,000-acre management area for big game was necessary, 43,000 acres of which could be multipurpose in use--both for timber harvest and big game. Management agreements have been consummated for this multiple-use area which is in both private and state ownership. The 5,200-acre "hard core" area in the center of things has caused most of the consternation. This is because of its intended single-purpose management for forage production for big game by means of clearing the timber, burning the undergrowth, and encouraging low growth bitter brush and other plants. Acquisition of this "hard core" area essentially by exchange agreements was undertaken, drawing in state officials, Federal officials, Congressional delegates, and the several owners involved. The process continues into the 1970s with the possibility that agreements may be consummated by COL Giesen's successor.



DWORSHAK BIG GAME MANAGEMENT AREA

Waterfowl

A rather widely publicized facet of the pool raising procedure for the John Day reservoir was "Operation Mother Goose," a very successful undertaking, not only for the goose eggs involved, but also as evidence of the Corps' concern for the overall effect of the project on the wildlife of this 70-mile reach of river. (Incidentally, the concern was not only for geese but also displaced rattlesnakes.) During land-use studies for the shorelands around the new reservoir, large areas were set aside for wildlife management by game agencies. In addition, about 30,000 acres of adjacent lowlands on the project, plus some specially acquired lands near Boardman, were obtained for establishment of a national wildlife refuge. This reach of river has historically been an important stop on the Pacific flyway, and the shorelands a nesting place for geese. The necessary filling of the reservoir by spring floods was certain to interfere with the hatching of wild goose eggs. Consequently, a week before the pool raising effort, an armada of boats carrying a task force of egg gatherers combed the shorelands and islands for goose nests. The eggs were taken to a state game hatchery at Finley, incubated, the young geese raised until able to take their place in the scheme of things, and released; 1,260 eggs were gathered and over 1,000 hatched out.

THE COLLECTION

PART OF THE HATCH

OPERATION "MOTHER GOOSE"

Archaeology

The solutions to ancillary problems of fish, wildlife, land use, and people in relation to construction of a dam once in awhile are required to yield to antiquity. The Columbia and lower Snake Rivers were evidently used extensively by prehistoric man. Accordingly, archaeological explorations have been a "must" before the pools behind any dam can make these hidden records inaccessible. Archaeologic digs are standard activities for every project. Extersive artifacts and remains of the fort were carefully documented for old Fort Walla Walla at the mouth of the Walla Walla River, before the McNary pool was raised, as were many Indian burial and campsites along the Columbia.

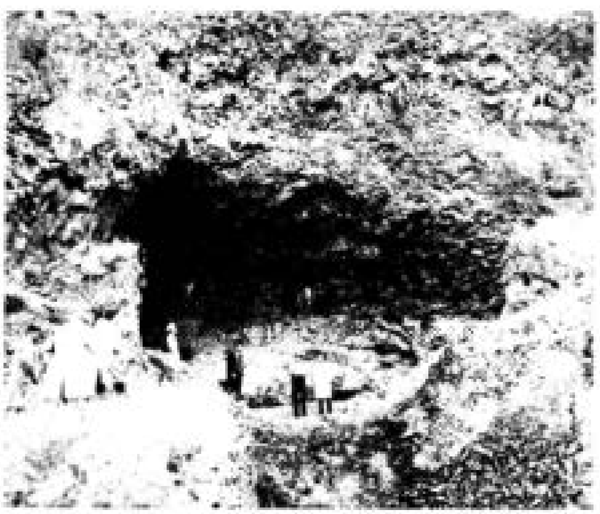
In fact, to recover other hidden treasures the gravels and sands of the Columbia River used for construction of McNary Dam were sifted for a period of two or three months by an independent operator to reclaim the placer gold that has been known to exist there for some time. The agreement for the recovery operation did not prove to be particularly remunerative at 20th Century prices and the effort ceased. In fact, reports have it the operator ended up paying the smelter for costs involved. Long lost in antiquity are the details of the arrangements made by LTC "Tex" Frisbie (the District's first Executive Officer) for the District to obtain its royalty share of the recovered gold, and his difficulty in determiring the procedure for its proper disposition. Publicity on the recovery of gold did strengthen many landowners' views that "gold values" should be added when their properties were acquired for the reservoir.

The lower Snake River channel banks have been considered particularly rich in prehistoric artifacts and the area carefully explored by the National Park Service and Smithsonian Institution. An area of particular significance is the shorelands and rock cliff caverns near the mouth of the Palouse River. Excavation had been carried on in this area for two years or so by Washington State University archaeologists and students with a wealth of finds. A concentrated effort was made during the summer of 1968 in the vicinity of the "Marmes Rock Shelter" to finish the studies prior to pool raising behind Lower Monumental Dam in December of that year. Even though that project was being built by the Seattle District, COL Giesen and his staff were directly interested in some of these special activities, essentially as an assist for Seattle.

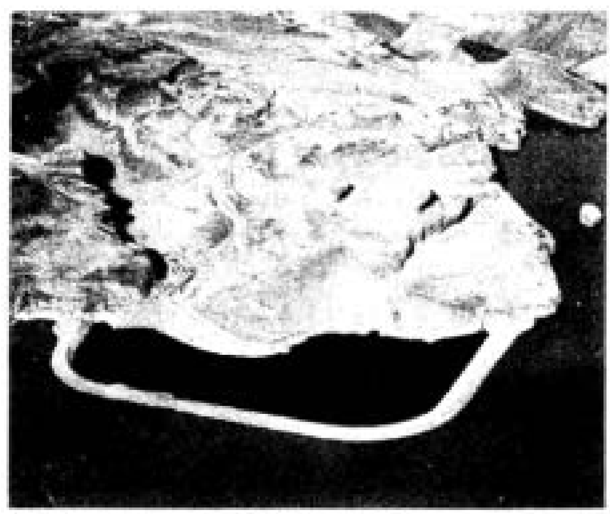
Marmes Man

As the explorations proceeded from the mouth of the cave to the area in front, additional remains were found. One turned out to be of great significance when the remains of "Marmes Man," reported to be from 11,000 to 13,000 years of age, were uncovered. Due to the importance of the find and critical time element, the Corps in two separate actions found $120,000 to loan the National Park Service to keep the dig active through the fall. As a result, parts of the remains of three additional humans and some artifacts were recovered, judged to be the oldest of their kind in the United States. It became apparent that the archaeologists with their meticulous method of exploration could not complete more than a small fraction of the fertile site explorations before the pool raising. Delays in beginning impoundment could be tolerated only until the end of February, but not beyond that, because of fish migration. Brain searching and soul searching were in order and the archaeologists were adamant that an area 300 feet by 400 feet adjacent to the rock cliff must be kept dry and available. An impervious levee about 2,000 feet long around the site appeared to be the only solution. A design of little more than concept scope was completed post haste by District soils and geology specialists with an overall cost estimate of $1¼ million. This amount was beyond the delegated responsibility of the project, so special authority was required. Archaeologists are not to be denied when a prize find such as this is made. National Park Service, Washington State University, the Seattle District, Walla Walla District, the Chief of Engineers, Congressional delegates, and, finally, President Johnson had part in the decision to build the levee.

The President directed the Seattle District to proceed using available funds, based upon this District's design. Everything went fine until the water came up, raising as fast inside as outside the levee, with great consternation in camp. While cutoffs had been installed with no time for explorations, some professional assumptions had to be made that there were no deep open passages in the basalt or deep gravel strata. This proved wrong. The known archaeological sites were carefully covered to avoid wash and "Marmes Man" now rests quietly inside a carefully prepared "crypt" in his separate section of the Lower Monumental pool until silt deposits from the Palouse River are deep enough to seal off water passages that cannot be stopped any other way. Thus ended a real "cliff hanger" for COL Giesen and several others, with damnation, decisions, destiny, and denouement all poised in the balance. We trust the shelter area can be pumped dry sometime in the future and history will record further data on some of the older inhabitants of this section of the Inland Empire.



MARMES ROCK SHELTER



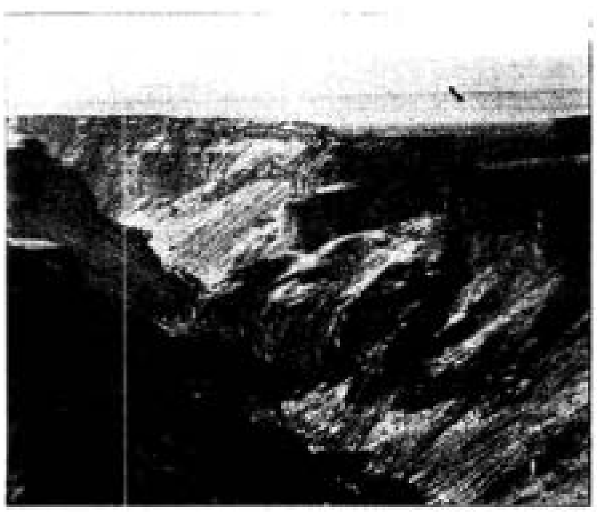
LEVEE AROUND SHELTER AREA

The Seattle District completed the necessary work on the Marmes Levee and the dam proper so that raising of the pool started 21 February 1969, reaching full pool by 26 February, placing the project in operation for fish passage. The first vessel passed through the lock on 15 April 1969 and the first generator went on the line 28 May. Dedication will await completion of the lower Snake River system to Lewiston. The project has been turned back to this District for operation.

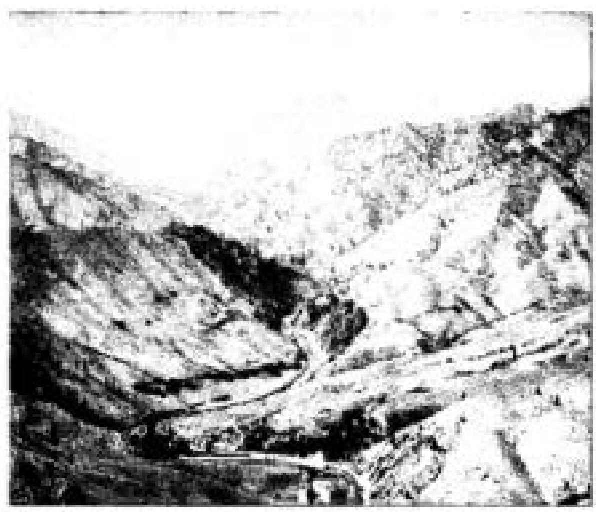
THE DISTRICT AND NUCLEAR STUDIES

An extracurricular exercise that the District was requested to make proved most interesting, drew considerable attention by the State of Idaho, and involved work by the Division and others. In 1957 the Atomic Energy Commission established the "Plowshare" program to examine the potential use of nuclear explosives for peaceful purposes. To implement the program the Corps established the Nuclear Cratering Group as a separate activity with broad authority for technical planning and execution of the joint research program. On 5 May 1966 the Walla Walla District was requested to make a search for civil works projects to demonstrate the excavation potential of nuclear explosives.

Two specific studies were undertaken on a "for official use only" basis. One study was to analyze the potential for a "slide dam" of major proportion in the Bruneau Canyon in southern Idaho. This study as originally conceived was for a nuclear explosion in one canyon wall creating a major "slide" of such proportions that a dam would result. The District analyses indicated that such an original concept would not result in a structure of sufficient height. The District staff proposed



LOWER BRUNEAU RIVER CANYON



TWIN SPRINGS DAMSITE - BOISE RIVER
(QUARRY AREA - LEFT SIDE OF PICTURE)

an alternate process of deep explosions creating an "ejection" and bulking of materials which would result in a much larger displacement of earth and rock. Such controlled explosions would then create a dam 300 to 400 feet high, completely filling the lower half of the narrow canyon at the study site. This would create a major reservoir for multiple use such as irrigation, flood control, and power. Limited field studies, office analyses, and report preparation proceeded on this particular research project until late in 1967. The study resulted in a report submitted to the Nuclear Cratering Group for their use and possible experimentation.

The second study was to investigate the potential for the nuclear quarrying of rock requirements for a conventionally constructed earth and rockfill dam. The previously investigated Twin Springs Dam on Boise River in Idaho was selected for this study. Considerable drilling and geologic study were made at this site with the initial analysis being done in 1966. The investigation proved that the area and geology were quite acceptable for this type of nuclear experiment and funds were then made available for more detailed drilling and preparation of definite plans for a research contract. This was a test program independent of the Twin Springs project, which was then under study and reported upon in March 1968, but it was hoped the project would be authorized for construction so the quarried material could be excavated and the test thus proven out.

It was at this point, August 1968, that the State of Idaho agencies, U.S. Forest Service, and Bureau of Land Management officials were advised by COL Giesen and officials of the Nuclear Cratering Group, and Atomic Energy Commission of the studies, the results of tests, the overall objectives of the "Plowshare" program, and the desire of the Nuclear Cratering Group to proceed with specific quarrying tests in the Twin Springs area. The presentation was received with mixed emotions, resulting in a considerable lapse of time for decision making. During the period from March to October 1968 the District planning staff made alternate analyses of other potential nuclear use sites in the Northwest, few of which proved desirable. Because of limited funds, a cool reception by the public and some state officials in Idaho, and no apparent alternate site particularly suitable, the quarrying experiment, at least for this section of the country, was indefinitely postponed. The District put considerable effort and professional know-how into these investigations with a lot of personal attention by COL Giesen. Analyses made indicate a definite potential for money saving advanced techniques for construction effort, and challenge future project investigations to possibly refine the idea to a practical method. Public acceptance of nuclear blasts, however, may take some time! The District's field investigations, planning, and original analyses for this research program, and the efforts of trying to implement it cost $133,400 during the three-year period.

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PEOPLE

By the mid-1960s the District began to show signs of maturity in staff as well as program. During its first decade it was a young group recruited from professional and technical fields looking for advancement, new experiences, and challenge. During that time there was turnover for those still looking for new worlds to conquer, as well as continual expansion of program and staff. Some though, after 10 to 15 years or more with the District, began to think of fishing, golf, travel, and other pursuits, so retirement was not an unheard of announcement. In fact, the Chief of each major segment of the District made the move from 1959 to 1966. Five of them were pioneer employees from the original staff. Oliver Lewis, who served in many positions and last as Chief of Construction, was the first to leave in March 1959. Louis Rydell, Chief of Planning Branch, found a most interesting position with Harza Engineering in October 1959; Richard Earnheart, an Electrical Engineer and Chief of Operations, but previously at the McNary project, turned to his hobby of electronics in June 1965. Otto Lunn, the doughty Chief of Engineering Design, went back to non-Federal dam building in August 1965, and Edward Wainwright, a man who worked in many jobs for Uncle Sam, and last as Chief of Supply, cut loose in December 1966. In fact, COL McElwee in his tour of duty from 1964 to 1967 had the unique experience of selecting practically an entire new key staff because of transfers, deaths, and retirements. This included Chiefs of Engineering and Construction twice; Chief of Operations, Design, Surveys, Foundations and Materials, Supply, and every Resident Engineer.

ENGINEERING

The one man that COL McElwee had to replace though, who over the years had made more far-reaching decisions, and had part in others that shaped the plans, program, and destiny of the District, was Edwin C. "Fritz" Franzen. As mentioned early in this history, Fritz came from the Tulsa District, was one of the first here, helped guide and shape the growing years, and afforded the District astute and mature judgment for the largest construction program in the Corps.

As the original Chief of Design Branch, Mr. Franzen had a direct influence on the shape of things at McNary for the second step of design and construction. When Mr. Reeves left in 1951, Franzen became Chief of the Engineering Division, the post he held until his retirement in December 1965. In that position he not only master-minded the design effort on about one and one-half billion dollars worth of civil works projects, but also the ten years of very trying military construction work of all descriptions. The Engineering Division includes the broadly constituted Planning Branch which is charged with investigating all water resource development, navigation potentials, flood problems, fish, wildlife, and public-use facets, as well as developing basic engineering data on water and its uses. Franzen had a keen interest and guided the myriad of studies made in all these fields, as well as the shape of the staff accomplishing them.

When Mr. Franzen left the service he was awarded the coveted "Meritorious Civilian Service Award" by the Chief of Engineers, the first to be made in this District. In addition, he was cited by the District Engineer for inclusion in the District "Gallery of Distinguished Employees." Soon after his retirement, Fritz, still feeling the urge for dam building, went to Brazil for about two years as consulting engineer on projects in that country. Upon his return he moved to the coast, only to get elected mayor of his community and active in its development.

The Engineering Division changed hands only twice in the mid-1960s. When Fritz Franzen decided he had fulfilled his assignment, COL Frank McElwee selected Fred W. Sneddon to take his place. Fred, a real westerner from Utah and Wyoming, had done yeoman service with Fritz in the exacting job of managing the engineering phases of the volatile military program for ten years from 1951 to 1961. He then was Franzen's assistant in the civil works field until tapped for the top job in December 1965. As discussed previously, 1966 was destined to be a most active year with heavy demands upon all segments of the District's engineering staff. Fred, an activist along with COL McElwee, was in the thick of it until a chilly winter evening at home in November 1966 when Fred, a relatively young man, slumped in his chair and passed to "greener pastures"; a top engineer who was evidently needed more for other, greater, engineering jobs.

COL McElwee again had to carefully evaluate jobs and people to fill the Engineering Division chair, nearly always the key civilian job in any District. After looking both physically and figuratively at several candidates from all segments of the country, the Colonel reached down into his own organization and again selected a man who was a top professional engineer, a demonstrated outstanding manager, and one thoroughly familiar with all phases of the District program. Harry L. Drake had come to the District at its beginning, moving up in responsibility through the Foundations and Materials Branch of Engineering. With the types of structures being considered and built, that branch was intimately involved in every project undertaken.

Harry is the type that delves into not only his own problems but familiarizes himself with all related ones, as well as those not so related. He is an inveterate reader and analyzer; willing to become involved in the broader aspects of projects, their objectives and formulation. He became Chief of Engineering Division in March 1967, with a strong constitution and sense of duty. The Engineering Division continues to be a strong and vital force in the actions and decisions of the District.

One other Engineering Division person deserves special comment in this document because of the technical knowledge and professional capability he brought to the District. Louis E. "Louie" Rydell worked with the Portland District many years in the planning program and had an intimate knowledge of the Columbia Basin and its water resource potentials. Furthermore, he had made many of the basic studies for the 1948 "308" Report, investigated the sites, and developed the economic evaluations for many of the potential projects in the Snake River Basin. Louie headed up the Planning Branch of the new District, carefully recruiting many of its people, and directed the many-faceted program for 11 years, until he retired in October 1959. His retirement was only to go to greener fields, and Louie spent several years in Pakistan as a consulting engineer developing a water resource plan for the Indus River. He then moved to Brazil to do similar work--a very knowledgeable, careful, and thoroughly professional engineer.

Glenn Von Gunten, an activist and very capable hydropower engineer, who had been Franzen's assistant in the late 1950s, took over Planning Branch for five years during the time when the District undertook the reanalysis of hydroelectric power generation. Von was one of the recipients of the Presidential Citation for the study. He saw greater opportunities in the Ohio River Division and transferred there in 1964.

This co-temporary historian then assumed the job of managing the Planning Branch from 1964 to mid-1970 when he, too, decided there were some home and community activities to be attended to. When he left he was awarded the coveted "Meritorious Civilian Service Award" by the Chief of Engineers, the second to be made in the District.

In reviewing the draft of this history a knowledgeable colleague of the author has provided the text of this one paragraph and insisted on its unedited inclusion to avoid what otherwise would be a significant omission of fact concerning the contribution of another key engineer. Howard A. Preston, a civil engineer, had a varied career in other Districts, both in civil and military work. He continued civil work planning in Walla Walla from 1948 until his retirement in 1970 after 40 years of Federal service. Howard had (and continues to have) a keen insight into all human affairs and especially the management and development of natural resources *for human benefit. He provided a strong backup to Rydell and Von Gunten in the early years and later shared the overall workload with Franzen, Sneddon, Drake, and each of the District Engineers in charting the District's planning for go, no go, on future projects. His personal enlightened philosophy subtly shows through in nearly every paragraph of this history.*

There was much "unfinished business" in the planning field at the close of this period of history, with the very popular words "environment and ecology" entering every page. Preston was succeeded by Willard E. Sivley, a longtime District employee who had proven himself in several fields of engineering, including Planning Branch studies. The ensuing decades of District history should contain some interesting evaluations of the water resource planning for people.

CONSTRUCTION

One of the early construction men of the District, while not with it very long, left his mark on its construction accomplishments. Sam Neff spent close to 30 years with the Corps, starting in 1928, out of college in the Missouri River Basin, and construction at Fort Peck Dam. In 1938 he was made chief of construction work at Dennison Dam in Texas. From 1940 to 1943 he was in charge of the Corps' extensive military construction work in Newfoundland, then returned to the New England Division in Boston as Chief of Operations and Engineering. He also served as District Engineer at Providence, Rhode Island. Sam next moved to Denver in the mid-1940s as Chief of Construction in that District. At Denver he heard about the McNary project and the challenge of construction activity was too much for him. He came to Walla Walla District in 1949 and supervised the McNary job through many difficult construction problems until June 1953 when he took over as Chief of the Construction Division in the District Office. About a year later the North Pacific Division office tapped him to direct the Division construction program. He was stricken suddenly in May 1956 while inspecting this District's construction activity at the new Glasgow SAC Airbase in Montana. A real loss to the Corps' capability.

In quite a different way, making his convictions known and being responsive to the local people, was Oliver Lewis. He was one of the farsighted individuals in the District Office who believed deeply in water resource development for people, and who had a major hand in the Clearwater and middle Snake study, its conception, execution, and subsequent programming. Oliver, a member of the Planning Branch of the District, was previously at Boise with the Portland District. He joined them in 1936 and during the war held a commission as Major in the Corps, directing Portland's activities in southern Idaho. MAJ Lewis, who was directly involved with the 1948 flood, recognized the need for stream control for floods and other uses, and was ever ready to point out those needs. Working with William E. Welsh, the Boise Watermaster and later Secretary of the National Reclamation Association, MAJ Lewis was a strong factor in the realization of the Lucky Peak storage project, the Heise-Roberts and Jackson Hole protective works, and many emergency works in southern Idaho. He became a colorful part of the Walla Walla District upon its inception and was ever an activist in stream control. COL Tandy drew heavily upon Oliver for technical assistance in several fields. He selected Oliver to become Chief of the Construction Division in May 1954, a position he held until his mandatory retirement in March 1959, having one of the longer tenures in that position.

When Oliver Lewis retired in 1959, McNary had been completed, Ice Harbor was well on its way, the military program was at its peak and the John Day Dam off to a good start. COL Symbol tapped Clarence C. Davis, then Resident Engineer on the Ice Harbor project, and a Texan, to head up the construction program. "C. C." kept the work organized for a little better than two years, then he, too, decided in July 1961 to retire and do other things.

The District had been bringing along good men to fill vacant shoes, and COL Beddow decided to fill the Chief of Construction position with Bertram W. Hoare, an ex-McNary construction man who had moved into the District Office as Assistant Chief under Lewis and Davis. Bert, a construction man at heart, but also interested in professional engineering and community and cultural affairs, held the position from September 1961 to November 1965. The lure of the military construction program in the Mediterranean area with a base in sunny Italy was too great, so Bert and his family took a three-year foreign tour of duty.

During that three-year period, C. B. "Gus" Olmstead moved in from the John Day project for about two years, only to also go to the Mediterranean (Saudi Arabia) for construction work for the Corps, and John E. "Jack" Butler then took his place in November 1967. Jack had been in the northwest military program for a decade, from 1956 until January 1966, with both this District and CEBMCO (Corps of Engineers Ballistic Missile Construction Office) which assumed our missile construction work. He moved into the District Office in January 1966, became Chief of Construction in November 1967, which job was again preempted by both Olmstead and Bert Hoare in September 1968, so Jack took Olmstead's place in Saudi Arabia. It was a "musical chairs" game for a short time when Bert reassumed command, Jack took an overseas job for a year or more, and Olmstead ended up moving to the Portland District in 1969 as Chief of Construction for that District. Butler came back from overseas in 1969 to reassume the position of Assistant Chief. A good experience was had by all, leaving the District with a strong Construction Division--and program. The Division was destined to remain stable for at least three years but Bert still has a far away look in his eye when he views a map of the Mediterranean area and "empties a little sand out of his shoes" once in a while.

OPERATIONS

The Operations Division for the District Office was almost 10 years in the making. Those 10 years stressed construction. When a project was completed (McNary - 1954) operating functions were assumed, at least temporarily, by a unit of the Construction Division. In 1958 the decision was made to establish a separate Operations Division. Richard L. Earnheart, Project Engineer at McNary, was selected to head it up and moved to the District Office in 1958. Dick, an electrical engineer previously with the Portland District and the Division's Hydroelectric Design Branch, came to McNary in 1950 when it was approaching the powerhouse construction phase. He did yeoman service working out the kinks, streamlining the processes, and placing a major power and navigation facility into the main stream of the Northwest's projects.

The work of the Operations Division for the next seven years (1958-1965) had many interesting periods, with Ice Harbor and a myriad of local flood control works being completed for the "shakedown" phase. During this period much emphasis was placed upon efficiency and economy of operation. McNary design had essentially followed the old Bonneville concept of manual operation. Dick, with a penchant for electronics, computers, and remote control, devised some better and more efficient ways of operating major power facilities with very limited manpower. These new systems were then infused into the design for the John Day and lower Snake projects at major savings. Earnheart turned over a smooth running and efficient Operations Division to his successor, Duane M. Downing, also an ex-McNary Project Engineer, in June 1965, who has carried on the good management and innovative approach Dick started. Since then Dick has earned the "Man of the Year" citation in his hometown of Hermiston, Oregon, for all of his civic activities--including the establishment and engineering of the McNary Golf Course, expansion and major improvements in the Good Shepherd Hospital, as well as service to his church. In June 1969 COL Giesen cited Mr. Earnheart for inclusion in the District's "Gallery of Distinguished Employees," the second to be so named.

ADMINISTRATION AND REAL ESTATE

This history has attempted to single out only a few persons who as principals with extraordinary responsibility, have made unusual contributions to the accomplishment of the Corps' mission and with some impact upon its policies and modus operandi. The opportunity to do that lies primarily in the "action" areas. There are two areas that, different from others, have such leaders still with the District and still doing distinctive service. These are the Executive Assistant for the District Engineer, and Chief of the Real Estate Division.

Van Natta Baldwin is a rare combination of judicious administrator; tactician who can foresee problems, weigh personalities, and push where necessary; as well as discreetly advise the District Engineer on critical procedural and policy matters. He was an administrator at

McNary when the District was formed. He moved into the Supply Division in 1948 and assumed the front office job in April 1951. Van is a bulwark for the frequently changed District Engineers and their Deputies--a most thorough supervisor as well as a source of sound advice for the entire office.

Max K. Tysor as Chief of Real Estate, a product of the Kansas prairie and later with the Tulsa District, started out in Civil Engineering, but working with land and people drew him into Real Estate. Starting here as a "Planning Officer" in March 1949 he moved to the Chief of the Division in August 1953. The acquisition and disposal of real estate has been an exacting job of major proportions, with relationship to people the key element. His Division has had to handle 4,900 tracts of land involving 200,000 acres at a cost of \$37½ million. Nine dams and reservoirs, the extensive military program, and a multitude of levee and channel works throughout the 1,000-mile Snake River Basin have demanded major effort, many times in an adverse atmosphere of reticence to move, such as "Snake River John". Max has many accolades in his file with adjectives such as astute, completely capable, quick to perceive, etc. Max, like Van, is a bulwark for the Executive Office on land and people problems.

Part III contains a list of the heads of the principal sections of the office during the period of this history. In addition, three organization charts for the District staff are included, one in 1949, essentially at the time of establishment, one in 1959 at the mid-point and a third in 1970 at the close of the period.

PROFESSIONAL EXPERTISE

A district with a heterogeneous group of professionals collected from many parts of the country, presented with major tasks of implementing large projects, faces those tasks with an inquiring mind. As the work of the District evolved, the ingenuity of its staff was whetted to devise better ways, or obtain better basic information as a foundation for the best design and operation. Some rather important research, new ways, and innovations resulted. Two or three have been mentioned, such as the changed concepts for hydroelectric power which resulted in a Presidential Citation; the new approach to plant operation at McNary Dam from manual to remote and computer operations; the extensive fisheries research on fingerling passage through turbines; and the innovative use of a bentonite slurry to hold excavated slopes while constructing an impervious underground core for seepage cut-off through levees. Some others should be commented upon briefly.

Aerial Photography; Stereo Plotting; and Earthwork Pay Quantities

The District's extensive use of photogrammetry was brought about by necessity. This was highlighted by the early McNary relocation work in rough, steep, barren terrain. In addition, there was a lack of skilled survey personnel. The first and somewhat experimental step of mapping was done through Fairchild Aerial Surveys using a stereoplanigraph for plotting. The maps were found to be exceptionally accurate. From that data it was concluded that pay quantity cross sections could be obtained satisfactorily if a few refinements were made, including premarked photo control points.

Subsequent refinement of both procedures and equipment showed that this method was more accurate and more economical than field survey methods, so this method of measurement was specified in construction contracts. The next step was to develop read out data for a punch card system so that the cards could be used both for computation of quantities by electronic computer and also in electronic plotting of cross sections where desired.

To extend the innovations further, it was found that a seven-man survey party for ground control work, equipped with a helicopter and two-way radios can set 150 photo control points complete with iron pipe monuments and triangle signals in one day in rough terrain in comparison with about 15 points a day by land transportation. By use of the helicopter the efficiency of observing and leveling at these points is also increased ten times.

The concept of the work objective is that photogrammetry is only a link in the total process of acquiring raw data and processing it to the final product--design data and pay quantities. To meet the total objective, the District developed the Graphic Data Reduction Section, an integrated unit for the reduction, compilation, plotting, and computing of data from field notes, soundings, and photogrammetry. The equipment utilized by the District for this extensive work includes the Wild RC8 aerial camera; two Wild A7 Autograph instruments with automatic digital readout equipment and automatic plotting table, each costing over $100,000; the peripheral section plotters; and readout equipment, all utilizing automatic data processing for obtaining the final results.

The expertise and highly sophisticated equipment and procedures developed by this District are used widely in the entire Pacific Northwest region. These methods have been and are presently being used just within the District on projects involving over 500 miles of highway and railroad relocations, for nine major dams for both design and construction. The projects involve over 400 million cubic yards of rock and earthwork quantities. The use of photogrammetric surveys also has a major advantage in the event of claims. The photographs make a complete record of conditions at the time they were taken. If claims are made concerning conditions or differences in quantities, they can be quickly settled if the construction area is photographed periodically.

Much of the credit for conceiving and developing this accurate and very sophisticated system for obtaining mass topography and measurement of earthwork quantities must go to Claude W. Waggoner, the Chief of the District's Survey and Drafting Branch. Claude came with the District at its inception, bringing with him expertise in survey work, and a brilliant and inquiring mind--a very competent engineer who ran a tight shop, accomplishing some major work for the District, and developing a couple of "firsts" in his efforts. He was impatient with people, but had infinite patience in working out the details of stereo plotting, data reduction, and better ways of collecting a tremendous amount of topographic data required for a whole parcel of major projects. Claude retired in December 1965 to turn his mind to other challenging ideas.

Snow Gages and Remote Data Collection

For system operation of a series of major storage reservoirs, it is critical that adequate information be available from mountainous areas throughout the period of year that snow accumulates and recedes. The routine procedure for measurement of snow depths and water content is to traverse a "snow course" physically measuring the depths at predetermined representative points by means of sinking a sampling tube and recovering a column of the snow. Such measurements are collected at specific intervals by the Soil Conservation Service throughout the Snake River Basin and much of the Columbia Basin in order to forecast the water supply for the ensuing year for irrigation and other consumptive uses. In addition, the data is collated for estimating total runoff by major tributary basins for flood control purposes.

When studies of the Clearwater Basin were undertaken and water resource projects envisioned, it was realized we needed better basic information on the water supply and runoff characteristics for a basin that contributes about 30 percent of the Snake River flow below the mouth of the Clearwater. The District, in 1963, contracted with the University of Idaho to perfect and develop a prototype radioisotope snow gage with the necessary equipment for containing the radioactive material, the receiver for the radio signal, and means of recording the signal. With this research data, radioactive snow gages were developed and installed at three remote locations in the Clearwater mountains, complete with radio equipment to transmit the measurement information all winter long to the District office in Walla Walla. The data is transmitted only upon interrogation of the specific gage by office equipment. The stations are completely self contained with their own electric supply adequate for a full winter's operation. The signals are received through an intermediate relay station which breaks the distance for sending down to a maximum of 40 to 90 miles. Much pioneering has been done with these stations on the use of radioactive isotopes for such purposes and evaluating their economic and effective capabilities.

In addition to the three radioactive gages, new and improved "pressure pillow" types of gages were installed at three locations, partly as research units and for basic data. The pressure pillows are circular, 12-foot diameter butyl rubber pillows, filled with 300 gallons of methanol which inflates them. A float well, with a digital recorder and transmitter, provides the measurements, based upon the weight of the column of snow on the pillow. Coupled with these snow measurement installations were three stream gaging stations in the Lowell-Kooskia area of the basin. All of the stations are tied to the District office by radio interrogation equipment.

The development problems of integrating such equipment into a five-month long snow season, with capability of measuring depths up to eight feet or more normally, with record depths of 15 feet or more, has been a challenge for the District. The experience has been one that has the attention of several interested groups, both academically and from the applied science field. The pioneering done by the District's very capable staff has been recognized. Economics indicates a preference for the pressure pillow, partly because of the safeguards and handling problems of the radioactive elements. The principles, as refined by the experimentation and experience, may lead to other uses of the radioisotope, however, in the future. With the Dworshak project coming to fruition in the next biennium, more and better hydrologic data will be needed for the Clearwater Basin in the near future. The same can be said for many other basins as the utilization and control of our water resources become more significant.

The Finite Element Method of Structural Analysis

The Matrix method of analysis has for some time been a textbook and academic procedure for making stress analyses in structures as well as solving for other unknowns. It has not been practical for commercial use because of the intricacy and volume of computations necessary. The District staff, when making preliminary analyses for Dworshak Dam found the need for better analytical methods of evaluating internal stresses in the structure. With an inquiring mind, they turned to the University of California, Berkeley, for help. Prior to that they had also been to the Bureau of Reclamation design staff in Denver, recognized arch dam designers, for instructions on their methods.

There was much coordination and negotiation with Professors R. W. Clough and E. L. Wilson at U of C who were using the Finite Element method for analysis on another dam which had cracked. As a result, three of the District's top analytical structural engineers went to Berkeley for a concentrated two-month course on the subject, because they saw potentials in the method. Being knowledgeable also in computer programming, they saw the potential for applying this detailed analysis in a practical way. Through the use of computers they succeeded in making a theoretical tool for the University into a very usable tool for the designer, particularly where special shapes and complicated structures are involved.

The Finite Element analysis is a general method of structural analysis which will satisfy any two-dimensional elastic structure of arbitrary geometry and material properties. The structure is represented by an assemblage of a large number of finite quadrilateral elements interconnected at the corners referred to as nodal points. The superimposed load, dead load, and seismic forces acting on the structure are applied by statically equivalent forces applied at the interconnected points, with the assumption that the stresses acting on the edges of the elements are constant within each element. These extensive stress analyses made practical by computer capabilities afford much more detailed investigations and more critical evaluations.

Several related stress analyses have evolved from the refinement of the process such as its use to analyze for prestressing of structure for superimposed loads and their proper distribution. Another use of the Finite Element analysis, as developed by the District staff, has been to predict the temperature regimen in a structure, and to design accordingly for the proper temperature control for dam construction.

This sophisticated but highly needed method of stress analysis as refined by the District's staff has gained much favor throughout the country. Other Districts, professional persons, and the Bureau of Reclamation staff have spent time with our engineers learning of the process and computer programming necessary to apply the method to their problems.

Structural Instrumentation

The extensive construction program that became evident in the later half of the 1950s, together with authorization of the Dworshak project in the Clearwater Basin in 1962, pointed up the need for better basic data on structural behavior. More extensive information was needed to match the design capabilities through use of the computer and the Finite Element method of analyses discussed previously. As a result the decision was made in 1963 to establish an Instrumentation and Measurement Section within the Engineering Division.

Instrumentation was not new to the District, with specialized soils and concrete meters having been installed on almost every project. However, such instrumentation and responsibility to monitor it had been left as an incidental task to the various designers. In common with other parts of the Corps, the results often left something to be desired. The detailed planning and design for the Dworshak Dam with the many innovations of design and construction envisioned, emphasized the need for better structural data and behavior. So the District moved out and implemented a plan to obtain the information through the new Section.

The magnitude of concrete placement at the Dworshak project would require complete temperature histories so that quick and accurate comparisons of predicted temperatures and those that actually occurred could be made. Likewise, the advent of computers bid fair to give the engineer a magnificent tool for predicting stresses and strains that would occur because of the temperature history, autogenic changes in the concrete, the various loads applied during construction, and finally the loading applied by over 700 feet of pool. To have full confidence in use of the new design tool, extensive instrumentation of the structure and foundation would be necessary so that comparison between predicted vector and scaler values and what actually occurred could be made. In addition, completed structures undergoing repair also required instrumentation if an evaluation of the effectiveness of post-tensioning systems was to be made.

The instrumentation at Dworshak, for instance, consists primarily of eight systems which measure foundation deformations, structural deflections, hydrostatic uplift pressures, concrete pore pressures, concrete stresses, concrete temperatures, contraction joint movements, and monolith alignment. Somewhere in the neighborhood of 400 different instruments are being installed to be read out in three instrument rooms and several read out stations. Needless to say, considerable research on design will result, and much more should be known about structural behavior.

As the result of the extensive work of the Section, a staff with considerable sophisticated expertise has resulted. Actually unforeseen at the time of its establishment was the large increase in demand for quantitative data on other structures, both within and outside the District where this ability has become well known.

Academic Study and Training Programs

From the advent of the District, the professional staff and District Engineers recognized the need for a steady input of young engineers in order to maintain a strong and virile planning, design, and construction force. In 1950 an active training program was initiated, and recruitment of college graduates undertaken. Only one was enrolled that first year but during the ensuing years the District has regularly sent recruiting teams to at least three universities, and has signed up 5 to 13 Engineering Trainees each year.

In the 20 years of the program, 145 professional engineers have graduated. Many are still with the District and a big percentage of the grads are still with the Federal Government, spread throughout the country. The training course is a formal, in-service program of 18 months with a definite schedule of work and study in every phase of the District's program. The program is administered by designated professional employees with periodic evaluation and checking on progress. The overall benefit has been well worth the effort.

Another program the District has fostered and been most active in is the Advance Study Program instituted by the Chief of Engineers for an academic year of resident study at accredited universities. The first year of District participation was 1963 when the present District Chief, Planning Branch, attended the University of Michigan and obtained a Master's Degree. In the ensuing eight years the District has sent ten of its promising professional staff back for graduate work in all phases of

Engineering, as well as a biologist and a landscape architect, each of them obtaining a Master's Degree, with the District assuming the cost of the education. In addition, the District has helped four others accomplish the same objective by supporting them for one-half of the academic year.

During the same period the District has had two of its top professionals work through the Planning Associates Program of the Board of Engineers for Rivers and Harbors, and a third is scheduled for 1971.

As a measure of the maturity of its staff the District has also had many requests by its professionals, and has been able to satisfy a good portion of them, for special seminars and courses in specific subjects. They have been taught by the outside staff of graduate centers and universities. These have been set up on specific "in-house" schedules for a term or semester and a definite course of study. They have been well received by goodly numbers and in some cases repeat courses have been given.

The educational program of the District has been judged as exceptional, with strong impetus from the top administrative officials. We have been given accolades for undergirding these professionals. Their capability and advancement within the Corps from the District to Office, Chief of Engineers, attests to the success of the program.

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UNFINISHED BUSINESS

A NEW DISTRICT ENGINEER

COL Giesen completed his tour of duty with the District and retired from the Corps in August 1970. His activities with the District were complete essentially at the same time as the close of this accounting of its history. COL Giesen left the District with it undertaking the largest volume of work, money-wise, in its career. He also passed on to his successor a staff of dedicated and very capable people, both in the field and in the office. In addition, he left with the warm accolades of the people of the Inland Empire and the warm respect of his staff.

Again, the Chief of Engineers reached into his extensive and competent staff to carefully select and assign a District Engineer on 1 September 1970, COL Richard M. Connell, an engineer with strong professional qualifications and good managerial experience; a Vietnam veteran who should see plenty of action in the Inland Empire, as he did in southeast Asia. There is much infinished business to attend to.

A LOOK AHEAD

A history of this type is destined to close with a book full of unfinished work. The Walla Walla District in 1970 exemplifies that proposition. As the first 22 years herein presented will attest, the tenor of the District's mission has modified considerably, and the versatility of its staff broadened. The initial effort was directed toward lower Columbia and Snake River navigation with emphasis on power and navigation dams and an ancillary project at Lucky Peak. Flood control grew to be very demanding, requiring more detailed attention as the District's age grew. In looking ahead from the vantage point of over 20 years of study and effort, flood control in all its forms looms large, coupled with multiple use for irrigation, recreation, water quality, and consumptive needs. Flood plain zoning is an alternate which, in some cases, is the most practical solution.

As alluded to in various sections of this document, there are a host of problems yet unsolved, many potential projects, some authorized, some a gleam in the planner's eye, and some works ripe for fruition. An inventory seems appropriate, possibly as a starting point for the recounting at a later date of the efforts and accomplishments in the next two decades.

Starting in the headwater in Jackson Hole, Wyoming, man is encroaching upon this gem of nature and changing its picturesque ranch and cattle economy to a recreation mecca. Either way, with the development of the bottom lands, control of the river is essential to prevent destruction of big areas of land and facilities. An extension of the levee system is under study to protect the lower ten miles of the valley which receives much attention now on frequent emergency basis.

Eastern Idaho with its high degree of agricultural development, fragile stream channels and banks, and practically full use of its water supply has many critical points. The North Fork, or Henrys Fork, was examined in the Upper Snake River Basin Report and better control of its flow is needed by storage without destroying some of its natural beauty. Power and irrigation are companion factors with Federally developed hydropower not looked upon favorably in some circles. Additional storage can be utilized to good advantage in the upper Snake system above Milner and, as long as Wyoming holds strong feelings against storage projects in that state, the only apparent major site is the so-called Burns Creek Dam proposed by the Bureau of Reclamation. The Corps reported upon it in 1962, only to have the report returned. Possibly the Corps should take the initiative again at some future date. Coming downstream, it is anticipated that history will report an early completion of the Ririe Dam and Reservoir, affording a high degree of protection to the Idaho Falls area, Willow Creek, and Sand Creek Basins.

Little has been said in this history about the Blackfoot River Basin. It, too, was reported upon in the Upper Snake River Basin Report and the project for modification of the existing Blackfoot Dam and Reservoir has been previously noted. Design studies for the modification were started in 1965 on what appeared to be a relatively uncomplicated change, in order to effect better utilization of the storage space. However, changing Corps criteria on design of spillways for flood passage tripled the size of the spillway, complicating the structure remodeling. In the reservoir area the plans were jelled enough that by 1967 the public was brought into the changing reservoir operation and land-use requirements. Shoreline summer homes, duck habitat, wildlife, and access problems surfaced. 1968 and 1969 witnessed more polarization. When the project design can be finalized and reconstruction initiated remains for later history.

Like the Blackfoot Basin, the Portneuf Basin as a whole has received little mention, even though there has been almost continuous thought and frequent analyses of flood problems throughout the basin. Frustration for adequate solutions seems to be the order of the day. Extensive studies of flooding along Marsh Creek were made about 1950 with no answers the local people could accept, either headwater storage or channel works. In the Portneuf main basin, the community of Bancroft frequently experiences floods, but solutions are costly and beyond their means to finance for cooperative measures. Some relief is being given through small detention dams under the SCS programs. The town of Lava

Hot Springs has experienced devastating floods and a flood channel through the community was authorized in April 1968. Preparation of construction plans was initiated in FY 1969 with the aesthetics of any channel design receiving close scrutiny. Storage in this basin is most difficult to accomplish because of the presence of the railroad, on a controlling grade, and the transcontinental highway winding their way up the bottom of the valley. A basinwide survey review study published in June 1969 concluded that for other than local protection projects, the only flood control and water resource development project that appears feasible is a small storage unit in the lower valley of Marsh Creek with a diversion canal from Portneuf River near McCammon. A reservoir at this location would afford added protection to the Pocatello area, as well as being a major recreation lake with some irrigation benefits. The Portneuf Basin, of interesting geological formation and good agricultural area, needs additional control for its water resources and will no doubt receive added attention in the next decade.

A project in southeastern Idaho which has a direct relation to the Corps activities in the upper Snake Basin, but which is the responsibility of the Bureau of Reclamation, is the American Falls Reservoir near Pocatello. This project works effectively with Palisades Reservoir and Jackson Lake on upstream to obtain extensive control of flood flows and storage for irrigation. The American Falls Dam has been found in need of very early rebuilding because of deteriorating concrete. Better utilization of this space for multipurpose flood control, irrigation, power, water quality, and recreation has long been recognized and needs to be carefully considered in the planning phase now underway for its rehabilitation. System flood control benefits possibly could be creditable to the rebuilding costs if adequate provisions and operating procedures are agreed to by a "troika" of the irrigators, the Bureau, and the Corps. The State of Idaho also has a major concern about full use of this important reservoir. The District needs to keep an interest in, and furnish constructive input to, the solution of this problem.

An area of Idaho that has a very unusual geologic formation is the north side of the Snake Basin from Idaho Falls to the Thousand Springs area, a vast underground reservoir in the massive porous basalt layers. Surface water losses to this underground stream are common from the St. Anthony, Idaho Falls, Blackfoot north-south line west to the Big Wood Basin. The waters of the Camas Creek-Mud Lake area, as well as the Big and Little Lost Rivers, all disappear into the lava beds, to return to the Snake River in the Thousand Springs reach of Snake River from Twin Falls to Bliss with a steady flow of about 6,000,000 acre-feet per year. We have discussed previously the very critical problems of the Mud Lake area in attempting to balance the spring flows that reach the lake against irrigation demands, losses to the underground, and artificial storage in this big saucer, for later use by agriculture. This problem was recognized in the 1948 "308" Report, but justification of any work that was acceptable to the local flood control district was difficult. In spite of the studies, critical flood problems have arisen and flood fights have been necessary. A solution has not been found that is more than an emergency measure as recounted for the spring of 1969. An adequate overflow channel from the lake to preclude overtopping may be a necessity.

The Big Lost River Basin, the entire flow disappearing within a half mile or so into open basalt, has a similar history of heavy snows, floods, emergency channel work to control the stream, and study for better control and utilization of the waters for flood control, irrigated agriculture, and recreation. The Chilly Sinks, Mackay reservoir with its spotted history, the Arco flats, some of the best trout fishing in Idaho, and intensive agriculture along the channel banks, complicate permanent solutions. The basin needs better control, however, for multiple water uses.

The Big and Little Wood Rivers drain a section of Idaho with spectacular contrasts reaching from dry, parched, rocky lands supporting only rattlesnakes to rich, irrigated agricultural areas, dryland wheat country in the Camas Creek section, heavily timbered areas with good lumber production, high mountainous divides, excellent big-game hunting and trout fishing, as well as a sophisticated recreation section at Sun Valley near Ketchum. Careful studies have been made of the Little Wood River in Carey Valley, through Shoshone, and the reach at Gooding. The design of an adequate flood channel that can be accepted by the local people seems to be a difficult task. The entire basin was also analyzed carefully in the Upper Snake River Basin Report of 1961. That cites the potential for a storage dam above Ketchum for better utilization of the Big Wood waters. With continuing flood problems both in the upper basin from Ketchum to Bellevue and the Shoshone-Gooding area of the lower basin, as well as state emphasis on better water utilization for all purposes, a basinwide survey report review was undertaken in FY 1969. There are many facets to the local and state interest in any plan for tampering with Wood River waters, but again there is need for better control and utilization.

The Boise River Basin is one of the best regulated and highly utilized tributaries of Snake River. However, because of this fact and the pattern of use, the summer flow pattern has become unbalanced and there is possible need for other uses such as an industrial or municipal water supply. In addition, to afford greater flexibility, improve storage regulation for the entire system, and utilize the existing head at Lucky Peak for hydroelectric power, one more unit of storage (the Twin Springs Dam and Reservoir above the Arrowrock Dam of the Bureau) appears feasible and desirable. The Twin Springs Dam has been cited previously in connection with the nuclear cratering studies. The question of optimum development of the Boise system was considered in the Upper Snake River Basin Report of 1961. A subsequent Interim Report No. 6 of that report for the integrated plan of power units at Lucky Peak supplemented by upstream storage for better utilization was submitted in March 1968. Power was also included in the Twin Springs Dam. Later in 1968 the report was submitted to other Federal and state agencies for review and comment. A critical review is underway as this history period ends involving the water users, the muncipalities, ecologists, fish and wildlife groups, recreationists, the Department of Interior, and power interests. Here, as in eastern Idaho, further development of hydroelectric power by Federal means is not looked upon favorably in some circles. The position of the State of Idaho as expressed by the Governor will no doubt have much weight in further development in the Boise system. This is being awaited with interest.

As an inventory of unfinished business the so-called "Boise Front" projects must be cited. Two of them have been authorized and the design for them started. They are important to the growing community and center of government. In addition , the city, county, and the Corps must, as a follow-up, review the completeness of the overall protection afforded this urban area, and question the need for control of adjacent hillside watersheds.

The Upper Snake River Basin Report contains careful analyses for water resource development in the Payette and Weiser River Basins. Both areas are extensively developed for agriculture and, consequently, the Bureau of Reclamation has been the prime mover in further control of the streams with detailed studies subsequent to the Basin Report. The Corps has contributed to them, and maintained a direct interest because of flood control. In addition, throughout this 20-year period of history emergency flood control measures have been taken in the lower valleys of both streams. An extensive levee system, built by local effort and strengthened, extended, and raised by the Corps has resulted. Further control of these streams is needed and subsequent study, either directly or in collaboration with the Bureau, is on the books.

The position of the Salmon River Basin in any inventory of unfinished business is open to debate. There are currently strong forces demanding that the basin below Salmon City (the lower 250 miles) be kept inviolate in perpetuity. This reach of stream has been investigated and analyzed by both the 1948 and 1958 Columbia River Review Reports ("308" Review) citing the water resource development projects of evident economic justification. Wild and scenic rivers legislation, together with that on wilderness areas, sets a large section of Idaho aside, including this reach of Salmon River, and precludes any changes in natural conditions. There is little question that the strong positions taken by the preservation-conservationists will predominate over that of the development-conservationists. With the limited development in the upper Salmon River Basin and relationship to the Snake River Basin below, there is little evidence of potential control measures for flood control or intra-basin consumptive uses. There are interesting potentials for export of upper Salmon River waters to southern Idaho for irrigation purposes, and this idea may bear further analysis as resource development is delved into deeper, and "reasoned choices" carefully considered, in addition to strict economic analyses. Levee and channel work, as well as emergency flood-fight effort, has been done at Salmon City and a few other very local areas including Round Valley at Challis. Further extension of these efforts, other than emergency steps, do not appear imminent.

The Corps of Engineers sponsored a Planning Short Course for District and Division Planning Supervisors in the western half of the United States at Stanford University in June and again in October 1968 titled "Alternatives in Water Management." The main "case study" for that course was based upon the Salmon River Basin, with the presentation of the hydrologic, geologic, geographic, and environmental factors as well as previously studied water resource development potentials. The basin evaluation was presented by this District in an hour-long illustrated lecture. The environmentalists' evaluation of the Salmon Basin was made by Mr. Bruce Bowler, an eminent lawyer from Boise who is an ardent "wilderness" advocate and Idaho Wildlife Federation member.

It will be interesting in the next few decades to see what happens to the Salmon River. A Chinese proverb says "The trees like to be quiet, but the winds are restless." When one is in parts of the Salmon Basin in its primitive state, you can feel the river say "go away and leave me alone" but the "winds" of humanity are "restless."

As outlined previously, the Asotin Dam, without a navigation lock was authorized in 1962 as described in the 1958 "308" Report review. The Inland Empire Waterways Association has always felt that a navigation lock would be essential to the project and requested a review resolution from Congress which was passed in September 1963 by the House. Economic studies for evaluating future waterborne commerce were initiated in 1966 with preliminary evaluations finding that a lock would be economically feasible only when limestone is found to be needed in the lower Snake and Columbia River areas. The report has not been finalized, and the preliminary layout will not preclude a lock's later installation. Polarization has become evident over the desirability of any structure at the site because of the recreational use of the middle Snake River reach from Lewiston to Hells Canyon. The Asotin project was at one time scheduled for construction monies as the logical next step after the Lower Granite Dam was underway in 1966, but has very definitely been put way back on the shelf. The dam is "tarred with the same brush" as the other plans for development in the middle Snake now being debated, and with conflicting legislative proposals. If "clean" hydroelectric power is found the lesser of several evils at a later date, the Asotin Dam is still a logical next step in the late 1970s for Snake River development.

The unfinished business for the District in the eastern part of Washington and Oregon is essentially all in the flood control field other than completion of the four lower Snake River dams. The Palouse River in Washington needs control and the communities of Pullman, Washington, and Moscow, Idaho, need a potable water supply. Pullman also needs flood protection but decries loudly any channel works such as protects Colfax. A survey report-type study is underway. The needs are very real. Answers appear difficult.

The Tucannon, Touchet, and Walla Walla Rivers of southeastern Washington draining the Blue Mountains all are flood prone, including Mill Creek through Walla Walla. Local control works with frequent emergency repairs seem to be the order of the day with future storage potentials on Touchet and Walla Walla Rivers by the Bureau of Reclamation and the Blue Creek Dam on Mill Creek by the Corps. Again, the needs are real but realization may take time.

The Umatilla Basin in Oregon through Pendleton has considerable local flood protective works along its banks and requires frequent emergency repairs. The Bureau of Reclamation has an extensive irrigation study underway which, if realized in the '70s, will afford considerable control.

The Malheur, Grande Ronde, and Willow Creek (Heppner) problems have all been reported upon in this history. The Powder River lying between, with Baker and its large Baker Valley vulnerable to floods, has been afforded protection by the new Mason Dam in the upper Powder Basin, built by the Bureau of Reclamation. We trust that future accounts will show that their problems will all be little ones from now on.

The large John Day River Basin in north central Oregon and the most unusual closed Silvies Basin to the south are receiving extensive study for not only flood control but much better utilization of its water supplies. They are a somewhat isolated section of the state with flood problems, need for irrigation waters, good fish and wildlife habitat, a good cattle country, and an area interested in welcoming people on vacation. As of the preparation of this document there are many potentials being discussed and we trust some of them will come to fruition.

THE INLAND EMPIRE DISTRICT

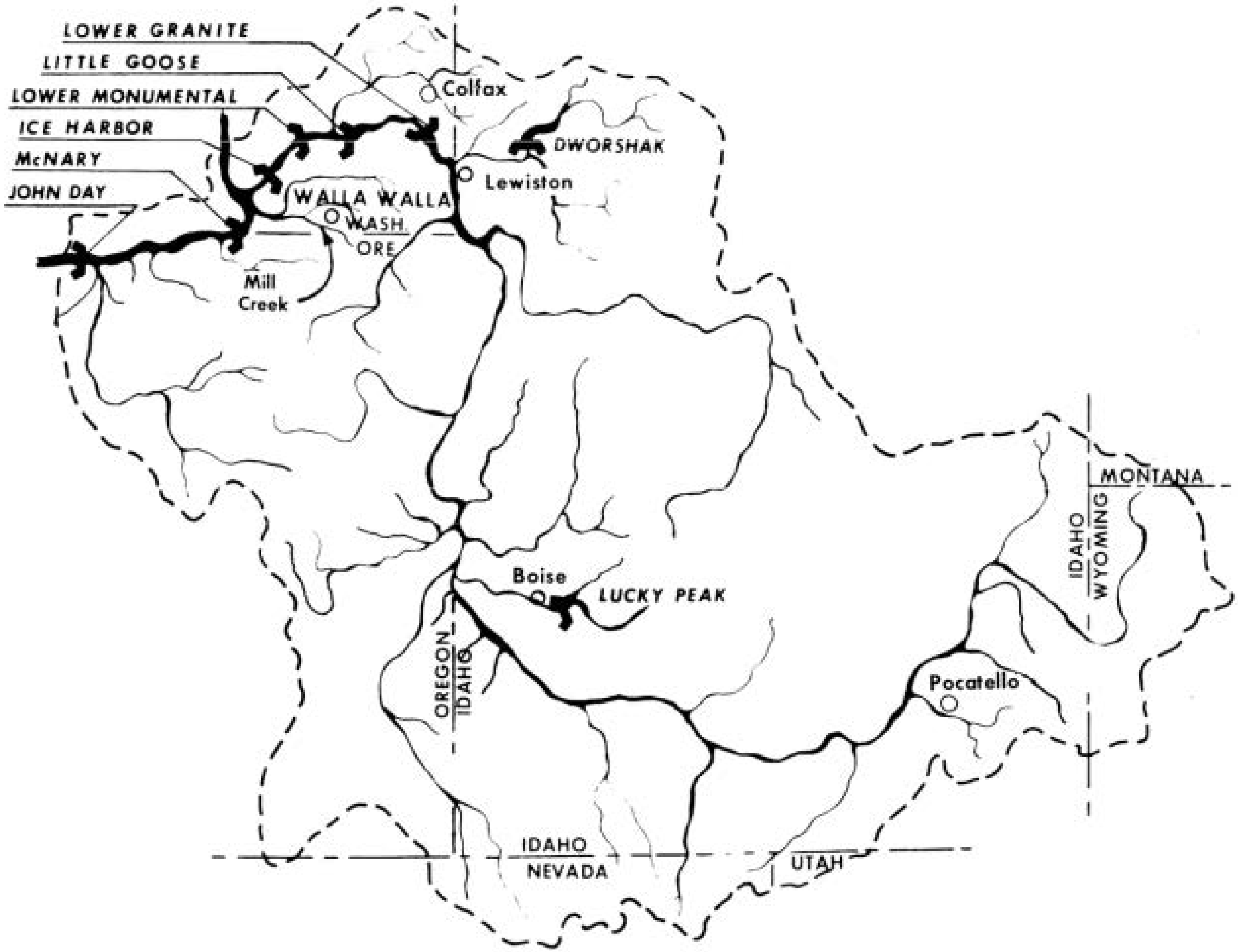
Bill Gulick, the eminent present-day writer of Inland Empire stories, has just completed a well illustrated and perceptive narrative about the entire Snake River Basin titled "Snake River Country". In his preamble he says - "Somewhere along the way I learned that a great river influences the lives of the people in its watershed just as surely as the acts of those people influence the life of the river. Without water, people die. Without people's concern, a river dies". Such a true statement, and one which all of us trying to effect some semblance of control of our turbulent streams and having them work for man, are always thinking of.

In retrospect, as one ticks off the many studies underway, the remaining needs for water control, and the difficulties inherent in realizing them from an economic standpoint, the environmental protection evaluation, and the needs of people, a phrase from a technical paper comes to mind. "Benefit-to-cost analyses should be used to evaluate the economic feasibility of any particular water-resource management effort, and to aid in the selection among management alternatives. Their use should stop there. The final selection should be based upon a careful balancing of technological, legal, social, and political factors as well as economic consideration." If we could just put some dollar values on those other factors to go along with the economic dollars!

Toynbee once wrote "You can measure people by their response to a great challenge." History will show that the Walla Walla District had, and still has, a great challenge--many of them. The response of the first 22 years will show in many more ways than the concrete, steel and rock revetment that makes up the "monuments" described in Part II of this history. The benefits to the entire western United States will, I am sure, be much greater than the total dollars mentioned by LTG Wm. F. Cassidy, Chief of Engineers, when visiting the District in September 1968. In reviewing the projects he stated that of all the civil works dollars appropriated to the Corps of Engineers for construction since their establishment by George Washington, the Walla Walla District in 20 years had spent one tenth of that total amount. Those benefits will grow with the next two decades. Even though the expenditure may not be as large in the future, the needs of the Inland Empire people are great and its growth potentials are marked.

P A R T II

"T H E P R O J E C T S"


LOWER GRANITE
LITTLE GOOSE
LOWER MONUMENTAL
ICE HARBOR
McNARY
JOHN DAY
Colfax
DWORSHAK
Lewiston
WALLA WALLA
WASH.
ORE.
Mill
Creek
Boise
LUCKY PEAK
OREGON
IDAHO
MONTANA
IDAHO
WYOMING
Pocatello
IDAHO
NEVADA
UTAH

PREAMBLE

This initial period of history for the Walla Walla District is basically project oriented. The District's original charge was the construction of McNary Dam on the Columbia, the four lower Snake River dams, and Lucky Peak Dam on Boise River. Other tasks envisioned for the new District in the Inland Empire were also structure related--not the extensive maintenance dredging, clearing and snagging, and repair and restoration efforts so prevalent in the older coastal and established mid-continent inland waterway districts.

Early "operation and maintenance" work was accomplished by a unit within the Construction Division. It wasn't until October 1958, ten years after creation of the District, that a full fledged Operations Division was established in the District Office. This came about because of the growing complexity of keeping completed works in operation; the growing demand for better reservoir management; and the extent of levee and channel works that had come into being throughout the District, as well as emergency flood control measures demanding attention.

Part II of this tome will recount some of the highlights of the establishment of projects and putting them into operation. The accomplishments of most of them toward the betterment of the "well being" and economy of the Inland Empire and, in fact, the western part of the United States must be evaluated in the history of the District for the ensuing period. Better judgment can then be placed upon their impact on the water resource development of the basin and relationship to people. So far, I believe the people of the region as a whole will support the thesis that the development of our streams in the Columbia Basin for the economic betterment of the region and the country has been very much on the plus side. True, some ardent "environmentalists" decry any disturbance of our streams--for any purpose--even people--possibly forgetting that "environment" is also defined as a part of the central city and its needs.

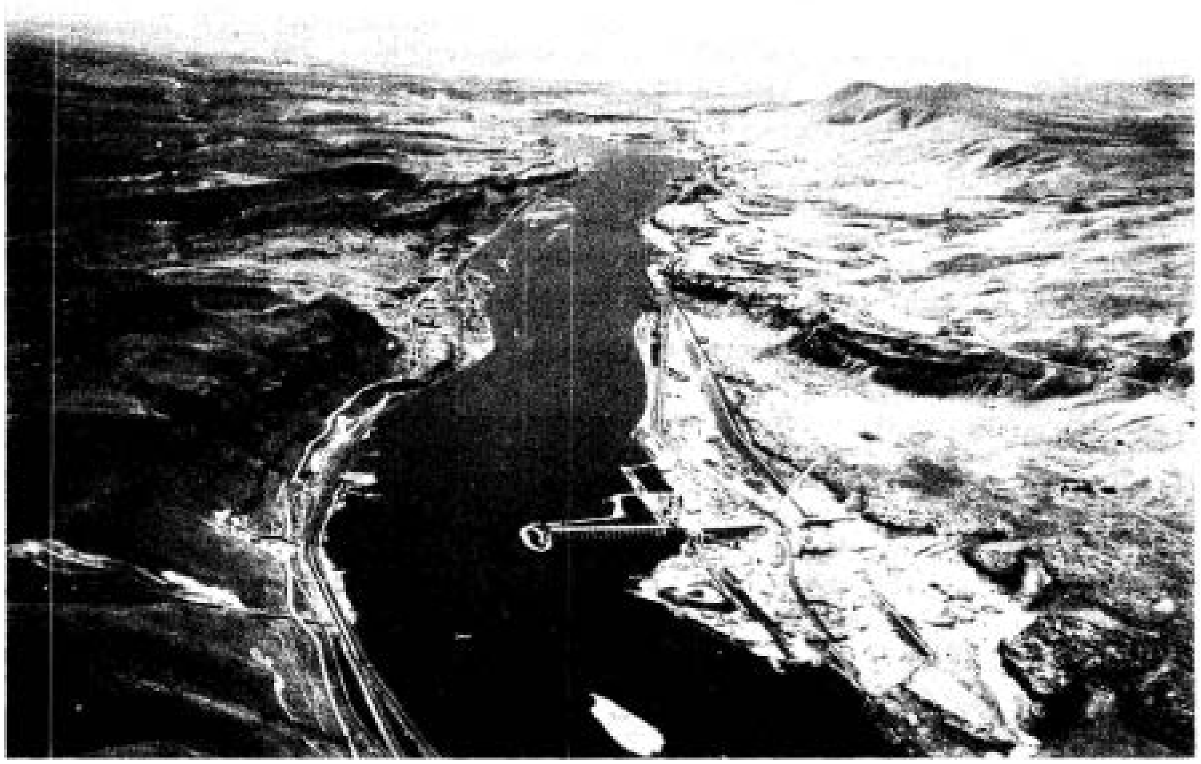
In spite of this construction effort of the District, practically second to none other in volume of work accomplished in a 20-year period, the staff has been constantly alert to the impact of the projects upon people and the resources. Tremendous strides have been made toward the optimum use of the project-related lands by the public, by commerce, and our wildlife, and the District staff has been the catalyst for much of it. Research has been an integral part of development to minimize the impact of projects upon the locality. In addition, the young, virile staff of the District constantly searched for better ways of accomplishing the task at hand, and as a result the District has received kudos for innovative and better projects.

When placed into the operational phase, the District has again received high marks for recognizing community needs and opportunities of serving both commerce and people. Project operation--and features--have been modified to afford the best practical service for our natural resources as well as the manufactured ones. A sixth grade young lady in one of our city schools was a part of a class experience in a five-day resource study at a youth camp. They investigated an old abandoned community, as well as the many parts of the forest and stream, talking about plants, animals, ecology, and environment. The girl commented, "We don't have any environment where I come from." Water resource development projects many times help to put some positive "environment" where she comes from. The service to people by these projects will be an important evaluation for the ensuing period of the District's history.

JOHN DAY DAM

THE PROJECT

The advent of the John Day project foretold a cardinal event--the completion of the lower Columbia resource development for multiple-purpose use. The attempts to improve the stream for transportation of man and his goods, which started 100 years before, were approaching fruition. The sequence of those efforts is recounted to some extent in the first part of this history, and that of the Portland District also tells of early plans and efforts.



JOHN DAY DAM SITE AREA LOOKING WEST WITH MT. HOOD IN BACKGROUND

A dam at the John Day rapids was first discussed seriously in early 1932 in H. Doc. 103, 73d Congress, 1st Session, (printed 10 June 1933). In that report the consensus was that a system of ten dams should ultimately be built on the Columbia River in the United States, primarily by other than Federal interests, but any project below Snake River should be required to have a navigation lock in it 60 feet wide, 360 feet long, with a 9-foot depth over the lock sill. That report opted primarily for the Warrendale site (Bonneville) and "Head of Grand Coulee" as the most practical first units, knowing that the Bureau of Reclamation was very interested in the Grand Coulee site for power and irrigation. The Chief of Engineers as one of the main reasons for not recommending any major construction at that time found that this "...ultimate development to be foreseen would have an installed capacity of about 8,000,000 kilowatts. The Grand Coulee development alone would be able to meet any probable increase in power needs of the accessible area for a period of 30 years in the future." These were deep depression days and "belt tightening" was the order of the day. Federal programs for relief of our economic ills had not been promulgated as yet.

The John Day project was subsequently reviewed as an integral part of the 1948 review of the Columbia River "308" Report. The Flood Control Act approved 17 May 1950 as Public Law 516 is the authorizing document for projects cited in that review, including the John Day Dam. As then envisioned, its reservoir would contain 2,000,000 acre-feet of flood control storage in the top 40 feet. This large pool fluctuation in this particular reach of the Columbia River and its impact upon the communities was found to be very damaging and by a review report submitted to Congress 9 August 1956 (S. Doc. 10, 85th Congress, 1st Session), the flood control storage was reduced to 500,000 acre-feet, to be used primarly as a "last ditch stand," assuming upstream storage would accomplish most of the control needed.

As discussed in the first part of this history, General Order 15 dated 12 July 1955 from the Office, Chief of Engineers established new District boundaries which placed the John Day project and the John Day River Basin in the Walla Walla District. A letter from the North Pacific Division Engineer dated 18 July 1955 advised this District that it would have the responsibility for planning and design of the project. A subsequent letter of 10 August 1955 transmitted the first advice of allotment for work on the dam. The fiscal year 1956 allotment was for $550,000 and the 1957 allotment was for $1,450,000. A site selection report was initiated and submitted on 15 June 1956.

ITS LOCATION

The John Day project, unlike the dams on Snake River where construction progressed upstream, was required to fit snugly in between two projects with essentially fixed characteristics. The Dalles Dam which started in 1952 was well along to fruition and its pool elevation set at 160 feet with the upper limit of its backwater influence at about the mouth of John Day River. The McNary Dam upstream was a going concern with certain tailwater requirements for navigation, power production, and fish passage. John Day Dam had to be tailored to fit these two.

The site selected for the authorizing document of 1950 was at river mile 217.3, slightly below the mouth of the John Day River. That site, while apparently suitable otherwise, showed a rather deep hole in bedrock near the north bank and the earlier reports had qualifications as to the acceptability of that exact site. When approval was received to initiate design studies in 1955 the actual siting of the project was the first order of business. A five-mile reach of river was carefully examined, covering about an equal distance both above and below the John Day River.

Several factors had to be considered in selecting the site other than the physical condition of the river channel and its geology. Navigation to and past the dam was an important one with a need for adequate sailing lines and insurance of a good, deep approach for the lower lock entrance without critical cross currents. Power production and optimum operation of the turbines was another. As recounted in the first section of the history, new concepts of hydroelectric power generation relating to both size of units, their setting in the water column, and the number of units for peaking capability, as developed by the blue ribbon task force of the District staff, dictated more overlap of projects to obtain deep, lower draft tube settings.

The need of storage space for the necessary 500,000 acre-feet of flood control with a minimum of reservoir fluctuation emphasized locations below the mouth of John Day River. In addition, relocation problems in the five-mile reach also had their impact. A critical factor which had to be weighed carefully against other advantages or disadvantages was the fish and wildlife aspects of the John Day River. That stream supported a good run of anadromous fish, particularly steelhead trout. Chinook salmon used the stream to some extent and planting of juvenile fish was being undertaken, along with screening of irrigation diversions in an attempt to build up the fish runs.

The Oregon Game Commission, as an expression of concern which was reiterated by other state and Federal agencies, stated:

> "The John Day River is an important factor in maintaining the anadromous fish runs of the Columbia River. Locating the dam above the mouth of the river would be of great benefit to these runs. The difference between having to negotiate two major dams, or three, will be significant and could spell the difference between a marginal run and one which can yield a harvest."

The Washington Fish Commission expressed an even broader objection.

> "It is apparent that despite the protests of the combined fishery groups, some type of dam is to be built at this site. Assuming this, our position is that one of minimum height should be erected and all flood control features be deleted from the project in order to minimize potential fish losses that will mount as the height of the dam increases. We also urge that if this dam is to be constructed, it should be built above the mouth of the John Day in order that this river may be left as another means of partially minimizing the fish losses that will occur."

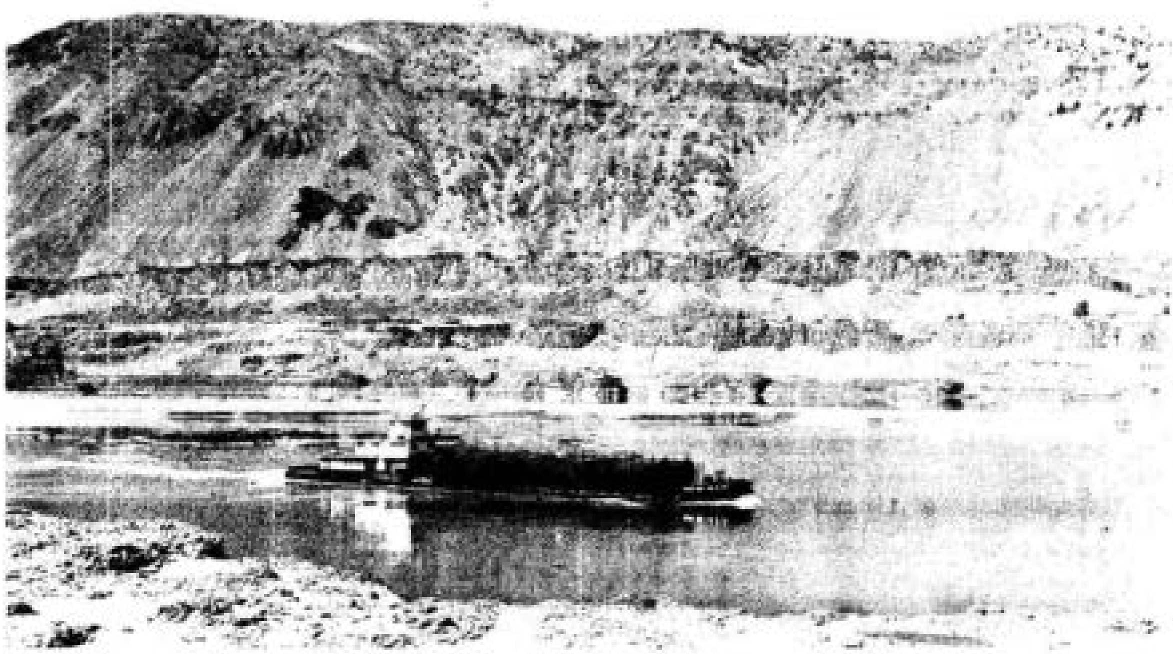
COLUMBIA RIVER GORGE - VICINITY OF THE MOUTH OF JOHN DAY RIVER

Five sites were selected for careful study during the winter and spring of 1955-56. The results were furnished a Site Selection Board for examination and evaluation early in April 1956. The site selection report was completed that June. The detailed studies, including preliminary layouts of structures and cost estimates were for dams at river miles 215.3, 216.4, 217.3, 218.0, and 220.2. After weighing costs, benefits, physical problems, and the intangible ones like fish runs and people, this Board selected the location at river mile 215.3 as best, and planning proceeded on that basis.

Just one year later, March 1957, the District assembled a distinguished Board of Consultants composed of five consulting engineers from the private sector, along with men from OCE and the Division. This Board made a critical evaluation of the District's studies, including three alternate layouts for the dam which previously had been established near river mile 215.3, but finally was located at river mile 215.6. Mr. Franzen in his introductory remarks rather modestly said, "The project is rather large scale; our spillway capacity is 2,250,000 cubic feet per second; we recommend an ultimate power installation of 2,500,000 kilowatts (later increased to 2,700,000 kw); our lock will have a 110-foot lift; we have a 77-mile reservoir; and we have quite a bit of relocation work--80 miles of SP&S, 60 miles of Union Pacific, 40 miles of Washington highway, and 30 miles of Oregon State highway." (Mr. Franzen forgot to mention incidentally that two communities were moved in their entirety and major segments of two others were to be relocated, also.)

The Board's evaluation resulted in an overall plan for a straight axis dam with agreed foundation and structural conditions, and the District went to work on detailed design. The cost of the dam as then planned was $420,438,000, only $18,000 more than the estimate made for the 1948 authorizing report, which was quite a different structure. The July 1970 cost estimate is $469,000,000.

The structure, as finally planned, consists of a fish ladder and powerhouse against the Oregon (south) shore with the powerhouse structure 1,975 feet long housing 20 units of 135,000 kw generating capacity each. In the center of the river is a 20-gate spillway 1,228 feet long with individual tainter gates 50 x 59 feet. Between the spillway and the navigation lock is a second fish ladder, then the standard navigation lock at the north (Washington) shore with clear inside dimensions of 86 x 675 feet having a maximum lift of 113 feet--the highest single lift in the world. The lock has a downstream vertical lift gate 86 x 114 feet. Connecting these three units and tying the structure to the Oregon shore cliffs are four segments of concrete non-overflow dam aggregating 868 feet in length. On the Washington (north) shore an earthen embankment 1,608 feet long ties the concrete structure to the canyon wall, making an overall length of structure of 5,869 feet. The relocations work for the railroads, highways, communities, and incidental facilities through the 77-mile-long reservoir area involved the handling of almost 200,000,000 cubic yards of materials, much of it hard rock.



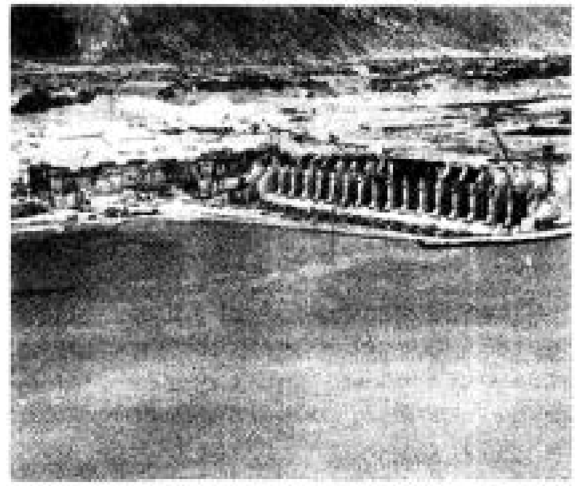
NAVIGATION ON OPEN RIVER IN THE PROJECT AREA

CONSTRUCTION

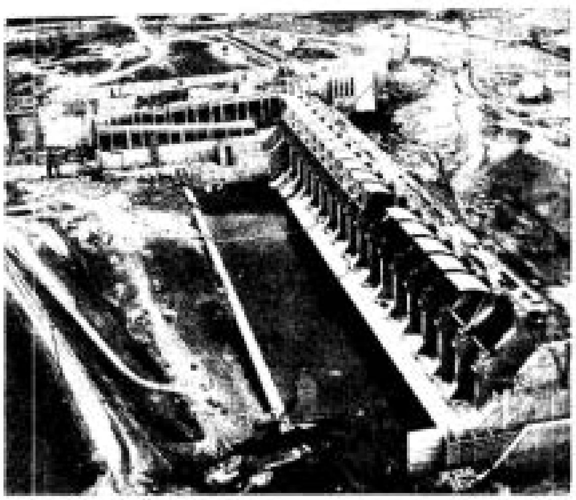
To build a structure in the Columbia River with a 10-year construction period, it is imperative that navigation on the river be maintained. This criteria, along with others, dictated that building of the dam start at the north shore and progress south to the Oregon shore. Funds allocated during 1956 to 1958 were utilized for design purposes. A fiscal year 1959 allocation of $7½ million signaled the start of actual construction. The north shore cofferdam, as well as some of the incidental items on that shore, was started in July 1958 and completed before the flood season of 1959. This first stage included the navigation lock, north embankment and concrete nonoverflow section, the fish ladder, and 19½ bays of the 20-bay spillway, all within the cofferdam or on shore. Since the river continued to flow in the south half of its natural channel, there was no impediment for fish or navigation.

The contract for construction of these dam features within the first step cofferdam was awarded in December 1959. A big celebration was held on 4 June 1960 for the symbolic first concrete pour, attended by the Division Engineer, Inland Empire Waterways executives, people from the surrounding communities and, of course, those directly related to the event. Construction within this cofferdam progressed without any great impedimentae from nature, such as floods or extra severe weather.

1st STEP CONSTRUCTION - 1959



FLOOD STAGE - JUNE 1961



1st STEP NEARING COMPLETION - 3/62

SOUTH SHORE WORK - FALL 1962

The cofferdam received the supreme test during the spring flood of 1961. It was designed to withstand a flood of 700,000 cfs without overtopping. To prove the computer, slide rule, and engineers were accurate, the flood that spring peaked at 699,000 cfs and came within inches of the top of the cofferdam. Man, in his quest for his considered well being, created some problems in that periodic strikes by several unions at various times delayed the progress to the extent that the contractor was permitted an extension of construction time of 174 days during the life of this contract.

In the subsequent discussion of the Ice Harbor downstream navigation lock gate, with the transition to a vertical lift type, problems of adequate construction techniques are discussed. These really came to a head at John Day where the problem of adequate welds for the type of high strength steel used came to the surface. The shop welds for the fabricated sections of this unprecedented sized gate were questioned and examined. This gate for the highest single lift lock in the world, a distinction wrestled from the Ice Harbor project by the fact that it has a design head of 113 feet compared to Ice Harbor's 103 feet, is 88 feet wide and 113 feet high. It is an all welded structure of a series of arched girders 15 feet thick with a skin plate 1-1/8 inches thick and weighing 1,800,000 pounds.

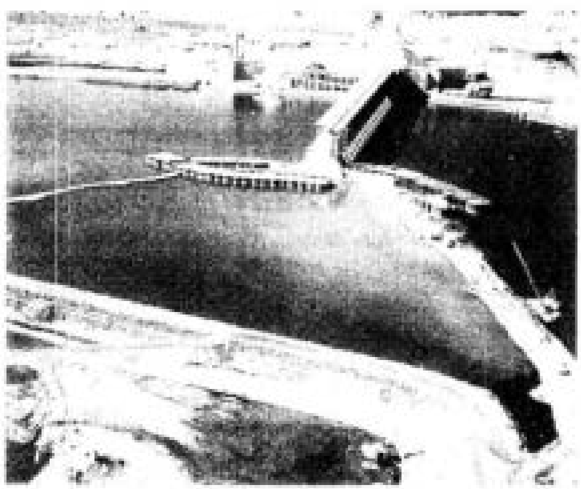
Because of reports from Mountain Home Missile Base concerning underbead cracks adjacent to the welds in T-1 steel, this District decided to spotcheck the welding on the downstream gate sections as they were shipped to the site, using radioactive isotopes and ultrasonic tests. This proved to be no short afternoon's procedure. The request for testing was initiated in September 1961; the first two sections of gates were received at the site in February 1962; first reports on examination received in April 1962; a consultant team was employed in May 1962; extensive tests and evaluations continued until August 1962; and a decision to repair the gates was made on 10 August 1962. Erection of the repaired sections in the gate slot started on 22 October 1962 and was completed by 27 February 1963--a year and a half of careful professional evaluations and, to some extent, innovative and pioneering engineering in the handling of exotic steels and their use. The contract execution was delayed 163 calendar days due to the experience.

During the construction period for the north half of the river, preparations were underway on the south shore to tailor it for initiation of the second phase of construction. It was necessary to put the Union Pacific Railroad and highway onto a shoofly and detour riverward in order to prepare the narrow ledge on that side of the river for the permanent alignment for both traffic routes. This was initiated in June 1960. The railroad operates approximately 20 trains a day on its single-track line and Highway 30, a transcontinental system, carries heavy truck and auto traffic. Accordingly, heavy duty, adequate detours were a must. In addition, the state was in the process of converting the route into a four-lane section of Interstate 80N, necessitating extensive modification of design criteria for the permanent realignment. This change applied to all of the highway relocation work on the south shore.

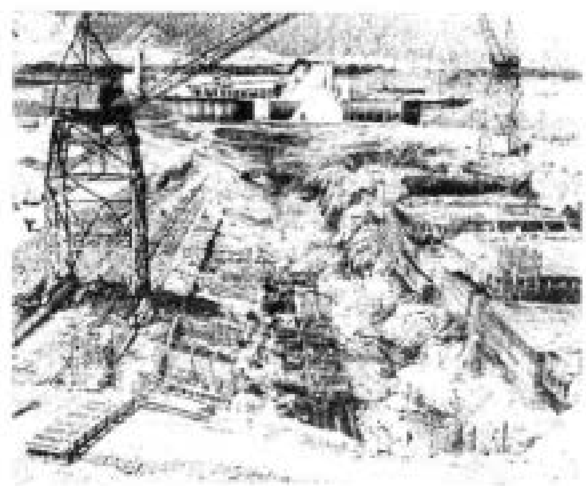
The necessary low-level temporary traffic facilities were completed in the fall of 1961, making way for some of the permanent dam nonoverflow structure against the cliff landward of the detours. This was started in June 1961 and completed in May 1962. That short section of dam structure, in turn, made it practical to start the grading for the permanent railroad and highway alignment over it and in the reach past the dam eastward to the mouth of the John Day River. That highway and railroad work was combined with the construction of the second-step cofferdam on the south shore, all in one package, which was started in August 1962, extending to June 1964.

In the interim period, work progressed on the north shore so that by June 1962 the permanent structures within the cofferdam were sufficiently advanced to permit the cofferdam removal. As soon as the flood season was over the south shore cofferdam was started. In order to permit work to start without delay on the powerhouse excavation, an intermediate river leg dike was built parallel to the Oregon shore while the larger cofferdam was being completed. The final cofferdam enclosed an area of about 80 acres and was in place by November 1963, encompassing the area for the powerhouse, fishladder, concrete nonoverflow sections, and the south end of the spillway.

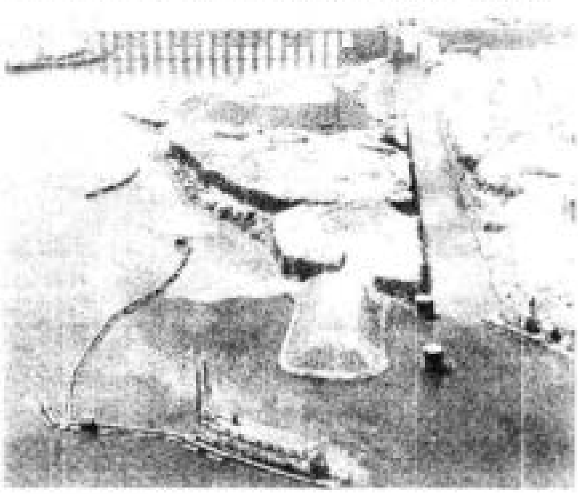
The cofferdam design was innovative by the District staff, in that the upstream and downstream legs were designed for earth embankment materials using steel cells only for the river face, where space is at a premium and stream velocities are high. This new concept has proven highly successful, even where the differential head has been as much as 60 feet, as at John Day. The ultimate in this concept of cofferdam construction was reached at the Little Goose project where the structure to enclose a 60-acre area has only 16 steel cells around the river end of the cofferdam.



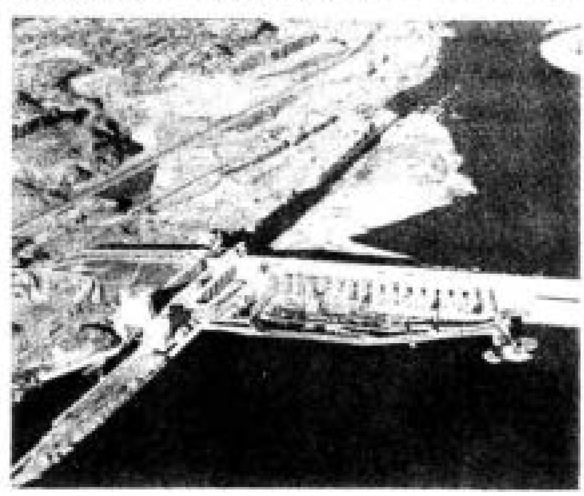
SOUTH SHORE COFFERDAM - FALL 1963



POWERHOUSE CONSTRUCTION - JULY 1964



TEMPORARY NAVIGATION CHANNEL



RAISING LOW SPILLWAY BAYS - 1967

Some of the steel cofferdam cells used at John Day are among the largest ever built. They were of the cloverleaf type over 80 feet high and 72 x 55 feet in plan. They differ from other large cells in that they rest on bedrock with no overburden to lend lateral support. During this second stage of construction the river passed through 17 of the spillway bays that had been left 75 feet lower than their ultimate height. Navigation proceeded through a temporary blockout in the upper sill of the lock and a temporary upstream entrance channel through a rock bluff. This condition for river and navigation held from early in 1963 until January 1968 when the raising of the pool behind the dam became imminent.

The contract for the construction of the south half of the dam was let on 9 August 1963. This $78 million contract included not only the work in the cofferdam area, but its removal, construction of the third-step cofferdam and raising of the low spillway bays, completion of the navigation lock upper sill, removal of the third cofferdam, and essentially putting the project into operation by raising of the reservoir behind the dam. The five years of concentrated effort for this second step construction; the critical third phase; the raising of the reservoir as well as the attention to the many contracts for relocation work in the reservoir area, was a very active period.

Localized foundation and construction problems, material and equipment supply problems, as well as difficulties with nature and man, presented themselves to be solved not only by the contractor, but by the designer, the financial experts, and Resident Engineer. The records would indicate that a well coordinated tripartite team solved the problems without materially affecting the five-year overall construction schedule for this segment of the project work.

The first concrete for the powerhouse and other structures in the second-step cofferdam was poured on 26 June 1964 and the occasion was appropriately documented by a celebration at the site. The concrete and structural work continued almost continuously until January 1967, when it was complete enough to remove the cofferdam during the ensuing three months. The next major step was to raise the 17 low bays of the spillway and complete the upstream sill and gate of the navigation lock. This required the third-step cofferdam which was closed in August 1967, right after the spring high water, diverting the entire river flow through ten skeleton bays of the powerhouse structure. Completion of this phase of the project during the third-step diversion was the most critical in the entire construction. Time was of the essence and the contractor worked six days a week during most of it and seven days at critical periods. He placed 225,000 cubic yards of concrete to raise the spillway bays during this winter period.

From January to April 1968 the navigation lock was closed to traffic while the upper sill block was raised, and work on the lock and upper gate completed. Temporary pipelines were used to transfer petroleum products, caustics, liquid ammonia, and other chemicals around the project, to and from barges upstream and downstream. Seven eight-inch diameter lines were installed with appurtenant pumps, valves, and fixtures serving two separate docks above and three below the dam. No provision was made to handle dry bulk commodities, such as small grains or miscellaneous cargoes.

Fortunately, streamflows and weather conditions were fairly favorable that winter, and all was in order on 16 April 1968 to close the intake gates to the ten skeleton power units in the powerhouse and start the impoundment.

The filling of the reservoir was not just simply closing the outlet spigot and letting the bucket fill up. The date for the filling was a three-way compromise. The contractor would have liked more time to accomplish the preparatory work. The fishery interests were very concerned over the early spring runs of steelhead trout and Chinook salmon and wanted the filling action which would stop all fish movement out of the way by the last of March. In addition, they felt very strongly that the initial filling should take no more than three days because of the complete block to the fish movement. The navigation interests, of course, were more than anxious to complete the work and eliminate the impedimenta. The critical factor, however, was water, and when it would be available naturally, or in a sufficient quantity from some artificial source.

The 77-mile-long reservoir contains better than 2,000,000 acre-feet of stored water. Mid-April was considered about as early as adequate natural flows would be available. Knowing this would still not be sufficient to fill the reservoir in the time required for the anadromous fish, releases from upstream reservoirs had been negotiated with the Bureau of Reclamation, Idaho Power Company, and Bonneville Power Administration. Water releases to arrive in the John Day reservoir during the three-day schedule were carefully planned. Storage from nine projects was released from 10 to 50 hours ahead of the zero hour. Those projects contributing to the success of the venture were:

Albeni Falls	245,000 A.F.
Duncan (Canada)	35,000 A.F.
Kootenay Lake	44,000 A.F.
Grand Coulee	360,000 A.F.
Chief Joseph	81,000 A.F.
Wells	34,000 A.F.
Brownlee (Idaho Power)	113,000 A.F.
Ice Harbor	20,000 A.F.
McNary	180,000 A.F.
	1,112,000 A.F.

The natural flow of the river did the rest. Since it was actually a below-average flow, the filling required an extra day to put the fishways into operation.

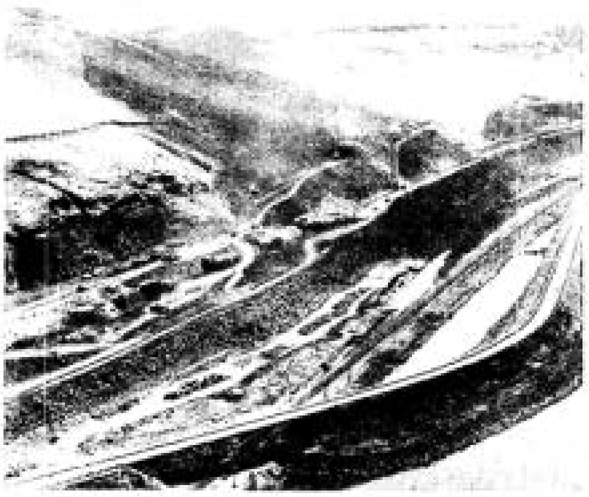
During the first day after the closure there was no water flowing past the dam and the mighty Columbia River was uncharacteristically quiet. The Dalles and Bonneville Dam reservoirs were used to maintain about 50,000-cfs flow in the lower Columbia. As soon as spill was possible at John Day, releases of 50,000 cfs were made for the lower river. The filling plan worked successfully, the 2,000,000 acre-feet of water was in the reservoir, and the project placed into operation on 21 April 1968, providing the final link in slackwater navigation from the ocean to the Tri-Cities area, a distance of 325 miles, and up the Snake River another 40 miles. The first generating unit went on the line 12 July 1968. Construction work at the dam, in the reservoir, and on fish hatcheries will continue until almost 1975 so future treatises will recount the myriad of loose ends yet to be collected and some of the impact of the project on mankind.

RELOCATIONS

The movement of five towns, 140 miles of railroad, 87 miles of roads, and many people with firmly established daily lives requires patience, understanding, discussions aplenty, negotiations, and in some cases legal proceedings. Behind it all are endless searching of records, studies, evaluation of property conditions, and careful documentation. The real estate transactions for the entire John Day project required the procurement of 58,540 acres of land and appurtenances at a cost of $12 million. The process of obtaining rights-of-way starts as soon as the delineation of project needs can be made and usually carries beyond the completion of work. The relocation costs for the railroads, highways, utilities, and communities affected by the reservoir amounted to $165 million of the total dam cost of $461 million.

Work on relocations was initiated by the first contract awarded in 1958 and continued until the summer of 1968. Ten major contracts were utilized for moving the 80 miles of railroad on the north shore (Spokane, Portland & Seattle). When the rail was laid on the new alignment, new welding techniques were employed, with the rail sections welded at a central location into lengths of 1,400 feet and transported to the site. The entire 80 miles of new track were constructed as a continuous welded rail operation. The new line was occupied in June 1967.

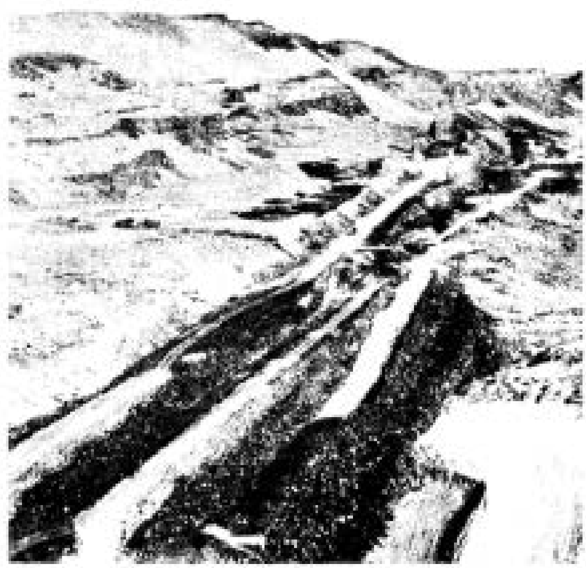
The relocation of the main line of the Union Pacific Railroad on the south shore was complicated by the steep terrain of the canyon walls and the necessity of finding space not only for it, but for Interstate Highway 80N in sections of the canyon. In some places the new routes, because of high talus slopes and rock cliffs, overlapped the existing old roads, necessitating numerous "shooflies". This relocation started in 1961 and was accomplished in three major stages. The 60 miles of railroad and 34 miles of Interstate Highway 80N were complete by the summer of 1967. Congress had already passed the Interstate Highway Act which changed the classification of the existing Highway 30 and, prior to the completion of relocation negotiations with Oregon State, had passed a bill which made projects similar to John Day responsible for relocation of highways to present standards for existing traffic. This dictated a combination of two- and four-lane construction, depending upon grade and access. The added cost for completing the highway to four-lane interstate standards was assumed by the State of Oregon. About 40 miles of Washington State Highway No. 14 was similarly relocated along the north shore parallel to the SP&S rail line and completed late in 1965.



I-80 HIGHWAY & UPRR RELOCATIONS

BORROW AND RELOCATIONS
BLALOCK, OREGON

MOUTH OF WILLOW CREEK, OREGON



NORTH SHORE HIGHWAY AND
SP&SRR RELOCATIONS, WASH.

The relocation of rail and highway facilities encountered two spectacular disasters during the process, both because of floods. A very unusual sequence of weather conditions caused major flooding and damage or 22 and 23 December 1964, nct only in the numerous minor tributaries ard normally dry canyons and draws along the John Day reservoir area, but also in contiguous areas including the entire John Day River Basin. Steep water courses draining relatively small areas averaging three to eight miles in length discharge into the Columbia River along both the north and south shores. The design discharges for the numerous bridges and culverts in the relocation work were based on 50-year rainstorms combined with snowmelt. One such canyon (Alder Creek) where the railroad and highway structures over it were designed for 6,500 cfs carried an estimated 17,700 cfs.

HIGHWAY AND RAILROAD DESTRUCTION AT ALDER CREEK CANYON, WASHINGTON

Considerable repair work was required throughout the reservoir area and design discharges were re-evaluated. Even the contractor and Corps headquarters at Rufus, Oregon, just downstream of the dam were not exempt. Erosion, debris, and deposition created havoc in this small community and construction work on the dam was halted for several days because workers were unable to get to work. As discussed briefly in Part I of this history when discussing the project, the second and most serious disaster as a result of the same flood was the failure of the foundation under one bridge pier of the new Interstate 80N bridge over the mouth of John Day River just two miles upstream of the dam. Excessive flood flows undercut the pier, causing the loss of two deck spans then high above the natural river. One man was killed when he and his car went down with the bridge, and later a car ran the highway barricade and plunged off the bridge, killing two men. For the traffic on the freeway, it was fortunate that the old lower level highway bridge had not been destroyed and a temporary detour was utilized for several months until the spans could be replaced.

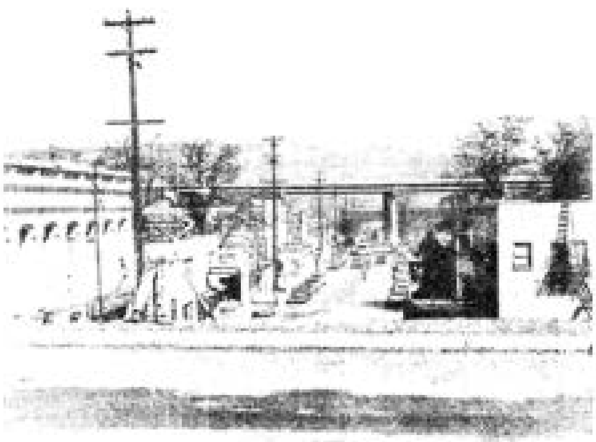
THE COMMUNITIES

The reservoir requirements dictated that portions or all of four towns be relocated, complete with community services such as schools, city hall, and utilities, with full consideration of all the attitudes and desires of the affected people. These were Arlington, Boardman, and Umatilla, Oregon, and Roosevelt, Washington. Of these, Arlington received the greatest impact. Located on the Columbia in a canyon at the mouth of China Creek, the business district occupied most of the limited canyon bottom with the residential area spreading to the steep hillsides. The John Day reservoir and relocation of the railroad and highway landward would flood or eliminate about 90 percent of the business area and approximately 25 percent of the residential area, including the school. Several schemes to provide either protection or reconstruction were studied and presented to the residents of the community for their recommendations. One even proposed to move the entire community out of the valley and onto benchlands to the west. Their preference was to relocate the homes and school on higher surrounding ground, but maintain the central business area in approximately its original location.

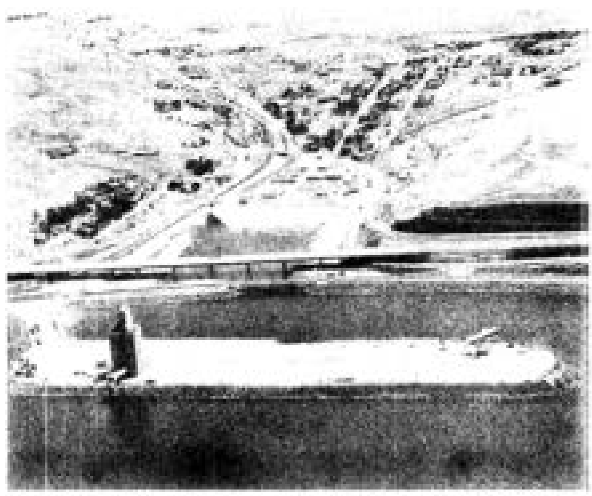
To effect the business relocation an eight-square-block area near the southerly or upper limit of flooding which had been partly business and partially residential was selected and cleared of buildings. A compacted fill was then constructed to raise the new business area out of the backwater zone. In order to minimize settlement after the pool was created, a unique system of consolidation was resorted to. The natural dry silts in the canyon floor were saturated through a system of wells into which was pumped river water. This saturation was maintained during the placing of up to 30 feet of gravel fill, and for a short time afterward. Settlement since filling the reservoir has been negligible. This procedure was an innovative method of insuring a solid foundation for the community, wherein saturation of a porous silt soil, with a high fill superimposed on top, has been utilized to provide a stable base upon which to build.

ARLINGTON, OREGON - BEFORE

ARLINGTON DURING TRANSITION



ARLINGTON - OLD BUSINESS AREA

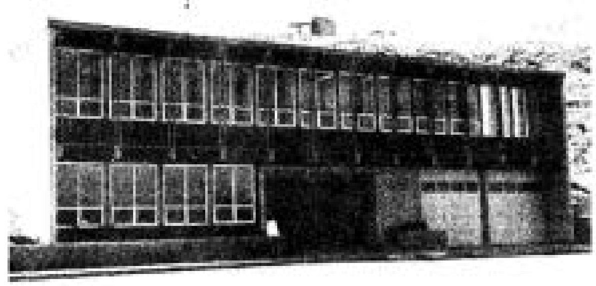


ARLINGTON'S NEW WATERFRONT

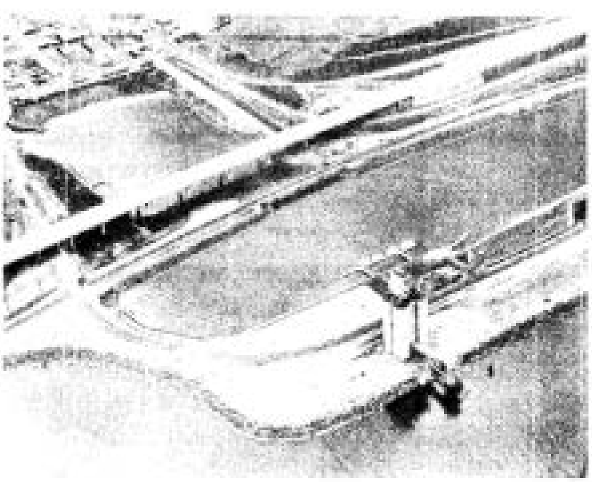
One of the first steps to vacating the portion of Arlington to be flooded was replacement of the grade school building, a typical school building of the turn of the century in the older section of the community. The new school site was selected on the benchland above the town and a modern one story building and playfield designed. Congress in 1958 passed a new law providing that, for relocation work such as this, when necessary because of a Federal project, the replacement of public facilities, roads, public buildings, and schools would be to modern standards for the current use, not based upon an appraised present value. The contract for the new school was let in May 1960 and occupied in the winter of 1961-62.

In a similar manner, new schools were built for the community of Roosevelt, Washington, across the river from Arlington, and also at Boardman, Oregon. Subsequently, at Arlington, a new city hall and sewage disposal plant were built and considerable work done on drainage and water supply, including lining of China Creek which had been an intermittent flood problem. While the upheaval at Arlington was particularly difficult in keeping a going community in operation during the process, as well as being nostalgically painful, the changes have resulted in modern new buildings in the business district, new streets, new public utilities, new city hall, new school, and a new port and recreation facilities on the new lake. About \$3½ million of Federal monies were spent at Arlington in the process.

ARLINGTON, OREGON - SCHOOL



ARLINGTON, OREGON - CITY HALL



ARLINGTON, OREGON - PORT AND RECREATION AREA

BOARDMAN, OREGON - SCHOOL AND COMMUNITY

The communities of Roosevelt, Washington, and Boardman, Oregon, were moved in their entirety by adopting a new location and starting fresh, after the pains of choosing the proper site. This afforded a more orderly transition. At Umatilla, Oregon, the process was only the vacation of the affected area. The town fathers decided that a new subdivision area was necessary for those displaced and it was built as a replacement public facility. Those moving, however, seemed attracted to other areas nearer the new lake and most have bypassed the subdivision. The community will have room to expand as it increases in size in the future.

THE TRANSITION OF POWER

Before leaving the work at the dam it might be well to record the evolution of man's thinking and planning for hydroelectric power in the Pacific Northwest. The development of the John Day power picture may be fairly typical of that transition of thought. The common fault of making "too small plans," of which COL William Whipple was critical as District Engineer, is not necessarily a large factor in this process. Rather, the large capital cost of generating capability, fabrication expertise, and availability of a ready market seem to be prime items in an industry that has experienced phenomenal reorientation of concepts in generation, transmission, and use. Studies for Columbia River development in 1932 found that a 100-foot-high dam at John Day site could generate about one million kilowatts of power, but there was no market and, hence, no justification. That study opted for 27 generating units of 40,000 kw each, which were large by standards of those days. In comparison, the Puget Sound Power and Light Company was building Rock Island Dam at that time and the initial installation was two units of 15,000 kw each. Inland Power, with a project on Lewis River to serve Portland, installed one unit of 45,000 kw. Bonneville, which was started as a depression work project soon after, had original plans to install only two units of 43,000 kw each, with the feeling that the project would flood the power market.

By the time the 1948 "308" Report review was being prepared, and the expansion of the region as a result of the war experience had taken place, more justification for the John Day project was envisioned and it was authorized in 1950, providing for 14 units of 85,000-kw capacity. This installation would still provide only 1,200,000 kw of total generation, about the same as the 1932 report estimated, since the concept was still to provide for prime power or "base load" with high load factor guarantees. This concept held to some extent through the preparation of the 1958 review report which modified the John Day storage concept and anticipated an installation of 12 units initially at a unit capacity of 108,700 kw for a total of 1,305,000 kw. The ultimate installation was foreseen as 20 units and a total capacity of 2,174,000 kw, recognizing the future need for more peaking capacity with a resultant lower load factor for the plant.

The 1960 annual report cites subsequent power studies then under review which, if implemented, would provide for "...an initial installation of not less than eight units and an ultimate installation of 20 units. The nameplate rating of each unit has been increased from 108,700 kilowatts to 135,000 kilowatts. In accordance with inclusion of the completed power studies, the initial power installation will consist of at least eight units at 135,000 kilowatts each - a total of 1,080,000 kilowatts." The increase in size of units was the result of more sophisticated design criteria, model studies, and experience. By 1962 the initial number of units had increased to ten. A review in 1964 found the need for more generation in the immediate future, particularly for power peaking purposes and the California power intertie. That study settled upon 16 units for the initial installation at John Day, which is the current program under construction. By mid-1970 twelve units were in place and working, with the additional four on a firm schedule. With their completion in 1972 the project will have the distinction of containing the greatest installed generating capacity (2,160,000 kw) of any existing powerplant in the United States. The remaining four units are tentatively scheduled for much later this century. To summarize, the changing concepts of power demand and generation for a project of essentially the same hydraulic head has, over the years, dictated the following design changes.

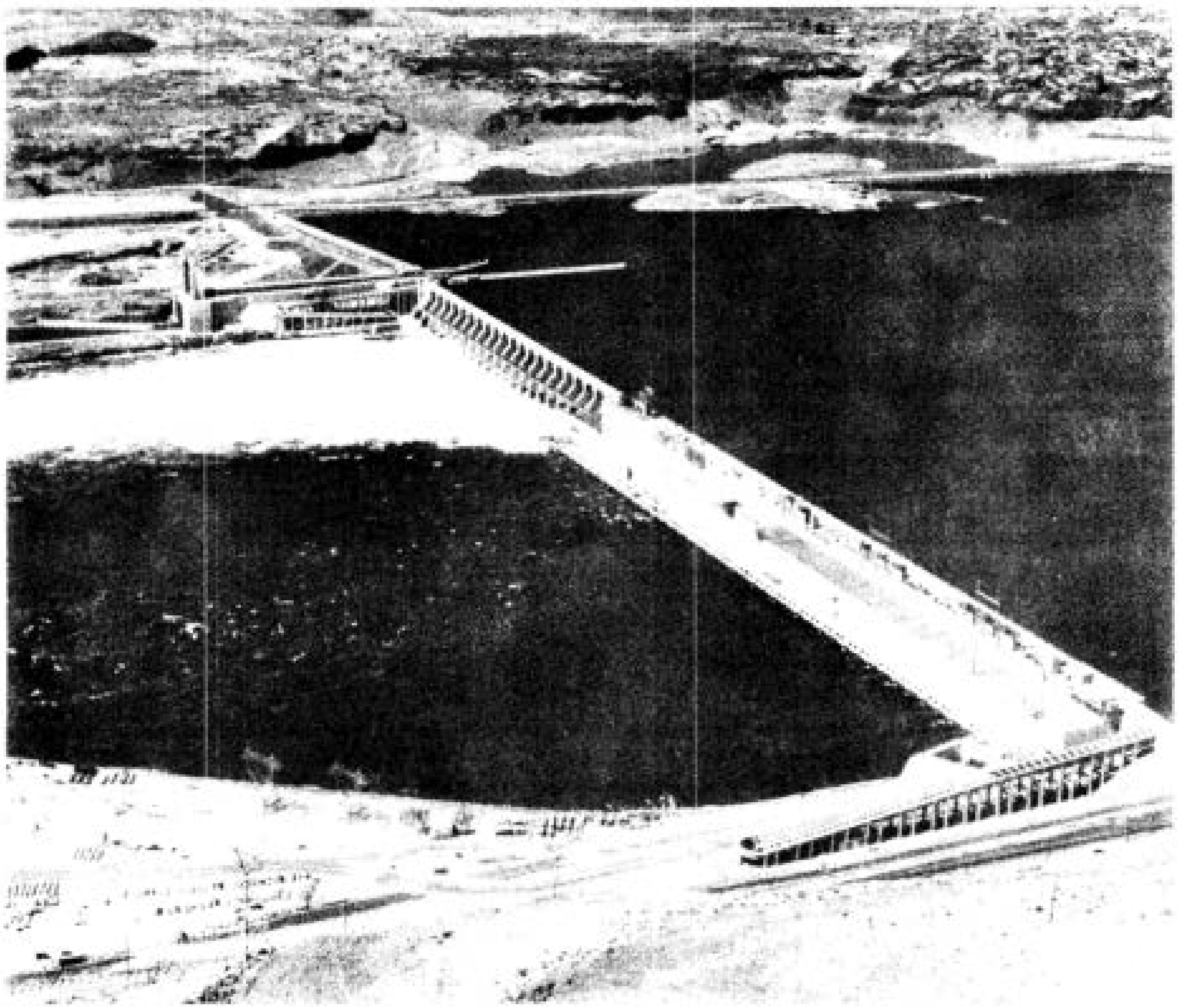
1932 --- 1,080,000 kw capacity	1958 --- 2,174,000 kw capacity
1948 --- 1,105,000 kw capacity	1962 --- 2,700,000 kw capacity

LAKE UMATILLA

In anticipation of the creation of a 77-mile-long reservoir in a very picturesque, long, narrow river canyon with a surface area of some 52,000 acres, the naming of the reservoir was a popular subject. Even before construction was initiated in 1958 familiar local names were being presented by groups and communities with names of pioneers, historic names, and Indian names on the list. The official name is usually the result of action, both by the Congress and the U.S. Board of Geographic Names. For the John Day reservoir the decision in 1958 was that it would be called Lake Umatilla after the Indian tribe of that name who fished and hunted in the area. As a byproduct, the people of the town of Umatilla were happy since they had felt for some time that McNary Dam was rightfully Umatilla Dam because of its location at the long-identified Umatilla rapids. A lake in their front yard with their name on it was some compensation.

OPERATION

With the sophistication of operating procedures, remote control, computer introduction, and extensive integrating of power distribution systems, the responsibilities for individual project operations have progressed through a series of changes. Some of this evolution is most evident in the operation of the lower Snake River system and is discussed there. As a result of this development in integrated operation, a decision was made by the Division Engineer in 1967 that for optimum conditions an integral unit of The Dalles and John Day Dams was best. Accordingly, after considerable discussions and evaluation of alternates, the operation of all facets of the John Day Dam and reservoir was allotted to the Portland District. Subsequent inter-District agreement divided the operation of the reservoir area between Portland and Walla Walla because of natural geographic conditions.



JOHN DAY DAM AND LAKE UMATILLA - JUNE 1968

COMMERCE AND INDUSTRY

The communities along the reservoir, in conjunction with their county governments, have formed public port districts and are actively promoting landside facilities for taking advantage of the commercial navigation on the river. Lands designated for 12 public port terminals around the reservoir total 300 acres. In addition, 3,000 acres of project lands adjacent to the reservoir at 12 locations have been designated for industrial use and have a direct effect upon the private lands shoreward of this Federal margin. During the project construction period Oregon State was actively promoting the Boardman space-age industrial park. It was their very firm conviction that much of the success of the venture depended upon an adequate frontage on the John Day reservoir. Accordingly, after extensive negotiations, over 1,000 acres of project lands along 8 miles of the waterfront west of Boardman were sold to the state for that future development.

The public port terminal areas are well distributed around the reservoir perimeter, with seven in Washington and five in Oregon. Grain elevators and transshipping facilities were the first to develop at Arlington and Umatilla, Oregon and Paterson, Washington. Other facilities and additional grain and petroleum storage should follow now that the reservoir is in being.

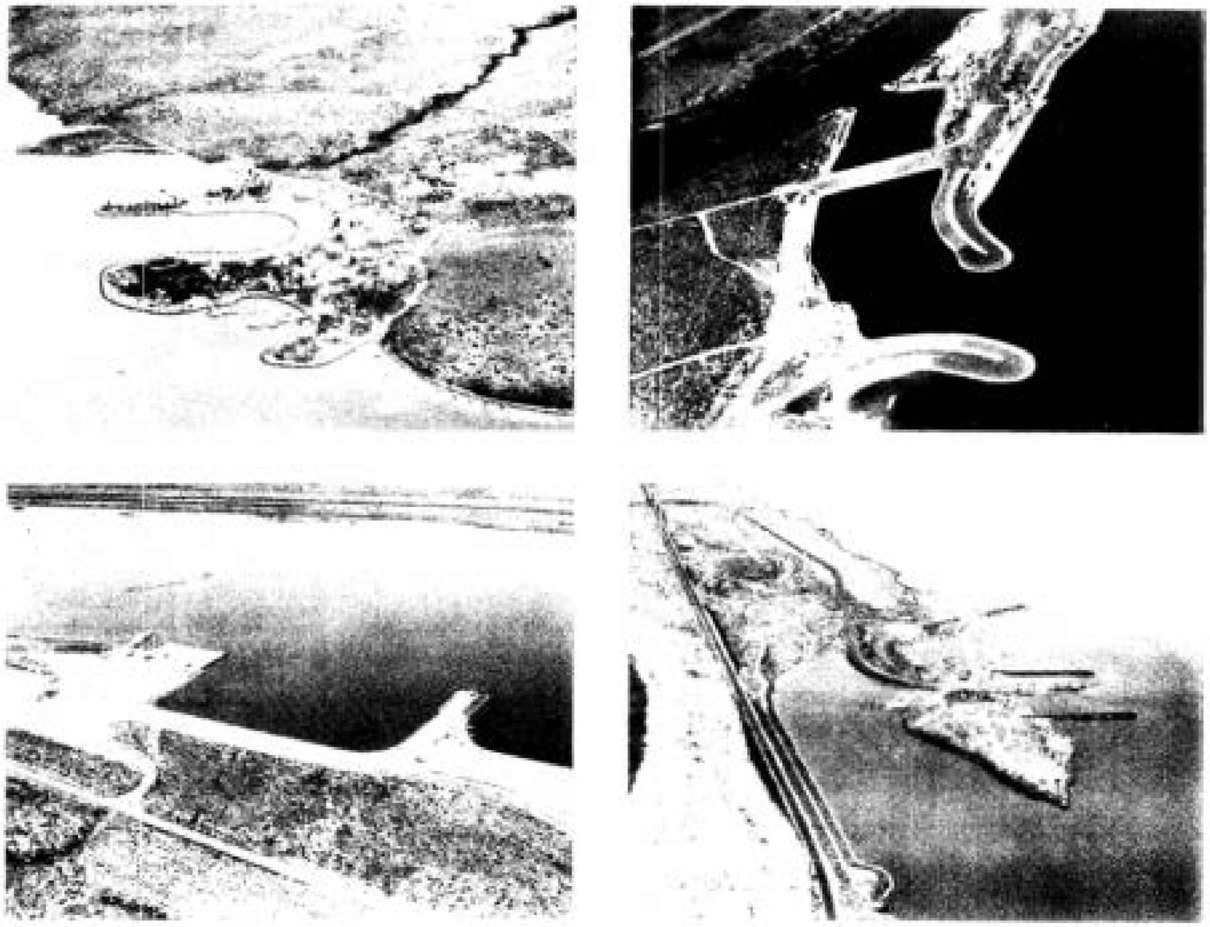
Columbia River commercial traffic was not impeded by the construction effort to a measurable extent except for the four-month period in 1968 when preparations for raising the pool were underway. Movement on the river past the dam has been fairly uniform, awaiting opening up of the Snake River area as shown in the following summary:

Calendar year 1965	1,802,200 tons
1966	1,688,230 tons
1967	1,920,566 tons
1968	1,283,165 tons
1969	1,861,430 tons
1970	2,285,567 tons

PUBLIC USE OF THE RESERVOIR

The John Day Dam created a long, narrow body of highly usable water for general recreation. The natural stream of the Columbia River, while a very scenic and exciting reach, was not readily approachable. Boaters moving through this reach or using it for local recreation needed considerable skill in navigation and careful maneuvering because of rock shoals and rapids. The reservoir created for the public a 77-mile-long reach of moderate currents, easily navigated and still in a very scenic canyon with new vistas and resources. Throughout most of its length the reservoir is less than two miles wide. Downstream from Arlington, Oregon, both shores in this 25-mile reach are flanked by rugged basalt cliffs and steep canyon walls 1,500 feet or more high, typical of much of the

Columbia Gorge east of the Cascade Mountains. Upstream the shoreline topography on both sides of the pool tends to be more gentle and rolling. Of the tributary branches and side canyons created by the reservoir, John Day River, Willow Creek, and Umatilla River on the Oregon shore and Rock Creek in Washington are the most important from the public use standpoint.



RECREATION AREAS UNDER DEVELOPMENT

In planning for public recreational use of the project, three needs were dominant: the need for public access to the water; the recreational needs of visitors from within the region; and the needs of those from outside the region. Provision has been made in the land use planning for 18 sites at more or less regular intervals along the shorelands, with development sequence based upon the anticipated demands over the years. About 4,650 acres are set aside for these needs and budgetary scheduling provides for some work initially at all 18 sites to make them available. The initial Federal development cost is estimated at about $7,500,000. After this is accomplished it is anticipated that non-Federal interests, which will operate and maintain the sites, will do much of the additional development of over $3 million. Work on many of the sites has been active prior to, and since the pool raising in 1968, and about $3 million has been spent through fiscal year 1970.

As with the operation of the dam, the recreation and reservoir management responsibilities for the lower 40 miles of the reservoir area are with the Portland District. Upon completion of construction of the various units of the initial development, their management then is assumed by that District. The operation and management of public use sites above the Klickitat-Gilliam County lines in the upper 37 miles of reservoir remain with the Walla Walla District, by agreement, because of the overlapping responsibilities in the Umatilla-McNary area. Public use of the John Day reservoir is growing rapidly and future history will have to evaluate its extent and relative merits. From an objective long-range viewpoint, the use of a newly created shoreline park area by a multitude of people with its vista of starkly beautiful canyon walls, rolling hills and wheatlands, and a most attractive long, narrow stream, indicates that extensive use of the reservoir by many people for many pleasant hours of refreshment seems inevitable and must be provided for.

FISH

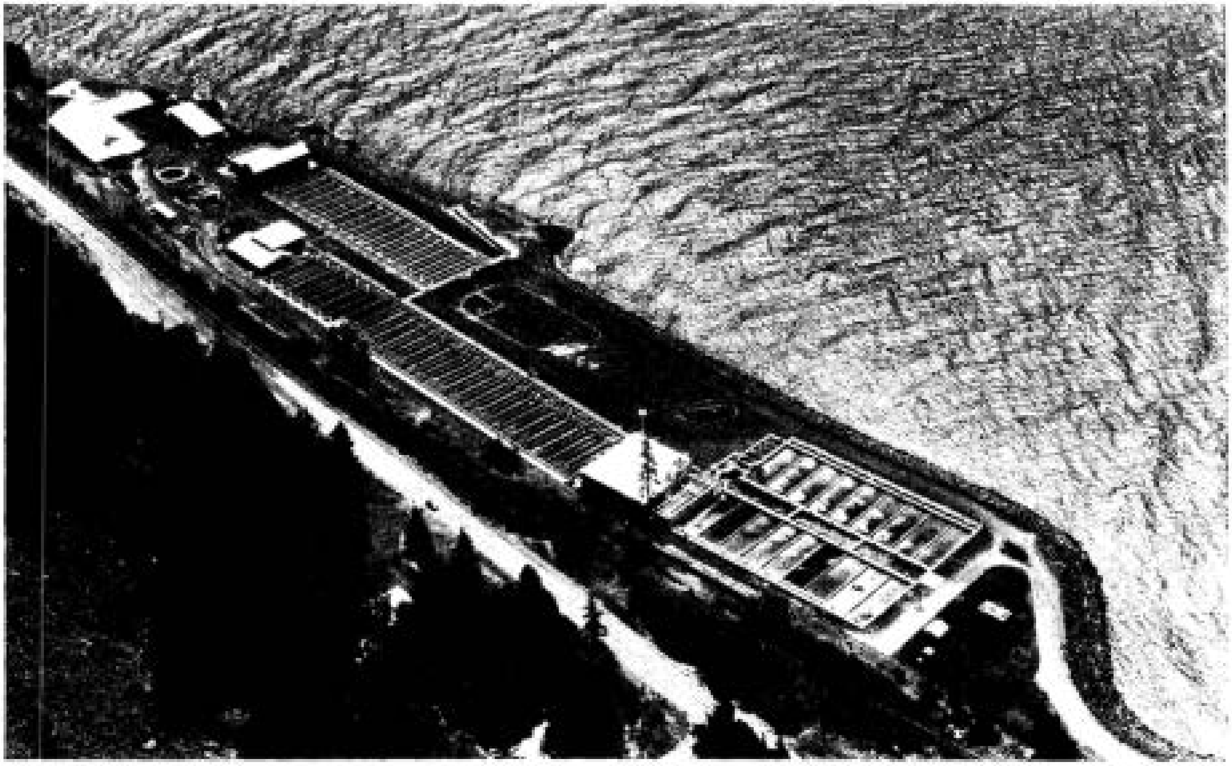
In the lower Columbia and lower Snake River system of water resource projects, the John Day Dam and reservoir has probably received more attention and evaluation, from the standpoint of the movement and life cycle of anadromous fish and migrating waterfowl, than any other individual project. The collection facilities and fish ladders at the dam profited by the design, construction, and operational experience from McNary and the lower Snake projects, as well as the research done at the laboratory established at Bonneville Dam and financed by the several dam project funds.

Passage at the dam during construction was effected without major problems, using temporary ladders. A blockout through the dam on the north side for a ladder exit during the second-step construction cared for the north shore fish. A blockout through the structure south of the powerhouse, coupled with the powerhouse collection system, provided passage during the third-step work. With the start of construction, the problems that surfaced, as well as desires for improving conditions, more than kept the District staff occupied. These were in two general categories: the loss of spawning area for fall run Chinook salmon as a result of creation of the reservoir and its deep water; and the loss of some of the isolated major islands in the natural stream used extensively by wild geese and ducks for resting and breeding. Upon raising the pool and observing passage activities at the dam, a third problem surfaced, to which no one had paid extensive attention previously--the interesting and marked expansion of shad runs in the Columbia and Snake Rivers with the advent of The Dalles Dam.

Little attention has been paid to shad on the west coast. With the advent of Bonneville Dam some incidental accounting of shad runs was possible for the lower river, since they could not pass Celilo Falls. They migrated over the overflow fish wiers of Bonneville without difficulty at the rate of 5,000 to 6,000 a year. The Bonneville experience was used for research and to demonstrate possible means of shad passage for east coast structures, where shad runs are an important resource on several streams. The Dalles Dam was put in operation in 1957, thus permitting some of the small run in the lower river to pass on upstream. 1961, the first year for a return run from the 1957 spawning year, marked a big increase in shad count at Bonneville Dam and appearance in numbers, even at McNary Dam. The 1962 count of shad at Bonneville bloomed to 600,000 fish as compared to earlier 6,000 fish runs. They are now caught in the sports fishery from shore with 200,000 to 300,000 taken. No commercial fishery has developed so far.

The range of the shad has progressed upstream into Snake River, with passage of 10,000 or so past Ice Harbor in 1969. With the appearance of shad in the upper river, concern with passage has increased since it has been found they will not sound as salmon do and pass through deep submerged ladder orifices. Because of this, Ice Harbor was a considerable block. The ladder wiers at John Day were accordingly fitted with special shad orifices close to the surface, in the middle. Experience disproved this answer because the shad stayed close to the ladder edge. By cutting daylighted slots in the wiers close to the edge, the problem appears solved. Time will tell. More should be known about the Columbia River shad run. They could have commercial potentials, as well as for the sportsman, and evidently do not object to water resource development if the stream can be kept in good condition. Again, the future will have to evaluate this. The potential may just be aborning.

The other two natural resource problems for John Day were of more import and demanded greater attention. The authorizing act for The Dalles and John Day projects recognized the potential loss of spawning grounds for fall Chinook salmon and agreed that it was a project responsibility to mitigate for the loss. Since they were a lower river spawner, not prone to move too far upstream from tide water, upriver spawning areas were not considered practical. In addition, good success has been realized in growing them in hatcheries, with several in the basin. Accordingly, early negotiations turned to artificially constructed spawning channels and hatcheries as potentials. The spawning channels were soon ruled out because of geography and water supply. Several evaluations were made of possible hatchery locations with state and Federal fishery agencies, such as possible sites at the mouth of the Deschutes River, the Klickitat River, lower Lewis River below Vancouver, Washington, and other local areas along the Columbia. Water supply and other problems ruled them out, with the final decision to enlarge the existing Federal hatchery at Spring Creek in Washington on the Bonneville pool and also enlarge the existing hatchery in Oregon at the base of Bonneville Dam.



SPRING CREEK HATCHERY

The original intent was to have one of the hatcheries in operation for the fall run of fish in 1968. This did not materialize. Using the modern, highly automated, and sophisticated design for a hatchery as developed for the Dworshak Steelhead Hatchery, the construction for Spring Creek Hatchery is scheduled to start late in 1970. The hatchery will be doubled in size to handle 20 million eggs and rear the fingerling from them for release each spring. The Bonneville Hatchery expansion is still in the design stage with plans to enlarge it one and a half times. It is trusted that the return from 30 million eggs, incubated and raised under controlled conditions, will offset the lost spawning effort in Columbia River from The Dalles to McNary.

One facet of the fish monitoring effort, in evaluation and maintaining the runs, is the careful record of fish passage at the dams and publication each year. The several runs are identified by species as well as the timing for their passage, from which the progression upstream can be traced together with the dropoffs to intermediate streams and losses to the fishery. The fish identification and counting started with the very utilitarian flat white counting board of Bonneville and McNary Dams over which the fish pass at the upper end of the ladder. A little cubbyhole was built for the fish counter adjacent to the board where she would have a good view to quickly identify eight to ten species of fish darting over the board and tabulate them. This process of counting is still basically the same, but better facilities to view the fish, and accommodations for the public, have been provided.

At the Lower Monumental and Little Goose Dams, the ladder was turned on edge for one step in its lower extremity and the fish swims past a viewing window through a vertical slot. The windows are large enough so the public can exclaim over the size of some of the steelhead and summer run Chinook while the counter records them. The fish viewing room at John Day was sure to be a popular visiting area, so better accommodations for the public were provided and the many species of fish moving in the column of water are easily observed. Displays are shown around the room and it should prove to have good appeal. With the development of the video tube and its use for recording western drama action, the movement and identification of fish by video tape was a challenge too good to be passed up. Experiments are now underway to keep better track of the wily salmonoids as they move upstream to their native spawning grounds.

FISH PASSING FISH LADDER VIEWING WINDOW

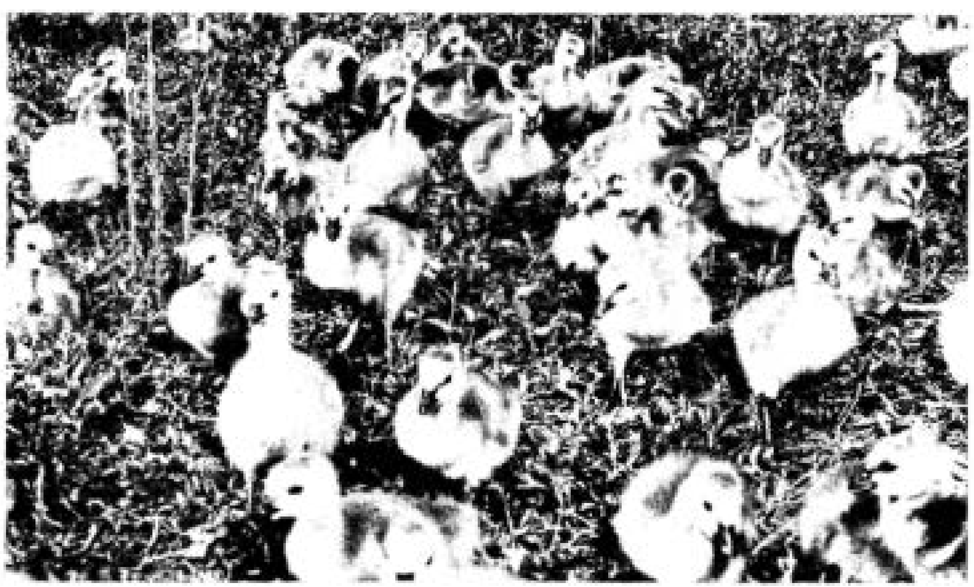
WILDLIFE

The reach of Columbia River from McNary downstream to Arlington has been known for its good duck and goose hunting, as well as a rearing area. The Pacific Flyway passes through this general region as well as along the Snake River. With the advent of the project and evaluation of the anticipated new shoreline and adjacent land areas, as compared to the existing low areas and islands, it was found that there was a potential for considerable loss of good habitat for waterfowl. A generous taking line policy along the new reservoir on both shores in the vicinity of Boardman, Oregon and Paterson, Washington, with lands made available for management by the wildlife agencies, was not considered adequate to compensate for the losses. Over 11,000 acres were included in some of the negotiation agreements.

Lands contiguous to these blocks of project lands at Boardman, Oregon, and Crow Butte on the north shore were deemed very desirable by the agencies. The project authorization made no provision for waterfowl mitigation through purchase of additional lands, so the Walla Walla District, by agreement, prepared a special report for a proposal to buy the additional area through a special act of the Congress. The U.S. Fish and Wildlife Agency provided the justification for the proposal which specified that the District purchase an additional 3,200 acres of private land and 527 acres of public lands to be used exclusively for a National Waterfowl Management Area.

Approval was received from Congress in 1965 and the management area established. It is composed of 11,000 acres of project lands above the normal water level, about 17,000 acres of adjacent shallow water and marshlands of the John Day project, and 3,800 acres of adjacent special purchase lands making a total management area of about 32,000 acres. The area was established, impoundment dikes constructed, and croplands planted by the time the reservoir was created. The area will provide necessary resting and reproduction habitat for an estimated 100,000 ducks and 40,000 geese, as well as providing for about 20,000 days of hunting annually. Reports of the first two years of operation are most encouraging with good use by both the ducks and geese as well as by the wily hunter.

The highly publicized and highly successful goose egg hunt made by boat, helicopter, and jeep, dubbed "Operation Mother Goose," to collect eggs laid along the shoreline and on islands just before the raising of the reservoir pool in April of 1968, has been recounted in Part I of this history. The geese raised from those eggs were distributed widely throughout the area, marked, and have been making history of their own.



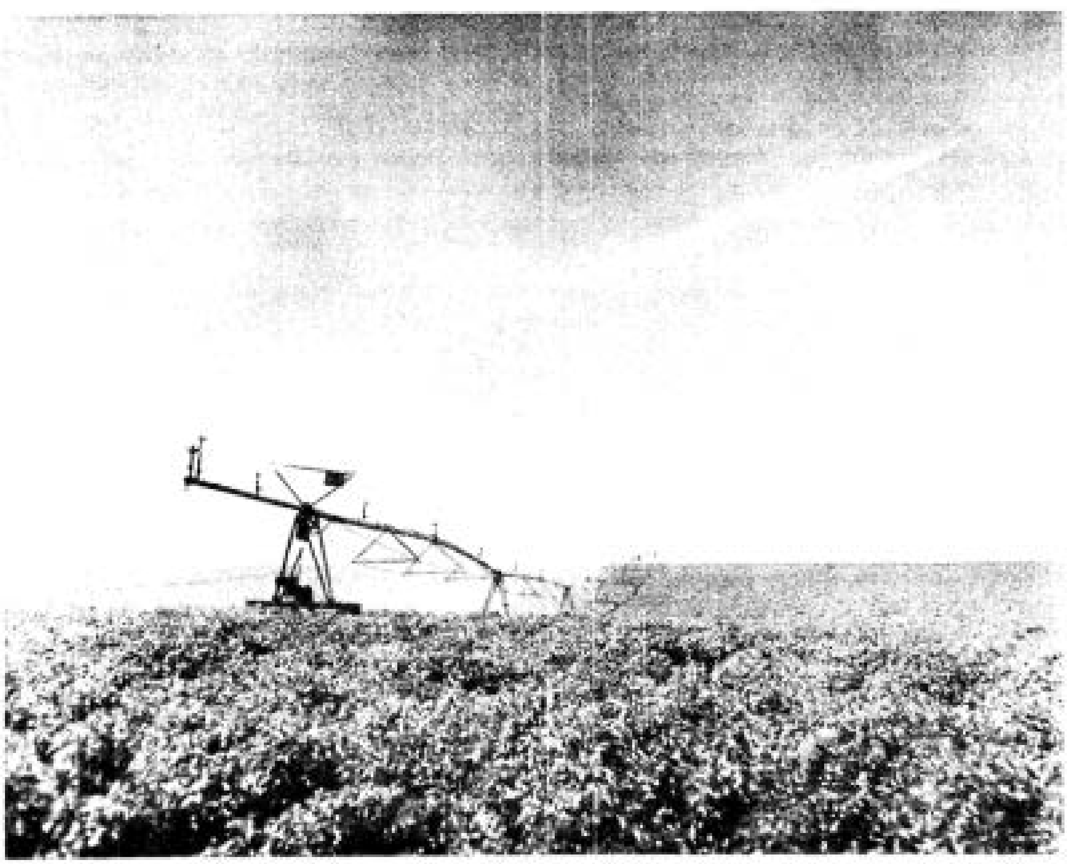
GOSLINGS IN HATCHERY

IRRIGATION

The authorizing studies for the John Day project found that about 150,000 acres of arid lands around the reservoir area could benefit from the reduced pump lift to make them potentially irrigable. These lands lie primarily in the upper half of the reservoir reach and their owners have begun to take advantage of these potentials. To date four major units are under operation.

Unit	Permit Date	Acreage
Desert Magic - Morrow County	1971	10,000 (under development)
Columbia Power District - Benton County	1967	10,000
Mercer Ranch - Benton County	1968	3,000
D & M - Umatilla County	1967 & 1968	2,000

In addition, a major unit in Oregon near Boardman and a second one across the river in Washington near Paterson, each possibly involving as much as 20,000 acres, are under active planning. With the proper economic atmosphere during the 1970s for land use development, the desert around the project may bloom with a variety of agricultural crops.

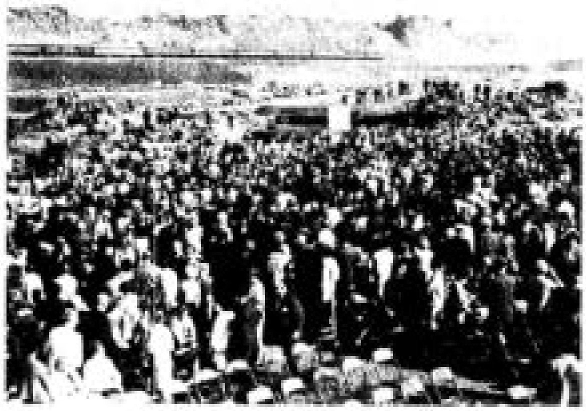


SPRINKLER IRRIGATION PUMPING FROM RESERVOIR POOL

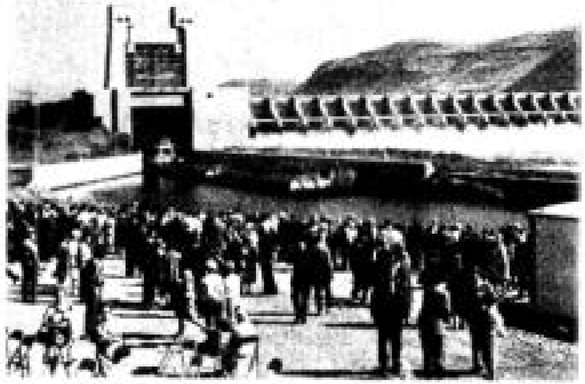
PROJECT AWARD

Each year the Chief of Engineers through an Awards Program recognizes "excellence in design" for the many facilities under the Corps' program of development throughout the world. Professional members of several technical societies serve as special jurors, selecting projects each year which merit special recognition. The John Day Lock and Dam received "First Place Award for Engineering Design" in 1969. The judges' comments are quoted here as a good summary of the magnitude, complexity, professional integrity, and the District's sincere efforts in creating a project of this kind.

> "John Day Lock and Dam, Columbia River was selected for the First Place Award because of its comprehensive design achievement, considering the magnitude of the project, its multidisciplinary requirements, and the complexity of engineering and construction problems involved. As the most recent main stream dam the Corps has built on the Columbia River, this structure embodies a culmination of many years of design experience. This tremendous river required continuous and careful control over several years of construction. Raising the water level required the relocation of major railroads, highways, and at least one town. The designers were further challenged by the need to provide an extremely high lift lock.
>
> "The jury took into consideration the unusual programmatic conditions which complicated the design problem, including large scale planning and construction aspects, and noted that efficient and skillful solutions were produced for this many faceted project. In terms of architectural appearance, the decision is unified, well-articulated and restrained. Major design features are interesting in form and detail. Smaller elements such as the fish ladder, are neatly designed and expertly related to the entire composition, while still maintaining maximum functional efficiency. Materials throughout have been logically selected and expressed. In addition to the engineering functions the complex has a significant recreational value, not only to this area but to the entire country."



VISITORS AWAITING THE VICE PRESIDENT (SPECIAL TRAIN FROM PORTLAND IN BACKGROUND)



SPILLWAY OPEN AND BARGE LOAD OF WHEAT MOVES FROM THE NAVIGATION LOCK

LTG STANLEY R. LARSEN, 6TH ARMY; LTG WILLIAM F. CASSIDY, OCE; COL ROBERT J. GIESEN, NPW; BG ELMER P. YATES, NPD

DEDICATION

As with the previous celebration for the completion of McNary Dam, the entire region felt a gala program should mark the realization of the John Day project. A dedication is the brain child of a local group or organization which has a vital interest in the conception, growing pairs, and fruition of the work. The dedication of the John Day project was master-minded by the Inland Empire Waterways Association with the able assistance and participation of a host of commercial, civic, and local governmental groups. A warm invitation was extended to President Johnson to do the honors but he was busy doing other things, so Vice President Hubert Humphrey was designated to officiate.

It was a gala day at the dam on Saturday, 28 September 1968--warm and sunny with a festive atmosphere. The occasion demanded much preparation, including bands, singing groups, fly-overs, boats, lots of flags, concession stands, first aid, traffic control, a bank of 20 special phones and plenty of circuits, as well as special police from Fort Lewis, for the Vice President and other dignitaries. An estimated 6,000 or more people attended, including a special train from Portland, 110 miles to the west, carrying 800 passengers.

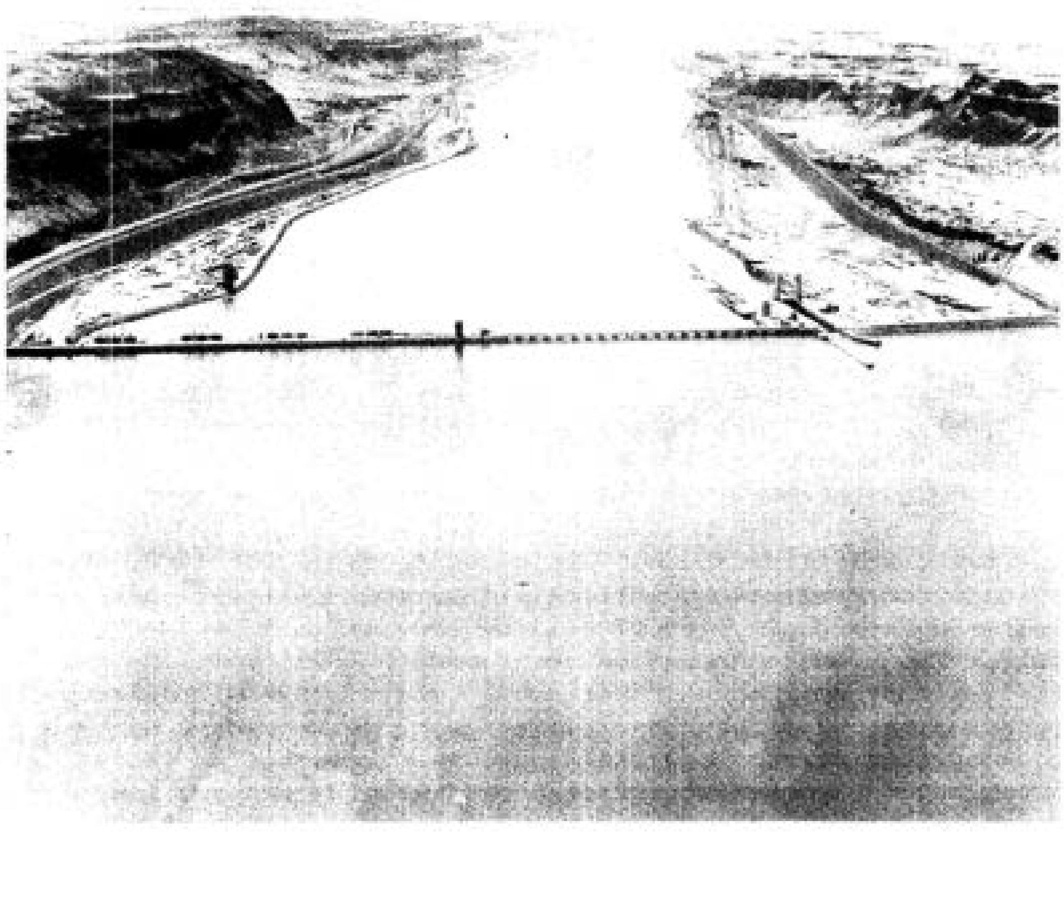
Prior to the formal speeches an Inland Empire commemorative tribute was enacted indicating the symbolic union of the entire region. Vials of water from tributary streams at 42 Columbia Basin cities were poured together, then to be emptied into the Columbia River at the dedication site.

The Governors of three states shared the platform with the Vice President: Governor Tom McCall of Oregon; Governor Daniel J. Evans of Washington; and Governor Donald W. Samuelson of Idaho; all three having short messages complimenting the project and the Pacific Northwest for its development progress. LTG W. F. Cassidy, Chief of Engineers, presided for the Corps, with COL Giesen, District Engineer, riding "shotgun' to insure a smooth running program. U.S. Senator Warren G. Magnuson of Washington did the honors of introducing the Vice President.

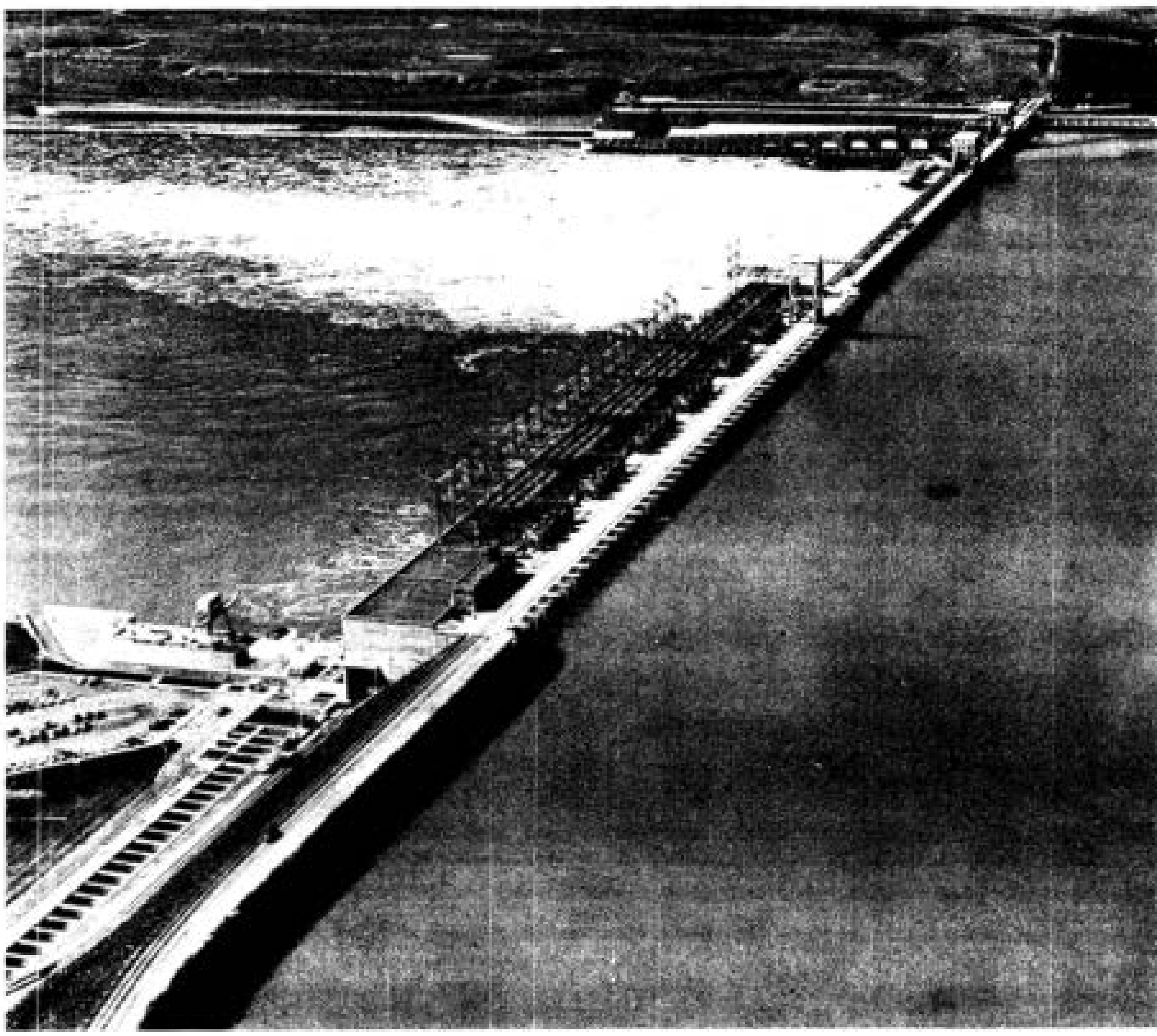
The Vice President, who was a presidential candidate in the forthcoming November election, while tilling some political soil, stressed resource development, with care in the process. He declared, "This is the wisest investment the nation ever made." To protect our resources the Vice President proposed a "Heritage Riverway" program "based on the total attack strategy of the Model Cities program, to begin rescuing and renewing America's rivers. Multiple-purpose development no longer is good enough. All purpose conservation must be our standard. America is crossing the threshhold of a new era in resource use, demanding that progress means quality in total environment as well as quantity."

Early the morning of the 28th the spillway gates to the dam were closed so that no water appeared to be flowing past the project (except through the power units). Upon completion of his talk the Vice President "threw" a big switch which released a multitude of brightly colored balloons below the spillway, opened spillway gates for a cascade of water, and opened the lower lock gate to the highest single lift lock in the world, out of which came a tug and four barges carrying 10,000 tons of wheat to Portland, the largest single tow to ever navigate the river.

The day was right, the attendance was good, the dignitaries present were pleased, the sponsors put on a good show, the project was impressive, and everyone seemed to have a good time. Thus was a major Columbia River dam dedicated.



"ROLL ON COLUMBIA - ROLL ON"
JOHN DAY LOCK AND DAM - AT RIVER MILE 215.6 - LOOKING WEST



COLUMBIA RIVER - McNARY DAM AT UMATILLA RAPIDS
(FROM SOUTH SHORE LOOKING NORTH)

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McNARY DAM

SITE HISTORY AND AUTHORIZATION

The Umatilla Rapids as a site for a dam had been studied for 25 years prior to the project authorization. A Portland District report of 1922 cited the need for five "navigation" dams in the reach of Columbia River from Celilo to the Snake River. It was anticipated that each dam would be 35 to 45 feet in height. The Umatilla Rapids Dam was one of these units, as well as a fifth one at Homly Rapids, the really critical navigation hazard, about five miles below the mouth of the Snake. That report contained an alternate proposal for eight "low dams" ranging from 15 to 28 feet in hydraulic height, which also included the Umatilla Rapids and Homly Rapids sites. No action was ever taken on that report.

House Document 103, 73d Congress, 1st Session, in 1933 went further and had more detailed information for a "power dam" at Umatilla Rapids. The structure had a "dog leg" layout with a height of 76 feet and a pool elevation of 330 feet. Navigation past the dam was by means of tandem locks, each 60 feet by 360 feet with 38-foot lift. The powerhouse was to include 14 units at 65,000 kw each. Power was plentiful at that time and no action was taken on this proposal.

Practically concurrent with the 1922 report of the Portland District, which did not include any detailed onsite investigations, the Bureau of Reclamation developed extensive plans for an irrigation project with a Umatilla Rapids Dam as a principal unit, using power revenues to pay a significant part of the irrigation project costs. They drilled 24 holes at the site in 1923. House Document 103 describes their studies as follows:

> "...The Umatilla Rapids Association was organized at Umatilla and Pendleton, Oreg., in the early part of 1921 for the purpose of promoting the building of a dam and power plant at Umatilla Rapids. Some money was raised and a preliminary survey of the site made in the spring of the same year by Lewis & Clark, engineers, of Portland, Oreg. The report (unpublished) prepared by this firm showing the site to be

a favorable one, the Umatilla Rapids Association, with cooperation of other civic organizations, secured an appropriation of $10,000 by the Oregon Legislature and $50,000 by Congress for a comprehensive study of its possibilities. This study was made by the United States Bureau of Reclamation in 1923.

"681. As a result of this investigation, a bill was introduced in the Seventieth Congress calling for an appropriation of $45,000,000 to build the dam and power plant, the Government to be reimbursed for both principal and interest through the sale of power. Similar bills have been introduced in subsequent sessions, but none of these has as yet come to a vote. (1933)

"682. The plan for development as worked out by the United States Bureau of Reclamation proposed a dam...with crest at elevation 310.5. This would give a static head at low water of 57.5 feet and at time of record flood about 27.5 feet. .... It was proposed to install 34 propeller-type water wheels each of a capacity of 28,000 horsepower when operating under 56-foot effective head. Each wheel would be direct connected to a 25,000 kilovolt-ampere generator."

Navigation facilities for passage at the dam are not mentioned in this summary. Power subsidies were not looked upon with much favor during the depression years and the project never received approval. It should be noted here that in 1949 and 1950, when construction of the dam was underway, the Bureau made extensive review studies of irrigation potentials including these older plans, both for projects in Oregon and Washington, with either diversion works in the dam abutments or pumping plants adjacent. The lower lying soils are sandy, delivery of water is difficult, costs were high, and the plans did not meet with local favor. However, scattered individually owned irrigation projects have developed in the past ten years utilizing pumped water supplies.

One more study was to be required before Umatilla Rapids Dam received approval. The Division Engineer, as a review of previous reports, reanalyzed the Columbia River and Snake River to Lewiston, partly because of the start of construction of both Bonneville and Grand Coulee Dams. The report, prepared in 1937, was subsequently printed as H. Doc 704, 75th Congress, 3d Session, dated June 1938. This study, recommending four more dams on the Columbia and four on the lower Snake became the official document upon which subsequent authorization was based. That document envisioned a dam at Umatilla Rapids with a pool elevation of 310.5 feet, a power installation of 385,000 kw, and a navigation lock 56 feet by 360 feet with a controlling depth of 9 feet.

House Document 704 was prepared as a comprehensive analysis for the optimum development of the Columbia and Snake Rivers from Bonneville Dam to Lewiston, Idaho. It found that anticipated navigation benefits were not commensurate with the cost but "it is possible that sufficient surplus power from the dams can be sold within the next 50 years to make the improvement economically sound." However, the report found that under the economic conditions of that time, and the large blocks of power being constructed at Bonneville and Grand Coulee, no improvements could be recommended. The study did, however, present a carefully thought out analysis of water resource development which has been basically followed over the ensuing 30 years and the total objective accomplished within a 40-year period.

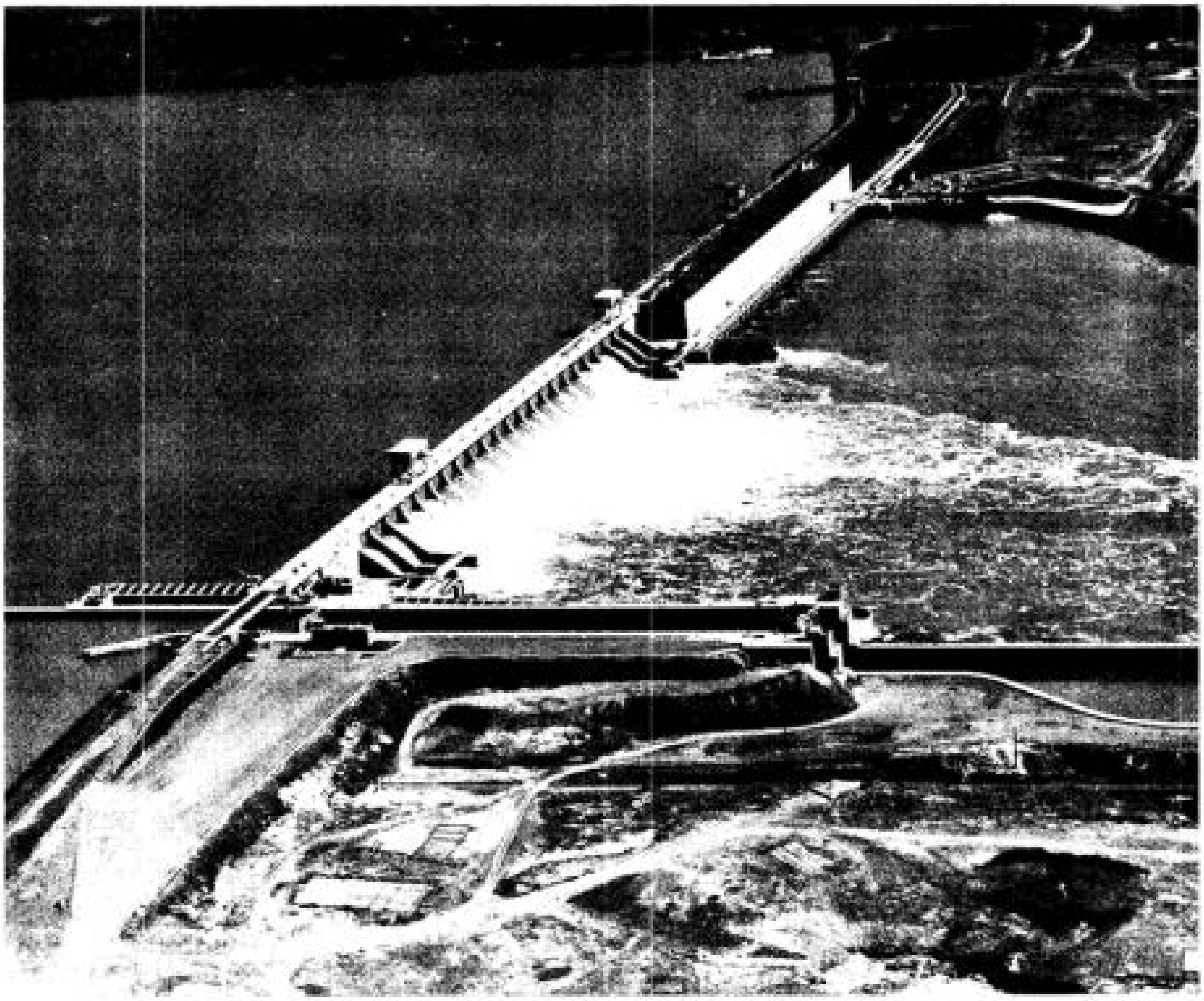
At the time of completion of H. Doc. 704 the war drums were beginning to beat, the depression ended, and an era of development for the Pacific Northwest set in. The pressure was on for more power and river development, so in 1945 the Congress authorized the construction of Umatilla Dam by P. L. 14, 79th Congress, 1st Session. In that document the stipulation was made that when completed, the dam would be named McNary Dam in honor of the late Senator Charles L. McNary. Between the preparation of H. Doc. 704 and project authorization two additional studies were made which incrementally found that the pool elevation behind Umatilla Dam should be 340 feet instead of the originally studied 310.5. The authorizing act specified that elevation, "if a dam of that height is found to be feasible."

Definite project studies to delineate the dam features were initiated in 1942. Reports on specific components were issued in 1942, 1945, and 1946. Public hearings were also held in 1944 and 1945 concerning primarily the navigation structure to be provided. The initial allocation of funds for the project was made by Congress in FY 1945 with construction funds in FY 1946. The first contract for construction was awarded on 11 April 1947.

THE DAM

The dam structure at river mile 292 is 7,365 feet long with a designed hydraulic height, before the John Day Dam was constructed, of 92 feet. The south (Oregon) shore earthen embankment is 2,465 feet long; the powerhouse 1,422 feet long housing 14 turbine generator units of 70,000 kw each, a 22-bay spillway 1,310 feet long with 50- by 53-foot vertical lift gates; the navigation lock with a clear inside area 86 feet by 675 feet; and the north shore (Washington) embankment 1,560 feet long. Nonoverflow concrete structures for the fish ladders, gate repair pits, administrative area, and abutments occupy the remaining 520 feet. The total project cost is $290 million. The navigation lock with a design head of 92 feet laid claim to be the highest single lift in the world.

This claim has subsequently progressively moved to other projects in the District as they were created, resting at present with the John Day project having a maximum hydraulic height of 113 feet.

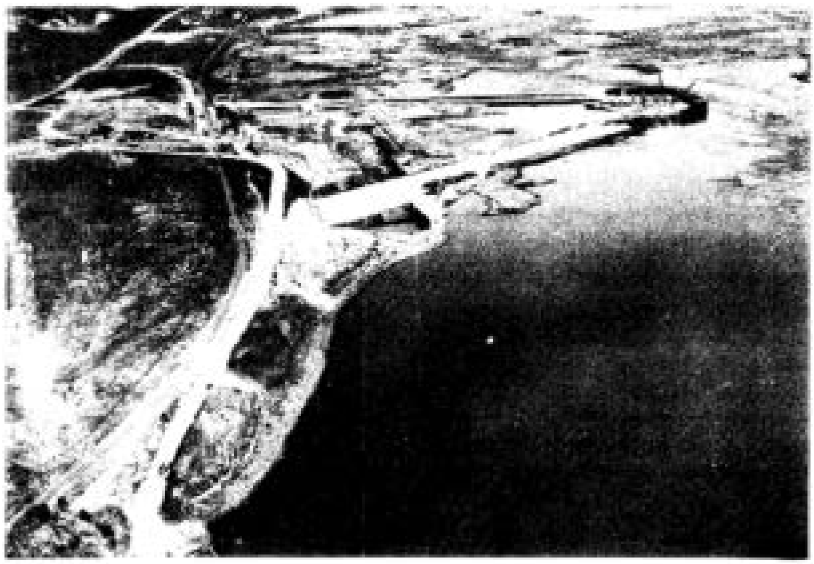


McNARY DAM - RIVER MILE 292

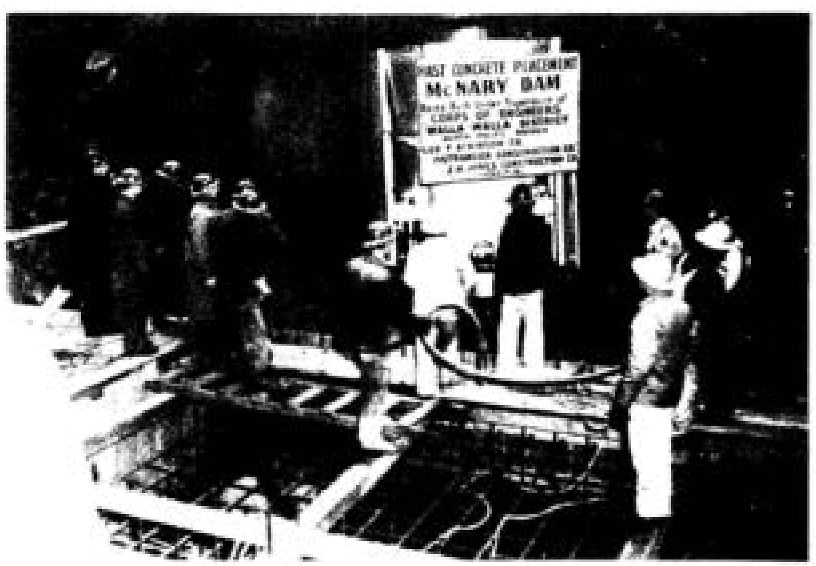
CONSTRUCTION

Control of the River

The physical realization of the McNary project was accomplished in five basic steps related to the manipulation of the river during construction. The first two steps were taken by the Portland District prior to establishment of the Walla Walla District, so the project was a "going concern" on 1 November 1948. The initial step in 1947 had been excavation for the navigation lock area on the north shore, an access road, and some railroad work, all of which could be accomplished without disturbing the river.



NORTH SHORE COFFERDAM AND NAVIGATION LOCK EXCAVATION - MARCH 1948



FIRST CONCRETE POUR - IN NAVIGATION LOCK - 15 DECEMBER 1948

The second step was the large north shore cofferdam enclosing a major portion of the spillway and all of the north shore structural facilities including the fish ladder, fish lock and nonoverflow section. The cofferdam was completed on 26 May 1948, just in time to receive the second largest flood of record which peaked on 30 May, overtopping the cofferdam. Repairs were made, the cofferdam pumped out, and work proceeded later that summer on excavation within the cofferdam. Actual construction of the dam got underway on the north side late that fall after the project was turned over to the new District. The first pour of concrete took place early that winter. It was made with appropriate ceremony on a Friday afternoon late, and the weather promptly turned bitter cold with one of the coldest weekends of the year. Some of the concrete was removed the next week and the structure started again.

The third basic step in the building process was the so-called junior cofferdam on the south shore to start construction of the south shore fish ladder and a portion of the powerhouse, still leaving an adequate channel open for the river. The fourth step involved the construction of the major south shore cofferdam, closing the river channel, forcing all of the river flow to the north through low spillway bays left incomplete to accommodate this move. The major portion of the powerhouse and nine sections of spillway were then constructed within this cofferdam.

The final step was to remove the fourth step cofferdam and again divert the river to the south through skeleton powerhouse bays while the low spillway bays were completed. As soon as they were finished the pool level behind the dam was raised and lock and power units placed into operation. All that then remained was to dedicate the project (a major undertaking when the President of the United States does the honors) and complete the details. Those seven years of work, however, were fraught with many decisions, anxious moments, major accomplishments in terms of structural features and work programs, and several heartaches, since 24 men lost their lives in building the structure and the relocations involved.

Townsite

The townsite for the dam had been established in 1947 and 1948. Based upon the concept of the Fort Peck Dam in Montana which was a construction community fairly independent of the surrounding area and a work force with considerable hand labor, a major influx of 7,000 persons was anticipated. As work progressed it became apparent that such a concept was no longer valid because construction effort was much more mechanized, needing less manual labor, and the surrounding communities had much more appeal to the families than a "construction camp". As a result, the townsite was only partially utilized and the private businesses established there were not a marked success.

One entrepreneur who built and ran a cafe on the townsite (his development based upon Government estimates of employees and families) made a claim for his losses. After much negotiation, a special bill was finally presented to Congress to purchase the building and business. After some soul searching and consideration, Congress passed the measure and the District obtained the defunct enterprise for $50,000.

Upon completion of the construction work and transition to an operating project, the townsite was declared surplus. The General Services Administration, by authority of special legislation, deeded the entire area to the Confederated Tribes of the Umatilla Indian Reservation for their beneficial use.

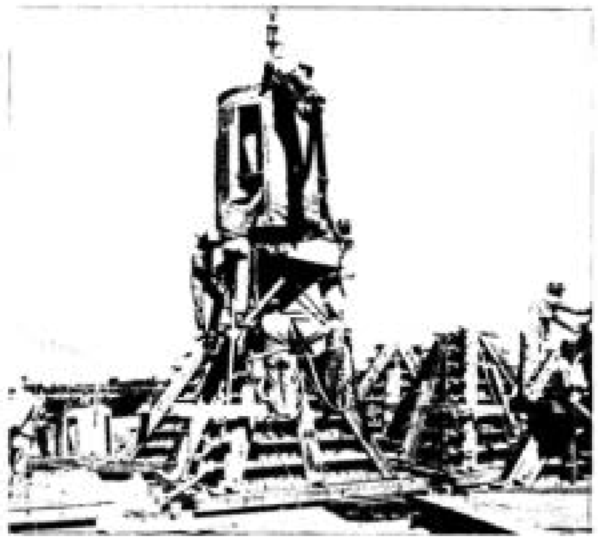
Cofferdams

The training and temporary control of a stream the size of the Columbia, with variations in flow of almost 20 to 1, is a major challenge to the engineer, possibly one of the reasons why he likes to build dams on big rivers. As noted previously, the first cofferdam was overtopped by the 1948 flood almost as soon as it was built. The major south shore cofferdam was designed to bow to the river's gyrations and be overtopped by an ordinary flood, which it was in 1951 and 1952. The ingenuity of the engineer was really challenged, however, with the closure of the upstream leg of the second major cofferdam on the Oregon shore. This required forcing the Columbia River away from the natural rapids at this point and diverting it through the 12 low spillway bays constructed on the north shore. The constriction of the river flow created pool differentials of 15 to 20 feet, even for very moderate flows expected during the operation.

Studies on methods of river closure were initiated in 1945, including analysis of other people's problems with similar closures. The cofferdam was constructed of steel cells 60 feet in diameter, 40 to 60 feet in height with a gap in the upstream leg across a natural deep channel about 240 feet wide, through which most of the low flow of the river (60,000 to 70,000 cfs) passed. To plug this hole was the challenge. The possibility of constructing steel cells was investigated and abandoned first. Large timber cribs were very seriously considered, to be floated into place and sunk. In fact, this scheme, as against others, caused considerable altercation in the "rear echelon" design studies carried on in Portland during 1950. A "brainstorm" of carefully placing an old Liberty Ship across the opening and sinking it was another idea. Otto Lunn, directing the work of the rear echelon, always alert to better ideas, and a student of technology, after studying experience at Passamaquoddy, opted for utilizing stone carefully dropped. Model studies were made, shapes analyzed, and the decision was made to use 3,000 precast concrete tetrahedrons weighing 12 tons each.

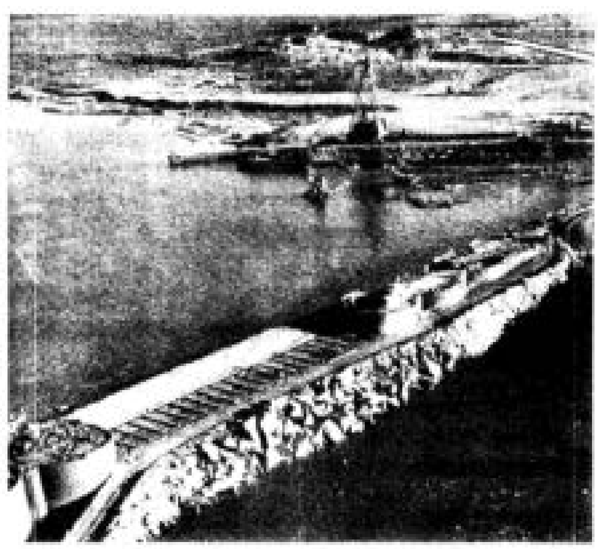
There was some skepticism over Otto's decisions (with Franzen backing him up), so additional model tests were made, both at the University of Washington and Bonneville Hydraulic Lab. As a final check a 1:24 scale construction model of the 240-foot closure area was built at the McNary damsite which was used to further test current actions and schedule the actual drops by grid system coordinates, using a cableway with movable towers across the opening. Realizing there were critical points in the operation and critical stages for the river, procedures were established and the signal given to "go." The operation started on 10 October 1950 and was completed 21 November 1950 with many anxious moments, changes in procedure, and as much as 50 percent fluctuation in the river flows, but little question of success. After unwatering the cofferdam it was found that the tetrahedrons behaved very closely to the planned procedure and accomplished one of the most difficult river closures ever undertaken. The details of the operation have been well documented and are available for the planners of a like venture.

OREGON SHORE COFFERDAM
READY TO CLOSE GAP IN CELLS
NOTE TETRAHEDRONS IN FOREGROUND



THE MAKING OF A TETRAHEDRON

MISSION NEARLY ACCOMPLISHED



CLOSURE SECURE - READY FOR
CRIB SUPERSTRUCTURE

The strict and limiting criteria under which this closure had to be made added to its complicacy. Minimum interference to navigation on the river was one objective; anadromous fish runs of the Columbia River are an important resource which cannot be interfered with; and work during the period of low flows in the Columbia was a must. Compromises were required because low flows are more stable in September and October, with winter storms in November. However, the fall run of anadromous fish is heavy in August and September which negated use of those months. The 10th of October was established as the earliest closure could start to preclude interference with the runs. Regardless of time, navigation, which was difficult past the site under any circumstances, was insistent that the elapsed time be a minimum. Resulting records indicate that no traffic used this reach of river from 10 October to 15 November, the fish runs were passed successfully, and the river staged an early winter flood with a peak on 4 November of 150,000 cfs which was almost a record for that day and, incidentally, the maximum design criteria for the operation.

Fish--and Dam Construction

The Columbia River is one of the principal streams of the world supporting the Salmonoid species of fish. Through a long period of time during which they had undisputed access to the river, major species developed with particular limits and patterns of movement, geared quite a bit to the stable cycle of river flows. Three major species utilize separate segments of the basin as spawning and rearing areas with definite periods of migration. These are the Chinook and blueback salmon, and steelhead trout. The Chinook and steelhead migrate through the main stem of the Columbia from March through October. Bluebacks migrate past McNary Dam during late June and July. Delays caused enroute from any source may become critical, and man-made obstacles are deemed particularly obnoxious. Hence, expedited passage at dams is a project obligation.

To put the construction activities at McNary into proper focus it must be remembered that the economy for dam building was not particularly favorable from the time of Bonneville until the mid-40s, especially with respect to strict cost and benefit analyses. As a consequence, during a 10-year period little had been done in objective analyses of the good and mediocre points of the Bonneville project as a run-of-river power and navigation project. This was particularly true for a scientific study of its fish passage facilities. They worked very satisfactorily; the passage figures were the first to ever be accumulated so the magnitude of the fish runs could be evaluated, and the sequence of passage figures and life cycles indicated no diminution that could be credited directly to the construction and early life of the project. The 20 years of very active dam construction during the '50s and '60s was not envisioned and the fishery agencies had other problems with which to occupy themselves, so research for the sake of knowledge was not high on the agenda. As a result, fish passage facilities at McNary are strikingly similar to those at Bonneville, with some arbitrary decisions thrown in for width and slope of the ladders, for instance.

Fish passage during construction was not impeded during the first phases and the fish had free movement, even past the large north shore cofferdam. When the large south shore cofferdam was complete and water passed through the low spillway bays, the fish could still move freely through the spillway area at low flows. Three temporary ladders were required, however, to care for fish movement under spring flood conditions; a main ladder around the north end of the cofferdam, one on the north shore for migrants following that side of the river, and a third to be operated when the south shore cofferdam was overtopped. Most of the evaluations, analyses, modeling, and decisions for these temporary ladders were done by the District, which was a new venture for most of its staff.

Particular thanks and recognition must be given to two men who provided the District their special knowledge of fishways and gave unstintingly to insure a successful plan. These two are Harlan C. Holmes, a true Research Biologist with the U.S. Fish and Wildlife Service, who dedicated himself to making fish passage work. Harlan also had a very good working knowledge of hydraulics and mechanical engineering to stand him in good stead on fish ladder research. He was a rare combination of a "pure" scientist in relation to the physiology of fish and an "applied" scientist concerning their actions, idiosyncracies, and means of accommodating structures to them. The other person, while on retainer by the District for his expert knowledge, also had a dedicated purpose of making fish passage a success. This was Milo C. Bell, a mechanical engineer, who early in his life became involved in the Frazier River salmon problems with the International Salmon Commission and, while with them, developed the now famous and much copied Hells Gate-type fish ladder. Milo and Harlan worked many hours with the District staff threshing out the numerous problems for both temporary and permanent passage facilities and were ever ready to come to the site when a problem arose. Milo Bell, after 20 years, is still a mainstay in fishway design, as each project up the Snake becomes a reality and the now active research studies dictate changes. Harlan has retired but he maintains a professional interest in the Salmonoids.

As the word temporary designates, the McNary ladders, which were incidentally of the Hells Gate-type, required considerable attention because of floods, barges striking them, and fish not finding them the way man thought they should. With the exception of the Washington shore ladder, they operated for two seasons (1951 and 1952) in an adequate manner, however, and they, together with other emergency measures, got the fish past with little or no evident damage to spawning chargeable directly to the project.

Two or three little emergencies occurred which may warrant brief space. The 1951 spring flood was too much for the Washington (north) shore wooden ladder and it took off downstream. Substitute measures were instituted, including locking the fish through the navigation lock like a boat, which proved quite proficient. About the first of July in 1951 it was found that a major run of blueback was proceeding up the river but they were not getting past the dam on the north side. A large seven-foot-diameter round steel bucket with a bottom dump cone was hastily constructed. The fish were led into the lower end of the permanent ladder and into a specially prepared trap for the bucket. The bucket was then hoisted by derrick over the top of the navigation lock wall and submerged in the upper pool to empty. The bucket, which was put into operation on 5 July 1951, did yeoman service during the higher river flows until the final pool raising in 1953, passing large numbers of fish, particularly bluebacks which seemed to prefer the north shore currents.

To test the ingenuity of the engineers, bluebacks at one time found a damaged or open grating in the Washington shore ladder and became trapped in a chamber into which access was difficult. The trusty mechanical or structural means of snaring the fish and removing them was to no avail. As a last resort the project hired some Indian fishermen to come in with their Celilo Falls-type dip nets and dip the fish out. Some were rescued but it was a difficult operation, at best, and many proceeded no further toward their historic spawning grounds.

A third problem on the north shore was with a large triangular area adjacent to the lock wall having a very enticing eddy and pool as a resting spot for fish. Under certain flow and eddy conditions it became a haven for too many, so a flat fish net 12 feet in diameter was devised which was handled by a mobile crane on the lock wall. The net dipped fish every few minutes out of the eddy, sometimes on a 24-hour schedule, placing them in the navigation lock to proceed upstream, a very successful emergency operation. The McNary experiences proved valuable for other projects of the Corps and other agencies on ways of solving problems, as well as those to avoid next time.

INDIAN BURIALS AND FISHING

The McNary Dam and Reservoir area historically was used extensively by the Umatilla, Walla Walla, and Cayuse Tribes as well as a travel route for Nez Perce, Yakima, and Warm Springs Tribes. There were many Indian artifacts found throughout the area, as well as the remains of old Fort Nez Perce, later to be named Fort Walla Walla, at the mouth of Walla Walla River. More importantly, though, were the Indian burials along the river which had considerable religious and sentimental meaning to the members of the three tribes now living on the Umatilla Reservation at Pendleton.

Land acquisition along a reservoir, at least along the Columbia and Snake Rivers, is an interesting vocation. McNary reservoir, invading the riverfront properties of eight communities, as well as the lands of one pseudo town, seemed particularly so. The interest was enhanced by the many, but unknown, Indian burials. Early in the program for relocations and acquisition, discussions were started with the Board of Trustees and Tribal Council of the Confederated Tribes. Little concrete evidence on burials could be obtained, but a strong and vocal interest was evidenced. Several meetings were held, with proposals and counter-proposals relating to their ancestors. However, the hard fact that the location of their burials was in most cases unknown precluded any practical means of recovery and preserving.

COL Whipple and his staff, in the discussions with the Council, suggested judicially it would be very fitting and proper that the burials remain undisturbed and that they lie quietly beneath the water. This required some careful thought by the tribal Chiefs--and some carefully expressed, long presentations by them. Even though they could converse in English, official statements were made in their own tribal tongue. One elderly but eloquent Chief, Jim Kanine, required two interpreters, one from his native tongue Walla Wallan to the Umatilla language, and the second translating it into English for us. At the council meeting on 15 July 1949 the Chiefs made their decisions known, as did others, but the Tribal Council membership was to vote on the proposal of undisturbed burials. After several orations that would shame some of our modern generation for eloquence and feeling, the proposal was put to the members of the Council for vote. The first vote lacked a majority in favor, with several evidently abstaining. Some of the Chiefs or older people had not voted since they had "spoken" previously and felt they didn't need to express themselves again. The Council had just recently adopted the democratic process of voting on tribal matters and the old Chiefs did not understand the need to vote on a decision after they had stated their position as a Chief. The final vote was a clear majority. As Jim Kanine, Willie Wocatsie, and Toy Toy so ably expressed it "...Let's not disturb those who are buried there; let the waters of the mighty river that they loved so well flow over their graves. I know that when we pass on our mortals turn to earth, and as long as we exist by the water let those of us who may, return to the water...."

It should be noted that the white man had to make doubly sure of such momentous decisions and he made certain that those sleeping quietly beneath the waters would not raise up to plague him. The minutes of the Tribal Council were introduced into the white man's court as evidence of the agreement, and a court order was obtained to confirm this action for the remains of the deceased. Subsequent occurrences again proved the white man to be the despoiler. In the interim, prior to the reservoir impoundment in December 1953, artifact hunters had little respect for "those who are buried there" and several graves were robbed and destroyed, with the remains scattered indiscriminantly. Policing of the reservoir area against such wanton action proved a difficult task, especially on long weekends. Some severe criticism was received from the Indians, and justifiably so.

Fishing activities by the Indians were never spelled out in any detail; however, there was some discussion of the 1855 Indian Treaty rights that might be abrogated or damaged by McNary and other projects. While the extent of fishing and any remaining rights to this open stretch of river were possibly quite tenuous, those for Celilo Falls at The Dalles were very real. Consequently, when The Dalles Dam was authorized by the 1950 Act, attention was shifted to that very real loss, by not only the Umatilla Tribes but the Yakima, Warm Springs, and Nez Perce Tribes. Charles Luce, a very astute and able attorney in Walla Walla who represented the Umatilla Tribes, was retained by all of the Indians to present their case against the Corps for the Celilo Falls fishing rights. Any miscellaneous fishing activities on upstream to the Snake seemed to be subordinate but included in those discussions and no further action was taken with respect to McNary, even though a claim had been filed. The eventual settlement with the Federal Government awarded $23.5 million to the Yakima, Warm Springs, Umatilla, and Nez Perce Indian Tribes.

Mr. Luce later became head of the Bonneville Power Administration and was the articulate advocate for the Canadian Treaty for development of the Columbia River headwaters, and the California power intertie. Subsequently, Mr. Luce was appointed first as Assistant Secretary and then Under Secretary of the Interior. He later resigned to accept the position of President of Consolidated Edison Company of New York. He has retained his ties with Walla Walla and the Northwest. With the Consolidated Edison's "Big Allie", "Storm King", and brown-out problems, Mr. Luce would no doubt be glad to come back and dicker further on Indian rights.

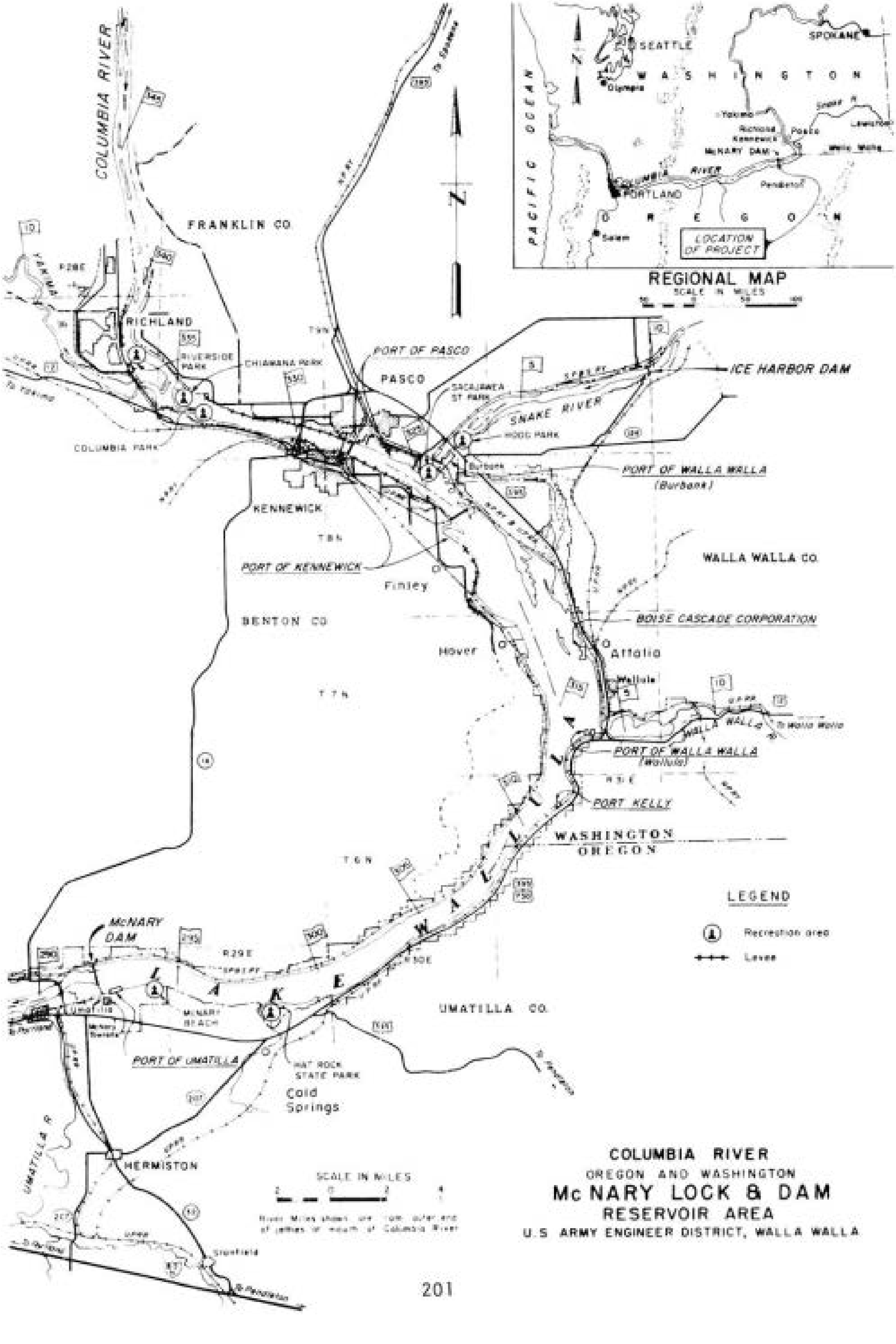
TRIBAL REPRESENTATIVES AT McNARY DAM DEDICATION

LANDS AND COMMUNITIES

As one physical measure of the impact of the McNary project on the area, with a relatively conservative land acquisition policy of the time, it was necessary to purchase 41,391 acres of land and improvements for the 64-mile-long, 38,800 acre pool which has a total shoreline length of about 242 miles. The lands, some in urban areas, cost the project $10,753,000. As indicated previously, McNary reservoir became a part of eight communities, some to their detriment and others with some advantages. Three of the small communities--Attalia, Hover, and Wallula--were acquired and completely inundated, with Wallula and Attalia moving to high ground; Wallula as a completely new community with physical movement of houses and other facilities; Attalia evidenced only by the "whistle stop" on the railroad, and the section quarters. Wallula, Burbank, Findley, Kennewick, Pasco, and Richland now have their public port facilities for commercial, industrial, and recreation uses, primarily administered by port commissions. Portions of the new "Atomic City" of Richland, built on relatively low land at the confluence of the Yakima River with the Columbia, needed protection from the McNary reservoir by a levee system, as did the communities of Pasco and Kennewick. In Richland, and in the high-value residential area west of Pasco, the levees blocked rather attractive waterfront areas and the sweeping views of the Columbia River. Many of the owners were disappointed to lose their scenic views. In the non-leveed areas, the owners of homes and riverfront expanse above the project flood properties also are required to contend with recreation users of the shorelands between their home and the lake, and some of their careless manners.

The Federal Government owns about 30 miles of the riverfront in these communities with 17.8 miles of levees protecting them. Reservoir management requires a very judicious crew of rangers for the problems of those behind the levee and waterfront property, as well as administering the rapidly increasing public use of the very attractive reservoir area with a multitude of recreation opportunities. The reservoir, named Lake Wallula, has almost 11,000 acres of project lands surrounding it. Approximately 2,100 acres are designated for park purposes, while 10,400 acres of the land and adjacent water areas are set aside for fish and wildlife refuge management.

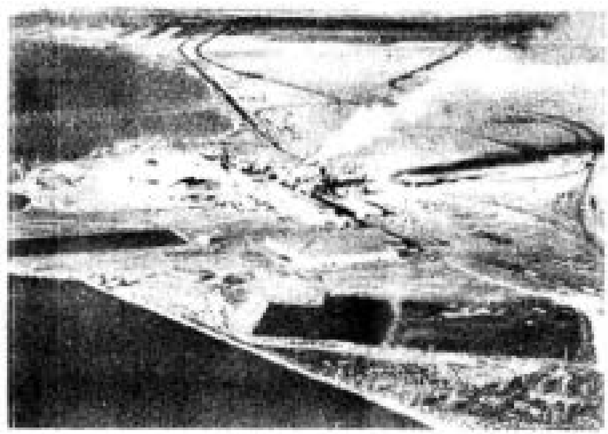
A very important sphere of reservoir management directly related to the primary purpose of the project--navigation--involves the question of using project land for port development and commerce. On some projects before World War II, flowage easements only were acquired; however, for the McNary project the land acquisition policies had been modified so as to acquire fee title to a blocked-out perimeter encompassing the reservoir. This resulted in the project owning an important and strategic band of shoreline completely around the reservoir. Some of this land had to be exchanged with the railroads for their relocated rights-of-way. However, larger segments were available for collateral project uses such as recreation and wildlife noted above.



COLUMBIA RIVER
OREGON AND WASHINGTON
McNARY LOCK & DAM
RESERVOIR AREA
U.S. ARMY ENGINEER DISTRICT, WALLA WALLA

Port development along the reservoir is a necessity. As indicated, project ownership of the shoreline used to be a minimum, with flowage easement only. Under such control, private industrial development and navigation interchange has little problem. McNary shorelands being owned in fee, however, posed complications in obtaining land title for permanent structures or long-term leases from the Government. The Port of Walla Walla, a state-authorized public taxing body created as a result of the Columbia and Snake River development, approached its development problems with no inhibitions and with considerable finesse. Needing project shorelands both for development and access to the river, it soon became apparent that having only leased land in a negotiating portfolio for enticing industry to locate in the area was not adequate. No authority existed for the Corps to sell such shorelands for those purposes. As a consequence the Port, with the technical assistance of this District as well as its professional support, proposed and obtained special legislation through Congress for the sale of parcels of McNary shorelands within the jurisdiction of that Port authority. This was P.L. 85-130, dated 14 August 1957. Other port districts, after analyzing the potentials for such

CHEMICAL PLANTS - FINLEY



BOISE-CASCADE PAPER PLANT
WALLULA

SNAKE RIVER PETROLEUM TERMINALS

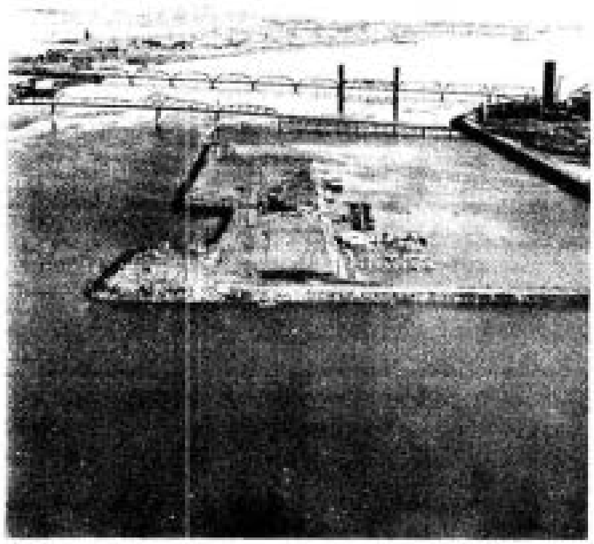
BURBANK TERMINAL
WALLA WALLA PORT DISTRICT

land use in their area, worked with the Inland Empire Waterways Association (IEWA) for general legislation of the same calibre. IEWA and others, drawing on this District and the Corps for technical assistance, obtained enactment of Section 108 of P.L. 86-645, dated 14 July 1960. This law authorizes the Secretary of the Army to sell lands at any Corps project to public agencies for public port and industrial purposes when such sale will be to the best interest of the project. Since obtaining the legislation, it has been used in several other Districts to solve land-related navigation problems. For the McNary project, approximately 2,000 acres have been sold to the five port districts for waterfront development. These sales have also created a use for considerable adjacent land areas and economic development. As a result, the urban areas at the mouth of the Yakima, Snake, and Walla Walla Rivers have become major harbor and industrial complexes for which this District has received some kudos for its forward-looking land use policies. Five port districts and facilities for over 20 concerns having a plant value of about $100 million are currently operating around the McNary Pool.

The McNary land acquisition procedures, because of the policy of purchasing fee title to a fairly wide band of shorelands, ran afoul of a counter type of private land development, which generated considerable acrimony. The sagebrush and desert area at the mouth of Cold Springs Creek, Oregon, about eight miles upstream of McNary Dam with the advent of the project was a bright gleam in the eye of its owner, Mr. R. W. Richmond, for a completely new major community in Oregon; a town of 100,000 people, second only to Portland. He could not be dissuaded from his vision, nor could the District convince him that the Federal Government should have adequate lands along the shore. Availability of reservoir frontage obviously would be an important adjunct to a community of 100,000 souls. How it was to be used and controlled was the question. "Negotiations" were carried on for ten years with Mr. Richmond. A compromise settlement was reached eventually for only a flowage easement for the Government, covering the lands above the high water and erosion line of the reservoir. As a sequel, the Port of Umatilla subsequently entered into negotiations for a portion of these lands, only to find the price and conditions excessive for them on a judgment settlement. The Port paid $10,000 in court just to be able to dismiss the condemnation suit and not take the land. The site remains, as of this writing, a dry, parched, open parcel of wasteland with bank erosion taking some toll, and a not too careful general public using the waterfront without much care. It will be interesting to see how the next generation plans for this reach of shoreline.

RELOCATIONS AND LEVEES

To provide navigable water throughout the tri-city complex of Pasco, Kennewick, and Richland as well as into the mouth of the Snake River, together with better power production and overall project function, a pool level of 340 feet above sea level was chosen early in the planning for the dam. Such a level, coupled with the strong need for some flood protection to the communities as evidenced by the 1948 flood, dictated an extensive levee system extending from the mouth of Snake River upstream past the new City of Richland. This levee system in front of urban areas is in effect a long continuous dam since some of the developed lands behind the levee are at or below pool level. The design and construction of these community front "dams" required some innovative engineering, such as extensive provisions to cut off underground seepage for depths as great as 70 feet, with major portions of the levees thus being underground. Interior drainage through the developed communities also required unique treatment. About 18 miles of levees were constructed, and pumping plants with a total capacity of about 300,000 gallons per minute have been installed.



KENNEWICK LEVEES AND
CLOVER ISLAND RECREATION AREA

RICHLAND LEVEE AND WATERFRONT

PASCO - KENNEWICK LEVEES
HARBOR FRONT AND BRIDGES
(NPRR IN FOREGROUND)

UPRR BRIDGE BELOW SNAKE RIVER
(TO BE REPLACED)

The need for a positive cutoff core in the extensive levee system demanded careful analysis. Two ways were possible; either dig down and put in impervious material or grout with bituminous materials. Studies were also made for grouting with bentonite in place. The actual work was accomplished with a bentonite slurry in an excavation trench. This slurry held the trench open until impervious material could be backfilled into the cavity which extended to the Ringold formation below as a seal. This method of holding a trench open in a region of high water table and loose material, as devised by District professionals for the project, was later patented by outside specialists and has been used at several other projects. The pumping experience indicates a complete success for the sealing of the levees with essentially interior water contributions having to be handled.

In 1950 the criteria for designed height of the levee system dictated protection against an uncontrolled flood equal to the 1894 flood of record. Little effective storage was in the Columbia River system at that time except for Grand Coulee, but there were many ideas for some. Since then, with the Canadian Treaty and other projects that have come into being, there has been almost 30 million acre-feet of storage realized for the system which effects a major degree of control. As a result, the levee heights are more than adequate under present-day conditions and the communities would like to shave off some. None have been lowered as yet.

Coupled with the levee system, the reservoir area required extensive relocations of utilities. A total of 80 miles of main-line railroad track was relocated which, at that time, comprised the largest railroad construction project in the Nation. In addition, the locations of 31 miles of state highways, 9 miles of county roads, and 83 miles of power and telephone lines were revised. The water supply intakes and filter systems for Pasco and Kennewick also required rebuilding. Seven major bridges were either modified to some extent for approaches, or rebuilt, as was the Madame Dorian bridge over the Walla Walla and the Northern Pacific Bridge over the Columbia River. Two critical railroad bridges at Burbank, the Union Pacific Bridge across the Columbia and the Northern Pacific bridge at the mouth of the Snake, are considered to be hazards to navigation and are currently under negotiation for major changes to the navigation span. (The Northern Pacific bridge over Snake River was modified late in 1971.)

A disastrous "happening" befell the major highway bridge near the mouth of Snake River during all the other changes underway along Columbia River from McNary to Pasco. The bridge deck caught fire one night in 1950 and was completely destroyed. This bridge, which was due for some alterations, is a vital link between southeast Washington and eastern Oregon with the Tri-Cities, the Yakima Valley, and through routes to the west. The next bridge over the Snake River was some 80 miles upstream, and to cross the Columbia to Kennewick the closest ferry was about 40 miles downstream. Concurrent with that loss was the closure of the highway downstream through Wallula Gap by reconstruction for the

McNary project. This precluded using the ferry crossing below McNary Dam unless a long detour was made into Walla Walla and south. To travel from Walla Walla to the Tri-Cities, a distance of 45 miles, required a detour of about 120 miles south to Athena and west to Umatilla, Oregon, crossing the ferry, then north to Kennewick. Row boats, walking the railroad bridge, and other means of crossing Snake River were resorted to until the Corps induced the Army to build a pontoon bridge at the mouth of the river. This served until the highway department could install a one-way plank deck on the bridge remains.

OLD SNAKE RIVER HIGHWAY BRIDGE
(Tri City Herald)

NEW SNAKE RIVER HIGHWAY BRIDGE

With no suitable bridge to work on, there remained no compensable interest of the McNary project to help pay for a new bridge. Great consternation resulted, to the extent that Congressional assistance was sought. Fortuitously, special legislation was being undertaken by the Northern Pacific Railroad to clarify the legality of Federal participation in the cost of the new bridge required of them at Pasco over the Columbia River. Congress finally agreed to add a separate clause to that pending legislation directing participation of the project in the new highway bridge that had then been constructed. The special act, which is also applicable to other bridges for the project, is named the McNary Bridge Act, passed as P.L. 546 dated 15 July 1952. As a result, the project reimbursed the state for about 60 percent of the highway bridge cost ($1.4 million), as well as legalizing the old Northern Pacific bridge and investing $5 million for that new structure out of a total cost of $5.5 million.

DAM DEDICATION

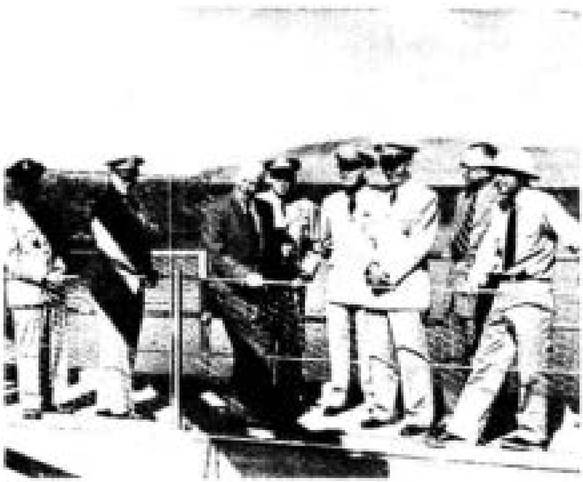
A gala occasion on 23 September 1954 properly dedicated the project, as a major stride in harnessing the Columbia for the benefit of mankind, and as the initial unit in a two-decade program of water resource development that has not been paralleled to date. With this sense of regional activity, and long persevering to realize the McNary project, the possibility of a Presidential dedication was seriously considered as early as 1952. It was not until July 1954, however, that President Eisenhower officially accepted such an invitation by the local people. The White House stipulated that local interests should take the responsibility for arranging the ceremony and its execution, with the Corps giving an assist for physical facilities, security, communications, and the like.

To implement the dedication, several months before the principal speaker was affirmed a separate local corporation had been established--The McNary Dam Dedication Committee. This official body, with a budget of $20,000 supported by Inland Empire Waterways Association, port commissions, counties, and cities, did yeoman service in working out every detail. Thirteen committees of local citizens worked out specific procedures and arrangements for everything from hot dogs to first aid; from traffic control to special trains; from a myriad of high-school bands to the Navy's "Blue Angels" flying demonstration; and from commercial barge tows and pleasure boats to a water show. Thirty special phone circuits were required, including one direct to the White House; parking for 7,000 to 10,000 cars; space for special trains; ten concession stands; extensive sanitary and first aid facilities; traffic and security control for 50 miles around; and careful patrol of all the water areas. TV, radio, and newspaper coverage was complete.

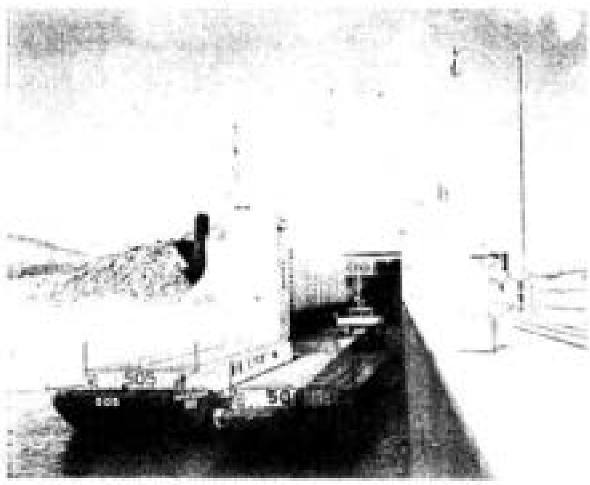
The President was given a royal reception in Walla Walla the evening before and motored 50 miles to the dam that eventful morning. A tour of the project, the dedication ceremony, and luncheon occupied about three hours at the project, with a departure for Pendleton, Oregon, and

PRESIDENT EISENHOWER

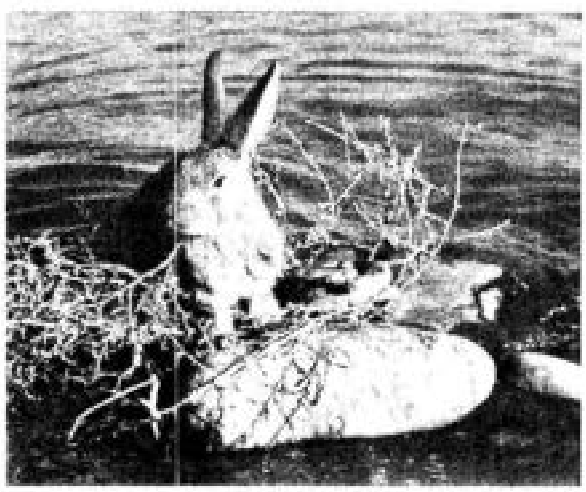
THE PRESIDENT, MRS. CHARLES McNARY, GOVERNOR LANGLIE



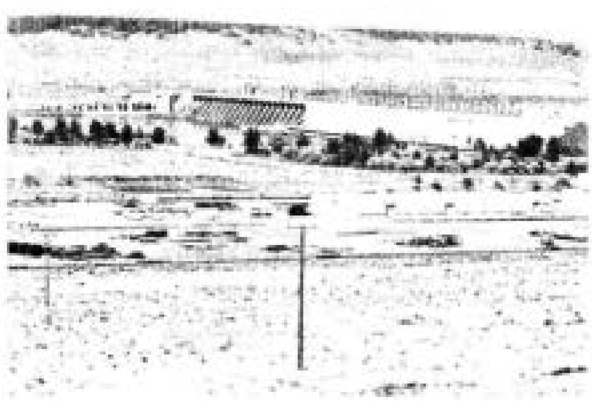
CORPS OFFICIALS AND THE PRESIDENT



NAVIGATION LOCK PASSAGE



TWO CASUALTIES TO LAKE WALLULA



THE COMPLETED PROJECT

its airport at 1:00 PM. He was accompanied by the Secretary of the Army, Robert Stevens; Chief of Engineers, MG Samuel D. Sturgis; and the Secretary of Interior, Douglas McKay; all three of whom had parts in the dedication ceremony. In addition, the Governors of the two states were an integral part of the program, each making an appropriate talk before the President did the honors. They were Arthur B. Langlie of Washington and Paul L. Patterson of Oregon.

It was a beautiful day with an estimated 40,000 visitors. The dam and all its appurtenances were thoroughly examined by all, with lots of activity all day, both on the water and in the air. Most importantly, however, a genial, interested President gave a very appropriate dedication speech and pushed the symbolic button that put the project into operation for all its uses--navigation, power, recreation, irrigation, and better stream management. The Committee did a top-notch job for the President and citizens, and the downstream "big bend" in the Columbia River had its "day in the sun" of publicity.

It was upon this occasion that President Eisenhower announced, or reiterated carefully, his philosophy of partnership in hydroelectric power generation. In his speech he said, "There are some who contend that the development and distribution of hydroelectric power is exclusively the responsibility of the Federal Government...Only thus, these zealots would have us believe, can we poor citizens be protected against exploitation by what they call 'predatory' exponents of capitalism - that is, free enterprise. ...I happen to hold this conviction: That, here in the Northwest, your own public agencies and your own private companies--operating under both Federal regulation and your own eagle eyes out here--can work in the public interest at least as well as some far-off Federal agency." He complimented the cooperative effort of the Northwest Power Pool and the joint development of the hydro potentials. He continued, "In this effort we shall avoid extremes. We shall neither withdraw from the power field nor federalize all electric power generators in the United States."

As discussed in Part I of this history in connection with the development of other projects, the partnership in dam construction and power production was later proposed to the Congress, and several local private and public utilities filed a request with the Federal Power Commission (FPC) for the authority to build the power installations at the Snake River dams and at John Day Dam. Congress saw fit not to approve the legislation and the partnership idea did not materialize.

In this same speech the President unknowingly and unintentionally stepped on some political toes. The Dalles Dam was just getting underway and local interest was beginning to generate strong support for completion of the lower Columbia development by construction of the John Day Dam between The Dalles and McNary. The President had words of praise for Republican Senator Guy Cordon who was running hard for re-election and who was a supporter of further development of the Columbia. The Senator had expected the President to name John Day Dam as the next Federal venture. Instead he blandly stated that the next dam to be built in the west would be Libby Dam in Montana. This did not prove to be true because of international treaty and authorization difficulties. John Day turned out to be next, partly because the "river folks" rose up and had things to say; a month and a half later Senator Cordon was defeated at the polls by Richard Neuberger, a Democrat.

LAKE WALLULA

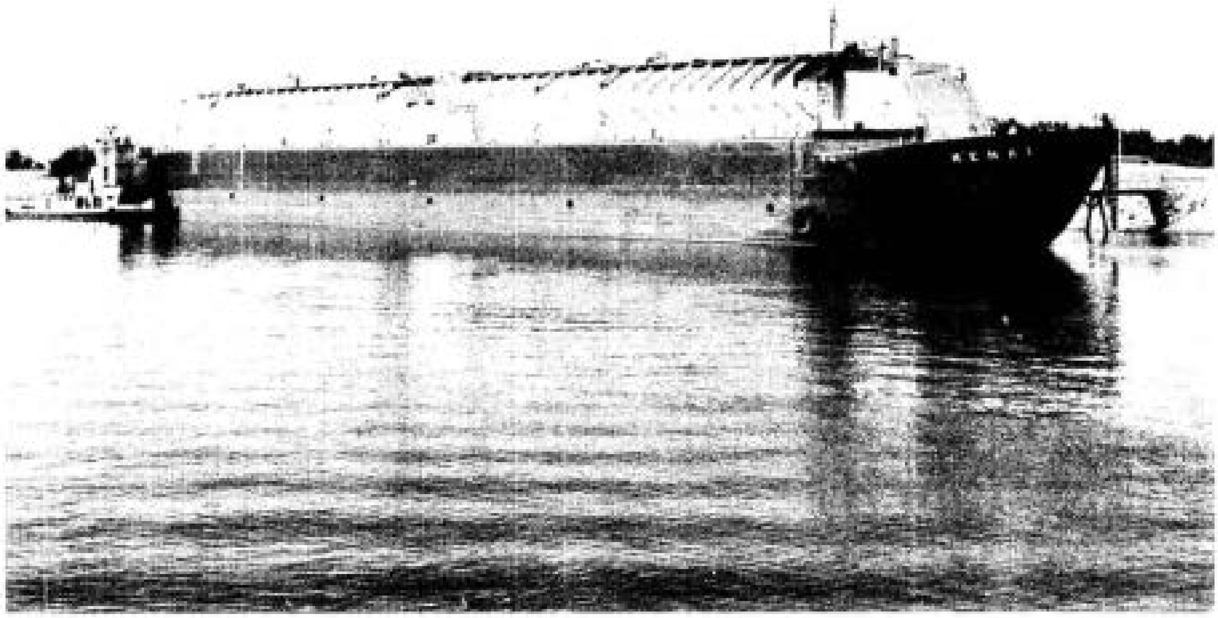
The body of water behind McNary Dam was simply known as McNary reservoir for several years, even after the dedication in 1952. There was considerable local interest in a separate name for this popular recreation area, however, with organizations, communities, and individuals making proposals. (A popular radio announcer for the region made quite a campaign in a humorous vein for "Veronica Lake" whose Hollywood figure was a well publicized subject of the time.) The decision in 1958 by the U.S. Board of Geographic Names was that this body of water should be called Lake Wallula. The name is commemorative of the Wallula Tribe of Indians who were in the lower Walla Walla Valley, the natural geologic formation at the mouth of the Walla Walla River called Wallula Gap, and the old historic community of Wallula, one of the oldest in the Inland Empire, which was moved in its entirety when the lake was formed.

NAVIGATION LOCK TRAFFIC

The general history of the District recounts some of the difficulties and the importance of boat traffic and river transportation on Columbia River from early settlement to the advent of the locks at Cascade Locks, The Dalles-Celilo Canal in 1915, and then at Bonneville in 1938. River traffic, with gold rushes, depressions, and competition from the railroads and highways, as well as natural obstructions in the river, has had a widely fluctuating history.

Records indicate that in the early days of the depression (1930-31) no traffic moved through The Dalles-Celilo Canal to or from the upper river. With the advent of Bonneville Dam and upturn in the economy, traffic at The Dalles rose to over 300,000 tons annually in the early '40s. The first full year of operation of the McNary Lock for 1954 shows a total tonnage moving through it of over 500,000 tons. Traffic increased steadily during the next decade until it leveled somewhat at 1¼ million tons in 1963. By the end of the '60s, however, it was reaching toward the 2 million mark.

Navigation tonnage through a lock is only one measure of the overall utilization of a waterway and reservoir area. The small privately owned power boat is fast becoming an important statistic in lockage and traffic on the river. They augur well for having an influence on project development and reservoir management. Reservoirs and stable river flows have had a major influence upon the boat and power unit industry, with many new innovations resulting.



BARGE "KENAI" LEAVING KENNEWICK FOR RETURN TRIP TO ANCHORAGE, ALASKA, FOR ANOTHER LOAD OF CHEMICALS. BUILT SPECIFICALLY FOR COLUMBIA RIVER AND OCEAN NAVIGATION.

RESERVOIR COMMERCE

The McNary reservoir, at present the upper terminus of the Columbia River navigation system and the juncture with the future Snake River navigable waterway to Lewiston, is a natural location for terminal facilities and commercial enterprises utilizing the river. It is a focal point for transportation related to the Yakima Valley to the west, the Hanford project, the major Columbia Basin irrigation project to the north, and the rich Walla Walla Valley to the east. Since establishment of the reservoir in 1954 port development and private industry have made major impacts upon the economy of the area. Port terminals, processing plants, manufacturing plants, chemical and fertilizer plants, petroleum storage, and grain storage all have made use of the five port district lands throughout the reservoir. The following tabulation illustrates the development around the reservoir during the past 15 years, much of it responsible for the current nearly 2 million tons of freight moving through the McNary lock annually. This data was introduced recently at Senate appropriation hearings by local interests.

MCNARY POOL PORTS

Port District	Plant Investment	Taxes Paid	Payrolls	No. Plants
Walla Walla, Washington	$ 32,410,000	$383,000.00	$3,100,000	13
Kennewick, Washington	47,122,000	444,266.00	2,508,000	12
Pasco, Washington	25,314,000	97,300.00	4,080,000	65
Benton, Washington	5,000,000	37,140.96	3,400,000	6
Umatilla, Oregon	2,536,059	55,106.00	2,100,000	4
Totals	$112,382,059	$1,016,812.96	$15,188,000	100

IRRIGATION

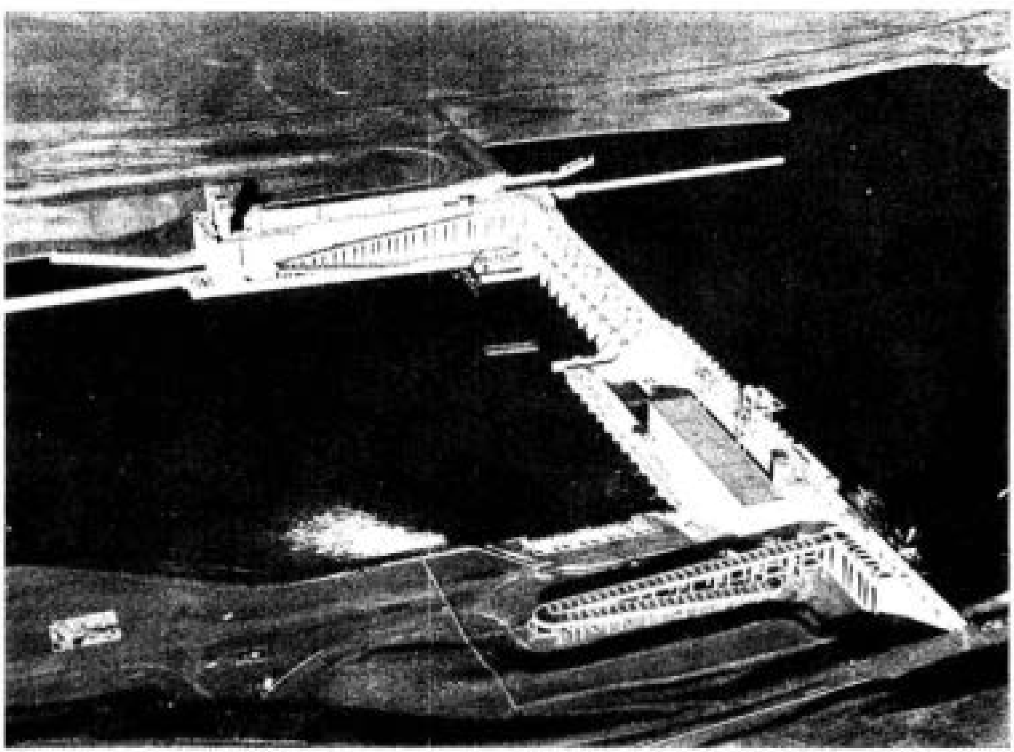
Irrigation of small tracts along the Columbia River was a reality prior to the McNary project, the largest unit being the area west of Pasco, in Franklin County. The triangle of land between the Snake and Columbia Rivers at Burbank had also been irrigated; failed as a project; and ultimately 5,400 acres included in the Columbia Basin project for further development. This was realized in 1956.

The Bureau of Reclamation had previously studied irrigation of extensive land areas along the Columbia from Umatilla to Boardman in Oregon, and Plymouth to Patterson in Washington, in connection with their plans for a Umatilla Rapids Dam during the 1920s. These studies were reviewed when McNary Dam construction was initiated for possible irrigation features to be an integral part of the structure. None were found feasible but the potentials for irrigated agriculture around the pool area became more real.

The irrigated land development around Lake Wallula which has come into being at least partially as a result of the project is:

Unit	Permit Date	Acreage
Walla Walla River arm	1963-68	550 A.
Burbank (Bu. Rec.)	1956	4400 A
Cold Springs-Umatilla Co.	1968	800 A. (initial)

SNAKE RIVER AT ICE HARBOR DAMSITE - 1956
LOOKING EAST (UPSTREAM)



COMPLETED PROJECT - DECEMBER 1962 - LOOKING NORTH

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CHAPTER 3

ICE HARBOR DAM - SNAKE RIVER

> There is an old saying - "The best prophet of the future is the past." In this vein the proponents of the lower Snake River development say - "What Bonneville Dam did for the Columbia River, Ice Harbor is doing for the Snake."

THE PROJECT

Ice Harbor received its name in memory of an ice-free cove just above the site, used for shelter by early river boat operators making the hazardous trips to the Idaho gold fields in the 1860-1870 period. The dam is the first of four planned for the lower 140 miles of Snake River to furnish a slackwater navigation channel to Lewiston, Idaho, 465 miles from the Pacific Ocean ("Idaho's picture window to the sea"). The dam, located at river mile 9.7, is 2,700 feet long with a normal operating height of 100 feet and a pool elevation of 440 feet above sea level. The project includes a single-lift navigation lock on the north shore with clear inside operating dimensions of 86 feet by 675 feet. South of the lock is a 10-bay spillway section 610 feet long. Each spillway bay has an overflow crest elevation of 391 feet with the pool water level controlled by a radial gate 50 feet wide and 53 feet high. The 10-bay spillway has the capacity to pass a spillway design flood of 850,000 cubic feet per second in comparison to the flood of record of about 410,000 cfs.

South of the spillway, and adjacent to the south shore of the river, is the powerhouse, a structure 680 feet long, 260 feet wide housing space for six turbines and generators each with the capacity of 90,000 kw. Three units were installed initially. As of the preparation of this history, power demands are such that design funds have been made available (FY 1970) for construction of the remaining three units. Turbine construction is scheduled to start in 1971 and the installation to be complete in 1975.

The fish passing facilities for the project are similar to the Columbia River plants and consist of two ladders, one on each shore with a fish collection system across the lower face of the powerhouse and a major collection entrance at the mouth of the north shore ladder adjacent to the spillway. A downstream navigation channel 250 feet wide and minimum depth of 15 feet is provided from the mouth of the river to the dam. The upper pool is 31.9 miles long, extending to the Lower Monumental Dam. To provide for the pool area and necessary development adjacent to it, 9,600 acres of lands and improvements were purchased at a cost of $714,000. Railroad and road relocations were provided for, together with six recreation sites and other wildlife areas. The total project cost is estimated at $157.5 million with the completion of the last three power units.

PROJECT DEVELOPMENT

The chronological review of lower Snake River navigation and its dams, as described in Part I, outlines the long history of the river use and studies for possible structures to improve navigation. The ultimate authorization for improvement of the 140-mile reach to Lewiston by means of major structures was adopted by the River and Harbor Act of 2 March 1945, generally in accordance with H. Doc. 704 of the 75th Cong., 3d Sess. dated 13 June 1938. That document was very general in scope. The authorization provides for construction of such dams as are necessary, together with open channel improvements for the purpose of providing essentially slackwater navigation between the mouth of Snake River and Lewiston, Idaho. Subsequent reviews, even before authorization, established the number of dams at five. Site selection investigations by 1947, coupled with establishing of the McNary Pool at elevation 340 which extended it up Snake River 8-10 miles, reduced the number of dams to four, essentially as now in place.

Design studies for Ice Harbor, including establishing the specific site for the dam, were initiated by the Portland District in FY 1948. The structural layout had been determined in sufficient detail so that a construction start was programmed for the first-step cofferdam by the fall of 1949 (FY 1950). This program was picked up by the new District, only to have a Presidential "hold order" placed on the project before any construction was initiated. The freeze lasted for five years. Some design money was available, however, and experience on McNary and other projects together with technical evaluation by this District's staff dictated changes in the Ice Harbor plans.

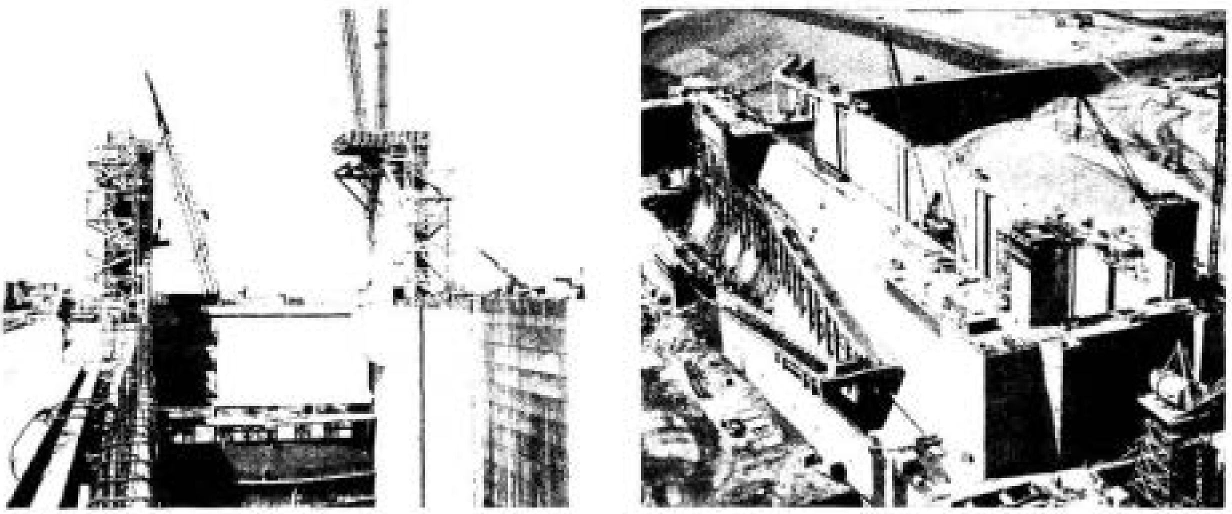
The studies of 1948 by the Portland District had established details for the first-step south shore cofferdam. A contract was also negotiated by them that year with Sverdrup and Parcel, Consulting Engineers of San Francisco, for design of the powerhouse. With no construction activity, that data was filed for the time being. Design Memorandum No. 1 in August 1952 summed up studies to date, including the power analyses of the contractor. A supplement to that Design Memorandum completed in August 1955 found need to modify the project features established in 1952 and before to provide for such changes as increasing the individual generator capacity from 65,000 kw to 90,000 kw, with three units initially and five ultimately; use of pumps rather than turbines to supply the necessary fish attraction water; the use of radial gates rather than vertical lift gates for the spillway; the downstream approach channel to the navigation lock to be 13 feet deep rather than 10 feet; and modifications to the navigation lock guide walls. A subsequent restudy changed the dimensions of the navigation lock from 86 x 540 to 86 x 675 feet, to make it standard with the McNary and The Dalles projects. These were rather major changes in the overall objectives for Ice Harbor and were reflected in the scoping studies then underway for the other Snake River dams.

Design Memorandum No. 2 in January 1956 firmed up changes and details of the cofferdam, and the first contract for construction was let in January 1956 as the result of an appropriation of $1 million for construction that fiscal year. Contracts were also let for the manufacture of three hydraulic power turbines and for steel for the cofferdam. The project construction moved ahead rapidly after that start, with design changes still to come such as adding the sixth power unit for future installation, thus increasing the installed capacity from the original 325,000 kw to a new total of 540,000 kw. This required moving the powerhouse to the south and changing the south abutment from an earthfill to concrete. The downstream channel dimensions were again revised and several modifications made to the fish ladders and the fish passage system, together with the working space within the dam nonoverflow structures.

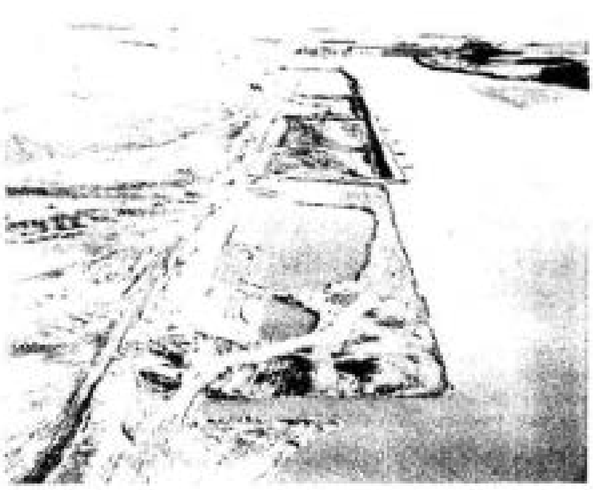
The modifications to the Ice Harbor fish ladders and collection facilities resulted from extensive analyses of the McNary facilities and experimentation done in the new fisheries laboratory at Bonneville Dam by the Bureau of Commercial Fisheries. The McNary project was in operation in 1954 with studies starting immediately. As a result, it was decided to eliminate the operation of certain features installed there. Fish ladder research at the laboratory in 1957 dictated changes in the design which were immediately integrated into the Ice Harbor north shore plans, with a few trepidations by the fishery agencies. These revisions made late in 1958 reduced the width of the north shore ladders in the second-step construction from 24 feet to 16 feet and steepened the slope to 1 on 10 from 1 on 16, as was used in the south shore ladder. The modifications also cut down the number of fish entrances across the powerhouse and reduced the auxiliary attraction water supply by about one-third. The changes improved passage conditions, and the cost of the Ice Harbor fish facilities were about half that of McNary ($12 million vs. $25 million). The Ice Harbor facilities proved to be good criteria for other projects on the Snake and Columbia Rivers.

The size of navigation locks for the Columbia-Snake River system has passed through an evolution of thought and justification analyses, with many sizes and shapes considered over the years. As indicated previously, the Ice Harbor lock finally achieved parity with the McNary lock in 1956 after work on the project had started. Due to the fact that the Ice Harbor project height exceeded McNary by 13 feet, the Ice Harbor lock was destined to take away from McNary the distinction of being the highest single-lift lock in the world with a hydraulic design lift of 103 feet. The John Day project didn't permit Ice Harbor to keep the honor for long, however.

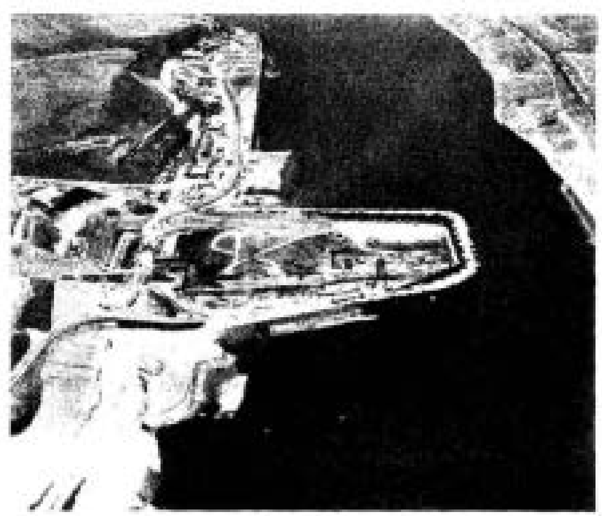
Designers get ideas at times, and computers aid and abet them in setting forth major modifications. Navigation locks have a long history of using double-leaf miter gates at each end for the passage of vessels. With the lower lock gate for Ice Harbor being an unprecedented height, the designers began casting about for a more rigid frame than the miter gate seemed to give. As a result, a composite vertical lift type gate was adopted late in 1958 in time for the second-step construction.



LOWER NAVIGATION LOCK GATE CONSTRUCTION WITH COUNTERWEIGHT TOWERS. NOTE ALSO THE NORTH SHORE FISHWAY ENTRANCE AND LADDER



DOWNSTREAM NAVIGATION CHANNEL EXCAVATION



FIRST-STEP SOUTH SHORE COFFERDAM AND CONSTRUCTION YARD - 1957

"Preliminary design studies proved that gates for high-lift locks with across-lock concrete girders offer definite advantages when both construction costs and facility of operation are compared." The Ice Harbor vertical lift gate as installed, with dimensions of 88 x 91 x 15 feet, weighs 1,400,000 pounds, balanced by two counterweights each 10 x 10 x 36 feet in size. It is an impressive sight to witness in operation, working very efficiently. The construction required an exotic type steel cover for strength which proved difficult to weld. (See John Day Dam experience.) There have been problems of maintenance of the steel as well as the structural composition of the lock walls in the vicinity of the gate, which have been remedied. Two other projects were subsequently built with vertical lift gates similar to Ice Harbor, John Day, and Lower Monumental Dams. All are functioning in good shape. However, with discretion being the better part of valor, design for the Little Goose and Lower Granite dams on Snake River reverted to use of the double-leaf miter gates. History may vindicate the designers, or disprove the quotation above.

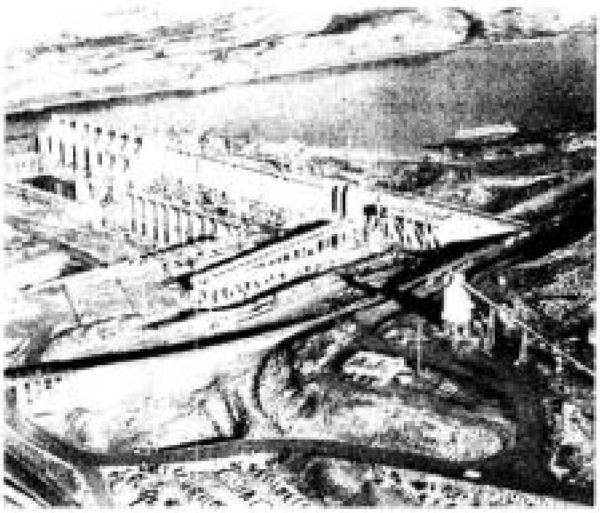
DOWNSTREAM CHANNEL

As mentioned above, an excavated approach channel to the navigation lock was necessary in Snake River for a distance of about six miles below the dam. Original studies anticipated a water depth of 10 feet for a 9-foot draft vessel. Subsequent studies deepened this to 13 feet of water with a channel width of 250 feet. Final decisions on the size and depth of lock dictated a depth over the lock sill of 15 feet, which required a deeper approach channel. The pool fluctuations for the McNary project were established at five feet--335 to 340 feet. To provide 15 feet of channel depth at minimum pool entailed extensive excavation for very infrequent use, since normal fluctuations were limited to only three feet. By agreement through the media of a design memorandum for the Ice Harbor project in January 1960, the channel depth was set at 15 feet for 14-foot draft vessels, assuming a minimum operating pool elevation for McNary of 337 feet. The channel was dug to this depth and a width of 250 feet by use of a series of temporary earthen cofferdams, at a cost of about $5 million.

CONSTRUCTION PROGRAM

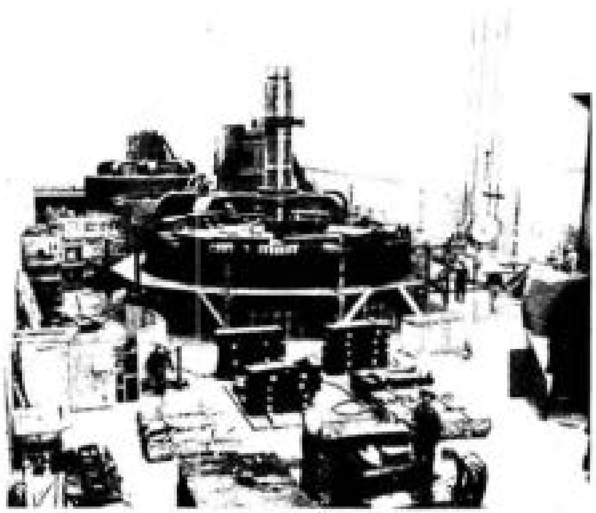
Absence of navigation traffic on Snake River has made the construction process for the dams much easier, by not having to provide passage under rather restricted physical conditions. The Ice Harbor construction was accomplished in four basic steps. The first-step cofferdam in the south half of the river provided for construction of the powerhouse, south shore fishway and pumphouse, south nonoverflow dam, and 7 bays of the 10-bay spillway. The construction was initiated in the fall of 1956 and completed to the extent that the cofferdam could be removed during the winter and spring of 1959.

The second phase of work on the north shore was undertaken in May 1959. The second-step cofferdam encompassed the remaining three bays of the spillway, the north shore fish ladder, the navigation lock, and the north shore nonoverflow dam. During this step the streamflow passed through the partially completed low spillway bays constructed previously and the three skeleton power unit bays of the powerhouse. This north shore construction continued, as did work on the powerhouse and other south shore features, until May 1962.

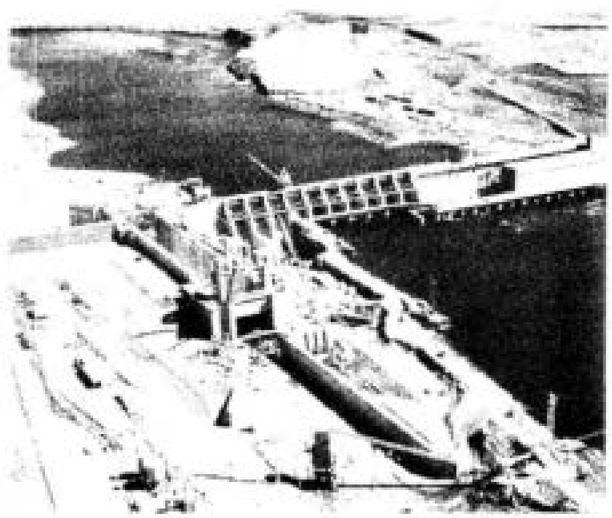


CONSTRUCTION WORK IN FIRST STEP COFFERDAM - 1958

SECOND STEP - NORTH SHORE COFFERDAM WORK - 1960

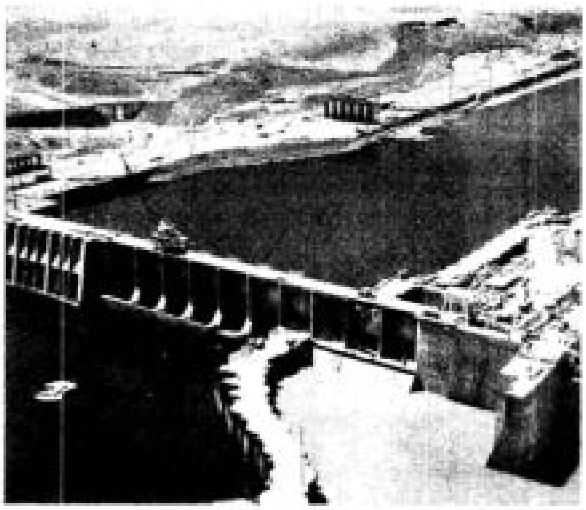


INSTALLATION OF POWER UNITS - 1961

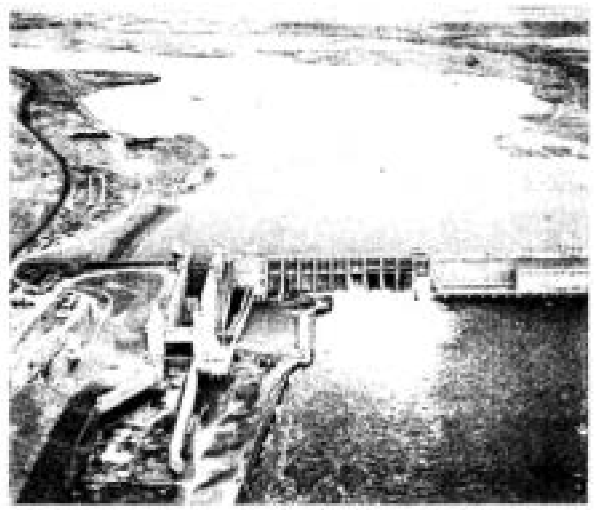


NAVIGATION LOCK AND SPILLWAY CONSTRUCTION - SECOND STEP - 1961

The third phase of the work, after removing the north shore cofferdam, involved the raising of the seven low spillway bays by completing the concrete work during low-flow conditions and preparation for raising the pool behind the dam. The low bays were raised in the fall of 1961 and filling of the initial 60 feet of the pool started on 28 November 1961. The final 40 feet of pool was created from January to April 1962. The first power unit produced commercial power on 18 December 1961, followed by the remaining two initial units in February 1962. During critical load rejection tests for the first unit on 5 January 1962 the turbine blade linkage mechanism failed, resulting in extensive damage to the turbine. It was necessary to disassemble the entire generator and turbine to effect repairs. The unit was out of commission until February 1963. The navigation lock was opened for normal traffic in October 1962, initiating commercial traffic in the lower 40 miles of the Snake River.

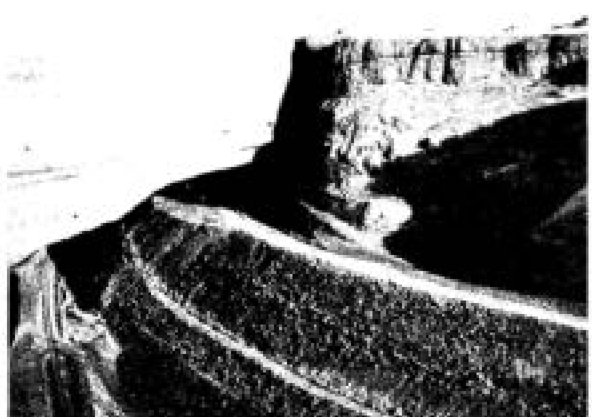


THIRD STEP - RAISING OF LOW SPILLWAY BAYS - FALL 1961



PARTIAL POOL - READY TO REMOVE SECOND STEP COFFERDAM - JAN 1962

RELOCATION OF SP&S RR TO HIGHER GROUND IN SAGEBRUSH COUNTRY



RELOCATIONS IN BASALT CLIFF AREAS UPRR ON SOUTH SHORE

The fourth phase, quite separate from the actual work at the dam, was the work in the reservoir area. The 9,600 acres of private lands were acquired primarily for the pool area and relocations. There were practically no roads to contend with except for stub ends to the river channel. Railroads lined both sides of the reservoir, however, which had to be relocated in the canyon to above the pool level. Fifty seven miles of railroad relocation were involved in the 32-mile long reservoir. The relocation work started in April 1957 and continued through 1961. Railroad relocations are a very exacting and time-consuming occupation. Continuous traffic and safety of operation require careful planning and tightly controlled execution of the construction effort.

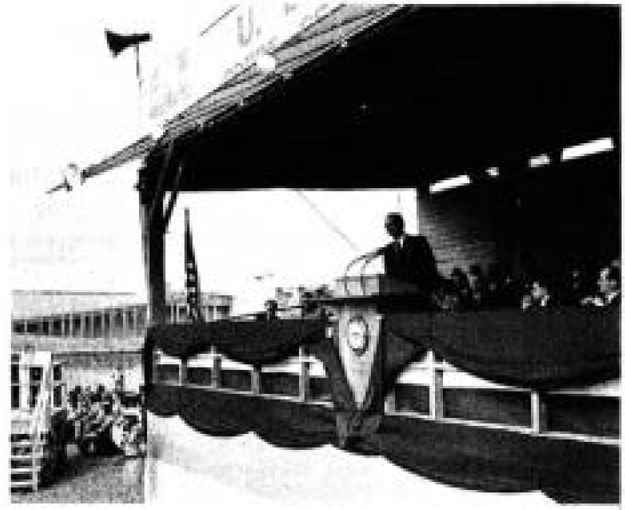
During the early planning for Ice Harbor, as the initial unit of the four dam plan, the relocation problem of the entire 140-mile reach was analyzed for alternative schemes of accomplishing the work. Three railroads were involved in the Ice Harbor pool, two in the Lower Monumental pool, and a single one from the Little Goose Dam to Lewiston. A joint agreement was attempted to place all rail traffic in the 140 miles of Snake River Canyon on a single line on one side of the river. Agreement could not be reached because of the operating and ownership problems involved, which were complicated. The relocation of each line ensued for the Ice Harbor project. Later condemnation proceedings for the Lower Monumental reservoir area eliminated the Northern Pacific tracks in that reach of river along the north shore, resulting in a joint-use agreement with the Union Pacific Railroad for the Camas Prairie traffic destined above Little Goose Dam.

DEDICATION

With the project coming of age and taking its part in the Inland Empire system of navigation and power enterprises, the proper dedication of this important initial step in the lower Snake River system was a must. Again, as with McNary, the local interests felt this occasion justified "top drawer" dignitaries and an invitation was sent to the White House in January 1962. Detailed planning was started immediately by the local sponsors, with the District involved in the physical facilities. The principal sponsors were the Port of Walla Walla, Port of Pasco, Inland Empire Waterways Association, the communities, and regional organizations. Plans were prepared covering transportation, traffic, entertainment, open house, communications, receptions, and, of course, the dedication ceremony proper. An Indian village was built, bands recruited, a marine parade scheduled through the lock, sky divers, a fly-over, refreshment stands, and a carefully outlined open house prepared. A foul weather, detailed "indoor plan" was even prepared for eventualities.

The decision was made at the White House that Vice President Lyndon B. Johnson would do the honors, and a date of 9 May 1962 was set for the occasion. That Wednesday broke warm and clear, furnishing an ideal day for the occasion. The Vice President was flanked by the Chief of Engineers, LG Walter K. Wilson, Jr., Senator Warren G. Magnuson of Washington;

MISS INDIAN AMERICA PRESENTS VICE PRESIDENT JOHNSON WITH A GIFT

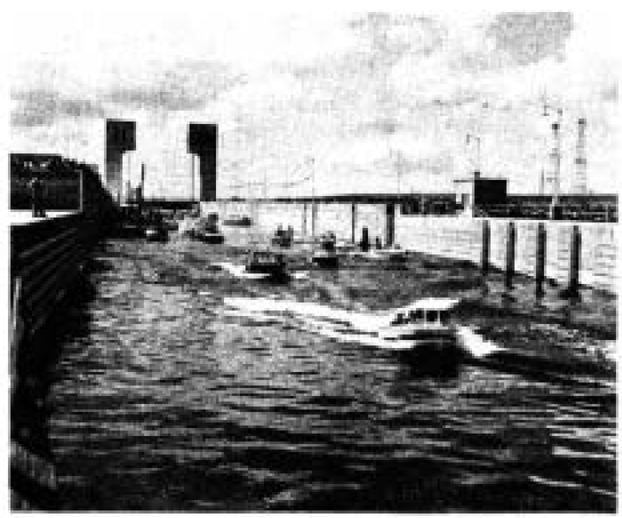


VICE PRESIDENT JOHNSON MAKES FORMAL DEDICATION OF DAM

THE DEDICATION SITE DOWNSTREAM OF THE DAM ON SOUTH SHORE

A PART OF THE GENIAL CROWD INTERESTED IN THE PROJECT

CORPS OFFICIALS, LTG WILSON, CHIEF OF ENGINEERS, MG LAPSLEY, NPD, AND COL BEDDOW, DISTRICT ENGINEER



PLEASURE CRAFT AT DEDICATION LOCKING UPSTREAM TO CRUISE ON LAKE SACAJAWEA and Senator Frank Church of Idaho. Governor Albert D. Rosellini of Washington and LG J. L. Ryan, Commanding General, Sixth Army, were also honored guests. The Governor had an active part in the ceremony, as did Miss Brenda Bearchum, Miss Indian America, who made a presentation to the Vice President. The dignitaries arrived at the Pasco airport; were escorted to town for an official luncheon; then proceeded to the project for a briefing, tour, and dedication at 3:00 PM.

The Vice President was a most genial and interested dedicator, entering into the occasion with verve and good humored repartee with Senator Magnuson, all in spite of a rather serious throat infection and being under sedation. In his speech he complimented the forward looking community leaders, IEWA, and others for the realization of the project as the initial unit of an important navigation and power development; for the irrigation potentials it held; and the many other resources for mankind. He also commented upon the major accomplishments now possible with the then newly ratified treaty with Canada for control of the Columbia. He reminded his audience of the rich heritage of Snake River and the Indian tribes to whom it meant so much, with the dams as a physical monument to them and the progress of mankind. It was a gala occasion with a good time had by all.

LAKE SACAJAWEA

During the construction of the project the proper name for the body of water behind the dam had been debated, as had similar questions for the McNary and John Day projects. Two women of the area became interested in the naming of the Ice Harbor pool and made a very successful campaign with 500 names on a petition. They were real pioneer residents of southeastern Washington with a great interest in this area of the Inland Empire and have done much for it--Mrs. Clarence Braden of Walla Walla, and Mrs. E. E. Allen of Pasco.

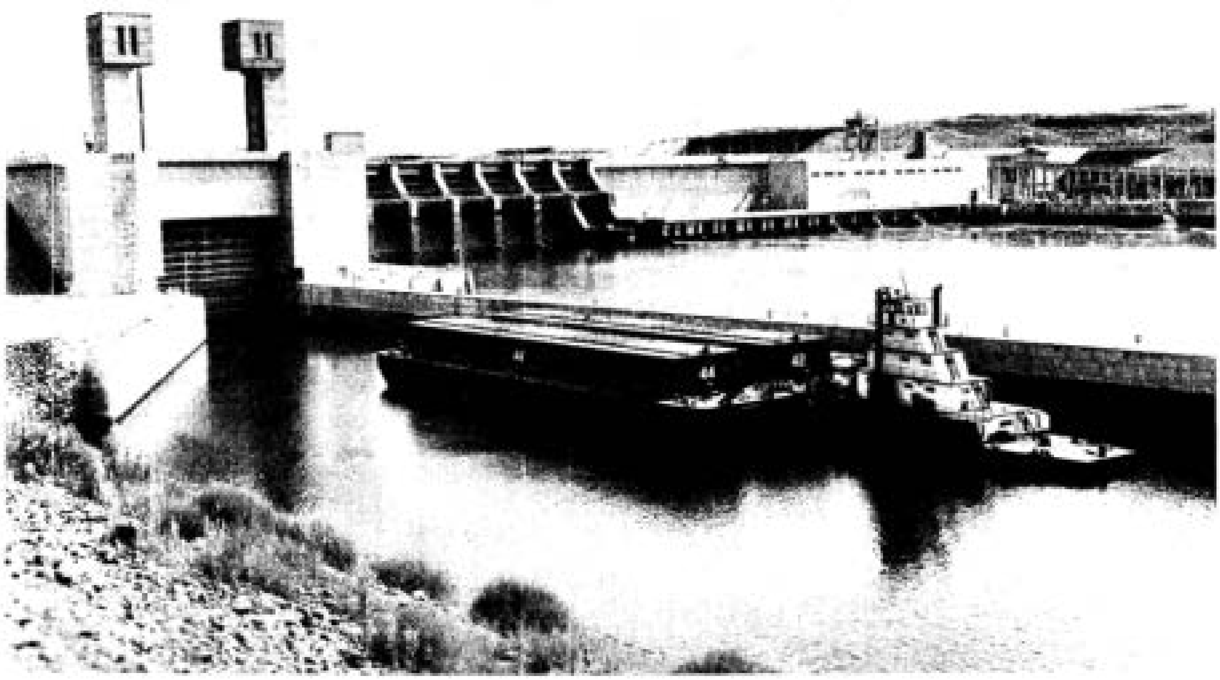
Working diligently with the U.S. Board of Geographic Names and Senator Magnuson, they succeeded in naming the body of water behind Ice Harbor Dam, Lake Sacajawea. Sacajawea was a Shoshone Indian maid married to the trapper Charbonneau who made most of the round trip with Lewis and Clark from the Mandan Village on the Missouri River and return. Sacajawea knew some of the languages and route over the Rockies and was a source of considerable assistance to the expedition. Incidentally, Sacajawea lived to a ripe old age of about 90, while both Lewis and Clark died relatively young. No doubt the pioneer women of this area had a warm spot in their hearts for this brave Indian maid who even gave birth to a child on the trip.

The official designation for Lake Sacajawea was made in January 1962, just a few months before the lake was to be created that year.

RESERVOIR MANAGEMENT AND NAVIGATION

The Snake River Canyon from Lewiston to the mouth has historically been an isolated region, approachable only at a few points where local roads venture down through a draw. Ardent steelhead fishermen and hunters ventured into the canyon at the road ends but the general public knew little of many miles of the canyon topography. In the 140 miles of river channel there are two railroad bridges and one highway bridge crossing the river. One ferry previously ran at the approximate site of the old Mullan Road crossing of the 1860s (Lyons Ferry). The ferry was displaced in 1966 by the Lower Monumental pool raising and the State of Washington built a second highway bridge to replace it.

Most of this 140 miles of stream was not navigable by the average pleasure boat, and commercial traffic was nonexistent. The advent of the Ice Harbor pool, named Lake Sacajawea, with the additional points of access that were constructed, and its deep slackwater lake without rapids and rock reefs, opened up a very scenic reach of river to the average citizen, whether he had a boat or not. Six park and public-use areas provide swimming, water sports, picnicking, fishing, and other uses, as well as a real pleasurable boat trip on the 30-mile pool area; and the public has been quick to take advantage of it.



COMMERCIAL NAVIGATION RETURNS TO THE LOWER SNAKE RIVER AFTER A HALF CENTURY OF ABSENCE. TUG AND WHEAT BARGES ENTER ICE HARBOR LOCK TO PROCEED INTO LAKE SACAJAWEA

FISHHOOK PARK - BOAT LAUNCHING
AND SWIMMING AREA

FISHHOOK PARK - SWIMMING AND
AND PICNICKING AREA

LEVEY PARK - BOATING, SWIMMING,
AND PICNICKING FACILITIES

WINDUST PARK AND PORT ELEVATOR
BOAT LAUNCHING, PICNICKING AND
SWIMMING

Commercial navigation has reappeared on the river. The Ice Harbor construction did not provide for interim boat traffic past the site, nor will the remaining three dams, so up until 1962 there was no movement on the river. Two port facilities have subsequently been built on the Ice Harbor pool, one at Windust on the north shore and the other at Scheffler on the south shore. These facilities provide for grain storage and transshipping for river traffic. In its first eight years of service the annual traffic on Snake River through the Ice Harbor lock had reached 290,000 tons (1967) practically all of which was wheat destined for downstream ports and foreign trade. Completion of the four dams should see a marked increase in through commercial traffic if all of the forecasts are to be realized. Land for port development on Lake Sacajawea is limited because of the railroad rights-of-way along each shore.

IRRIGATION

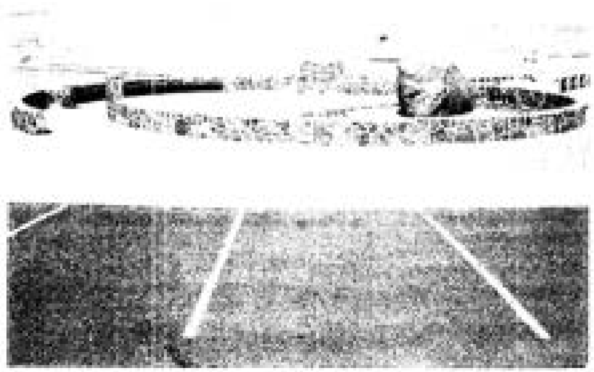
While not a project function, the Ice Harbor pool, by raising the water level about 100 feet, made Snake River water much more accessible for irrigated agricultural purposes. The advent of overhead and traveling sprinklers was also a factor. Through 1970, four major water users have installed pumping units in the Ice Harbor pool, pumping to adjacent lands. In the years 1963 to 1969 Walla Walla County alone doubled its irrigated acreage from 31,000 acres to over 60,000 acres, with half of that gain, about 15,000 acres, being served from the Snake River. An additional 3,000 acres are being served on the north bank. Anticipated land development in the next few years could put another 10,000 acres of marginal, arid, but fertile land south of the river under irrigation. Long-range dreams would add another cipher to that figure, possibly drawing the water from the Little Goose pool to save more pumping head.

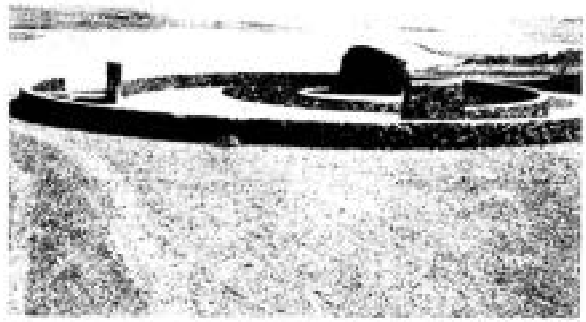
ARCHAEOLOGY AND INDIAN BURIALS

As with the Columbia River in the vicinity of the McNary project, the American Indian Tribes of the Inland Empire used the lower Snake River as a travel route and source of livelihood. As a result, there had been many burials, unmarked, as well as temporary campsites. Archaeological explorations were undertaken and some valuable prehistoric artifacts recovered, such as at "Windust Cave." A few known burials were moved but negotiations with the five tribes who frequented this reach of river were necessary for the unmarked graves.

Reminiscent of the McNary negotiations, serious talks were held with each of the tribes; the Yakimas, Umatillas, Warm Springs, Colville, and Nez Perce Indians for appropriate measures. It was finally decided that in lieu of attempted grave relocation, a single monument would be created to commemorate the ancestral burials of the five different Indian groups, permitting them to lie in peace beneath the waters of the Snake River.

After considerable study regarding a suitable theme representative of the cultures of the five Indian groups, a large boulder from the river canyon bearing distinctive ancient petroglyphs was selected as the focal point for the architectural design. The memorial was sited on a bluff above the dam overlooking the entire project area, and affording a commanding view of the lake in the river canyon which was the former home and final resting place of these Indian dead. The Indian memorial, with simple line and low silhouette, is in harmony with the semi-arid, windswept site. Walls of native rock surround the visitor and the ancient petroglyph, and with little explanation, the primitive symbols on the boulder stimulate thoughts of the past. Effective use of the archaeological feature and compatible architectural treatment of native materials at this high overlook area make this entire structure a focal point for the visitor and a fitting tribute.





INDIAN MEMORIAL LOOKING NORTH
DAM IS IN BACKGROUND

INDIAN MEMORIAL AND PUBLIC AREA
LOOKING EAST UP SNAKE RIVER

MEMORIAL PLAQUES TO THE TRIBES AND THEIR ANCESTORS

PETROGLYPHS ON MEMORIAL BOULDER

Construction of the memorial was completed in April 1965. Official dedication was held on 14 May 1966, with the several tribes being the principal part. The idea, design, and construction was submitted to the Chief of Engineers as a possible "Distinguished Architectural Achievement Award." The memorial was awarded first place in 1967 with the judges comments:

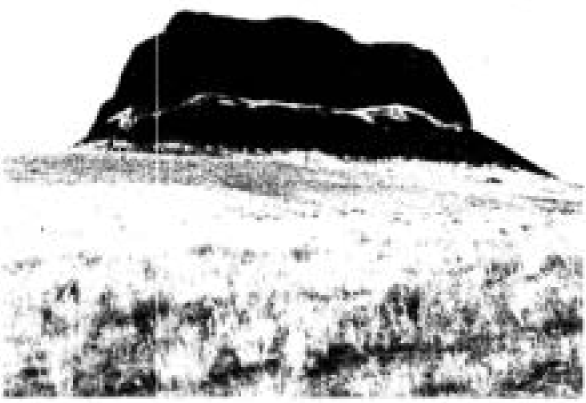
> "In selecting the Indian Memorial the judges praised the project for its 'simple and graceful' lines and for the 'restrained and dignified' use of materials appropriate to the historical background of the Indians. 'These materials,' the judges added, 'will gain in beauty with age.' "

The plaque on the monument reads--

A MEMORIAL

> "Indians once came to the river rapids to fish for salmon. Here they met friends, traded, played games, danced and sang. After drying their fish they moved back to their villages. But some were not destined to return home; they lie in burial grounds along the river. Now they rest undisturbed beneath the waters of lake Sacajawea. This great boulder, carved with petroglyphs by earlier Indians, was taken from near the riverbank and here commemorates the flooded burial sites. By this act we bind together the generations."

A most fitting reminder to the host of visitors to the project of the rich heritage of the Inland Empire, and the stark beauty of the lake and Snake River Canyon.



"MONUMENTAL" ROCK

THE DAMSITE
(LOOKING WEST - DOWNSTREAM)

LOWER MONUMENTAL DAM - RIVER MILE 41.6

LOWER MONUMENTAL DAM

THE PROJECT

This second unit of the four-dam project for the lower Snake River lies in the 2,000-foot-deep river canyon about 42 miles above its mouth. The project name, like Ice Harbor, originated from local topography. Columnar basalt spires have been left in this reach of river by the stream erosion of eons ago. These columns of "Monuments" identified this reach of the canyon. The "lower" qualification merely designates the geographic location of one of the damsites investigated in the early studies for Snake River development. The selection for the site of this dam was made by a somewhat different approach. The original decisions for the 1947 site selections were concerned primarily with the number of dams to be built, with their location at apparent physiographically suitable sites, as had previously been done. A good place topographically to build a dam has usually been an important factor.

Changing concepts for navigation and power generation needs, however, dictated much more consideration of adequate "overlap" and proper pool levels to obtain optimum development. The original location for the Monumental project was at river mile (R.M.) 44.7. Navigation depth increases to 15 feet and low-load factor power operation with larger and more units indicated this site to be too far upstream, even though it was suitable physically. Alternate sites were examined from R.M. 40.5 to 43.0 by extensive drilling, probe holes, geologic study, and topographic analyses. The established site for the dam at R.M. 41.6, just below the mouth of Devils Canyon on the north, was finally agreed upon as a result of the preparation of a special site selection report in December 1958. The findings of this report, which also firmed up the pool elevation at 540 feet, essentially determined the location of the Little Goose Dam, since that was a consideration in setting the pool level. Funds were first appropriated for preconstruction planning in FY 1958 and continued through 1959 and 1960. Construction funds were first made available in FY 1961.

Lower Monumental Dam, very similar to Ice Harbor in physical features, has a hydraulic height of 100 feet, an overall crest length of 3,800 feet, and a pool elevation of 540 feet above sea level. The dam essentially fills the lower canyon between the basalt cliffs. The physical layout is opposite from that of Ice Harbor because of the foundation conditions across the river in relation to the depths required for the powerhouse draft tubes and the navigation lock. The fish ladder and powerhouse on the north shore is about 700 feet long, housing space for six turbines and generators, each with the capacity of 135,000 kw; three units installed initially with the other three following, probably during the late '70s. This will provide 810,000 kw of installed capacity as compared to the earlier design of five units of 65,000 kw each or 325,000 kw total. (The project design was in the right time frame to profit from the objective power capacity and size of unit study as discussed in the description for the John Day project.)

South of the powerhouse is the 8-bay spillway section 500 feet long, with gates 50 by 60 feet, deeper than those of Ice Harbor. A fish ladder lies immediately south of the spillway, between it and the navigation lock which is adjacent to the south shore of the Snake River. The navigation lock is identical with the Ice Harbor lock in size, 86 by 675 feet. Earth and rockfill embankments flank the dam on both shores, each about 1,100 feet long, extending the project structure to the basalt cliffs. Access roads into the canyon were required on both banks to reach the project. On the south shore, improvement of about 10 miles of county road and construction of 3.7 miles of new road were necessary. On the north shore only unmaintained steep and tortuous single-track trails existed to the damsite. After changing plans a time or two it was decided that the most practical approach was an entirely new road down Devils Canyon from Kahlotus, a distance of 5.6 miles, a portion of which meant benching out the canyon side over the main line of the SP&S Railway, as it turns inland up the same canyon. Six alternate routes were studied in making this decision, none of which were very desirable from the standpoint of road building, nor was there unanimity of opinion on the most desirable route. Consensus was for Devils Canyon, which has proven to be good access to the project for operating personnel living in the area, since five homes were built at Kahlotus for employees. In addition, with the paucity of river crossings for the public, the deck of the Lower Monumental Dam is open for public use during daylight hours. This makes a very desirable shortcut to communities north and west of the project, and is used extensively.

PROJECT DEVELOPMENT - AND THE SEATTLE DISTRICT

Built in a sequence similar to Ice Harbor, the first construction was for the south shore access road in April 1961. Following closely was the contract for the south shore cofferdam encompassing seven and one-half bays of the spillway, the south shore fish ladder, and the navigation lock. This contract for $3.5 million, which also entailed some channel excavation along the north shore and a railroad shoofly, was awarded in June 1961 and completed in August 1962. The north shore access road up Devils Canyon was initiated in November 1961 and completed in August 1962. With these preliminaries underway and the area opened up, major construction could then begin with an appropriation in FY 1962 of $9 million. By the end of FY 1962 contracts had been let for three turbines for the powerhouse, as well as the construction contract for the navigation lock, fish ladder and spillway structures within the south shore cofferdam and the earthen embankment. This contract for $25 million was awarded in March 1962 and the project got off to a flying start.

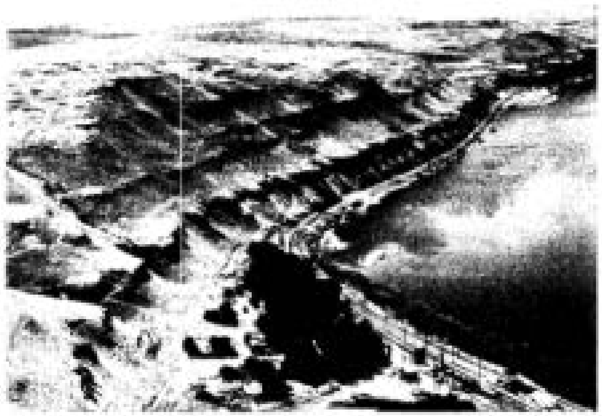
In the early '60s construction funds were not plentiful, at least for the Pacific Northwest. The Seattle District was experiencing a paucity of field work, with difficulties of maintaining a viable field crew experienced in construction work. They had been assisting in engineering design work for certain features, by agreement, since December 1959. With the Lower Monumental project just starting construction, Ice Harbor still with some work to finish, John Day Dam in full swing, and Dworshak in the design stage, the Division Engineer decided in the spring of 1962 that Lower Monumental should be constructed by the Seattle District. The transfer was directed on 1 June 1962 with the effective date of 1 July 1962.

By the early part of 1962 basic decisions had been made on the many features of the dam with design memoranda prepared. The fish ladders and collection facilities, always requiring careful coordination, were planned using the revised slope of 1 on 10 for the ladder with a 16-foot width as devised for the north shore ladder at Ice Harbor. The powerhouse collection system was also based upon the reduced number of openings and gate structures, as at Ice Harbor. The large quantity of attraction water required for the fish entrances is obtained by turbine-driven pumps in the powerhouse structure rather than the large electric-driven pumps as at McNary and Ice Harbor. The powerhouse features for the second-step construction, of course, were prepared by the Hydroelectrical Design Branch of the North Pacific Division. The details of construction of the rest of the many items in the second and third steps were assumed by the Seattle District, as was the railroad relocation and other work in the pool area. By agreement between the two Districts, real estate acquisition work, reservoir land use planning, including recreation site development, and coordinated inspection of anadromous fish problems were continued by this District. In addition, design work on some relocation phases was done by this District's staff as a service to the Seattle District. More details of the construction work are contained in the recently published history of the Seattle District.

RELOCATIONS

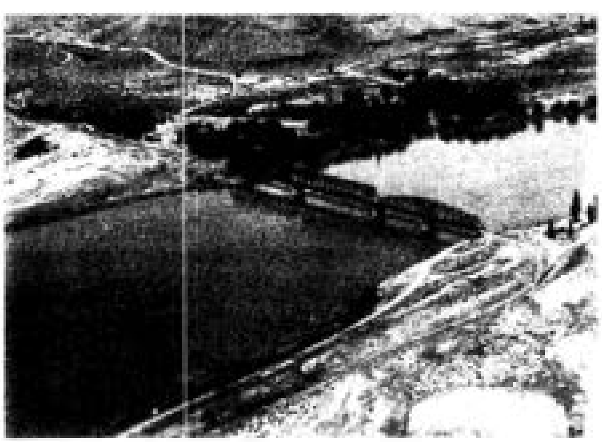
The extensive relocations work in the pool area was truly a joint effort. Essentially, the initial planning and negotiations with the railroads and counties were done by this District. The Seattle District made the final design and directed the construction. The 37 miles of railroad relocations were for the Union Pacific line along the south shore with a new high-level bridge across the Snake at the mouth of the Tucannon River rather than farther upstream at the old site of Riparia; the UPRR line up the Tucannon River; and modifications to the famous 3,920-foot-long Joso Bridge over the Snake--one of the highest and longest railroad bridges with a long curve in it over water in the United States. It was built in 1914.

When the project was initiated, the problems of relocating about 30 miles of the Northern Pacific Railway on the north shore loomed large. For the initial dam construction a shoofly was needed at the damsite to permit some north shore excavation. After that, the physical relocation question was debated with the railroad, with a counterproposal of abandoning the line from below the dam at Snake River Junction to Riparia near the Little Goose project. This included joint use of the south shore rail line (UPRR) since they both served the Camas Prairie Railroad from Riparia on upstream, and this portion of the NP tracks was only for that purpose. Long negotiations resulted, including formal condemnation. To relocate would have cost $20 million. An interim settlement agreement worked out by the Seattle District for $9 million was disapproved by the Division Engineer, with instructions that Walla Walla District proceed to condemnation. Final settlement provided for payment of $2¼ million, much of which went to the UPRR for joint use costs. In addition, the agreement provided for strengthening of the NP bridge at the mouth of Snake River at a cost of about $2 million to the Lower Monumental project, so the joint line would have the same carrying capacity as the old line. (Other costs for modifying the navigation span of this bridge are chargeable to the McNary project.) This solution simplified relocation work on the Lower Monumental pool considerably.

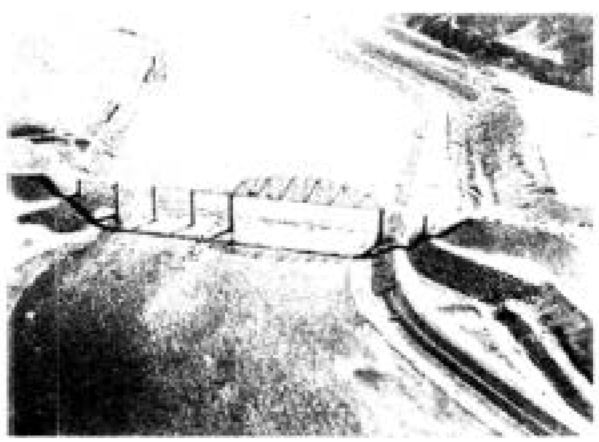


UPRR-AYER JUNCTION

UPRR-RELOCATED AYER TOWNSITE & LINE

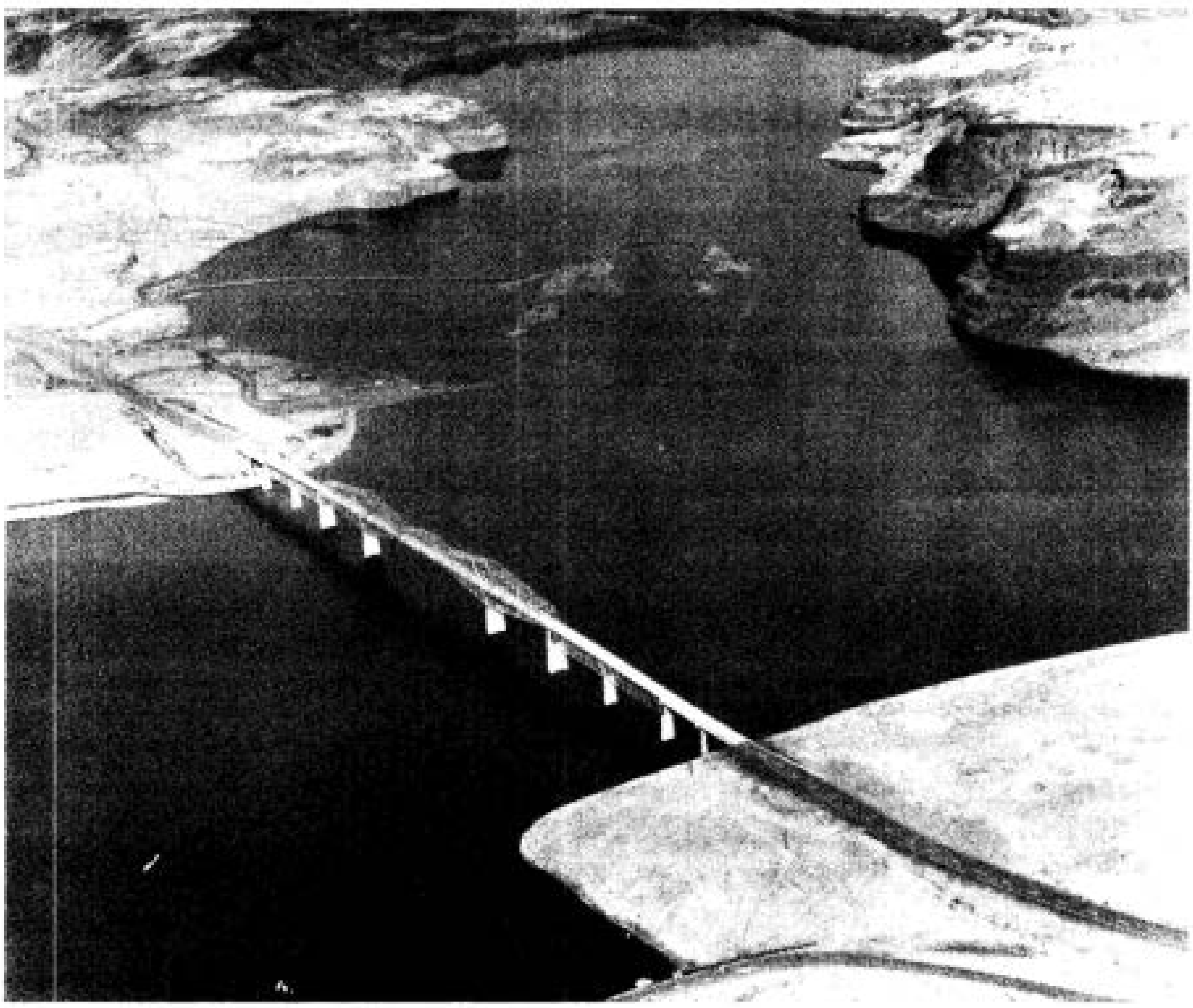


OLD UPRR BRIDGE AT RIPARIA
AND TOWNSITE



NEW UPRR RIPARIA-SARGENT BRIDGE
NEAR MOUTH OF TUCANNON RIVER

Another major change in the reservoir area was the retirement of the Lyons Ferry when the pool was raised. This was an "institution" of long standing at river mile 60 and the only means of crossing Snake River in the lower 85-mile reach between the mouth and Central Ferry bridge. The State of Washington recognized the need for a river crossing and with a surplus used bridge of major proportions on their hands from Vantage on the upper Columbia, they decided to re-erect it at Lyons Ferry. This was done in late 1968, affording the potential for another important east-west highway as well as a very convenient north-south connection in the direction of Spokane. The bridge is in place and future road improvements await to make it fully functional.



LYONS FERRY BRIDGE AT MOUTH OF PALOUSE RIVER. STATE PARK AT NORTH END OF BRIDGE. MARMES ROCK SHELTER AND LEVEE AT UPPER EDGE OF EMBAYMENT. TURNER BAY MARINA SITE IN FOREGROUND.

THE DAM

Work in the reservoir area and at the dam was completed by the Seattle District in the same four steps as at Ice Harbor. The construction effort was interrupted twice, however, because of Snake River floods overtopping the cofferdam. These delays set the schedule for completion back about a year. The interesting problems at the Marmes Rock Shelter, recounted in the first part of this history, also caused a delay of about four months. Finally, all was ready and the creation of the pool behind the dam began on 21 February 1969 by the closure of the spillway gates. On 6 January 1969 the flow through the three powerhouse skeleton units had been stopped because of high flows and all water was passed over the spillway crest. This was done to protect the powerhouse.

The full operating level of the pool was reached on 26 February 1969 and the several parts of the project put into operation by the Seattle District. The first vessel passed through the navigation lock on 15 April and the first generator went on the line 28 May. Unit #2 was placed in operation on 8 September 1969 and Unit #3 on 6 January 1970. As fast as parts of the project were complete, the Walla Walla District assumed the operation functions. The estimated total cost of the project, when the additional three units are installed, is $177 million. Of this, the 11,500 acres of land required for the 30 miles of pool, together with the condemnation action on the Northern Pacific rail line, cost about $5.8 million.

Dedication of the project will await completion of the remaining two dams upstream so the completion of the waterway to Lewiston, Idaho, can be properly celebrated. As of the publishing of this project record, no name has been officially given to the Lower Monumental pool other than the project name. Several have been proposed but strong feelings have not been expressed to spark official action.

Port developments are planned on the north shore near the Joso Bridge and between the Lyons Ferry Bridge and mouth of the Tucannon River for transshipment and loading of riverborne commerce. Work on the port facilities at the mouth of the Tucannon is programmed for 1971. Since port facilities were not complete and the Little Goose project was well underway, and astride of the river, practically no commercial navigation traffic used the lock during 1969 and 1970. Small boat traffic did, however, with new vistas--a very scenic reach of river open to use, and an interesting area at the mouth of Palouse River to visit.

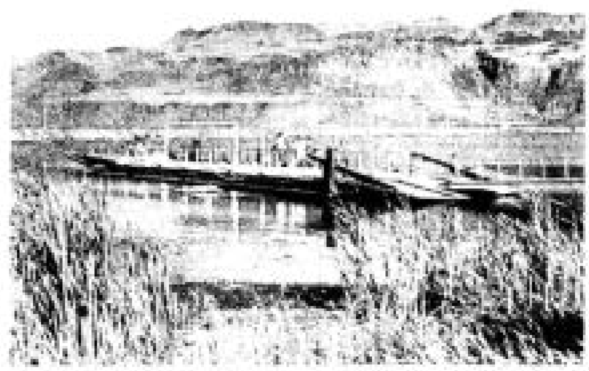
THE LYONS FERRY AREA

The "oasis" in the Lower Monumental pool area of the Snake River Canyon is the three-mile reach from Joso Bridge upstream to the Palouse and Tucannon Rivers. Lewis and Clark, on their trek to the Pacific passed this point on 13 October 1805, noting that here was the end of a rapids at a river mouth, which they named Drewyer's River in

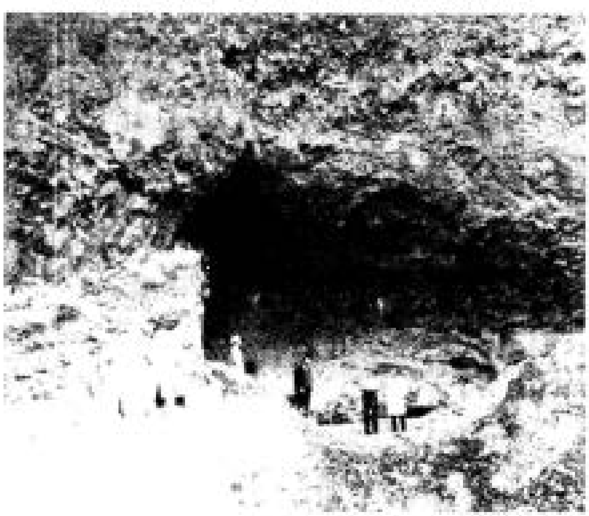
UPRR - JOSO BRIDGE

PALOUSE RIVER FALLS

EXCAVATING FOR INDIAN BURIALS



LYONS FERRY



MARMES ROCK SHELTER
("MARMES MAN" FOUND
IN FRONT OF SHELTER)

ROCK SHELTER AND LEVEE
AFTER POOL RAISING

honor of George Drewyer of the party (Palouse River, which later was named after the Indian tribe of the area). They also noted that Indians had some structures here and they bought some dogs to eat. Game was scarce. During the relocation of about 250 Indian graves in the Lyons Ferry area, making ready for the pool, the grave of Old Chief Bones was found to hold one of the Lewis and Clark Medals which were struck for the expedition, and which the two men gave out for special favors afforded the party. The old Chief, a Nez Perce, was a true friend of the early white settlers.

LT Mullan crossed in this vicinity in 1859 and 1860, while building the Mullan Military Road through this territory from Walla Walla to Montana via Spokane and the Clark Fork. The first ferry was franchised here in 1859 by J. Moore and E. P. Pierce, who called it the Palouse Ferry. In 1926 a Mr. Cummins who had bought the ferry changed its name to Lyons Ferry in honor of the family who had operated it so long. Mr. Turner took it over in 1945 and continued its operation until drowned out by the Lower Monumental pool and the state's decision to build a bridge.

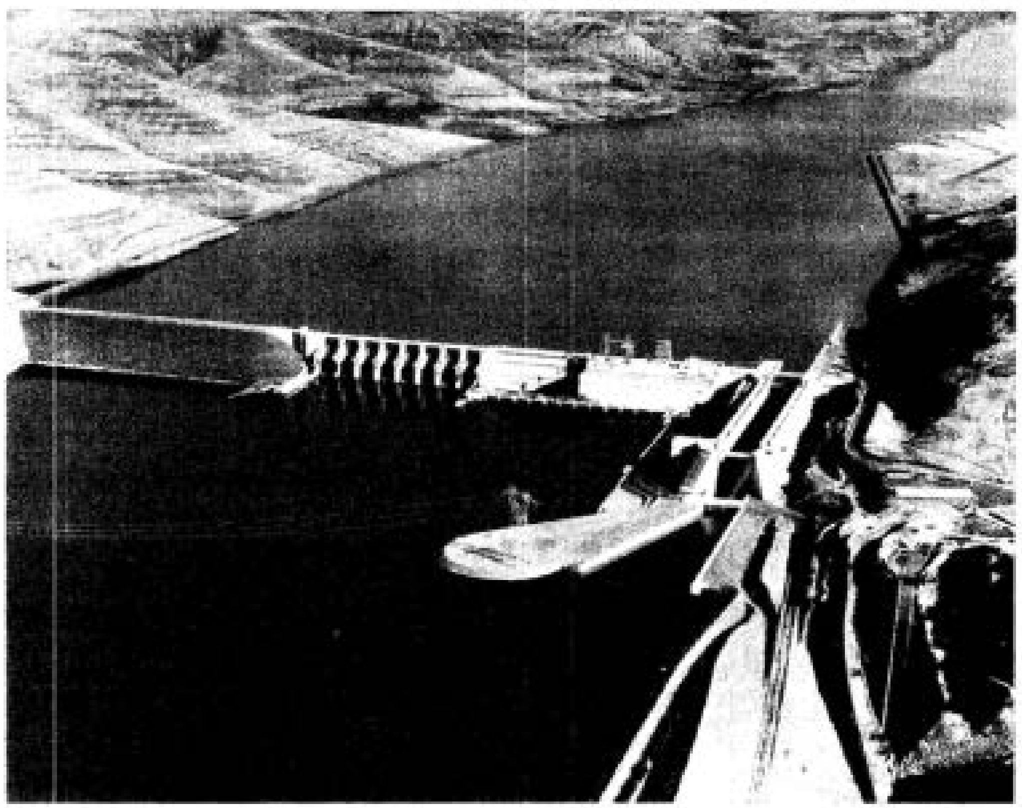
This ferry was no "contraption" that had to rely on external power or gasoline engines, and a fancy boat. The Lyons Ferry was a staunch old wooden barge, so rigged on an overhead cable across the river that the flow of water was the motive power and carried the three-car barge across. Either Mr. Turner or his wife could operate it upon call with the help of an Indian boy, and their service aimed to please. There were no published schedules--it ran when it was needed. Even though the ferry was retired, its historic presence has been preserved in connection with the Lyons Ferry Park. Turner Bay, a marina and recreation area on the south shore of the pool near the ferry site, was so named to remember this family's service to the region.

The lower Palouse River is famous, geologically, for the 200-foot-high falls about six miles from its mouth and the spectacular erosion pattern of the lower channel. The Lower Monumental project made this reach of river famous again because of the archaeological explorations in readiness of the project, as described in Part I of this history. The discovery of the Marmes Man and the prehistoric rock shelter findings created considerable stir, delayed pool raising, and holds a most interesting and speculative future if the area can again be unwatered sometime.

Because of these interesting events and geography of the area, reservoir management studies for land use dictated that the lower Palouse River arm of the pool should be an area of major recreation and public use development. A state park exists at Palouse Falls and the reservoir pool extends upstream to the park boundary. Land acquisition for the project thus made available a continuous area about six miles long of very interesting geography with good potential for a major park and water use area at the mouth of the river. The State of Washington agreed with this potential, with the result that a large public use area complete with hiking trails, camping, picnicking, swimming, temporary moorage, good boating, and water skiing will be developed. Two years of development are underway with an expenditure of three quarters of a million dollars. An extensive park area will result with a dedication and turnover to the State as a part of their park system in 1971.

Three other locations on the Monumental pool afford access to the water area for boat launching and limited recreation. A marina with boat storage and servicing facilities by means of a concession is being developed at Turner Bay, the only commercial boating service on lower Snake River below Central Ferry, at least for the time being.

SNAKE RIVER - LOOKING DOWNSTREAM AT LITTLE GOOSE DAMSITE. DAM TO SPAN RIVER AT BUILDINGS ON LEFT. RIPARIA RAILROAD BRIDGE IN BACKGROUND.



LITTLE GOOSE LOCK AND DAM - RIVER MILE 70.3 - LOOKING UPSTREAM

LITTLE GOOSE DAM

THE PROJECT

This third unit of the four-dam complex for the lower Snake River is one of the key units, in that it taps the big dryland wheat area of the Palouse country, and its pool sits astride the main north-south highway through the easterly edge of the State of Washington. Waterborne commerce destined to or originating in Spokane and east will look to the Little Goose pool area for transshipping facilities.

As with the other three units, this dam sits in the deep Snake River Canyon, isolated from normal land routes of travel. It's original site was near Little Goose Island, as differentiated from Goose Island further upstream. As discussed for the Lower Monumental Dam, the proper site for the dam had to be determined when the pool level for the Monumental project was set in order to assure optimum overlap for both navigation and power, coupled with proper site conditions for the dam.

The 1947 studies of tentative location for the four dams indicated the Little Goose Dam should be at about river mile 72.2. At the time of establishing the Lower Monumental pool height in 1959, analyses and field work established the Little Goose Dam at river mile 70.3. This was done after studying alternates at river miles 70.3, 72.2, and 75.3, at the same time evaluating five different pool levels for the Monumental project. When design monies were first allotted for the Little Goose project in 1960, the site selection was reconfirmed. In that study the pool level for Little Goose was then set. Also in conjunction with the analysis, the location of the Lower Granite Dam was established at river mile 107.5. Pool studies and general design analyses were continued for two years. Construction funds were made available in FY 1963 and contracts let for the south shore cofferdam steel sheetpiling and three 212,400-horsepower turbines. Additional construction monies were appropriated the following year and field construction of the Little Goose project began in earnest.

THE STRUCTURE

The dam is a combination of several concrete, gravity-type elements and a major earth and rockfill section. It has a hydraulic height of 98 feet and a total length of approximately 2,660 feet. From the left, or south bank, the various elements include a 92-foot-long concrete nonoverflow portion; a 186-foot lock section accommodating the navigation lock with inside clear dimensions of 86 by 675 feet; a 107-foot long concrete nonoverflow section separating the lock from the powerhouse and through which passes the fish ladder; a powerhouse 675 feet long housing a station service bay, three 135,000-kw power units, and three skeletonized bays for future similar units; a 30-foot nonoverflow section; an eight-bay spillway 512 feet long with radial gates 50 by 60 feet; a fourth nonoverflow section 147 feet long; and a 910-foot long earth and rockfill embankment tying the structure to the north shore. The estimated cost of the entire project, including relocations, is $152 million.

To the casual observer, and from this general description, the Little Goose project is a duplicate of the two downstream projects except for their orientation. With the three principal features to shift around between projects it appears that, as with the capricious dresser, the maximum use was made of combinations, with no two of them having the same order. Some of this can be laid to the changeable nature of Snake River, as well as the apparent random way in which the deposition and erosion of the original basaltic flows occurred. The rest of it can be laid to the designer and his planning for a navigation lock foundation in comparison to the structural requirements for a spillway as against the powerhouse. The hydraulic characteristics of a Kaplan-type turbine dictate a deep draft tube leading to the tailrace. The spillway and navigation lock require lesser depths, so the designer welcomes a variable river bottom of good solid rock. The navigator also influences the arrangement to insure optimum sailing ranges to and from the lock. With these and other criteria, the hydraulic engineer and his to-scale hydraulic model then moulds the project to fit the site selected. Thus is the perspicacity of the engineer in planning for a dam and its proper orientation.

Experience, tests, research, and judgment dictated three technical changes in the Little Goose project. In the original planning for the project the 1961 approved plan was for two fish ladders, one on each shore as had been provided for all of the downstream projects. Analytical studies and the experience downstream questioned this need for two ladders and, as an alternate, proposed a channel through the spillway to carry the fish collected at the north end of the structure to a single ladder on the south shore. This was finally agreed to. The plans as prepared in 1964, and built, provided for a channel 17.5 feet wide and 25 feet high under the spillway leading from the north entrance to the powerhouse collection system. A single ladder thus resulted, which is 20 feet wide in place of the two 16-foot-wide ladders of the original plan. Preliminary tests indicate that the salmonoids like the north shore of Snake River in this reach and have no fear or trepidation for the tunnel taking them across the project, using that route to a greater extent than the more sophisticated powerhouse collection system.

The second change in project feature was to revert to the more universal miter gate leaves for the navigation lock lower gate, in spite of their extreme height of 118 feet above the sill and over 92 feet between walls. As indicated for the Ice Harbor project, and experienced with the John Day project, the vertical lift lock gate, although technically sound, experienced some practical problems of drip, trash, machinery, and materials. For gates of this unprecedented size it was considered desirable to return to the conventional double-leaf miter type, which appears to be working satisfactorily. It will be interesting in future histories to review the experience of these two types of gates and their relative merits.

A very definite distinction between Little Goose Dam and the others on the river was its design to resist full uplift pressures under all structures of pool head magnitude. Many hidden features and much additional concrete were incorporated in the structures to accomplish this. The uplift was not from the pool as for normal dams, but is due to a subterranian artesian aquifer.

CONSTRUCTION

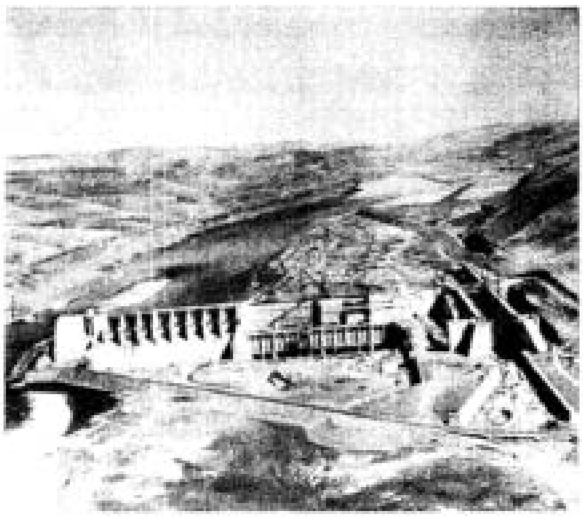
The sequence of construction for the Little Goose project was considerably different from the lower two dams. Due to the configuration of the stream it was possible to push the natural flow of the river to the north through a partially excavated channel. A single-stage cofferdam was then built from the south shore large enough to encompass the entire concrete structure of the dam. The cofferdam and diversion channel work was initiated in mid-1963 and completed a year later. For adequate access to the site it was necessary to construct about 10 miles of south shore access road over difficult terrain, as well as move a section of the Union Pacific Railroad along the south bank below the dam into the river to make way. This was accomplished in 1964 and early 1965, making ready for the single, large main contract for the complete dam structure, including the north shore embankment. This $73 million contract started in June 1965 and was completed in August 1970 after the project was in operation.

The structural work inside the cofferdam required over four years to complete, June 1965 to the summer of 1969, when the cofferdam was removed and the low river flows passed through the three skeleton units of the powerhouse. The 900-foot-long north shore earth and rockfill dam was built that fall and winter. Luckily, the construction of this final step was well along by late January 1970 when high river flows brought trash into the intake trashracks for the skeleton units. This forced the closing of the passage through the units and raising of the pool to discharge the river flow over the spillway ogee. A month later the spillway gates were closed and the final pool raising effected, with the fishways in operation on 1 March 1970. The first power unit went on the line 26 March 1970. The navigation lock went into service in April. The remaining two power units were put into service on 30 October and 8 December 1970.

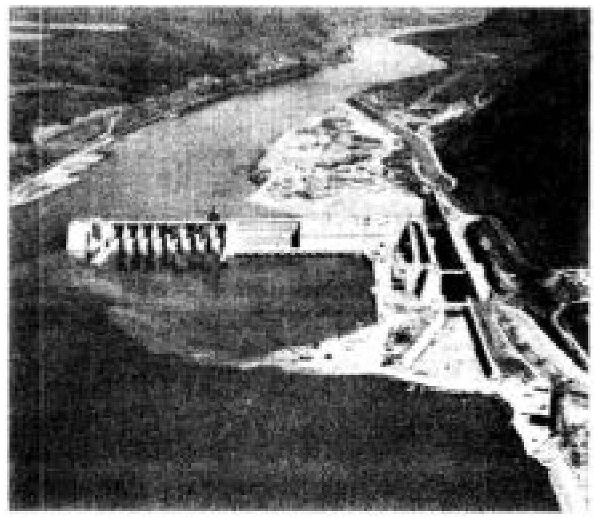
The Little Goose damsite, access roads, and pool area required the purchase of over 12,000 acres of land at a cost of $4¼ million.

1st-STEP COFFERDAM - OCT 1968

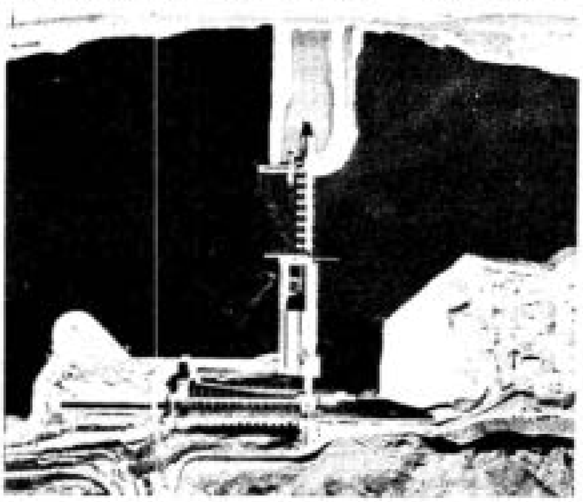
1st-STEP CONSTRUCTION - JUL 1967



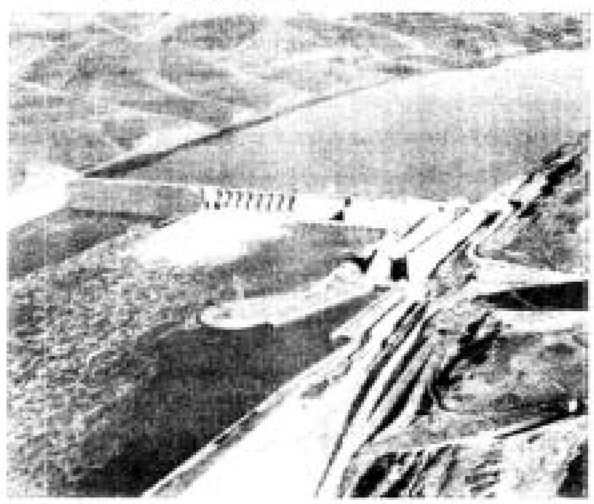
1st-STEP CONSTRUCTION - SEP 1968



COFFERDAM OUT - MAY 1969



START NORTH SHORE EMBANKMENT
SEP 1969



NORTH SHORE EMBANKMENT
AND POOL UP - 19 FEB 70

RELOCATIONS

As recounted in the story on railroad relocations for the Ice Harbor and Lower Monumental projects, the question has repeatedly bedeviled the project developer as to the optimum way of handling the extensive railroad installations in the Snake River Canyon. Early attempts were made to consolidate the trackage and result in a more economical operation for the railroads as well as effect a savings in relocations for the 140-mile Lower Snake River Project.

When the Ice Harbor construction became imminent in the mid-'50s, Fritz Franzen, as Chief of the Engineering Division, brought to a head the possibility for such a joint-line relocation and operations of the railroads onto the north side of the lower Snake River Canyon. Based on an evaluation by an Architect-Engineer, the Union Pacific; the Northern Pacific; the Spokane, Portland, and Seattle; and the Great Northern (as joint owner of the SP&S with NP) were asked in conferences at the Vice-Presidential levels, to consider joint-line operation up to Riparia at the Little Goose project. Even though the Corps offered to share with the companies the $40 million savings over separate relocations, they could not agree on a division of operation costs or distribution of the payment. There appeared to be no way the Corps could force a joint-line operation, so the concept of relocation for joint-line operation was dropped and separate relocations effected.

Later, as noted for the Lower Monumental project, 30 miles of the NP line below Riparia were eliminated by effecting a joint-use agreement with UP for their share of the Camas Prairie Railroad traffic above Riparia. Early in COL McElwee's tour of duty with the District (1965) an Architect-Engineer suggested the further possibility of abandonment of the 72 miles of Camas Prairie Railroad upstream of Riparia from below the Little Goose Dam to Lewiston. This railroad is a jointly owned line by the NP and UP railroads. Such a proposal had a direct effect upon the upper two dams of the complex with some implications for the Lower Monumental project. The right-of-way in this reach of river is owned by the Union Pacific but the Camas Prairie Railroad has a 999 year lease on it.

The Architect-Engineer's premise was that alternate rail routes via Spokane or through the uplands of Whitman County on the north side of Snake River were available. A careful analysis was made by the A-E, with COL McElwee very much interested in it. The results of the study were the basis of negotiations not only with the railroads but with the communities of Lewiston and Clarkston. The two communities, sensing the portent of major economic impact, prompted to some extent possibly by the railroads, drew upon the capabilities of the State of Idaho Transportation Council and the two Universities of Washington State and Idaho for formal reports taking exception to the proposal. Seventeen million dollars of potential savings in rerouting was some enticement, but the community and the railroad did not consider the alternate route as a viable substitute for a water level route, with the attendant 12-hour longer haul and scheduling problems, even with major upgrading of the alternate route and equipment. The traffic generated by this small railroad feeding into the major lines of the region is extraordinary. Considerable "discussions" ensued, with the Corps receiving "position papers" from both approaches as well as formulating some of its own.

The result was that abandonment and rerouting of traffic could not be countenanced by the rail owners, the communities served, or the Congressional delegations of Idaho and Washington. Continued study and negotiations with the rail owners, Union Pacific, and Northern Pacific, finally resulted in a satisfactory $50 million relocation plan for the entire reach. The portion of the work required to clear the Little Goose project was accomplished from March 1967 to the time of pool raising in March 1970.

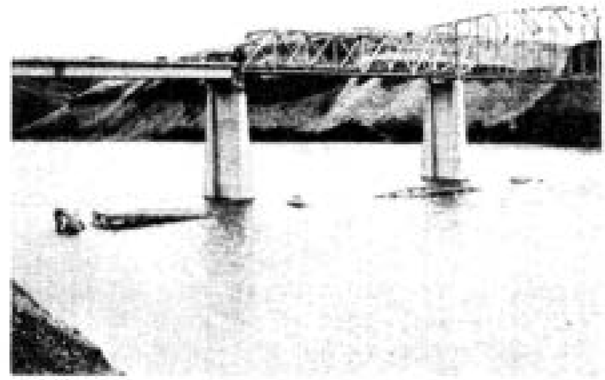
THE CENTRAL FERRY AREA

The relocation demands of the Little Goose pool area involved another important geographic area; that of the Central Ferry reach. Until the Lyons Ferry Bridge was built, this was the only highway crossing of this 140-mile reach of Snake River and carries a major north-south highway. Out of four possible points of access to the Little Goose 37-mile-long pool, the Central Ferry area with its side canyons on both shores is the only one with land areas capable of extensive development for water related resources, as well as effecting a river crossing. The initial problem was the existing bridge. Coupled with the bridge and adjacent highway relocation was the proper alignment of the relocated Camas Prairie Railroad and optimum use of the adjacent limited land area suitable for any type of development. Competition for use of the land developed between industrial and port facilities, as against public use in the form of a major recreation area. The extent of these competing uses affected the necessary relocations, particularly the railroad alignment.

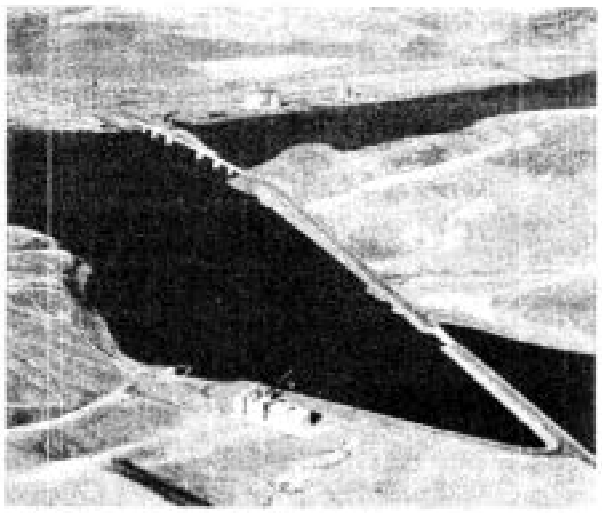
The Little Goose reservoir would inundate the existing state highway bridge and approaches as well as the portion of the roadway to the south which traverses the Deadman Creek and Meadow Creek coulees. The decision was to build a major new bridge about 100 feet upstream which would be 2,200 feet long, with the necessary navigation clearance. The approach to the bridge from the south necessitated 1-3/4 miles of highway relocation across the large embayment in the mouth of Meadow and Deadman Creeks. This includes provision for access to a 60-acre industrial development area on the opposite or westerly side of the bay near its mouth to be administered by the Port of Garfield County.

The approach road to the bridge from the north in Whitman County required about a mile of relocation, including an overhead crossing of the relocated Camas Prairie Railroad. The total cost of this major highway relocation effort was about $5 million. A novel method of disposal of the old deck girder bridge was resorted to because of the difficulties of salvage. A whole system of carefully placed, special explosive charges at all of the structural members was detonated at one time, neatly cutting them and dropping the eight spans into the river to remain there well below any usable depth of water.

OLD AND NEW CENTRAL FERRY BRIDGE



NEW BRIDGE AND REMAINS OF OLD BEFORE POOL RAISING



CENTRAL FERRY INDUSTRIAL DEVELOPMENT - GARFIELD & WHITMAN COUNTIES

CENTRAL FERRY STATE PARK AREA NORTH SHORE BELOW BRIDGE

The usable land area at the northerly approach to the Central Ferry Bridge was finally divided between a major state park on the west side of the road and industrial and port development on the east side. The park area encompasses 142 acres and the commercial development 188 acres. The Port of Whitman County is making "no small plans" for a variety of industrial and commercial uses of this area to serve the extensive Inland Empire region to the north, including Spokane. In a similar manner the Washington State Parks and Recreation Commission are looking forward to a highly developed state park at Central Ferry, with the help of the Corps, likewise serving a large segment of the population of this region of the Inland Empire. The economic development of this strategic area for all purposes could well surpass the cost of the relocation work. Future history will have to evaluate this.

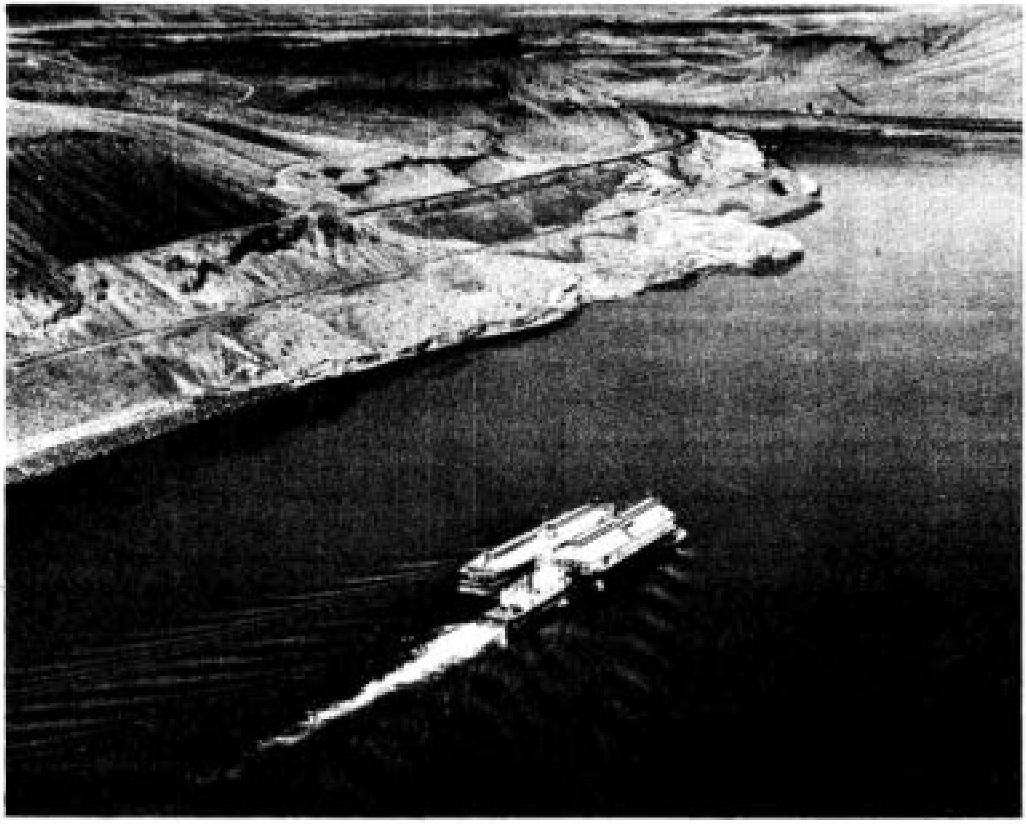
RECREATION AND GEESE

In addition to the extensive development at Central Ferry, limited recreation and fish and wildlife areas are set aside at the dam; at Willow Island about five miles upstream of Central Ferry on the south shore; at the mouth of Penewawa Creek on the north shore about midway in the reservoir; and on both shores near the mouth of Almota Creek, just downstream of the Lower Granite Dam. This latter area also provides for future public port and commercial development, probably for the transshipment of grain.

Wild geese have always been an important resource of the lower Snake River and the ardent hunter has gone to great lengths trying to outwit them during the passage of the geese through the region in the fall. In addition, there has been considerable nesting along the river by those who are attracted to this region in the spring. An innovative idea was developed in 1968 as a cooperative venture with state and Federal fish and game agencies. Isolated land areas in the Lower Monumental, Little Goose, and Lower Granite pools were identified, and, where practical, small islands created by cutting possible ties to upland areas to limit predation. The small islands and other areas along the pools were then earmarked for wildlife purposes and goose nests were constructed above the ground by placing straw-filled halves of oil drums on stilts. Forty such nests were installed to entice geese to continue nesting after creation of the pool areas. Very preliminary evaluations in 1969 and 1970 were optimistic enough that plans to expand the idea are underway. We trust the geese will remain in the area and look kindly on these man-made efforts. Only time will tell.

RECREATION DEVELOPMENT

EXPERIMENTAL GOOSE NESTS

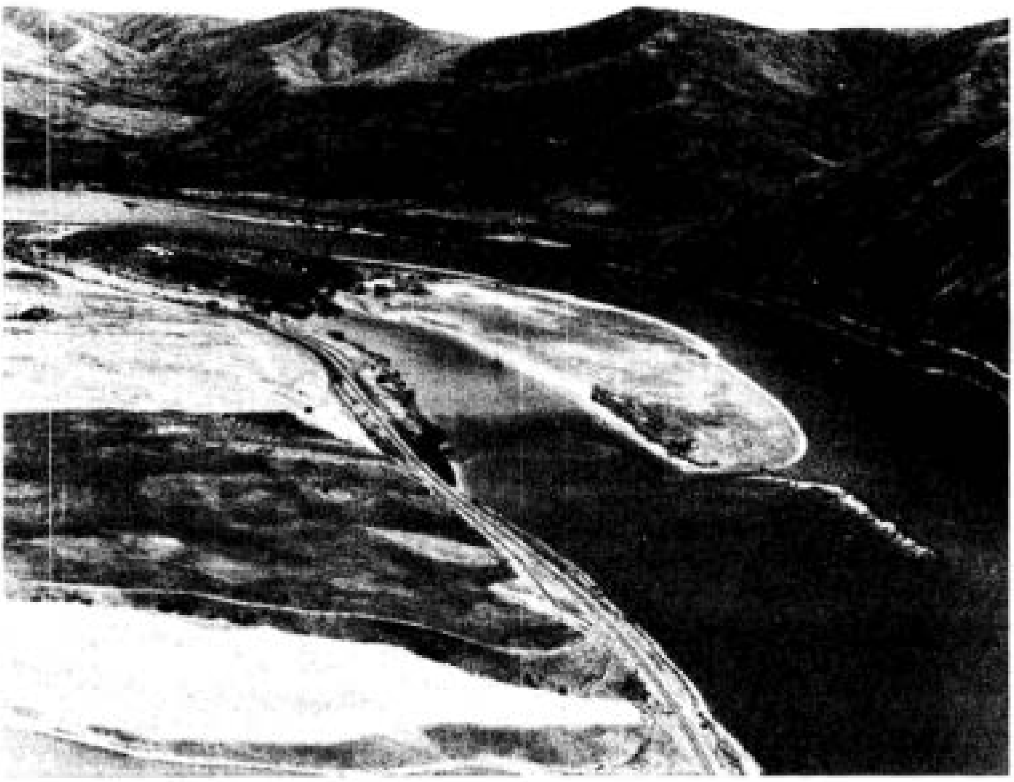


BARGES ON LAKE BRYAN

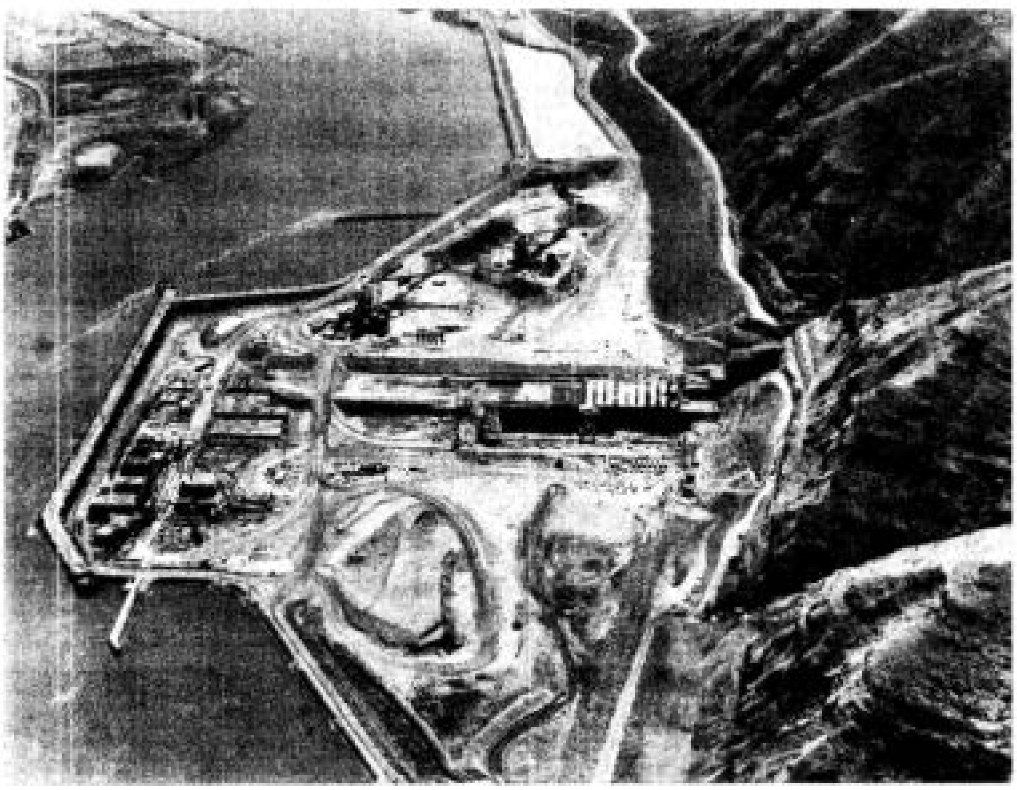
LAKE BRYAN

The people of the area broke with what had almost become a tradition for naming of man-made lakes in the region after Indians and their tribes; i.e., Celilo for The Dalles Dam, Umatilla for John Day Dam, Wallula for McNary Dam, Entiat for Rocky Reach Dam, and Sacajawea for Ice Harbor Dam. People in the Palouse country north of the Snake River have a warm spot in their hearts for Dr. Enoch A. Bryan, President of Washington Agricultural College from 1893 to 1916 (now Washington State University) at Pullman. Dr. Bryan then became Commissioner of Education for Idaho until 1923 when he returned to W.S.U., emeritus, until his death in 1941. In addition to being an eminent historian, Dr. Bryan was visionary enough to attempt to establish an idealistic community at "Riveria" on Snake River in the Little Goose pool reach, with the benchlands along the river irrigated for agricultural development as a part of the community.

U.S. Representative Catherine May of Washington, working with the Board of Geographic Names, introduced H. Res. 9135, 89th Congress, 1st Session, on 16 June 1965 to name the Little Goose pool "Lake Bryan". She worked on this proposal for five years before succeeding in December 1970, just days before she left the Congress.



LOWER GRANITE DAMSITE - LOG CABIN ISLAND
RIVER MILE 107.5 - LOOKING EAST UPSTREAM



CONSTRUCTION UNDERWAY - MAY 1971 - LOOKING UPSTREAM

CHAPTER 6

LOWER GRANITE DAM

THE PROJECT

This fourth and pivotal unit of the four-dam project for the lower Snake River is the one which will make the navigation project available to the rich agricultural area at the junction of the Snake and Clearwater Rivers. The communities of Clarkston, Washington, and Lewiston, Idaho, lie at the crossroads of Federal highways running north and south, and east and west with agricultural croplands to the west, and rich timber stands to the east. The area has long dreamed of an economic waterway connection to the Pacific for its produce and needs, as well as serving as a transshipping point for the products and requirements of Montana and even North Dakota. This idea started with the discovery of gold in the 1860s and may see fruition in the 1970s.

The lower 140 miles of the Snake River channel is generally thought of as a canyon section with very limited usable lands in the bottom and generally uninhabited. This has been true for most of this century with modern machinery and roads. It was not the case for certain reaches of the river in the later half of the last century. Settlers occupied the small flat alluvial fans at the mouths of creeks. The climate was more favorable and water was available. Two or three communities were platted and a few lots sold, but they never blossomed.

Probably the most extensive development was in the pool area of the Lower Granite project centering around the mouth of Wawawai Canyon and upstream for about 20 miles to Steptoe Canyon. The town of Wawawai was platted in 1878 with 30 blocks containing eight lots for every block, each lot being 50 x 100 ft. The streets were 60 feet wide. Not many lots sold, and in 1884 the plat was withdrawn. The reason given was the "the ground occupied by said town is more valuable for agricultural purposes than as a town site." Extensive orchards for apples and soft fruits were developed in this general area and the produce went to a wide market, moving downriver by steamer, or rail after it was built. Grain from the surrounding plateau or benchlands was also chuted or transported down the draws to the river to be moved out by steamer, and later by rail.

The changing economic climate and development of the extensive Palouse country, coupled with the difficulties of access to the canyon bottom, gradually drew the people away from the river and the lands have been used mostly for agriculture and livestock. In writing of the changes about to take place with creation of the 30-mile-long pool behind the dam, one author states, "It is difficult to visualize a future without orchards blooming on the river. It would seem that surely when spring arrives, petals from the past will rise to float on the surface of the lake. Nostalgia for the old days may grip the heart, but progress cannot be denied."

The Lower Granite site received its name from the high quality granite outcrops which occur at Granite Point, where they intrude into the basaltic lava flows which dominate this reach of the river canyon walls. This granite source is of sufficient rarity for the region that near the turn of the century and early 1900s the rock was quarried for bridge piers, building blocks, and other structures and used in several communities. The landmark for this particular source of cut stone is probably the block-square Custom House in Portland, Oregon, built entirely of this material, with 50,000 cubic feet of stone moved to Portland by steamer in 1898-99. Again, as with the Monumental damsite, the "Lower" designates one of several geographic sites for a dam.

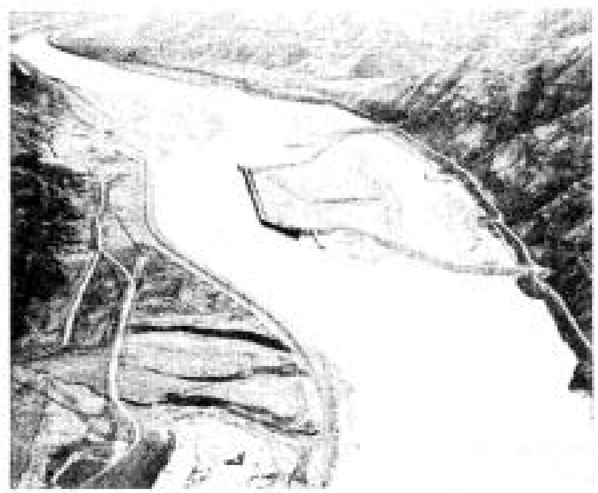
Granite Point and the original site for the dam, as presented in the 1947 report, is at river mile 113.7. Other sites were investigated downstream as design details of the projects were formulated with specific studies at river miles 105.2, 107.9, 108.4, and 113.1. Unfavorable river alignment and other physical conditions limited the site to this eight-mile reach and analyses opted for the site at river mile 107.5 as the best for layout and foundation. The river channel at this site, across the lower end of Log Cabin Island, is 1,600 feet wide, making it very adaptable to the single-stage construction used at the Little Goose site.

Foundation conditions and topography dictated that the navigation lock, spillway, and powerhouse be against the south bank of the river with an earth and rockfill embankment at the northerly end. The dam layout is similar to the Ice Harbor project with the powerhouse at the south end, the spillway in the center, and the navigation lock at the north end of the concrete section, actually in about the center of the entire structure. The normal operating hydraulic height will be 100 feet. The powerhouse, containing space for six generating units of 135,000 kw each, as well as an erection and service bay, will be 656 feet long. The eight-bay spillway with 50 x 60 ft. radial type gates will be 512 feet long. The navigation lock, with a clear inside dimension of 86 x 675 ft., will have a total width of 190 feet making an overall length of concrete structure 1,650 feet including three short nonoverflow sections between structures. The embankment section between the navigation lock and the north shore will be 1,530 feet long with the relocated Camas Prairie Railroad track tight against the canyon wall at the end of the dam embankment. The estimated cost of the entire project, including the extensive levee work at Lewiston, and relocations, is $216 million.

PROJECT DEVELOPMENT

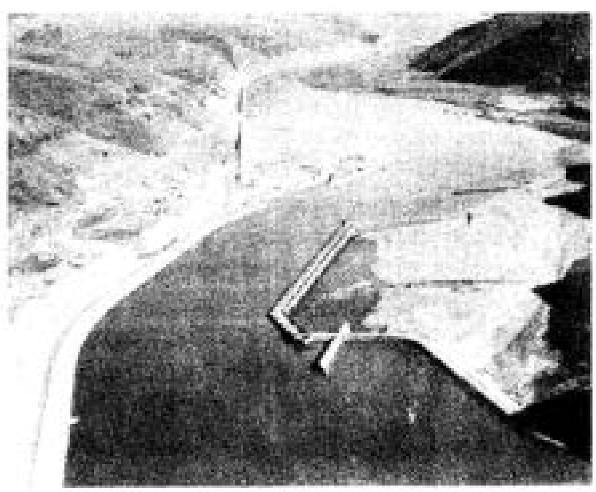
Funds for detailed design studies were first allocated in FY 1962 and continued through 1965. The first-stage construction contract for the cofferdam, diversion channel to the north, the railroad shoofly, and part of the navigation lock downstream guidewall outside of the cofferdam was awarded in July 1965. This work required about 1½ years to complete. In May 1966 a contract was let for a south shore access road to make the site more accessible to Pomeroy, Washington, and other communities to the south. North side access was available down the Almota Canyon from Pullman and Colfax to the north. Upon completion of the access road in the summer of 1967, work at the damsite was at a standstill due to austere budgetary conditions awaiting sufficient funds to award the main construction contract for the entire structure. This was finally agreed to by the Congress and in May 1970 the main dam contract was awarded for $105 million, to be completed by the summer of 1976 with the pool to be raised the spring of 1975 and navigation into Lewiston a reality.

START OF COFFERDAM & RIVER DIVERSION
LOOKING UPSTREAM - JUNE 1966



COFFERDAM & DIVERSION COMPLETE
DECEMBER 1966

ACCESS ROAD - POMEROY TO DAM
DECEMBER 1966



CAMAS PRAIRIE RAILROAD RELOCATION
AT DAMSITE - FEBRUARY 1970

Sufficient interim construction monies were available in 1967-70 for the project to continue purchasing of real estate, and in August 1968 a contract was let for relocation of the Camas Prairie Railroad from below the dam to Wawawai Canyon, about five miles upstream. The remainder of the railroad relocation work will be accomplished concurrently with the dam construction, as will the levee system around the City of Lewiston.

THE JUNCTURE OF SNAKE AND CLEARWATER RIVERS

A unique backwater condition exists in the Lewiston-Clarkston area of the Lower Granite pool. Considerable study of levee locations and alternatives with soul searching and testing of public opinion for acceptance has been required. Unanimity is still not achieved at this writing, but decisions were made and firm plans are being developed. Considerable areas of the two communities and adjacent urban territory lie in the flood plain of major floods of both the Snake and Clearwater Rivers. The area received severe damages during the 1948 flood, the second largest of record. The then existing plans for the Lower Granite Dam with its levees in the Lewiston area could have prevented a large portion of the damages, had they been in existence. The communities then sought to have the levee system built independent of the dam, and such an idea was authorized as a local flood protection project in 1950. The agreement on alignment and procurement of rights-of-way by a legal local sponsorship group proved very difficult. As a result, the levees became a part of the Lower Granite project again in 1959.

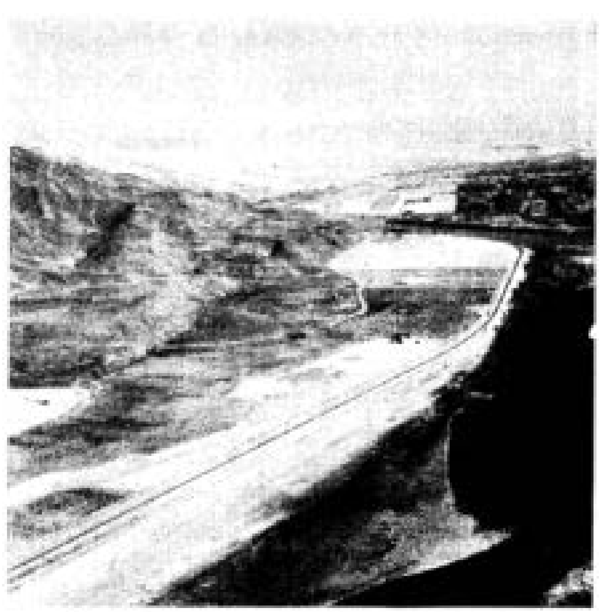
The pool level for the project and its characteristics has undergone extensive studies and metamorphism. The original Lower Granite pool elevation was set at 715 feet, which is about 10 feet more than natural river height at the mouth of the Clearwater. This did not afford good navigation conditions for the communities, nor did it give optimum conditions for public use of the reservoir, power generation, or adequate tailwater conditions for the subsequently authorized Asotin Dam on Snake River above the community of Asotin, Washington. An alternate plan of providing a relatively constant pool elevation at the mouth of Clearwater River by variable controls at the dam was devised for the 1958 Columbia River Review Report and resulted in a pool elevation at Lewiston of 735 feet. Subsequent studies found the optimum height to be 738, which was established in 1963. This concept of maintaining a constant pool level at Lewiston rather than at the dam 33 miles away did not alter materially the height of the levees required around Lewiston to protect it from a recurrence of the 1948 flood.

Those broad decisions, though extremely important for the port development and public use aspects of the two communities, were minor compared to the detailed discussions that ensued and are continuing on the levee locations, their use, other relocation problems, and the desires of the two communities for economic development. Even the Clarkston golf course became a focal point with its unique capability of affording almost year-round play in a sheltered area of a cold and snowy region. It is an important asset to this closely knit area. None of the communities of the region have more than primary treatment for their sewage disposal systems. The advent of the project, along with recent legislation for environmental cleanup, will influence the installation of at least secondary treatment of both municipal and industrial wastes.

ASOTIN, WASHINGTON - ASOTIN CREEK ENTERS SNAKE RIVER - LOWER RIGHT

LEWISTON & CLARKSTON ON SNAKE RIVER AT MOUTH OF CLEARWATER RIVER

PFI COMPLEX - PLANT, LOG POND, AND WWP DAM ON CLEARWATER RIVER



SNAKE RIVER - WILMA AREA TO CLARKSTON - POTENTIAL PORT AREA

THE PROJECT AND THE COMMUNITIES

Here at the confluence of these two streams with an urban area population of about 37,000 people in three communities and the normal amount of inter-city rivalry, the project, with its nine miles of levee and extensive rights-of-way requirements touches on almost every facet of community life. Some of these which will influence project decisions in the foreseeable future include:

a. The waterfront at Asotin with a historic building and county courthouse, as well as the community sanitary system and a park.

b. The river frontage at Clarkston with present uses ranging from a slaughterhouse, to the golf course; with homes, a nice sandy beach, recreation areas, and a sewage disposal plant and a garbage dump in between; as well as some of the best steelhead fishing in the northwest.

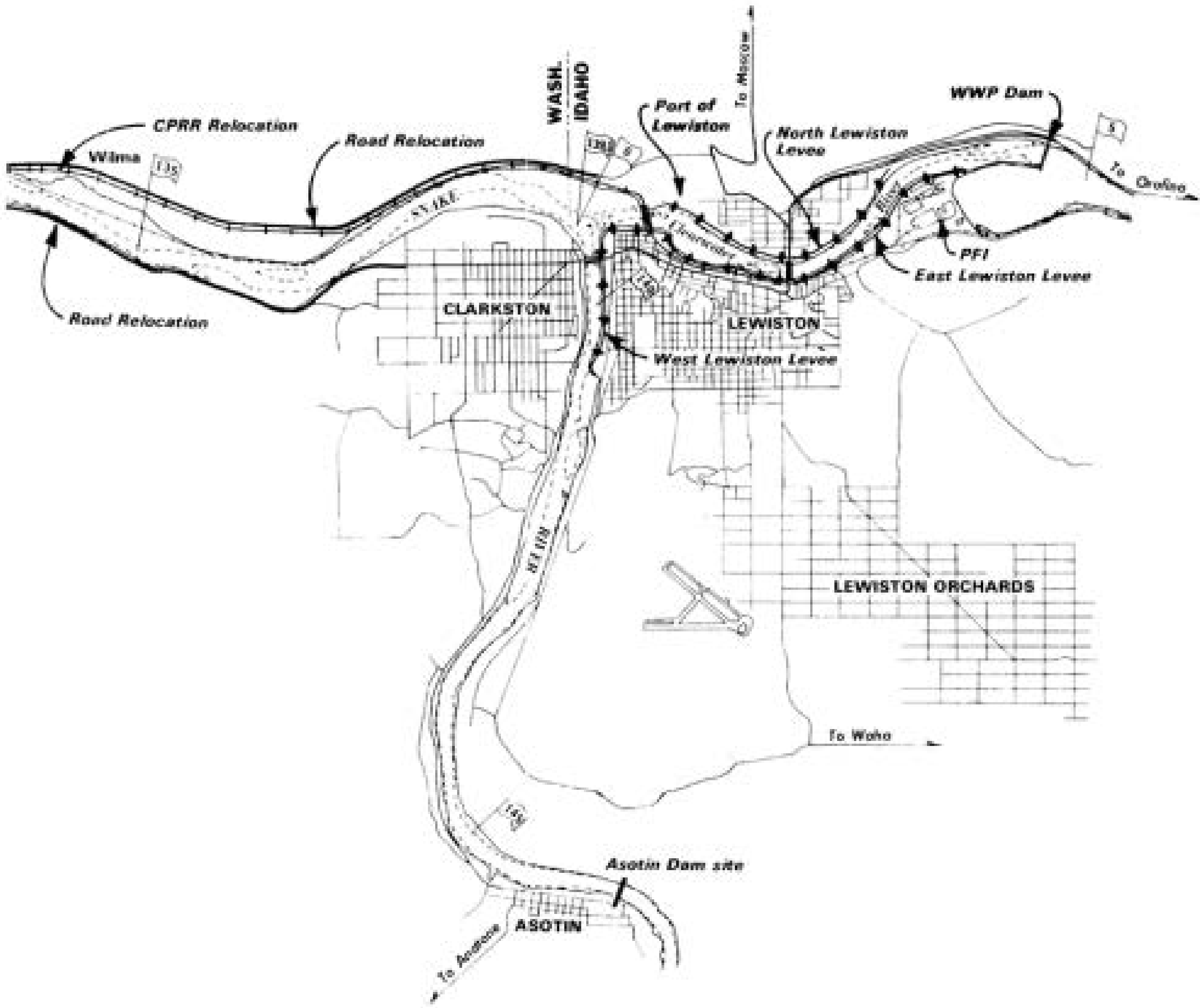
c. The road system and bridges interconnecting all of the communities.

d. Adequate locations for important port facilities to serve the waterway, as well as docking facilities for the several commercial operators of high powered boats taking an increasing number of visitors and inquisitive environmentalists into the Hells Canyon reach of the middle Snake River Canyon.

e. The best location for several recreation areas, including major state parks in Washington and Idaho, all of which would be river use related.

f. Lewiston and its business district is in cramped quarters oriented to the bottom lands along the rivers. The community must evaluate the cannery structures and its continued operation, including waste disposal; a major waste disposal line through the community for effluent from the big Potlatch Forests, Inc., (PFI) complex; its own sewage problems; a modified municipal water supply source; interior drainage contributions behind the levee system including Lindsey Creek canyon; a real vocal problem of the proper location of a bypass road around the business district for heavy trucking; and local demands for aesthetic treatment of any levee system.

The levee system with its multiple-use potentials and its strategic location as well as the rights-of-way acquisition, has a critical impact for all of these. In addition, the project impact upon the large Potlatch Forests, Inc., plant about four miles up the Clearwater River and on the related Clearwater Dam owned by Washington Water Power Company, just upstream, will no doubt require extensive negotiations. The dam with



LEWISTON, CLARKSTON, AND ASOTIN AREA
RELOCATION AND LEVEE SYSTEMS AT MOUTH OF CLEARWATER RIVER

its small hydroelectric plant is close to realizing its economic life span by standards of the Federal Power Commission, and the Lower Granite project reduces its effective head to where continued generation may be uneconomical. The PFI plant is affected not only by backwater conditions from the Lower Granite pool, but its log pond is behind the Clearwater Dam. A tripartite discussion is underway with one solution being considered of abolishing the dam, powerplant, and log pond. This would mean reorientation of the stream and industrial conditions in the area. Proper planning with long-range objectives could effect some important face lifting, with potentials for considerable economic development in the foreseeable future for this entire three-community complex at the confluence of these two rivers.

THE PROJECT AND FISH

The relationship between the development of the lower Snake River for navigation and power, and the existing and important runs of anadromous fish migrating to the upper river system has always been a point of discussion. Experience with passage at the dams, and records since the time of Bonneville Dam, indicate that the runs have been maintained, partially by supplemental breeding at the hatcheries in the system. However, the lower Snake River has been an important reach of river for sports fishing for steelhead trout, and ardent fishermen have not looked kindly on the four slack-water pools in place of the open river with the known good fishing reaches. For some of them, fighting 10- to 20-pound steelhead on a sports reel and line is much more to be desired than more economical transportation or electricity to operate the dishwasher at home. The critical reach for the steelheader is the section of the Snake River above and below the Clearwater River.

When Congress appropriated funds for the dam structures in FY 1970 the Northwest Steelheaders Association announced in December 1969 their intention to seek legal action to prevent construction. Being an organization with strong opinions and a penchant for action, they lined up several like-minded groups and National organizations with adequate finances. On 11 March 1970 they petitioned the U.S. District Court in Spokane, Washington, for an injunction to prohibit the construction of the Lower Granite Dam. This petition claimed "Unlawful and injurious acts". These alleged acts cover the project authorization, violation of laws, failure to report objections, misrepresentation, possible eutrophication, lost industry, pollution, and adverse impact upon Lewiston and Clarkston. The injunction was not forthcoming at that time and is still before the court for consideration (1971). Construction activity is continuing, and future history will evaluate this facet of the project, along with the many others discussed herein.

The history of development for the John Day and Dworshak projects recounts the extensive steps taken toward mitigation of possible fish and wildlife losses as a direct result of the projects. The early authorization for the four lower Snake River dams in 1945 specified only that adequate fish passage would be provided. No action was discussed, nor authorized, for mitigation of possible loss of river spawning grounds or wildlife habitat along the stream.

At the inception of the Ice Harbor work in 1956 requests were made by the fish and wildlife agencies for compensating lands and fish rearing facilities to offset those lost with the project. Similar requests were made for the Lower Monumental and Little Goose projects, at subsequent times. As the result of conferences on the question of actual losses and authority for any steps to be taken, the Bureau of Sport Fisheries and Wildlife, in April 1966, was requested to prepare a factual report covering the impact of the four lower Snake River projects on the resources. The report, financed with Corps funds, was to evaluate the total impact for the

140-mile, 4-project composite, rather than on a project-by-project basis. At the close of this period of history (1970) the report had not been received but assurances were made that an early and preliminary draft might be ready for unofficial review in 1971.

As the reservoir management plans evolved for the four projects during their construction periods, the wildlife agencies had an integral part in the planning for land use. Specific land areas along the shoreline were set aside to be utilized for wildlife purposes. The Ice Harbor pool area has 345 acres of shorelands, Lower Monumental pool 564 acres, and the Little Goose pool area 395 acres set aside for birds. It is anticipated that additional lands, not connected to the projects, may be requested for intensive management for both big game and birds, as well as some added hatchery capacity.

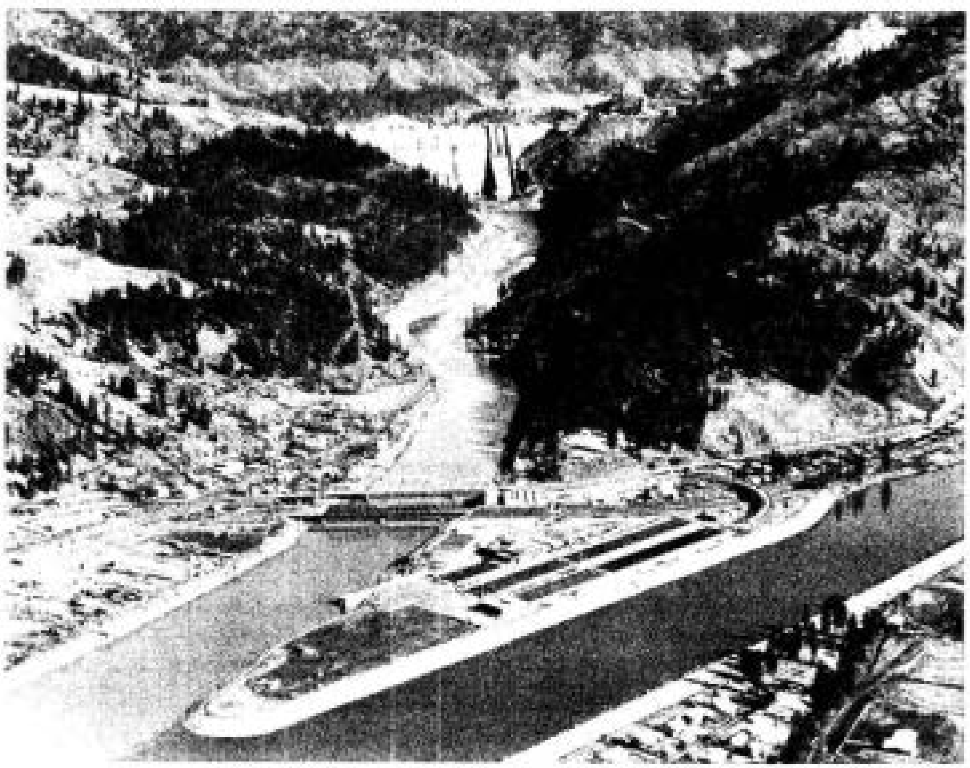
Upon receipt of the pending report and professional evaluation of the requests, added authority may be required for any extra facilities as was done for the John Day wildlife management area at Boardman, Oregon. The existing Columbia River Fisheries Development Program now has a number of hatcheries to its credit as compensating factors for existing dams in the Columbia and Snake River system. This program was justified to provide compensation for losses resulting from both then existing and future dams on the Columbia and lower Snake Rivers.

These four lower Snake River dams have not been popular with the rugged individualists, steelhead fishermen, or some of the bird hunters. The rugged back-packing naturalist, likewise, has opted for the natural look of the Snake River Canyon. The recreation minded families revel in the new vistas of the lower Snake River Canyon with its park areas, swimming, and pleasing scenery. It is important that the waterfowl and fishery resources of the 140-mile reach of stream be retained as an integral part of the overall environment of this important segment of river. This facet of the development plans should see professional agreement and fruition with the completion of the Lower Granite project.

IDAHO TO THE SEA

With the almost concurrent creation of the pool behind Little Goose Dam and its extension of navigation now to three quarters of the lower Snake River reach, together with letting of the contract to build Lower Granite Dam, all in the spring of 1970, navigation to Lewiston and full use of the lower Columbia-Snake River system for water transportation looms as a near reality. Industry in the Lewiston-Clarkston area, as well as that with potentials for use of the Central Ferry area, started to examine its needs and make firm plans for use of the waterway; new and innovative equipment for navigation is on the way; new ways of handling cargo are being installed; and the influence of the waterway is being felt into Montana and, reportedly, even North Dakota for transshipment of bulk commodities. This will be an area upon which future history may also have some interesting comments.

DWORSHAK (BRUCES EDDY) DAMSITE (BELOW BEND)
CONFLUENCE - NORTH FORK AND CLEARWATER RIVER - AT TOP OF PICTURE



DAM CONSTRUCTION UNDERWAY (FEBRUARY 1971)
FISH HATCHERY IN CENTER FOREGROUND AT MOUTH OF NORTH FORK

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CHAPTER 7

DWORSHAK DAM AND RESERVOIR

THE NORTH FORK CLEARWATER RIVER

The Dworshak Dam is located on the North Fork Clearwater River 1.9 miles above its confluence with the Clearwater River, in north central Idaho, some 40 miles east of Lewiston, Idaho, and 5 miles west of Orofino, Idaho. The reservoir will extend upstream about 53 miles into the heavily timbered, inaccessible North Fork Valley. The seed for creating water resource storage in the Clearwater Basin had been planted by the 1948 "308" Report for the Columbia Basin. In that report, a major storage project was considered on the main Clearwater at the "Kooskia Site" just downstream of the community of Kamiah. As an alternate for the basin problems, the Report suggested two dams on the North Fork, one of which was Bruces Eddy. (The natural site of the Bruces Eddy Dam had been looked at by others 25 years before.)

The germination of that seed occurred with the production of the Middle Snake Report of 22 December 1953 and later printed as S. Doc. 51, 84th Cong., 1st Sess., dated 14 June 1955. It was assisted through watering of the seed by COL F. S. "Tom" Tandy, then District Engineer, and Bert Curtis, the doughty Mayor of Orofino, Idaho, and head of the Clearwater Timber Protective Association. The Middle Snake Report, its production, and recommendations are commented upon in the first volume of this history, including the authorization for the Bruces Eddy, or Dworshak project by P. L. 87-874 dated 23 October 1962.

The Bruces Eddy name, long associated with the site, results from a natural "V" bend in the North Fork with a distinct eddy in the base of the V, which, among its other characteristics, is a good fishing spot. An engineer named Bruce Lipscomb lost his life in the sharp bend of the river at the turn of the century. The event identified the eddy for future generations. Immediately below the V, the river passes through a narrow deep cut in the high grade granite gneiss cliffs which form an ideal location for a major dam structure. Upon authorization for Federal construction, the project was renamed to honor the late Henry C. Dworshak, long-time distinguished Senator of Idaho.

Private power companies have investigated this site at two different times. The Grangeville Power and Light Company, since purchased by

Washington Water Power, performed the first investigation at this location in the early 1920s. In 1954 Pacific Northwest Power Company, a combine of private utility companies, was granted a preliminary permit by the Federal Power Commission to make investigations and studies on a project at the Bruces Eddy site. Preliminary investigations were undertaken, but this permit was allowed to expire without further action being taken.

The 1948 "308" Report outlined a plan for a dam at Bruces Eddy, 370 feet high with a pool elevation of 1,337 feet as only one unit of a two-dam development for the North Fork. The "Elkberry Site" further upstream would be the other. The Bruces Eddy project provided for a total reservoir capacity of 750,000 acre-feet and a usable capacity of 510,000 acre-feet for flood control and power. The powerplant would hold two units of 90,000 kw each.

The 1953 study of the Clearwater River anticipated there would be only two storage units in the entire Clearwater Basin for optimum control and development with the second one on the Middle Fork above the town of Kooskia. The S. Doc. 51 analysis provided for a Bruces Eddy Dam 570 feet in effective height with a reservoir having 2,460,000 acre-feet of total storage at elevation 1,540 feet, with 1,433,000 acre-feet active for flood control and power. The reservoir was considered to have important transportation savings as well as extensive recreation potentials. The at-site power provisions were for three units at 80,000 kw each, or 240,000 kw total capacity. In addition, it was anticipated that some reservoir releases would be made in the interest of downstream power needs. It was planned that logs would be rafted on the reservoir to a log passing facility at the dam, to continue their journey in the Clearwater River to the mill. In addition to the findings of that report, studies on dams with heights of 540, 600, and 630 feet were made.

Action on S. Doc. 51 was deferred for several years because of the decision by the Congress to request a full review of the 1948 "308" Report. The then active negotiations with Canada for storage in the upper Columbia would also have a major impact on project economics south of the border. In addition, a very active, but limited, group locally felt strongly that the Bruces Eddy project would have a major impact on the fish and big game resources of the North Fork Basin. They had good press coverage and real good letter writers in their midst. As a result, the White House, Congressmen, and the Corps received a myriad of letters of protest. The people were divided, however, and residents of the middle Clearwater area felt the advantages of the project for recreation, hunting, and fishing outweighed some possible loss. Senate Document 51 made provisions for fish passage at the dam but questioned a major impact upon big game.

THE PROJECT EVOLVES

The 1953 report was updated to a limited extent in 1955 for further consideration by the Congress and local interests urged early action. As a result, with still some questions being worked on for the subsequent

Columbia Basin Report, Congress--by means of P. L. 85-500, dated 3 July 1958--gave the project partial blessing by authorizing "The preparation of detailed plans for the Bruces Eddy Dam...at an estimated cost of $1,200,000." The funds were appropriated that year and design work initiated. Two years of investigations, alternate analyses, and studies in depth followed, including such questions as the type of dam to build and whether a change in height dictated a change in type.

The 1953 report specified a dam 570 feet high with a reservoir elevation of 1,540 feet. The 1958 "308" Review Report, which was actually prepared prior to the Congressional authorization for design and detailed plans, essentially adopted the studies of 1953 and 1955 for the project, retaining the height at 570 feet. During the latter half of the '50s it will be recalled, from the recounting of the development of the John Day and lower Snake projects, that the concepts of power development, as well as the art of dam design and construction, were changing rapidly. Consequently, when detailed plans were directed, the entire scope of the project was reviewed. As a result, the 1960 recommendations were for a dam with an effective hydraulic height of 630 feet and total height of 690 feet, having a reservoir elevation of 1,600 feet and active reservoir capacity of 2 million acre-feet. The ultimate power installation at that time was estimated at 512,400 kw, with six units of about 85,000 kw each.

The major question for that design study was the type of dam to be constructed for this nearly unprecedented height and size. Therein lies almost a story within itself, pitting professional judgment against professional judgment, and evaluation of extensive data on physical conditions. There were precedents for building straight-line concrete gravity, arch-type gravity, or thin-arch-type dams to the 693-foot maximum height proposed for the Bruces Eddy site. A number of rockfill dams had been built in the 400-foot range but one of almost 700-foot height was unprecedented. This was not considered as cause for eliminating the rockfill type, however, and careful appraisal of materials available and construction techniques was made. In fact, the design memorandum for the project concerned with the "Type and Height of Dam," dated 20 July 1960, recommended "that a rockfill dam be adopted for the Bruces Eddy project and that a normal pool at elevation 1,600 be approved."

This recommendation was not arrived at lightly, nor by universal acclaim. A contract was entered into in February 1959 with Harza Engineering Company of Chicago, Illinois, experts in the field, to study alternate types of dams for the site, using the project criteria in S. Doc. 51, and to recommend the most suitable type. Concrete gravity, arch gravity, arch, and rockfill dams were evaluated. The Harza report of 1 July 1959 recommended the adoption of a thin arch dam on the basis of cost, safety factor, existence of precedence for the proposed design, and shorter construction time. Upon receipt of this report, the District on 28 July 1959 assembled a distinguished panel of consultants; Mr. E. B. Burwell, Geologist; Mr. I. C. Steele, Engineer; and Mr. George E. Goodall, Engineer; as well as representatives of Harza Engineering Company, OCE, and NPD, to review the report findings. Conclusions of the conference were that rockfill and concrete arch dams were most suitable for the site, and that the basic site information should be refined further. A subsequent conference was called of all the consultants and agencies on 11 February 1960 with additional data and studies to review in detail. The consensus of the meeting was that, on the basis of cost, a rockfill dam should be adopted for the Bruces Eddy site. The above-noted design memorandum recommendation was made as a result of these evaluations.

After three months of agonizing evaluations and re-evaluations, the Chief of Engineers opted for a concrete structure, advising that analyses of the studies and records presented in the design memorandum did not reveal any realistic cost advantage to the rockfill type of dam over a straight concrete gravity dam. In addition, costs for a concrete dam can be supported by precedent, while such cost experience for rockfill structures had precedent for dams only half the height of Bruces Eddy. Coupled with these economic evaluations was also the professional judgment that for a 670-foot dam one should not design for least cost, but for maximum safety. Approval was given on 6 October 1960 to proceed with design of a concrete gravity dam, with further evaluations needed for optimum height of dam and initial and ultimate power installation.

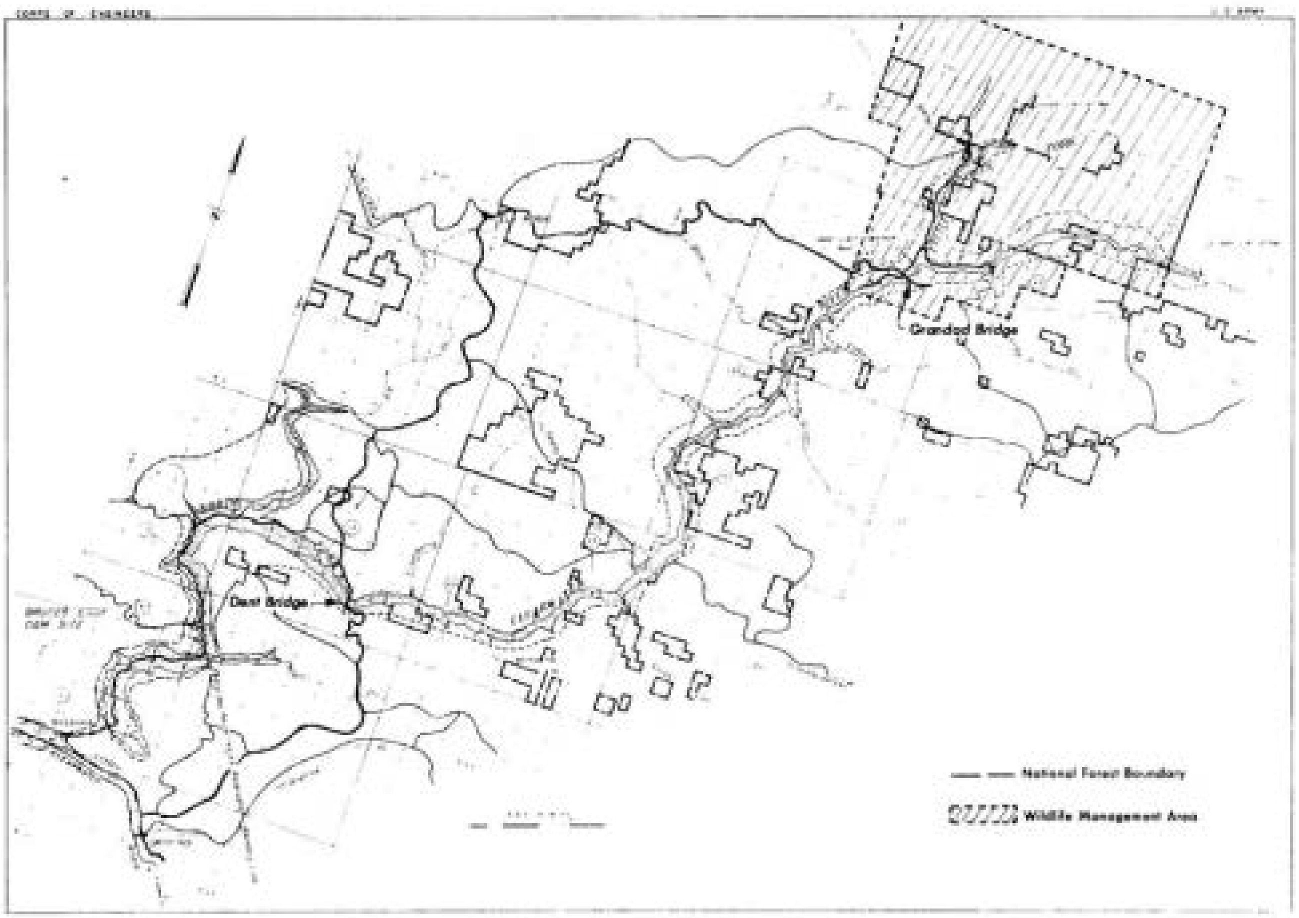
BRUCES EDDY - DWORSHAK

The use of a reservoir elevation of 1,600 with usable storage of 2 million acre-feet was approved on 6 September 1961. The General Design Memorandum of 15 September 1961 recommended three power units initially of 100,000 kw nameplate capacity each, with three additional units of the same size to be added as peaking capability is required in the future. The project was fully authorized in 1962 and the name officially became Dworshak Dam. Subsequent refinement of hydroelectric power requirements dictated a review of the Dworshak power capabilities and best use. Twenty-five power unit-powerplant combinations were analyzed in the course of these studies covering all facets of the contemplated plant. It was finally agreed in 1964 that the initial power facilities for Dworshak would include two units of 90,000 kw each and one unit of 220,000 kw. Provisions would also be made for the future addition of three 220,000 kw units judged to be needed peaking capabilities near the turn of the century.

Such were the initial steps and technical evaluations in determining the best project to be built at this ideal site, as the highest structure of this type in the Western hemisphere, on a stream with an extraordinary potential for serving man in his many needs for economic and social well being.

THE RESERVOIR AREA

The studies of the early '60s were concerned with several other problems of the project besides its structural characteristics. Fish passage facilities for the steelhead runs in the North Fork were an important facet. The North Fork Basin supports a high quality steelhead species as well as good trout fishing. The steelhead movement upstream past the dam was solvable without difficulty, using experience learned at the downstream dams on Snake and Columbia Rivers. Movement of the seaward-bound small fish past the dam was of different character. Considerable basic research was underway and had been accomplished by this District on passing fingerlings through turbines. This appeared to be a real potential for Dworshak and was adopted at that time with a plan for special gates on the turbine intakes to draw the migrating fish to the turbines. The need for some hatchery facilities was also anticipated, primarily for resident trout. These plans were later to become obsolete by further considerations, discussed later.



DWORSHAK RESERVOIR AREA

The reservoir area, and lands adjacent to it, support several species of big game. Although no real in-depth evaluations had been made for the actual impact of the created reservoir on such herds, some additional land purchases were anticipated to assist in management of the herds. This was a subject destined to be debated at all echelons of Government and private groups throughout the '60s with nearly as many opinions, professional and otherwise, as there were elk. The evolution of this phase of the project also warrants a little more coverage later.

Log handling for the extensive forest products of the North Fork watershed was another factor to be considered in the original planning. This subject has also gone through many changes in plans and objectives. The 1961 reports anticipated having to pass the logs at the dam to continue their travel downstream by water, as they had for many years in the past. No specific details were presented at that time but the problem, and potential for benefits in log movement were recognized. Provisions were made in the structural layout to include log handling at the dam and shuttling of them past the dam. Here again, the evolution of transportation plans made during the '60s modified the designs several times, as will be recounted later.

THE STRUCTURE

CLOSE TO FOUR MILLION CUBIC YARDS CONCRETE IN PLACE. BATCH PLANT UPPER RIGHT CORNER. SPILLWAY CENTER OF PICTURE WITH POWERHOUSE STARTING AT LEFT TOE OF DAM. DIVERSION TUNNEL AND FISH TRAP RIGHT CENTER. BYPASS ROAD AND VISITOR OVERLOOK HOUSES IN LOWER CENTER.

Dworshak Dam and the reservoir it creates will be an important element of the Columbia River system of water resource development. The Clearwater Basin is an important contributor to the water supply of the lower Snake and on downstream as well as a critical element for major floods outside its basin. The social scientist has decreed that the vital segment of the overall Snake River drainage enveloped in the Salmon and Clearwater Basins, with 20 percent of the total geographic area and a larger percent of the total water supply, together with their major contribution to the flows of lower Snake and Columbia River, shall remain undisturbed except for such regulation as can be realized by the Dworshak project. Although the North Fork comprises only about 25 percent of the total drainage area of the Clearwater Basin, its runoff is close to 40 percent of the total. This need for control of the North Fork dictated to considerable extent the scope of the project. With an average annual runoff of 4 million acre-feet, the 2 million acre-feet of storage is none too much for good regulation.

The dam is a concrete structure completely filling the narrow granite-gneiss walled canyon. The structure, with a length at the base of less than 400 feet in the streambed will have an overall length at deck level of 3,287 feet. The maximum height from foundation to deck will be 717 feet and the maximum width at the foundation line in the streambed will be about 550 feet. The thickness of the dam under the deck level will be 30 feet. The top of the dam will have a two-lane traffic roadway 27 feet wide with sidewalks cantilevered on each side. The spillway section to the left, or east, of the center of the dam will consist of two 50-foot bays separated by a 22-foot center pier at deck level. Radial gates will control the flow, each gate being 50 feet wide and 55 feet high. Three outlets at elevation 1,360, or 240 feet below full pool, complete with tainter valves, will control required normal releases into the spillway chute in excess of those passing through the powerhouse. Approximately 6,500,000 cubic yards of concrete are required for the structure.

The powerhouse will sit at the toe of the dam and free of the dam structure, essentially athwart the original riverbed. The structure housing the units will be 428 feet long by 160 feet wide. It will provide space for an assembly bay; two turbines and generators with a capacity of 90,000 kw each; one unit of 220,000 kw; three spaces for future units of 220,000 kw each; and ancillary office and equipment space. The penstocks through the dam to the smaller units will be 12 feet in diameter and those for the large units 19 feet.

To provide for the stream diversion during construction, a tunnel was driven through the left abutment. The horseshoe-shaped structure is 40 feet in diameter and lined with concrete to accommodate the spring log drives that pass through it for five years. The tunnel also provides easy passage for anadromous fish except during flood stages when velocities are excessive. Fish trapping facilities were built adjacent to the mouth of the tunnel and fish entering the trap during high flows are trucked around the project as required.

THE MULTI-LEVEL POWER INTAKE STRUCTURE

An interesting complication for high head, large volume dam projects such as Dworshak surfaced late in 1968 when second looks were taken at the overall water quality conditions. Multi-level withdrawal of water from the reservoir was considered in the early '60s in the planning for Dworshak for both water quality control and as a means of providing downstream passage of fingerling. The fish passage plan was dropped in favor of a hatchery. The effect of the project on water temperatures was quite thoroughly investigated by a consultant and agreed to by involved agencies. The primary objective at that time was in maintaining low temperatures in the lower river during the summer, and single level power intakes at elevation 1,400 were considered adequate to accomplish this.

Early in 1969 the Corps was requested to review the design because of revised and marked concern by fishery and state agencies on the adverse effect of low temperature water on fish movement, spawning, oxygen content, and the ecology of the lower Clearwater River. Computer models indicated that abnormally low temperatures would occur in the Clearwater during the period from 1 April to 1 October and the maximum differences during July and August would range up to 13 degrees below the junction of the North Fork with the main stem from that now experienced. Greater differences could occur under more adverse conditions. A seven-degree lowering could occur in the lower river near Lewiston. Full power peaking of three units could cause maximum hourly differences in the order of 20 to 25 degrees. Studies also indicated that unacceptably low dissolved oxygen content would also occur with the low level outlets as designed. These conditions were all judged to be quite unacceptable to the fish life of the lower river as well as other general ecological conditions.

Computer studies based upon multi-level withdrawal of water from the reservoir indicated that these temperature and oxygen problems could be remedied by installation of columnar type intake structures on the upper face of the dam for each power penstock, with a series of gates in the column providing means of withdrawing water from the reservoir at various levels to meet the downstream water quality requirements. These six intake structures for all power units, including ancillary features such as operating machinery, gates, trashracks and slots, were estimated to increase the project cost about $8 million. A special design memorandum was submitted on 3 October 1969 outlining the problem and recommended solution. The column of gates for each intake draft tube unit would be 175 feet in height and 65 feet wide with three tiers of gates in each structure. Time was of the essence since the dam structure would be built up to the low point of the intake gates by the following March. Approval was received on 17 November 1969 and the dam contract modified accordingly.

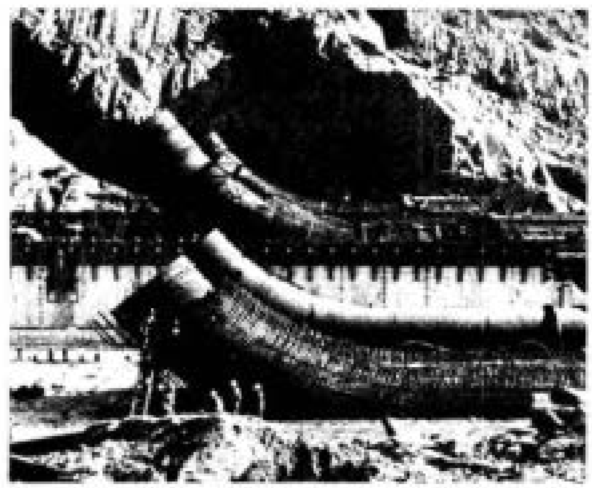
CONSTRUCTION

Full authorization for the project was given in October 1962, and construction funds were allocated that fiscal year. Acquisition of lands

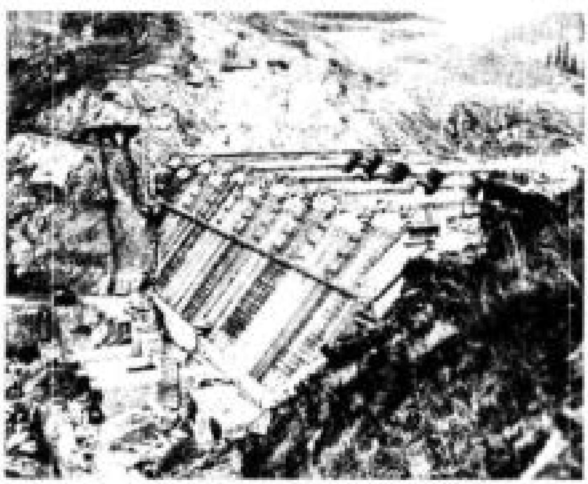
UPSTREAM DIVERSION TUNNEL PORTAL

TUNNEL EXIT WITH FISH CHANNEL AND TRAP ON LEFT

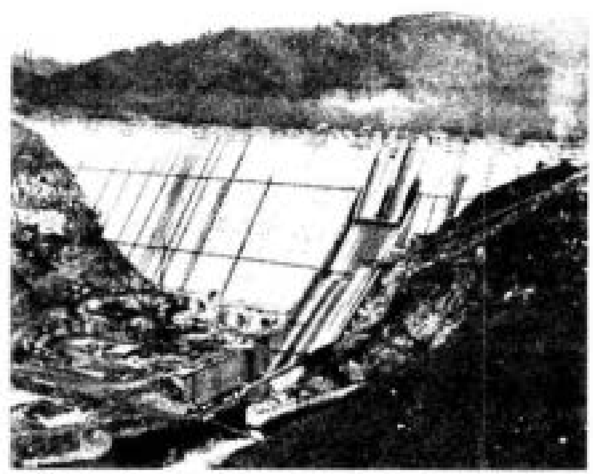
DAM BASE WITH DRAFT TUBES - OCT '68



EMBEDDED DRAFT TUBES - OCT '68



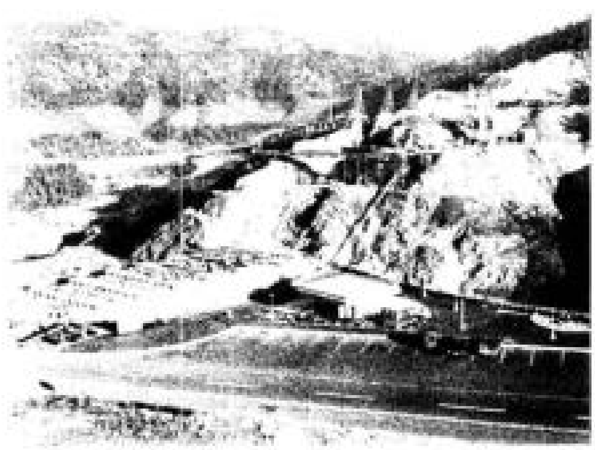
CONSTRUCTION PROGRESS - OCT '69
(2 MILLION CUBIC YARDS CONCRETE)



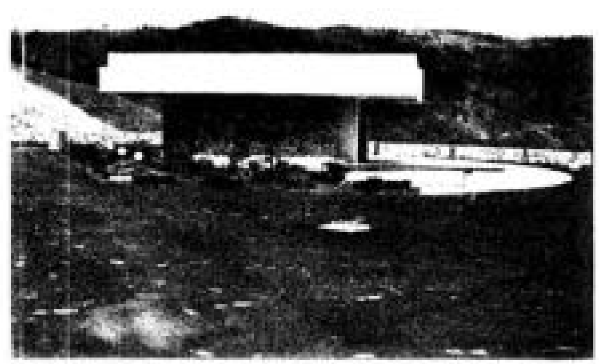
CONSTRUCTION STATUS - FEB '71
NOTE POWERHOUSE CONSTRUCTION UNDERWAY
(5 MILLION CUBIC YARDS CONCRETE)

for the damsite and access roads were initiated as soon as practicable, and the first construction contract for the right abutment access road awarded 23 April 1963. A clearing contract for the damsite and lower portion of the reservoir area was awarded a year later, 23 March 1964. Contract drawings and specifications were prepared and a contract let for the diversion tunnel on 4 January 1965 with the stream diverted through it in July 1966, after the spring flood and log drive. The upstream inlet channel to the tunnel is 600 feet long; the tunnel 1,722 feet long; and the outlet channel 1,250 feet, with fish trapping facilities alongside its lower end. The excavation work involved handling of about 200,000 cubic yards of random materials and 220,000 cubic yards of rock excavation, half of it in the tunnel. About 40,000 cubic yards of concrete were also required for the tunnel lining and other features.

With the diversion tunnel complete, construction of the dam was in order and a $131,216,000 contract was awarded 20 July 1966, the largest single contract ever let by the Corps in its 120-year history of building big projects. The builders, Dworshak Dam Constructors, are a consortium of major contractors in the country, and they attacked the job with verve and some innovative methods. Seven years are required to complete the work so this recounting of the project history can only get the project well underway. The contract for the powerhouse structure, sitting at the downstream toe of the dam, was advertised early in 1970 and awarded on 7 April 1970 to the main dam contractors for $17½ million, and its construction is also underway. The 1970 estimate of total project cost is set at $283,740,000. The next generation will have to evaluate the final accomplishments of the construction effort and utilization of the project for man and his well being. Several facets of the building effort should be commented upon because of their special interest not only to the professional engineer but to the layman viewing the project from a very attractive and informative public overlook area downstream and above the right abutment.



VISITORS' OVERLOOK AREA AND VIEW OF CONSTRUCTION AREA



OVERLOOK EXHIBIT AND VISITOR CENTER BUILDING

VISITORS OVERLOOK

This is proving to be one of the most visited spots in the Inland Empire, with plenty of "sidewalk superintendents." Such popularity was anticipated and a rather comprehensive structure and surrounding grounds were carefully developed as a visitors' viewpoint. The area is about 1,800 feet downstream of the damsite on the right wall of the canyon, more than 600 feet above the river. It has a commanding view of the project and river canyon as well as making an attractive setting for interpretive displays. The viewpoint and related facilities received an "Award of Merit for General Landscape Development" by the Chief of Engineers in 1970 under the annual program of "Distinguished Design Awards," the third such award for for the District. The Jury comments in making the award said:

> "The viewpoint and related facilities are excellent in functional concept and harmonize well with the rugged natural environment. Interpretive exhibits expand the educational and recreational values far beyond those of the usual overlook facilities. This little gem is marred only by the alien lighting standards which are inconsistent with the natural surroundings."

AGGREGATE

One innovative idea to speed the construction effort was the production of concrete. Thirteen million tons of aggregate were required

SCHEMATIC VIEW OF AGGREGATE CRUSHING PLANT BELOW QUARRY of carefully graded and high quality rock. The area around the dam is composed of granite-gneiss, the official classification being a hornblende biotite quartz diorite gneiss. This material was determined to be the best and cheapest source. Before accepting it, gravel terraces for 50 miles around the project were explored and evaluated, even in the Snake River above and below Lewiston. In addition, limestone and basalt deposits were compared for economic sources. The final decision by the District was that a portion of the promontory downstream of the left abutment rising about 1,200 feet above the dam was the best source.

Ordinarily this rock would be quarried and hauled down to a crushing plant in trucks. The contractor came up with the idea for chuting this rock from the quarry down into an underground crushing chamber, at about the elevation of the top of the dam. Workmen tunnelled deep into the mountain under the quarry site and there carved out a large chamber 87 feet long, 34 feet wide, and 102 feet high. They then sank a 20-foot-diameter shaft, 420 feet deep, into this chamber from overhead.

The crushing plant installed inside this man-made cave is capable of crushing four-foot boulders into six-inch fragments at the rate of 2,000 tons per hour.

This rock, dumped into the shaft from the quarry above, slides onto an apron feeder 10 feet wide and 26 feet long, which feeds it directly into a 54-inch by 80-inch gyratory crusher. Here the rock is reduced to minus 15 inches. The material is screened on 6-inch screens, and the oversize goes to two 5½-foot standard cone secondary crushers. From these crushers it is conveyed through a 750-foot-long tunnel to a primary aggregate pile outside near the batch plant. A television camera mounted in the underground chamber permits plant operators to watch the flow of materials through the big primary crusher to the outside plant.

The contractor had to strip two million yards of overburden off the quarry site before reaching the solid granite. Suitable parts of this material were placed in a fill in the reservoir area, just upstream of the left abutment, to be used as a project work and log handling area when the project is complete. The quarry rock is drilled and blasted, then loaded into 100-ton trucks by an electric shovel with a 14-yard bucket. The trucks haul the rock the short distance to the shaft where it is dumped. The quarry is being worked in 45-foot benches. As the rock is removed, the floor of the quarry is lowered and the length of drop shortened. Eventually, the floor of the quarry will be only 100 feet above the crushing chamber. This is believed to be a first-time application of this technique in construction.

The aggregate plant outside the crushing chamber is a high-capacity installation, capable of producing 1,400 tons of sand and aggregate per hour. Its function is to take the minus 6-inch material that comes out of the rock crusher and reduce it to the various sizes of aggregate required for the concrete mix.

The crushed rock is picked up from the surge pile and carried on conveyor belts into the aggregate plant. There it is re-crushed, screened into the sizes desired, and washed. An elaborate system of controls enables production of the exact quantities desired for the concrete mix. This composite plant is quite unusual for concrete aggregate production, in that the complete requirements for all concrete materials come from this process. The plant produces all needs artificially from one source, rather than using natural sand deposits for finer elements.

CONCRETE AND ITS PLACEMENT

In order to meet their completion schedule, the constructors must mix, transport, and place 6.7 million cubic yards of concrete for all of the project features - nearly 10,000 yards per working day. Two batch plants, standing 135 feet high, have been installed to produce concrete. They are equipped with a total of ten 4-yard mixers. Sand, aggregate, cement, pozzolan, and water are carried into the batch plants in an almost continuous flow. Sensitive electronic controls measure out and weigh the ingredients of each mix automatically, and 32 different combinations can be produced by the twist of a handle.

One of the District's most stringent specifications on the Dworshak project is that concrete going into the massive dam structure must be maintained at a temperature of no more than 45° F during the first hour in the pour. The problem is that on a typical summer day, the normal temperature of the aggregate would be as high as 80° and of the water, 72°. The addition of cement and pozzolan would raise the temperature of the mix to 120° F.

In order to lower the temperature of these materials, the contractor developed a refrigeration system costing more than $1 million. A variety of methods is used to reduce the concrete's temperature. On its way to the batch plant the coarse aggregate is chilled by a cold-water spray. Some 1,500 gallons of cold water per minute are required for this process.

In the batch plant, the aggregate is held in chilling bins where it is cooled further, by air, to 38° F.

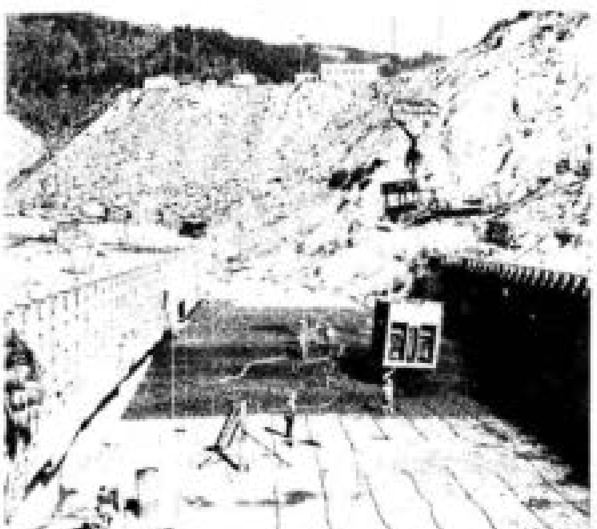
Finally, flaked ice is added to the concrete mix, at the rate of 280 pounds per batch. The refrigeration plant is capable of producing 360 tons of flaked ice per day.

The fresh concrete is shuttled from the batch plants to the cableway bucket loading dock in three railroad hopper cars. Each of these self-propelled cars carries 16 yards of concrete in its two hoppers.

The most dramatic feature of the Dworshak Dam construction setup is the cableway system designed to place concrete anywhere in the dam. Three cableways span the river gorge, each one of which carries an 8-yard bucket of concrete. Powered by electric motors, a cableway is capable of carrying this 25-ton load across the dam area at a speed of 2,100 feet per minute (about 25 m.p.h.) and of simultaneously lowering it at 950 feet per minute, claimed to be the fastest in the world.

BATCH PLANT AND OVERHEAD CABLEWAY TAKEN FROM AGGREGATE AREA.

BATCH PLANT CONTROLS.



LIFT POUR OF CONCRETE. NOTE COOLING LINES ON FLOOR OF LIFT.

RELATION OF BATCH PLANT TO TRAMWAY AND CONSTRUCTION SITE.

Each cableway is run by an operator in a separate control tower perched on the rim of the gorge. The operator controls all the motions of the cableway by radio--its horizontal and vertical travel, its positioning at the loading dock, its discharge position on the dam, and the movement of the head and tail towers independently on their tracks which extend 740 feet athwart the axis of the dam.

High above the damsite and out of sight of the action much of the time, the cableway operators rely on sophisticated radio communication with workmen on the site. Radio telemetry indicates the position of the towers, the cableway buckle, the bucket, and their speed of movement; a first time for a cableway system such as this. A plotter shows the operator the position of his bucket at all times, an important consideration during night-time operations and inclement weather. A digital read-out tells him the position of his head and tail towers. A tachometer indicates the hoist and travel speeds of his cableway. A bellman in the pour area "talks" the concrete bucket into position for dumping, as the cableway operator, nearly half a mile away, follows his directions.

The cooling of the concrete mix to insure placement at a temperature of 45° or less was described above. Equally stringent temperature controls were required in the structure itself for the curing process, which is the critical factor. Because of the need for a truly monolithic structure with a minimum of shrinkage and cracking in the mass concrete, the design criteria provided for no longitudinal joints and no grouting of the transverse joints. Temperature control of the cooling process was the key. The construction procedure provided that mass concrete be placed in five-foot lifts of varying widths longitudinally, at a temperature not to exceed 45°F. Each of the lifts run the full up and downstream width of the dam, even in the base, which meant as much as 6,000 cubic yards in a single pour. To maintain the 45° temperature of the curing concrete, refrigerated water is circulated through one-inch-diameter aluminum tubing embedded throughout the concrete, with water temperatures of 40° at entry and 60° at the exit point. Each coil is approximately 1,000 feet long. This cooling system required a refrigeration plant with a capacity of about 700 tons and an extensive closed circulation system to which the myriad of cooling coils are attached for a cooling cycle of about 21 days. The results have been most gratifying to date. With well over half of the concrete in place, only one very small crack has become evident.

The first bucket of concrete for the structure was poured on 22 June 1968 with about four hands on the lanyard. The millionth cubic yard placements after that were marked by appropriate celebrations:

First millionth cubic yard	28 May 1969
Second millionth cubic yard	24 October 1969
Third millionth cubic yard	31 March 1970
Fourth millionth cubic yard	13 August 1970

There is still 2½ million more to go by 1972. By the end of 1970 the contractor had earned over $100 million of his total contract of $133 million.

TIMBER RESOURCES IN RESERVOIR AREA

LOG COLD DECK ON RIVER BANK

LOGS PASSING DIVERSION TUNNEL

LOG HANDLING AREA AT LEFT ABUTMENT
POOL PARTIALLY RAISED WITH
CONSTRUCTION STILL IN PROGRESS

LOG HANDLING

As mentioned previously, the movement of logs through the reservoir reach to mills downstream has been a subject of much planning effort and negotiations. The Clearwater River has never been a working river, such as the lower Snake or Columbia, and has been exploited in only one way--that of carrying logs from the extensive forests in its upper region to the plants at Lewiston. The Clearwater is the scene of the only remaining log run in the country, which will terminate with the 1971 drive.

Cut logs are placed in "cold decks" at the edge of the stream all fall and winter. Upon the rising spring floods the many "decks" are forced into the river and float downstream. The river carries them as much as 150 miles. The tributary forest area has a sustained yield potential of over 115 million board feet annually. At present 50 to 60 million board feet of annual harvest is transported on the river.

The creation of the reservoir will change markedly the movement of logs to market. In addition, it will open up portions of the National Forest at its upper end, which heretofore have been landlocked and unable to be used to their full economic potential for timber production because of lack of access. The key to the best use of the reservoir for movement of logs to the market is movement past the dam. Planning for this has gone through an evolution of professional opinion, plans, and economic analyses over the past 15 years since the first report and methods of handling at that time. A water chute was first envisioned to keep the logs in the river. More detailed studies found operating difficulties with such a scheme, and a cable highline for bundled logs was discussed. Later studies and conferences with the users found that if the logs were removed from the water, the best method would be to truck them to the mill rather than place them back in the water below the dam.

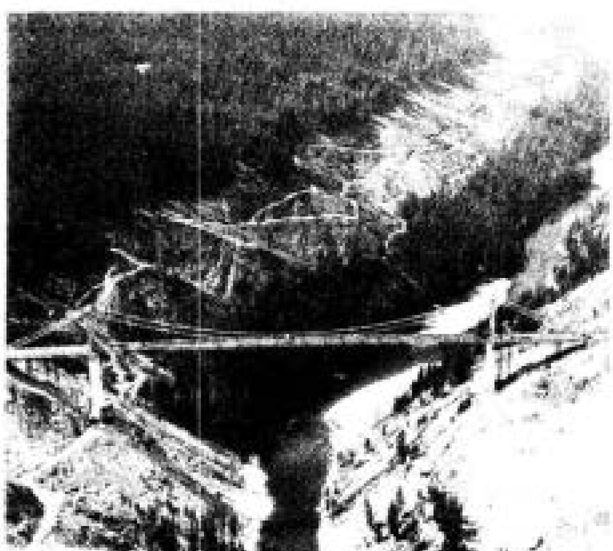
The facilities now planned are for a construction center around the large fill area at the left abutment as both a work and storage area. An inclined marine railway will be installed which can work throughout the range of the reservoir fluctuations. Logs will be bundled at their origin in sizes capable of being handled by highway trucks. They will be rafted to the damsite, removed on the marine railway, and loaded on trucks or placed in storage. The volume of movement on the reservoir and over the loading facilities remains under debate as yet (in 1970) until the larger users, such as Potlatch Forests, Inc., at Lewiston, firm up changes in their operation at the plant and method of logging in the woods. Regardless, the landing area at the dam should be an active spot and log rafts on the reservoir should be a common sight for future historians to write about.

RESERVOIR ROADS

Access to the North Fork stream prior to the creation of the project was limited to a water-level road along the right bank for about 14 miles from the mouth of the river, and forest service and private roads approaching the stream about 40 miles above the mouth at the junction with the Little North Fork near Boehls Cabin. A private road also runs up the North Fork and the Little North Fork for a short distance beyond this point. Original planning was to replace the water-level road above pool elevation and to make provisions for a ferry near the mouth of the Little North Fork.

Careful geologic studies found that simply moving the river-level road in the lower reach up above the pool was not practical because of alignment and unstable ground conditions. Access from Orofino, the county seat, to areas lying west of the river, including Elk River, was of economic and political necessity. As a replacement for the impractical raising of the river-level road it was decided that a bridge across the reservoir about 16 miles above the dam was practical, and the best solution. Dent Bridge, together with significant reaches of approach roadways in the vicinity of the reservoir, was approved on 31 March 1965 as the most satisfactory plan of relocation after studying five alternatives.

The relocation requirements for a new route including Dent Bridge involves rebuilding about five miles of existing secondary roads between Orofino and the bridge, and construction of three miles of new road as an approach to the bridge. On the westerly end of the bridge 2.7 miles of new road is required as the tie to existing roads in the Dent-Elk River area. The Dent Bridge will be a major structure spanning the reservoir at a very scenic point. The access roads were completed in the fall of 1969 at a cost of $1½ million, and the bridge placed under construction on 4 December 1969. It is the longest suspension bridge in Idaho, suspension with a main span of 1,050 feet and side spans of 250 feet each, with a cost of about $8 million. In addition to the traffic between communities, major public use sites lie close to the bridge on both sides, so it will have important uses for the recreation bound public also. The construction is moving along with a requirement that it be in use when the pool starts rising in the fall of 1971.



DENT BRIDGE FOR ACCESS FROM
WEST SIDE TO OROFINO
LOOKING DOWNSTREAM

UPPER RESERVOIR CROSSING NEAR
MOUTH OF GRANDAD CREEK
LOOKING DOWNSTREAM

The need for a reservoir crossing in the upper area near the mouth of the Little North Fork proved to be a particularly knotty problem. The original authorizing documents assumed a ferry would be installed in this general area. The problems of operating a ferry in this remote location with a pool fluctuation of 155 feet, as well as the need for better access, made a bridge much more practical. The area is far removed from the population, enveloped in both National forest and private timber holdings. Existing roads were of forest service type or private logging roads for access only and to "cold-deck" areas along the river. No public highways approached the stream, making a compensable interest difficult to establish. Problems of access for management, fire fighting, public use, and remote and necessary entry finally won out by entering into agreements with county and state governments as well as Federal ownership agencies for maintenance of the bridge and improvement of the approach roads. In addition, provisions were thus assured for through traffic from Elk River to headquarters on the two sides of the basin. This crossing will be the only one in the upper 36 miles of the reservoir. With this need and the principal of a bridge established early in 1968, design steps were quickly initiated because time was of the essence. The final agreement with the State of Idaho was executed on 14 May 1970 and a contract awarded for the Grandad Creek Bridge 17 July 1970, at a cost of $4 million. The bridge will be of the cantilevered deck-type truss with a main span of 504 feet and two side spans of 288 feet each. Schedules indicate the bridge will stay ahead of the pool raising even if the 2.4 miles of approach roads within the project boundary, which have not been designed as yet, are late. This bridge, and good highway access to this excellent wildlife, timber, and recreation area, should open an extensive new vista for both the economic and recreational benefit of people; a good analytical study for future historians.

THE NORTH FORK FISHERY AND HATCHERY

As has been written previously, the original documents for the Bruces Eddy project recognized the steelhead trout fishery of the North Fork as well as a resident fishery. In review, it was anticipated at that time that the adults could be passed over the dam very adequately and that the downbound fingerlings could pass through the turbines safely, based upon research then being done at high head dams by the District. Later experience at other reservoirs indicated problems of the fingerlings finding their way through deep, low-velocity reservoir areas. After much consultation, decisions were reached that the North Fork steelhead fishery would be replaced by hatchery reared stock. The design of an up-to-date hatchery was immediately undertaken in order to have it ready to handle some of the brood stock returning to the stream in the fall of 1968 and spring of 1969, since their progeny would be the last to leave the upper river before dam closure.

The decision was that the hatchery should be on a point of land at the mouth of the North Fork and use North Fork water as the native supply for the runs of fish using that stream. The permanent fish collection system for the hatchery will be at the Dworshak powerhouse in anticipation that the strains of fish native to the North Fork will be separated from the main stem fish by the time they move that far upstream. The adult fish will then be trucked to the hatchery two miles away. A ladder is provided at the hatchery for those so inclined to move directly into the hatching ponds.

All of the ramifications of hatchery design, including some innovative processes, were settled by the summer of 1967 and a contract let for its construction on 8 September 1967 at a cost of $8,300,000. As indicated, the hatchery was ready to hold some of the fall run of 1968 and it was completed by August 1969 in all its details--the largest known hatchery of its kind.

STEELHEAD SMOLTS BEING RELEASED FOR JOURNEY TO SEA. 20% ARE BRANDED AND TAGGED FOR IDENTIFICATION

REMOVING EGGS FROM FEMALE WITH TWO POUNDS COMPRESSED AIR WITHOUT DAMAGE TO FISH - SOME OF WHICH MAY THEN SURVIVE FOR A RETURN TRIP

The hatchery was designed from criteria supplied by the Idaho Fish and Game Department and the Bureau of Sport Fisheries and Wildlife, with a good bit of expertise included from the design staff of the District. It is operated by the Bureau of Sport Fisheries with a Hatchery Manager in the person of Biologist John Parvin, a most perceptive and active professional, interested in making things work, trying new procedures, and cooperating with the many units of the technical staff of the District required to make the new operation a success. The hatchery's accomplishments the first year are a testimonial to his capabilities--and those of the District. There are many unfinished items, including further expansion of the entire plant and greater production of fish, that will need future recounting. It is a cooperative effort that can be pointed to with pride, and augurs well for the Clearwater steelhead fishery as well as other sports fish production.

Mr. Parvin prepared a paper on the hatchery describing some of its operating capabilities and exceptional features. The following material is extracted from portions of that paper. The Dworshak National Fish Hatchery, in addition to providing for perpetuation of the North Fork steelhead trout runs will also rear catchable size rainbow trout, cutthroat trout, and Kokanee salmon for stocking the reservoir and its lower tributaries.

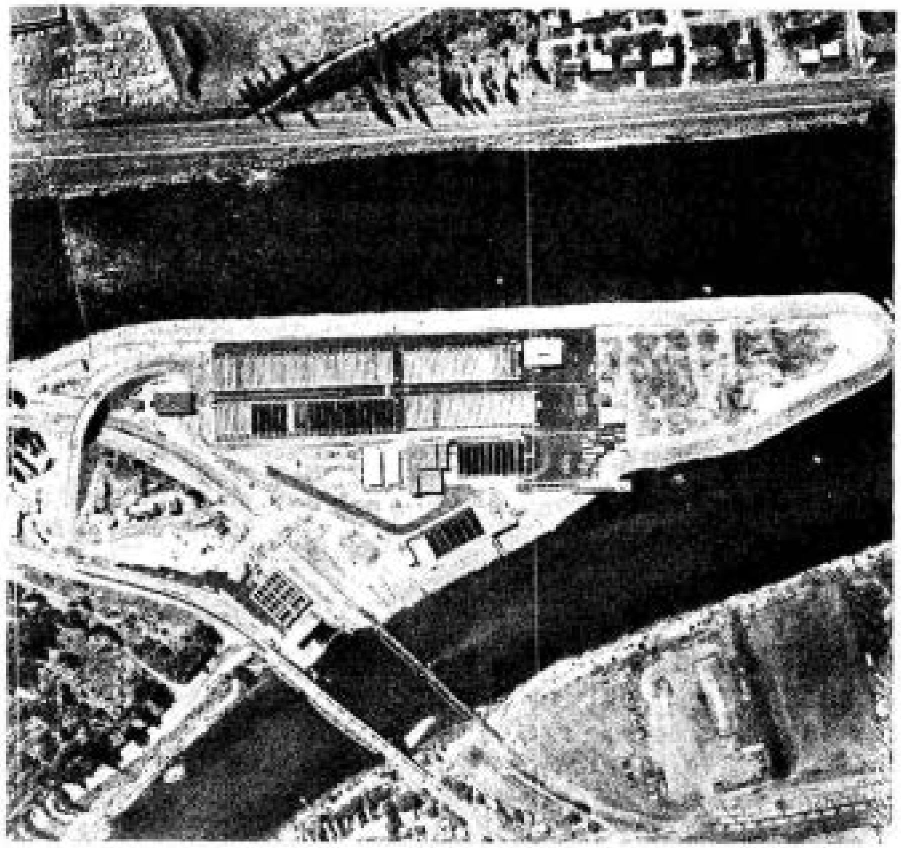
The present rearing facilities consist of 84 recirculating type ponds 17 x 70 feet in size, 64 rearing tanks for small fish, and 128 incubators. In addition to these facilities there are nine adult holding ponds 17 x 70 feet. The design for the hatchery construction and operation anticipated that there would be approximately 50 percent males and 50 percent females. During the first spawning season, 1969, it became apparent that this was not actually the case. Nearly 70 percent of the fish delivered into the holding ponds were found to be females. In addition, the average total number of eggs collected per female amounted to 6,200 eggs.

The first year a total of 3,200 adult steelhead were handled. The balance of the fish were transported above the dam and allowed to spawn naturally during the 1969 spawning season. It was anticipated that 9,600,000 eggs would normally be collected from 6,000 adult steelhead. Actually 11,000,000 eggs were collected from the 3,200 fish handled.

Dworshak steelhead leave the ocean in the summer and migrate up the Columbia, Snake, and Clearwater Rivers. Some arrive at the hatchery as early as October 1 of the same year and the latest arrive in March of the following spring. These are large steelhead, averaging 13.5 pounds apiece even after their long, strenuous migration journey. Fish over 20 pounds have been spawned at the hatchery.

Some eggs taken in 1969 were diverted for other areas. All remaining eggs taken were incubated and hatched at Dworshak for the station's program. About 1,400,000 of these steelhead reached migratory size by the spring of 1970. The first of these were released on 20 April 1970 and the releases were completed by the end of the first week in May. The station continued to rear an additional 1,800,000 steelhead which were too small to migrate. These will be released in the spring of 1971. During May of 1970 eggs were again collected from the upstream migrating steelhead. A portion of these will be reared to sufficient size to be released in the spring of 1971 along with the two-year-old fingerlings which are presently being held at the hatchery.

Computerized Feeding: The hatchery uses a pneumatic feeding system to introduce fish feed into the ponds. The feed is stored in



STEELHEAD HATCHERY AT MOUTH OF NORTH FORK (RIGHT)

large bins and is kept under refrigeration. Required amounts of food are removed from the bins and weighed by automatic batching devices which then introduce it into a pneumatic pipe. It is then blown through the pipe to the pond.

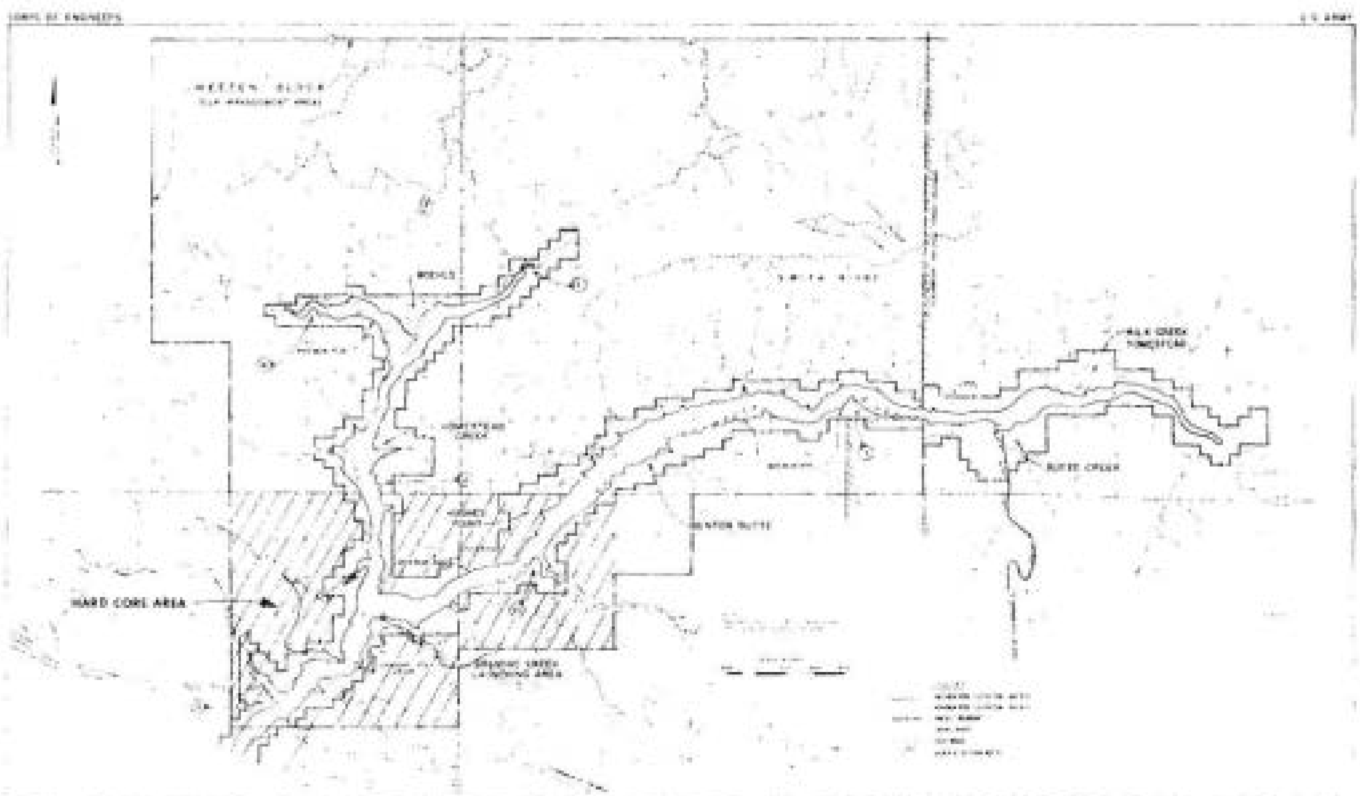
The feeding system is equipped with two modes, the manual and the automatic mode. The manual mode overrides the computer and can be used to feed the ponds as needed. For automatic operation the pond is selected on the control panel, the amount of feed registered on a dial, and the system actuated. The feed is then fed through the system. In addition to controlling the automatic feeding system, the computer continually scans 140 alarm points. If equipment fails or the environment in the ponds becomes unsuitable for fish, the computer will trigger local annunciator board alarms in the office of the appropriate buildings. If these alarms do not respond, a tone will be transmitted by the computer through the public address system. If no one acknowledges this alarm, the computer closes a relay which activates an alarm in the staff houses built adjacent to the hatchery.

Environmental Controls: The hatchery has the first large scale environmental control system for rearing fish. Water within this system is reconditioned and reused. A small percentage of fresh water is added to the system continuously. This makeup water is filtered, treated with ultraviolet rays, and heated or cooled as needed, and enters the system maintaining the temperature at the desired level. Waste water from the fish rearing ponds is collected and passes through crushed rock and oyster shell filters which remove the nitrogenous wastes and buffer the pH. The water is then pumped through an aerator and returned to the ponds. At the present time 25 rearing ponds have environmental control and are supplied with temperature-controlled, reconditioned water.

The rearing tanks and egg incubators can also be operated with reconditioned, heated water. Fish raised in the disease-free, warm water of the environmental control system grow extremely fast. The hatchery was able to rear a large number of steelhead to migratory size in less than one year through the use of this system. It usually requires two years or more to rear fish to smolt or migratory size in raw, cold river water.

BIG GAME MANAGEMENT

The reservoir area of the Dworshak project extends deep into one of the major forested areas of the United States and one which has been managed for timber production for many years. The timber harvest, coupled with favorable natural terrain and ground cover, has also fostered the growth of a very valuable wild herd of elk and deer that use the lower lands lying along the North Fork and Little North Fork as a winter feed area.



WILDLIFE MANAGEMENT AREA FOR BIG GAME IN UPPER REACHES OF RESERVOIR INCLUDING "HARD CORE" AREA FOR SINGLE-PURPOSE USE

This big game development has evidently evolved with the opening up of the area, a propitious fire or two, and management practices by the state game agencies. Lewis and Clark, in their diary for the time they spent through this area, both in the fall of 1805 and summer of 1806, were hard put to find enough to eat and had to depend upon the generosity of the Nez Perce Indian Tribes, their horses and dogs.

The reservoir has a surface area of 17,000 acres, with a length of 53 miles and shoreline length of 183 miles. About 15,000 acres of shorelands are actually inundated, and approximately half of this contributed materially to the production of big game forage or supported the herd during critical winter years. Studies made in the early '60s by the wildlife agencies estimated the North Fork Clearwater big game population at about 26,000 animals, most of which wintered on the southerly slopes north and east of the mouth of the Little North Fork. The feed available in this area during particularly severe winters was a critical item.

The principle that the project was responsible for replacement of some of these lands inundated by the reservoir, through modified management practices on other lands, was recognized in early authorizing documents. The report of the Conference Committee on the Flood Control Act of 1962 states in part, "In taking its action authorizing Bruces Eddy Dam...it is the intention of the conferees that the Secretary of the Army shall adopt appropriate measures to insure the preservation and propagation of fish and wildlife affected by this project...."

The normal land acquisition program for the reservoir area involved not only the 15,000 acres inundated but also about 26,000 acres above the normal pool elevation of 1,600 feet, much of which is available for random wildlife use, since only a limited portion of it is to be used for other concentrated public and project purposes. Approximately 3,000 acres of these shorelands are specifically allocated to wildlife uses, and another 10,000 acres are classified as general access lands for the public, which no doubt will be extensively used by wildlife, particularly in the wintertime.

As indicated, the authorizing act specified that mitigation of wildlife losses would be a project responsibility. Early negotiations established the premise that in order to mitigate the loss of the indeterminate usable acreage inundated, intensive management of other lands for wildlife, even beyond the project taking line, would be required. A report by the U.S. Fish and Wildlife Service in 1962 recommended that 26,000 acres of land beyond that taken for the project be acquired for wildlife management to replace the portion of the 15,000 acres inundated that was being used by big game.

Subsequent to publishing that report, the Idaho Department of Fish and Game made a detailed study of the land replacement program and developed a management plan encompassing a 50,000-acre block of land adjacent to the upper portion of the reservoir, strategically located to provide a maximum amount of southerly exposed slopes, for management by manipulation, clear cutting of vegetative cover, elimination of coniferous timber where practical, and encouraging growth of low growing cover suitable for forage. The plan was ideal from the big game manager's standpoint but was questioned from a multipurpose, natural resource, conservation concept, as well as a total project responsibility from a mitigation standpoint. Much of the lands involved are in state management for multiple-purpose uses, and subsequent negotiations resulted in a limited use agreement with the State Board of Land Commissioners providing for recognized wildlife uses but subordinating them to timber management. This management agreement encompassed 34,700 acres of the 50,000 acres originally requested.

Upon completion of this agreement within state agencies, a review of the project need to obtain about 13,700 acres of private lands involved was requested. A revised report of the wildlife agencies modified the plan outlining about 7,250 acres of private lands needed in addition to adjacent project lands. A subsequent agreement negotiated by the Idaho Fish and Game Commission with Potlatch Forests, Inc., on 25 October 1967, provided that about 3,160 acres of its privately held lands would be managed for wildlife in a similar manner to the state-owned lands which surround them.

The revised report also blocked out about 5,000 acres of land on both sides of the reservoir and around the Little North Fork which were considered vital to the big game survival, by intensive management on a single-purpose basis, as a winter feed area. These lands were owned privately, by the U.S. Forest Service, and by the Bureau of Land Management. Needless to say, extensive coordination effort has been required between all agencies over a four-year period to narrow the actual acquisition needs, as a project responsibility, down to the 5,000 acres of so-called "Hard Core" lands to be managed on a single-purpose basis. This management would be accomplished first by harvesting all the merchantable timber, removing conifers, and then flash burning periodically over a span of years to encourage the growth of shrubby plants. The burning technique would produce some of the prime browse whose seeds sprout only after burns. Later, the burns will regenerate short new growth after the bushes have grown too tall for the animals or timber begins to grow again. Substantial browse production is reached about five years after burning, and maximum production in about eight years.

The next problem was to acquire the 5,000 acres for transfer to the wildlife agencies for management. Ownership is mixed and, as with previous negotiations, the state and local governments were reluctant to remove any more private lands from the tax rolls and put them to nondirect revenue producing purposes. Sixty-four percent of the county is currently in Federal and state ownership, with Potlatch Forests, Inc., paying about 62 percent of the taxes received by Clearwater County. These factors influenced local opinion and polarized discussions between the game biologist, and timber and local officials. The ownership in dispute for the hard core area is:

U.S. Forest Service	90 Acres
U.S. Bureau of Land Management	210 Acres
Potlatch Forests, Inc.	4,038 Acres
Northern Pacific Railway	692 Acres
Milwaukee Land Co.	120 Acres
Total	5,150 Acres

Correspondence, meetings, and proposals brought forth the proposition early in 1969 that the privately owned lands involved be obtained through exchange with adjacent Bureau of Land Management forest areas outside the hard core area but in Clearwater County. Senator Church and Senator Jordan had become interested in the proposal and entered the discussions in depth. Analyses of Federal lands available in Clearwater County and problems of exchange led to the conclusion that the properties of Northern Pacific and Milwaukee Land Co. were infeasible of exchange, and steps were initiated in 1970 to purchase them outright. The principal of the land exchange for the PFI property was agreed to in 1970 and appraisals initiated to effect the exchange on the basis of value, not on land area.

ELK IN THE NORTH FORK WINTER RANGE AREA

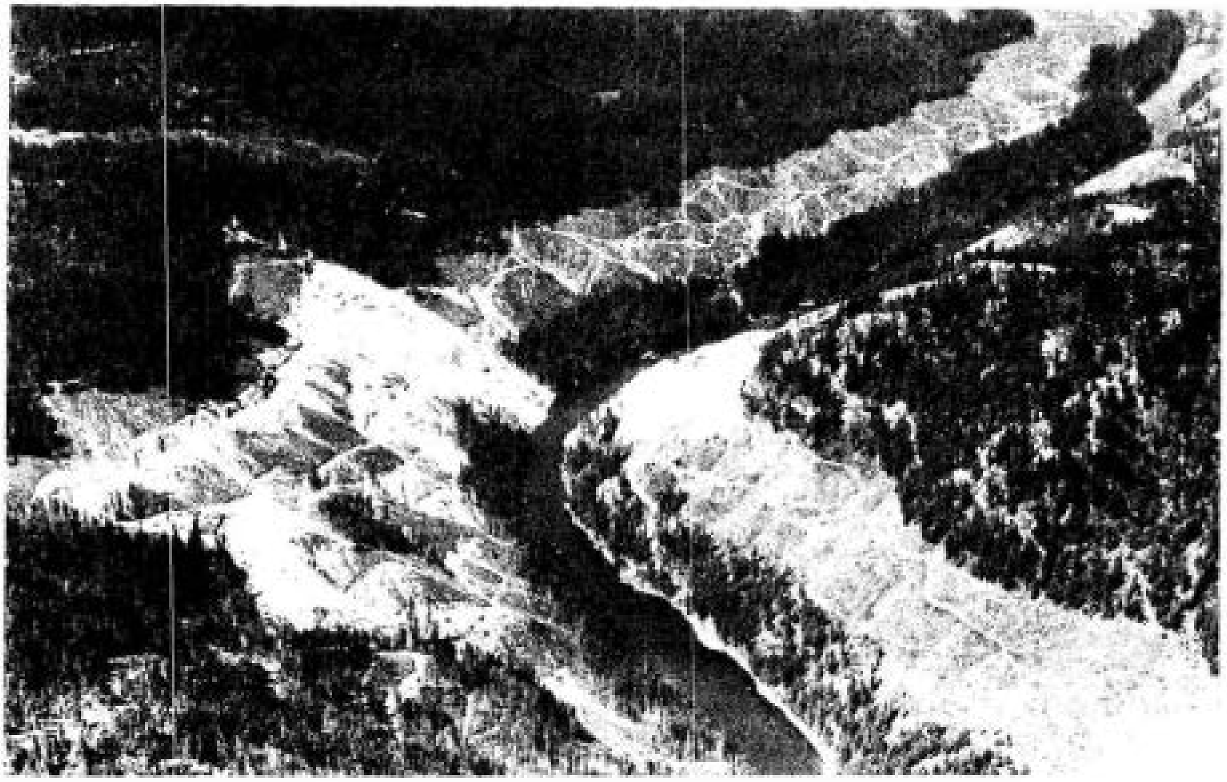
Thus ended some of the most difficult land use, land value, and land acquisition activities the District has experienced, stretching over a 10-year period before their termination. The invectives have flown thick and fast from the several wildlife organizations and individuals who have become involved because of delays and changes in plans. Resolutions have been passed demanding the resignation of COL Giesen, the District Engineer, and abolition of the civil functions of the Corps. Strong statements and positions have also been taken on the other side of the question, even with the final result. Actually in retrospect, COL Giesen, who retired from the Service upon completion of his tour of duty with the District, was one of the most interested and best allies the fish and wildlife component of our many sided economic and aesthetic life pattern could have had in this difficult problem. He always took a direct interest in these matters and influenced the objective analyses of his staff to insure the best answers practical for our "wild kingdom" and environment.

The problems of the dedicated biologist and manager of our wildlife are also most difficult in circumstances such as this. There are many indeterminates in such analyses, such as the attempts to put economic evaluations on a fishery or elk herd and their actions. Professional judgment must also play a big part in decisions, and there were dedicated professionals on both sides of the question. Now that the die has been cast, it will remain for future professionals--biologists and economists--to truly evaluate the optimum use of these 50,000 acres, including the actual number of animals using them. So far the large numbers claimed for the critical areas have not materialized during the winter months. The management of the land, over a generation or more, will be under careful scrutiny, both for the way the Land Board includes wildlife in its objective, and the wildlife management in producing browse which is found truly needed. The Dworshak project's future history for its reservoir management and husbandry of its total lands should prove interesting.

RESERVOIR CLEARING

The North Fork Clearwater River Basin is an undeveloped rugged, mountainous area with elevations ranging from the stream at 960 feet to over 8,000 feet. The 53-mile reservoir area will also extend up Elk Creek Valley about six miles, and the Little North Fork about four miles. The canyon is V-shaped, usually with steep side slopes at lower elevations, flattening at the upper end. There are only about 145 acres of cropland (hay and garden) in the reservoir area with very few homes or other structures.

The reservoir area characteristics change dramatically from the open Ponderosa forest at the dam to dense virgin white pine stands in the upper reservoir. This is due to the annual precipitation nearly doubling from 25 inches at the dam to over 40 inches at the upper end. Winters are usually mild and open at the dam but almost always severe and with much snow at the upper end of the reservoir.



RESERVOIR AREA CLEARING BETWEEN MAXIMUM AND MINIMUM POOLS

Tree growth includes white pine, ponderosa pine, Douglas fir, grand fir, cedar, and larch, all of which are merchantable species. Cruising estimates indicated about 200 million board feet of potentially merchantable timber growing in the reservoir area. Clearing of the reservoir was judged necessary from a line five feet above the normal pool of 1,600 feet elevation to a point five feet below the minimum pool of 1,445 feet, with no timber projecting above that elevation. Stumps were cut to within six inches of the ground and the land cleared completely of all brush, buildings, structures, fences, and other materials.

The clearing work was programmed to be accomplished over a nine-year period, with the first contract awarded 4 January 1965 for the dam area and lower reservoir. The fourth and last contract for the upper area was awarded in May 1970 for completion after the final incremental raising for the pool in 1973. The total cost of the clearing operation will be about $5¼ million, with the contractors retaining title to the merchantable timber.

One factor having a bearing on the clearing schedule and the contractor's program, particularly for handling the marketable materials, is the problem of the market absorbing the large quantity of logs available and the potential impact upon other logging in the Clearwater Basin. The general timber harvest area around this section of the North Fork has an average sustained yield of about 100 million board feet per year, and the annual log drives have furnished about 50 million board feet of this.

The first three clearing contracts were accordingly spaced about two years apart. The contractors removed the timber practical for marketing and burned the slash and all other combustible materials under carefully controlled conditions, except for a couple of small unanticipated conflagrations that required special attention. The fourth contractor, working in the upper areas with a termination date into 1973, has plans for floating more slash and usable timber to particular loading areas, and will harvest some of the downstream lower lying merchantable trees by felling and floating to the dam; an interesting overall procedure for accomplishing a time-consuming job under necessary natural and economic constraints.

PUBLIC USE

The many potentials for development and use of the lands and the water areas around the Dworshak reservoir have received more attention and comment by the general public, and the professional planner, than most other projects. From the time of the studies for S. Doc. 51 in 1953, when public use concepts were quite different, to the finalization of the reservoir Master Plan in 1970, a myriad of ideas, desires, and opinions have been expressed, and specific plans evaluated.

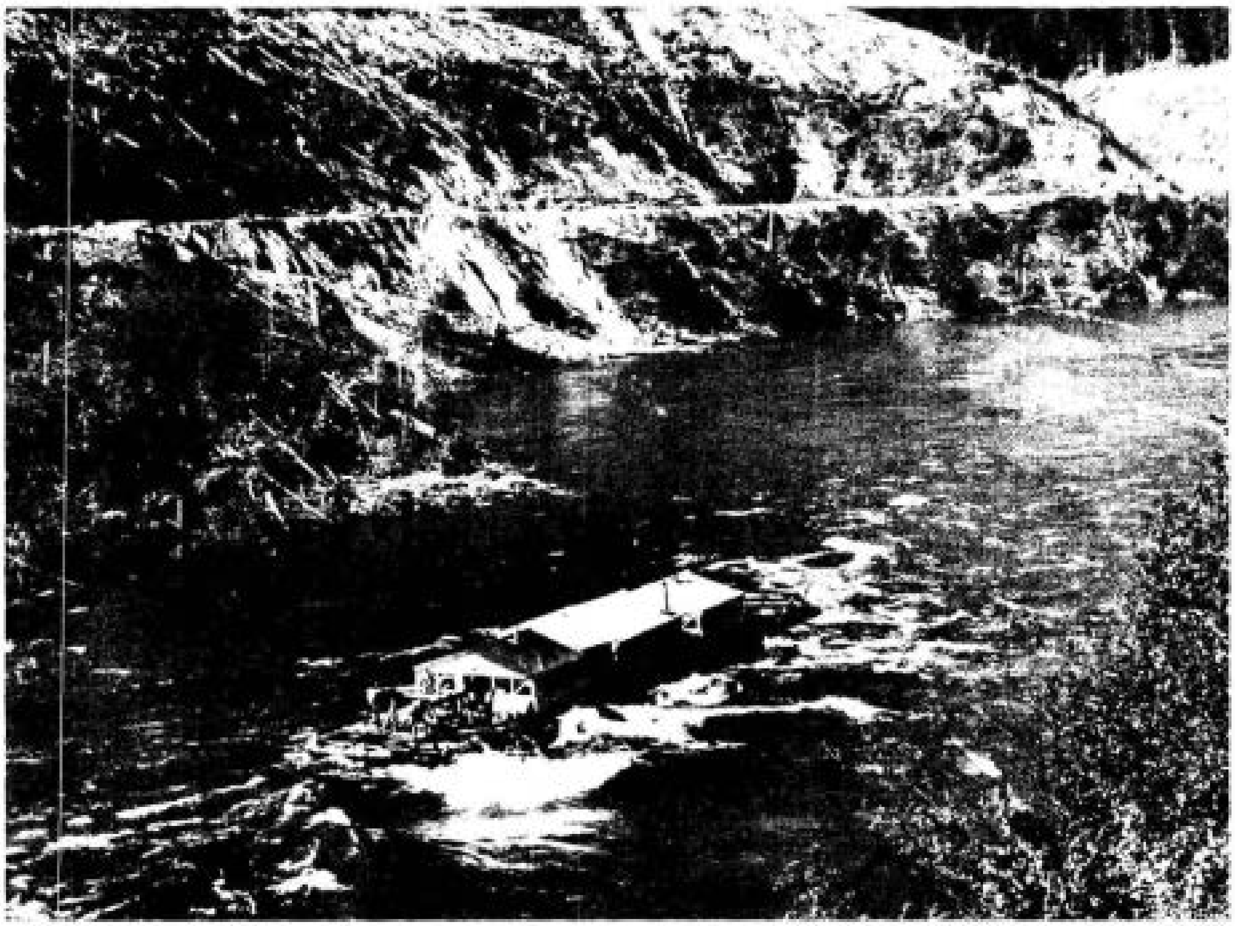
With the full authorization in 1962 and firming up of the dam height and operating characteristics in 1964, detailed planning for full use of the project by the public got underway. These plans were developed in sufficient detail so that a public hearing could be held on 6 May 1969 to obtain public input and reactions. It was a popular assembly, with 175 people attending. The Corps plans for the reservoir were explained, ranging from recreation and camping sites, concession lodging sites, boat launching ramps, and reservoir fluctuations to reservoir fishing, big game, log handling, access roads, and land uses. There was considerable input by the audience on their desires and the impact of the project upon the region. It was readily agreed that the impoundment would cause profound changes in the nature of public use, and that 50 miles or more of natural free-flowing river would be supplanted by other values made available by 17,000 acres of reservoir and opening up of the area to the general public.

The public use plan, prepared as a design memorandum, was submitted in April 1970. Steep terrain in many areas, soil conditions, limited accessibility, and reservoir operations placed specific controls on the overall plan. In addition, fish and wildlife and log handling use, as well as access needs, had some impact upon public use, and in some instances vice versa. Design plans have been formulated and contracts for some of the initial development are being scheduled. Twenty-four public use areas have been designated, nine of which have been selected for initial development. These include two launching ramps, one just above the dam and the other at the Grandad bridge; three recreation areas with boat access only; one group camp on the right bank halfway between the dam and Dent bridge; a small recreation area near Canyon Creek on the left bank above the dam; and two major park areas, the Freeman Creek State Park and Dent Acres, both on the right bank below Dent bridge.

MAJOR RESERVOIR BOAT LAUNCHING AND PARKING AREA AT BIG EDDY SITE
ON RIGHT BANK ABOVE THE DAM

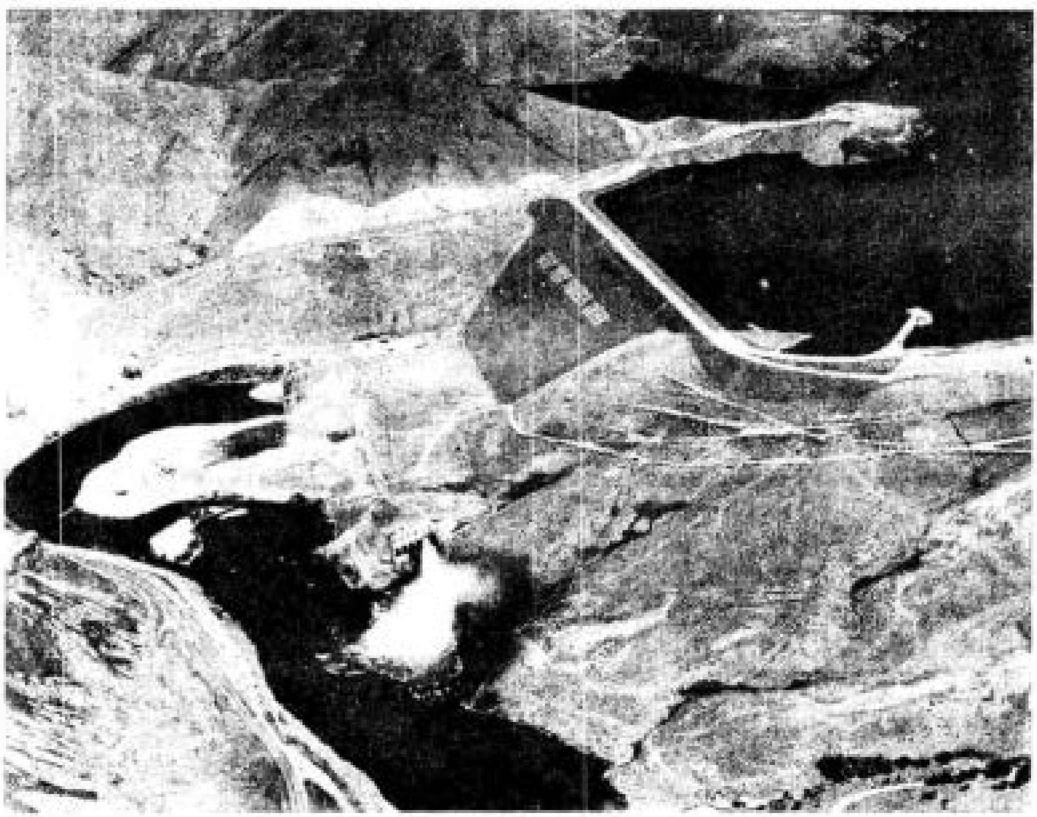
All of these areas will have facilities to care for the public, some more extensively than others. There will be picnicking facilities, restrooms, parking areas, boat tie-up docks, and in some, camping facilities. The initial development is all being planned for the reach of reservoir downstream of the Dent bridge, except for the launching ramp area at Grandad Creek bridge. The engineering soils specialists anticipate a relatively unstable shoreline area in many places, and a wait-and-see approach has been taken for much of the reservoir area. In addition, with the difficulties of access and the relative remoteness of this back country, even of the Dent bridge, limited use is anticipated during the initial years. The major point of access for boaters will be the Big Eddy site just above the dam.

From the time of initial planning for recreational use on the reservoir, the Nez Perce Tribal Council, representing the Indian Nation of the Nez Perce, has been interested in managing and developing some of the recreation potentials of the project. A portion of the project in the immediate vicinity of the dam lies within the original boundary of the reservation. The Council has definite plans for a tourist development along U.S. Highway 12 just east of Orofino, with a major motel unit and curio shop as the key. Somewhat as a satellite to this highway project, the Council has requested a lease on the Dent Acres major recreation area of several hundred acres just downstream of the Dent bridge. They plan an extensive development here of a "Tepee Village" for overnight lodging, a restaurant, and other tourist facilities, both water and land oriented. Access to the area would be by taking the tourist to the Big Eddy launching area at the dam by car, then transporting them up the reservoir by boat to the "Tepee Village." The Council is making extensive and firm plans for all this development, with general agreement on the scheme by the District. Financing and specific plans are in the offing with reported good potentials. It is a new approach for cooperative development in areas such as this, and a new venture for the Indian Nation. We trust future historians can wax eloquent on the accomplishments, as well as full use by the people of the region, of this beautiful reservoir area.



A REMINDER OF AN HISTORIC EVENT - THE MAJOR LOG DRIVE EACH YEAR FROM THE NORTH FORK OF CLEARWATER RIVER TO THE MILLS AT LEWISTON. FIFTY TO SIXTY MILLION BOARD FEET OF THE ANNUAL TIMBER HARVEST WERE FLOATED DOWN RIVER. THIS "WANIGAN" FOLLOWED THE DRIVE AS THE LOGGERS' FLOATING BUNK HOUSE AND KITCHEN - THEIR HOME ON THE RIVER FOR A WEEK TO TEN DAYS.

BOISE RIVER - LOOKING DOWNSTREAM - DAMSITE IN CENTER OF PICTURE - 1949



LUCKY PEAK DAM - 1960

LUCKY PEAK DAM - BOISE RIVER, IDAHO

Preliminary investigations of the Boise River Basin for flood control, to determine the most desirable location for a storage project, were undertaken by the Portland District in 1939-40, with a report submitted to Congress 19 September 1940 and printed as H. Doc 957, 76th Cong., 3d Sess. The spring flood of 1943, the third largest for the Boise River, prompted a review of the earlier studies, and the District submitted a Survey Report dated 2 January 1946 recommending the project. This Portland District report received prompt attention, and the Chief of Engineers forwarded it to the Congress by date of 13 May 1946. This was a year for an Omnibus River and Harbor Bill, and many other projects were also awaiting action. The Lucky Peak project was one item in such a bill and received authorization through P. L. 526, 79th Cong., 2d Sess., dated 24 July 1946, at an estimated cost of $10,684,000.

The lower 65 miles of Boise Valley has experienced many floods. The first settlement of the Boise Valley was in the early 1850s and the records of floods date back to about 1865. Since that time there have been 27 floods of consequence, with 10 of them having discharges in excess of 20,000 cfs--this in comparison to a channel through the valley which could carry only 6 - 10,000 cfs without overbank flows. The flood of 1872 has been estimated at 50,000 cfs and that of 1896 was measured at 35,500 cfs, while the 1943 flood reached 25,000 cfs. Arrowrock Dam was the only storage project in the basin at the time of Lucky Peak authorization. Built in 1915 and raised in 1937 as a single-purpose irrigation project, its operation afforded only incidental control of floods. Over 100,000 people occupy the lower valley with a highly productive irrigated agricultural economy. The City of Boise, housing the State Capitol, is the largest community in the state and subject to severe floods. At approximately the same time that the Lucky Peak project was being considered, the Bureau of Reclamation initiated construction on the Anderson Ranch Dam and Reservoir on the South Fork of Boise River, with some plans for diversion of water to the Mountain Home area. The Anderson Ranch authorization provided for irrigation storage, power, and flood control. The project was put into operation in 1950 with an active capacity of 423,000 acre-feet. The Arrowrock reservoir had storage capacity for 286,000 acre-feet.

THE STRUCTURE

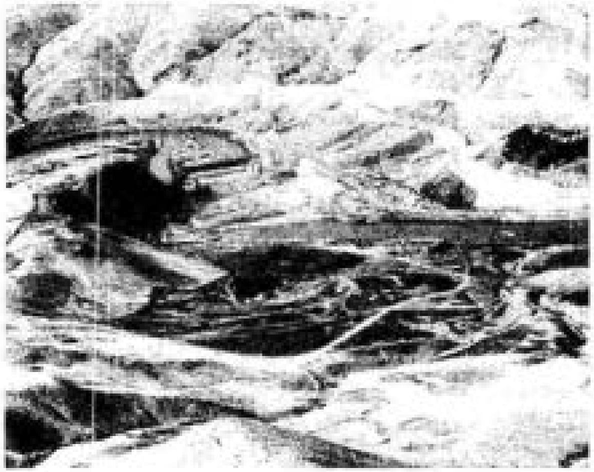
The Lucky Peak project, at river mile 64.5, was authorized and built to provide 280,000 acre-feet of flood control space with a gross capacity of 306,000 acre-feet. The dam is a rolled earthfill structure 328 feet high from foundation to crest and an effective height of 243 feet. The embankment is 1,730 feet long. The original plans provided for a gated spillway and chute in the left abutment with a capacity to pass 123,000 cfs at maximum pool. This was later redesigned to provide a 600-foot-long concrete ogee section in a natural saddle without control or without lining of the spillway area below, because of the infrequency of spilling. The spillway, as built, has a capacity of 93,000 cfs. The outlet works for normal operation of the project are by means of a lined tunnel 1,200 feet in length through the left abutment, 23 feet in diameter. An intake tower at the head end in the reservoir contains two Broome type emergency closure gates 10 feet by 23 feet. The discharge end of the tunnel is regulated by means of six 5- by 10-foot slide gates and one hollow jet valve for fine adjustment when monitoring irrigation releases.

CONSTRUCTION

Congress approved the construction of Lucky Peak through the appropriation of $3.5 million in 1949 for the fiscal year of 1950. Real estate purchases had been programmed, and procurement of the damsite and lower reservoir area was underway by the fall of 1949. The first construction effort was the driving of a diversion tunnel which remains as a permanent structure for the outlet works. A tunnel capable of carrying flood flows of 15,000 cfs was found to be excessive in cost when considering ultimate needs, so a combined plan for a temporary bypass stream channel in the left abutment, with a capacity of about 10,000 cfs, and the diversion tunnel to carry 5,000 cfs under free-flowing conditions, was decided upon. The tunnel contract was awarded 2 November 1949 at a price of $1½ million. The intake structure was to follow early in 1952 and the outlet works later that year.

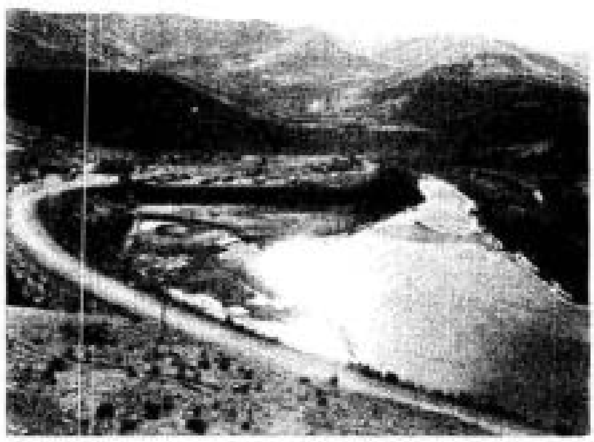
The Dam

The main dam contract was awarded on 10 May 1950 for a total cost of about $3½ million, specifying completion early in 1954. The plan of attack was to cofferdam the right-hand portion of the dam, leaving the diversion channel on the left. The materials under the embankment section within the cofferdam area were excavated to a solid foundation, and the dam embankment was raised to within 45 feet of the top. This portion had to essentially be complete well above the natural river during the low flow period of 1950-51, and be ready for flood eventualities in 1951. Upon completion of this portion, and the availability of the diversion tunnel, the bypass channel was closed and the remainder of the dam built. Viewed from downstream, the line of demarcation between the two steps in construction is still visible due to use of different quarries as the source for the rock face.

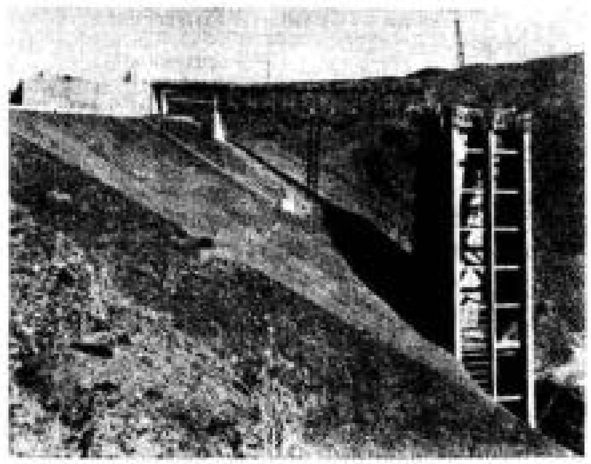


TEMPORARY DIVERSION CHANNEL AT LEFT ABUTMENT

DAM RAISING; ROAD RELOCATION; DIVERSION CHANNEL; AND OUTLET PORTAL



DIVERSION CHANNEL CLOSED; DAM CONSTRUCTION UNDERWAY



INTAKE TOWER FOR OUTLET WORKS; SPILLWAY ON LEFT; DAM ON RIGHT

SPILLWAY CREST UNDER CONSTRUCTION

DAM NEARING COMPLETION; INTAKE TOWER AND SPILLWAY UNDERWAY

Roads

During this same period of 1951 to 1954 the intake works to the tunnel were built by a separate contract let 21 December 1951, and the outlet works by a contract awarded on 5 November 1952. The highway relocation work was carefully coordinated because an unusual flood with some pondage in the reservoir area could cut the highway use which was the only route to the interior of the Boise Basin, Idaho City, and Arrowrock Dam. In addition, the construction of the right abutment to the dam effectively blocked that water level highway. The highway (State Route 21) which originally followed the river canyon was rerouted over the right abutment of the dam, then struck across country to the Mores Creek arm, where a bridge was constructed over the canyon. The contract for the road relocations to Mores Creek was let on 1 October 1949, and construction of the Mores Creek bridge awarded 13 July 1951, both to be completed in FY 1954. The highway relocation was accomplished at a cost of about $3 million and the bridge $1 million.

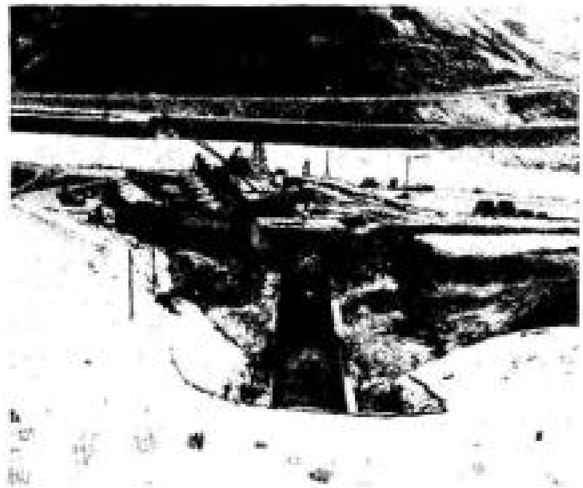
Mores Creek Bridge

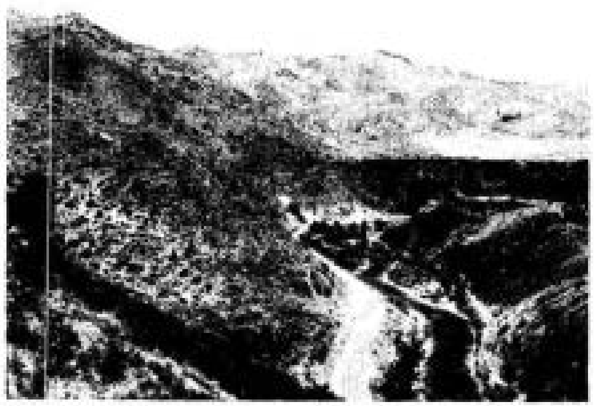
The bridge, a rather spectacular steel cantilever section with high concrete piers over a deep vertical-walled canyon, was a popular project to watch. One of the project's less ardent supporters in Boise dubbed it "the million dollar bridge to nowhere," which didn't particularly please the upper basin inhabitants, particularly the hardy souls in Idaho City. History may attest that in the '70s this route developed into an important cross-state route, tying southwestern Idaho with the Salmon River country at Stanley by a new route through the Boise Mountain range. The road to Arrowrock Dam along the new reservoir was relocated by contract in 1952 and 1953. Both of the highways cut through rather unstable materials. With a wet winter in 1954, slides developed early the next spring which closed the roads for short periods. Extra contract work was required to correct the problem that summer at a cost close to $1 million. The project relocations required movement of 13 miles of state highway, 6.3 miles of county roads, and 2 miles of farm road.

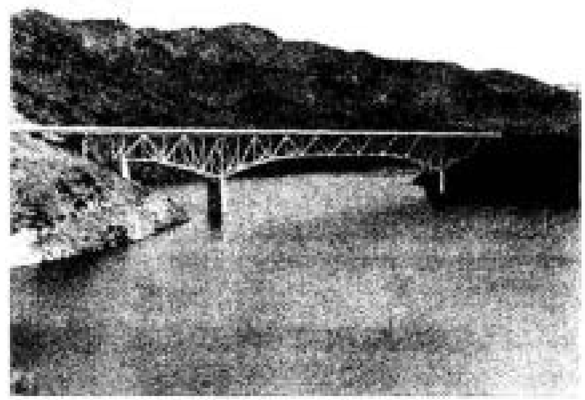
Spillway

The spillway for Lucky Peak dam passed through a transition of planning and design. The original studies in the mid '40s opted for a gate controlled chute spillway down the left abutment. The early design memorandum provided for a 223-foot-long spillway section with five radial gates. The spillway would narrow into a 100-foot-wide concrete-lined steep channel down the face of the natural slope. At the start of construction in 1949 a modified spillway was proposed only 92 feet long, with three deeper radial gates discharging into a concrete apron converging from the 92-foot width to 20 feet, in a distance of 500 feet. From that point it was an unlined channel to the river below.


OUTLET WORKS WITH FLIP BUCKETS ON LEFT


OUTLET WORKS, PENSTOCK, VALVES, AND FLIP BUCKETS


MORES CREEK CANYON BEFORE BRIDGE CONSTRUCTION


MORES CREEK BRIDGE AND RESERVOIR


RELOCATED ROBIE CREEK ROAD


RELOCATED HIGHWAY #21 TO IDAHO CITY

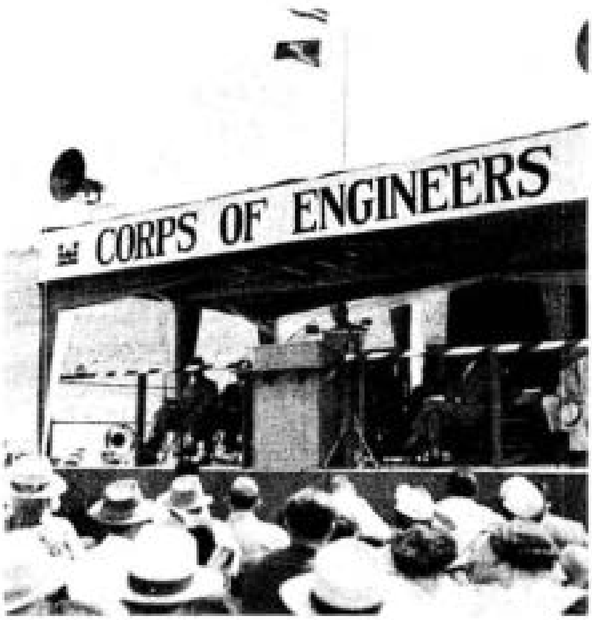
Early studies for the feasibility of installing power at Lucky Peak, and favorable findings for such a potential, influenced the spillway design because of the power penstock. A decision was made in early 1950 to defer any power installations, at least at that time, because of the operating and storage requirements for irrigation. Accordingly, the spillway needs were reviewed and the advantages of an unregulated structure explored. The studies resulted in a decision for a 600-foot-long fixed weir section built in a low saddle close to the left abutment. No channel would be provided for the spill to the river below, and the water is allowed to find its own way down the slope. Flood routing studies, with the storage available, indicate that very infrequent use of the spillway will be experienced. Of all the known floods of the basin in the past 100 years only one to five would create a spill, depending upon operating criteria for the outlet works. The spillway design proceeded upon this basis and a contract was let for its construction on 5 November 1952 for about $300,000.

Arrowrock Dam

One of the requirements of the authorizing act specified that adverse effects were not to be created upon the structure of Arrowrock Dam 11 miles upstream. The creation of a reservoir pool at Lucky Peak at elevation 3060 raised the normal tailwater at Arrowrock about 100 feet. This necessitated revisions to the outlet works, the main entrance gallery, and the interior drainage system. There was no problem of stability and flood profiles for maximum floods indicated a maximum backwater height of 3072 which was provided for in the modifications. These modifications were placed under contract on 25 October 1952 and completed in the spring of 1954 at a cost of $260,000.

ARROWROCK DAM AT HEAD OF LUCKY PEAK RESERVOIR

With all of these facets of the project cared for and the construction essentially complete, storage was scheduled for the spring of 1955. It started in March and a full reservoir resulted on 25 June 1955. The project was officially dedicated on 23 June 1955 by the Assistant Secretary of the Army, the Honorable George J. Roderick, and state officials as recounted in the first part of this history.



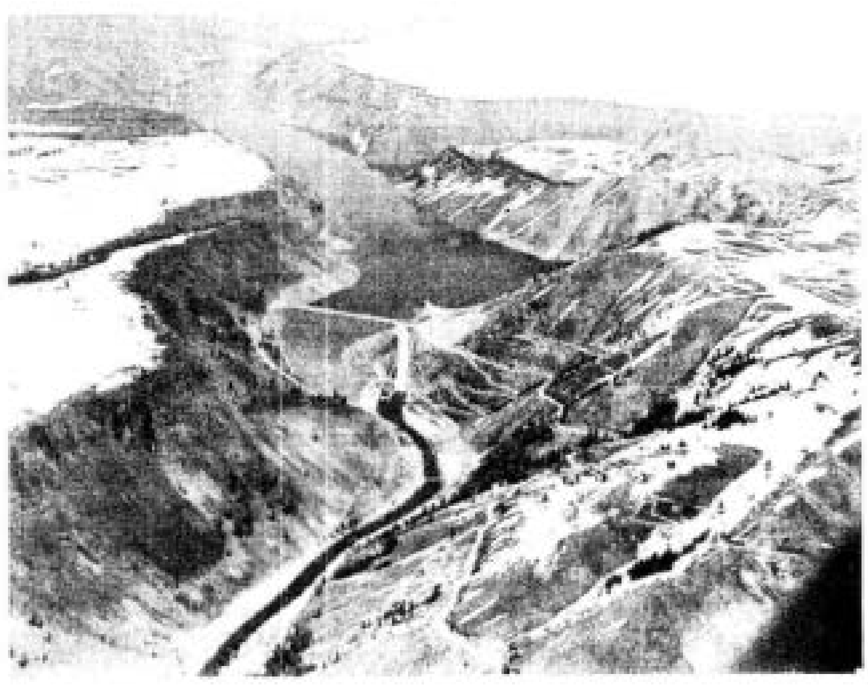
DEDICATION ADDRESS BY
BG E. C. ITSCHNER

LUCKY PEAK DAM AND OUTLET
WORKS IN OPERATION

THE PROJECT AND FUTURE DEVELOPMENT

The very uniform releases at the Lucky Peak outlet works, primarily for delivery of irrigation water, have always raised the thought of loss of energy when one views the "rooster tail" created trying to dissipate the energy in the water before it reaches the stream again. As indicated above, early hydroelectric power studies could not justify the cost of installation. After completion of the project, Idaho Power Co. considered applying for a license for a plant at Lucky Peak, but decided against a formal request. Subsequent studies in connection with the Upper Snake River Basin studies during most of the '60s again analyzed the feasibility of a powerplant at Lucky Peak, this time in connection with additional storage upstream at the Twin Springs site. A report was submitted on this potential in March 1968. The proposal for another storage dam in the Boise Basin was not received with loud acclaim, nor was additional Federal power generation in this portion of the state. The report is still pending as of this writing. Complicating all of these decisions on the optimum development for the Boise Basin, are the studies that have been underway for over 20 years on potentials for exchange of water between the Payette River to the west and the Boise system, in order to irrigate large tracts of land from the Mountain Home area westward along the northerly slopes of Snake River. These potentials may need resolution before the full scope of Boise River development can be programmed.

TWIN SPRINGS DAMSITE UPSTREAM OF ARROWROCK RESERVOIR (DAMSITE IN CANYON SECTION, CENTER OF PICTURE)



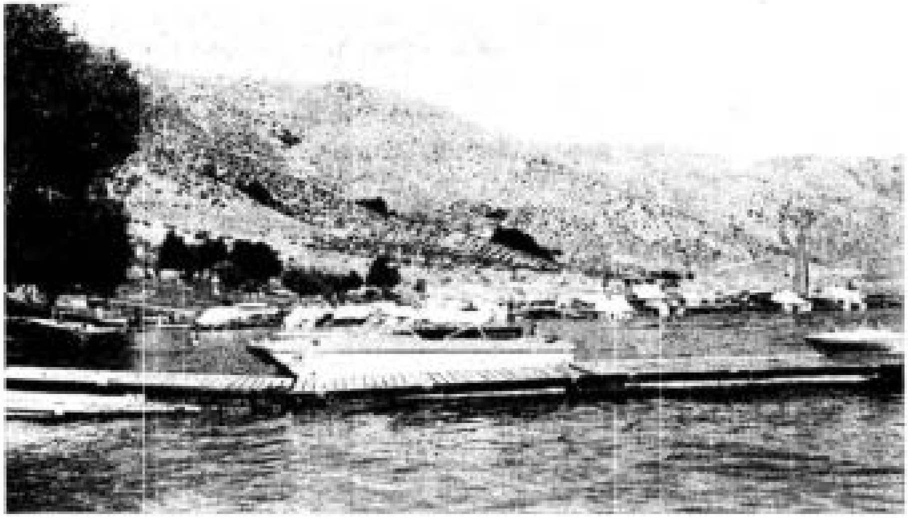
ANDERSON RANCH DAM BUREAU OF RECLAMATION - SOUTH FORK BOISE RIVER

PROJECT OPERATION

The plan of operation for the Lucky Peak project deserves outlining, since, in essence, this quarter million acre-feet of space makes available to the lower Boise Valley a multiple-use system operation of about one million acre-feet of storage. This amount is required to afford practical control of the more frequent floods. Absolute protection is not economically feasible. In order to get that million acre-feet of storage, the Corps and the Bureau of Reclamation, in conjunction with the Boise Board of Control, pooled the storage resources of the basin with the provision that Lucky Peak would operate in full coordination with the two upstream projects. This provides not only the optimum flood control potentials, but also a safety factor for conservation storage by utilization of storage in Lucky Peak for irrigation. The three reservoirs are operated on a forecast basis, with a rather sophisticated snow survey system monitoring the moisture in the basin during the winter. Total anticipated runoff is estimated from these surveys and the needed reservoir space charted accordingly. Evacuation of the necessary storage space is then programmed to meet the needs for flood control, at the same time insuring refill at the end of the flood season. By this coordinated plan, 418,000 acre-feet of Anderson Ranch space is available, 285,000 acre-feet of Arrowrock space, and 280,000 acre-feet of Lucky Peak space is used, making a total of 983,000 acre-feet. That same amount is then also usable for irrigation, assuming the annual runoff is sufficient to fill the space vacated the previous year for irrigation. The project has more than proved its worth in the 15 years it has been in operation, saving the lower valley from two or three serious floods, affording added irrigation flexibility, and providing one of the best recreation spots in the region.

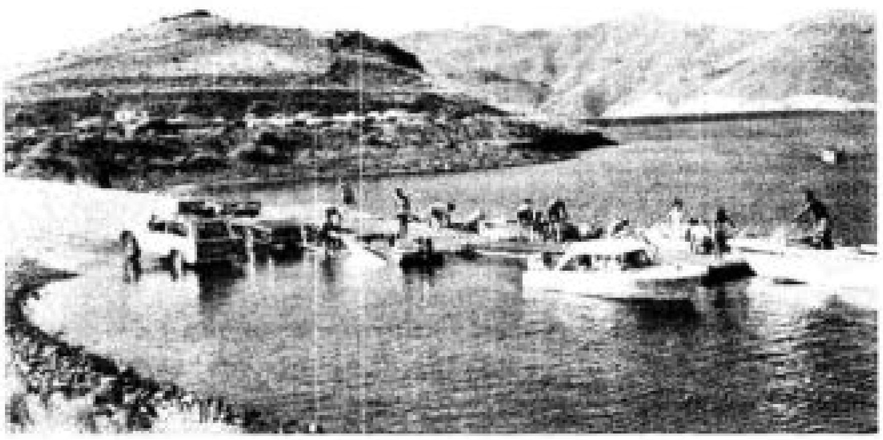
RECREATION

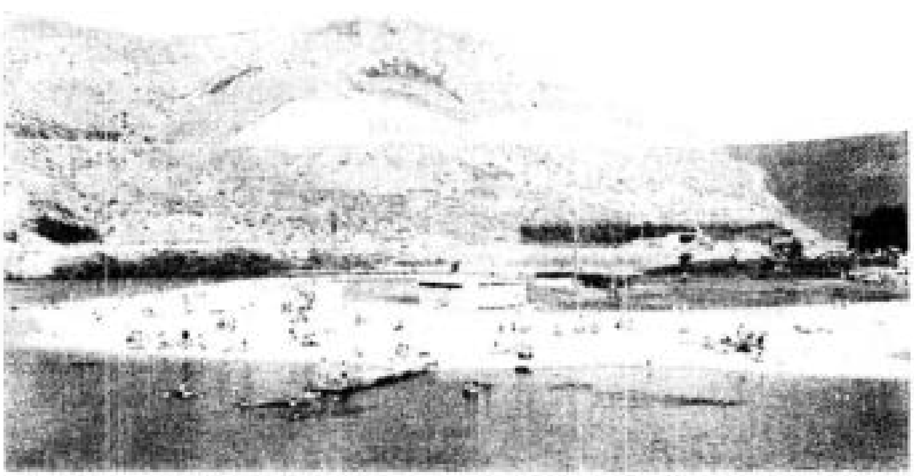
At the time the project became operational, recreation and public use was provided for only to a limited extent with rather meager funds and minimum facilities. A launching ramp for boats was built at the dam, and a beach and play area was developed halfway up the reservoir. These quickly proved inadequate since the people of the valley adopted the project for water-related recreation, from sun bathing to skin diving. The State of Idaho became interested in the potentials and needs, and by lease agreement developed several facilities, primarily expanding the park in the central part of the reservoir. In the 15 intervening years the public use facilities have been gradually expanded by both the State and this District, providing one of the major recreation resources of the State. The operation of the three storage reservoirs for delivery of irrigation water is so scheduled that the Lucky Peak pool is kept full from June until Labor Day, if at all practical. During 1970 an estimated 45,000 boats were launched into the reservoir, and 1,250,000 visitors came to the project for some type of recreation activity.



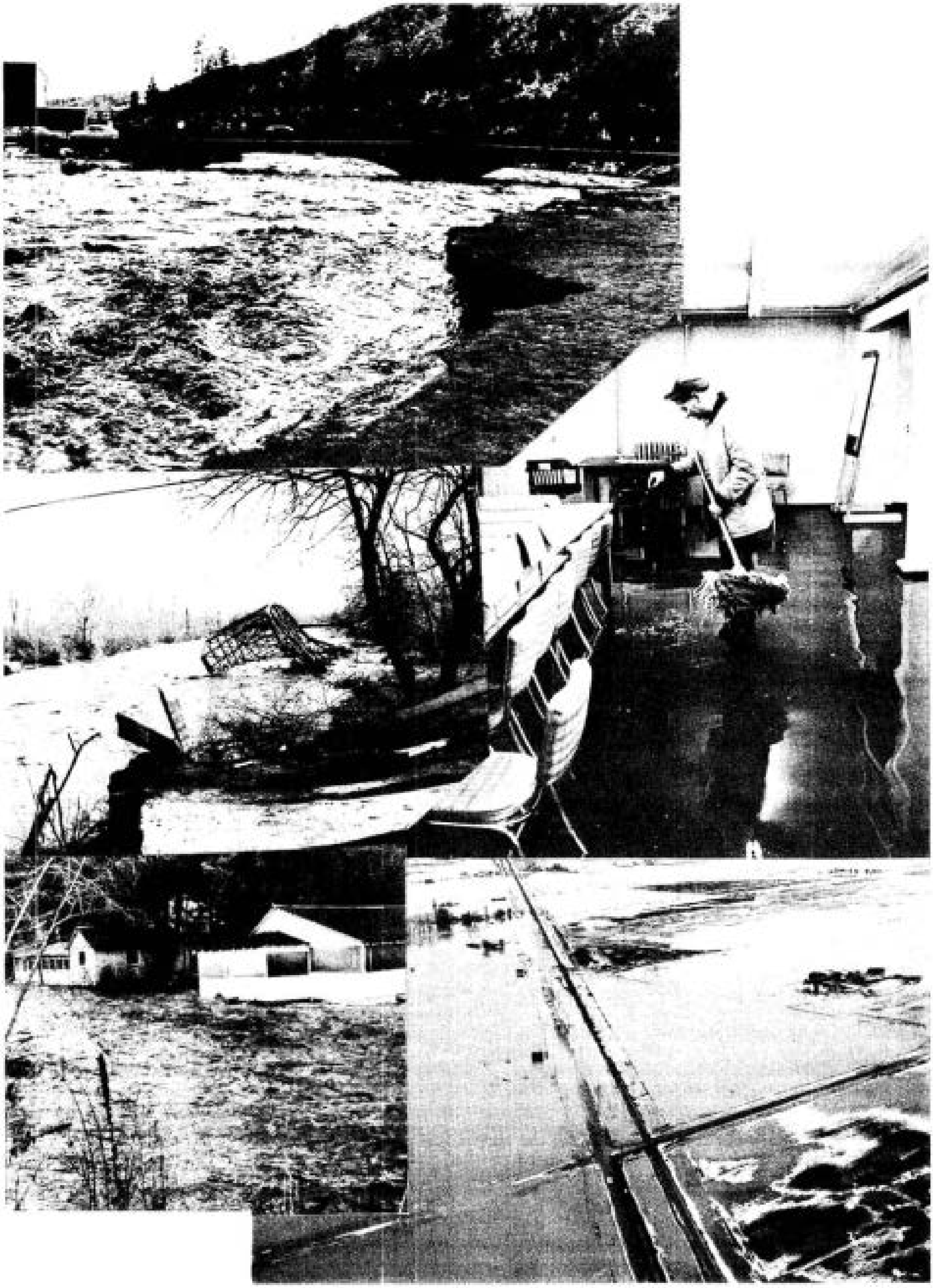
LUCKY PEAK
RESERVOIR

RECREATION
MECCA FOR
BOISE AND
SOUTHWESTERN
IDAHO





RELAXATION
IN THE SUN



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LOCAL FLOOD CONTROL WORKS

A history of the realization of local flood control in the Inland Empire, if it were complete, would require a volume within itself. Every tributary stream of the Snake River system, as well as the Columbia, has an experience of serious flooding at some time, very much to the detriment of mankind and his well being. Possibly in the "scheme of things" floods and their destructive effects have a compensating objective on a natural stream undisturbed by man and animals, but when humans need land, food, and communal habitation the river valleys become occupied, and the streams' destructive idiosyncrasies cannot be tolerated.

The first part of this District's activities recounts briefly some of the more critical local flood problems and their solutions, such as the $2,250,000 Jackson Hole levee system; the 40-mile-long levee system from Heise to Roberts north of Idaho Falls, costing about $5 million; and the frustrating Mud Lake problem in eastern Idaho. Three of the more formal and extensive projects involving a small storage unit, concrete-lined channels, and difficult construction through urban communities deserve some individual attention, however. As much as for other reasons, this is to recount the inherent difficulty in realizing a major construction project through an established town, with extensive local cooperative effort necessary. These three units are the formal channels through Colfax, Washington, on Palouse River; at Pocatello, Idaho, on the Portneuf River; and the comprehensive Mill Creek project at Walla Walla.

MILL CREEK (WALLA WALLA RIVER)

The history of Mill Creek, a tributary of the Walla Walla River with its transition from a mountain stream spilling out of the Blue Mountains onto the fertile valley of the Walla Walla Basin, is somewhat typical of the numerous tributary streams in the District. The community of Walla Walla, like many others, lies on the broad alluvial fan in the foothills with the stream passing through the heart of the urban area. Mill Creek, with its headwaters in the heavy snows of the Blue Mountains, is subject to wide fluctuations in flow. Low flows of less than 100 cfs can bloom into floodflows within a few days' time. The record flood of 31 March 1931 reached 6,000 cfs at Walla Walla. Several times since, and before that time, floods have done damage throughout the lower valley where damage starts with flows of 1,200 cfs. At the same time the reaches of Mill Creek in the ten-mile transition area from mountain to valley make a very picturesque stream, much sought after by the people of the area, and a very pleasant recreation stream on hot summer days.

MILL CREEK STORAGE UNIT
Diversion dam at left with channel to reservoir across top of picture. Storage dam structure upper right. Lined channel with stabilizers through center of picture to diversion structure controlling flows into Garrison and Yellowhawk Creeks for irrigation. Channel continues through town.

The Project

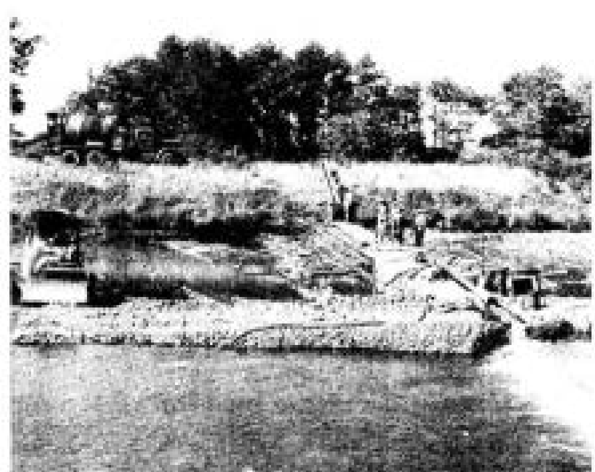
The Bonneville District, in February 1938, prepared a report on the Walla Walla River and Mill Creek, probably prompted by the April 1931 flood which was the most disastrous of record, leaving the community practically divided, with damages of over $1 million. The report recommended a plan of improvement consisting of trash barriers; a flood control reservoir formed by an earth dam across a lateral valley, off-stream to the south above the town; a diversion structure to divert flows from Mill Creek into the reservoir; a division works downstream a half mile to bypass some flood flows and irrigation waters into Yellowhawk and Garrison Creeks; and channel improvements between the diversion and the division structures. The project was authorized in 1938 and the dam and appurtenant works constructed by 1942. The dam is an earthfill structure 145 feet high, 3,200 feet long, with a storage capacity of 8,300 acre-feet and reservoir area of 225 acres. The project cost $1,500,000. The floor and natural abutments of the dam were found to be porous and considerable leakage occurred when the reservoir was used. Remedial sealing was accomplished in 1950 to preclude damaging downstream seepage.

The community was still vulnerable to some floods and a report was submitted in 1947 to complete intermittent WPA work which had been done, and pave the bottom of a formal channel through town. This was approved and the work accomplished in 1948 at a cost of about $600,000. The combination of the reservoir and the channel through town affords protection for a flood equal to that of 1931, or about 6,000 cfs. The reservoir and downstream channel projects were both constructed by the Portland District. The system has been used to good advantage over the past 20 years, with flood diversions into the reservoir on at least three occasions and the channel through the community doing yeoman service several other times.

1931 FLOOD IN WALLA WALLA

MILL CREEK CHANNEL ENTERING TOWN

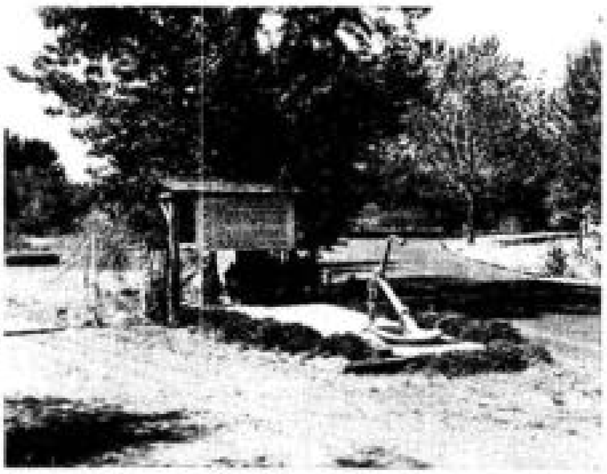
CHANNEL THROUGH TOWN



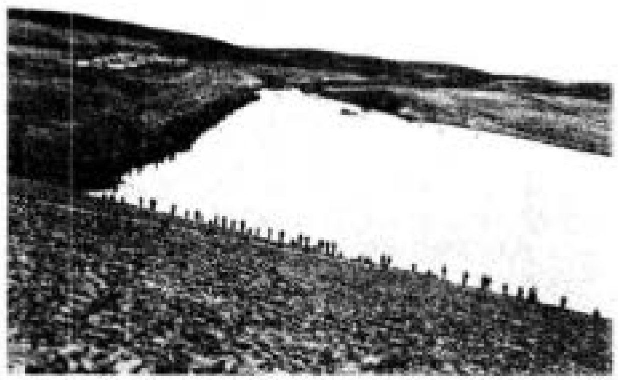
FLOOD CONTROL DISTRICT REPAIRING STABILIZERS

The Reservoir Area

As an aid to insuring a good seal in the bottom of the reservoir, a regular schedule has been established of diverting late spring floodflows into it that are heavy with silt, filling the minimum pool which creates a lake about 30 feet deep with an area of about 60 acres. At the same time an effort is made to maintain the minimum pool through as much of the summer and fall as irrigation rights will permit. Some lands around the reservoir and diversion dam area have been developed for recreation while others have been planted for bird cover and late fall hunting. The reservoir is stocked each spring by the state with legal-sized trout, and an intensive sports fishery has developed, especially for youth. The combined project has accomplished much for the community, both for flood control and recreation of several varieties and is a good success story for a small project.



ROOK PARK AT DIVERSION DAM



OPENING DAY OF FISHING IN RESERVOIR

LANDSCAPED CHANNEL OF MILL CREEK THRU TOWN

Further Needs

The people of the Mill Creek Basin and below realize that they are still vulnerable to less frequent but high-volume floods, and flood fights have been required along Mill Creek on three occasions. In addition, water for irrigation of the fertile bottomlands is in short supply during dry years by as much as 50 to 80 percent. In the interest of better utilization of the available water in Mill Creek, a resolution was obtained from Congress in 1955 requesting the Corps to review its studies on Mill Creek in the interest of further control. This was done in the early '60s in collaboration with the Bureau of Reclamation, and a report submitted in 1964 recommending an onstream storage dam just below the mouth of Blue Creek.

BLUE CREEK DAMSITE IN CENTER OF PICTURE
(BLUE CREEK ENTERS MILL CREEK FROM THE LEFT)
(MILL CREEK CANYON AT TOP OF PICTURE - LOOKING SOUTH)

This dam, about 200 feet high and 2,700 feet long would store about 35,000 acre-feet of water. The project would be located near the mouth of Mill Creek Canyon about nine miles above the community and above all of the other flood control and diversion works. The storage capacity would be used for flood control, irrigation water supply, municipal and industrial water supply, water quality control, sports fishing, waterfowl, and recreation in general. Questions were raised concerning portions of the report. Problems also developed concerning sponsorship of some facets. As a result, definite decisions concerning the acceptability of the project have not as yet been made. The community is interested in the project and as concern develops for optimum utilization of our water resources, and possibly another flood or two, the urge for the project may regenerate.

THE COLFAX PROJECT

The need for control of the Palouse River on its way through Colfax was expressed during the '30s as a part of the need for the whole basin. A preliminary report of 31 October 1938 outlined the problem and need for further study. An interim report of 10 August 1940 narrowed the potentials for control, but indicated the engineers should look further.

SOUTH FORK ORIGINAL CHANNEL PAST COLFAX BUSINESS DISTRICT

COMPLETED WORK THROUGH SAME REACH OF SOUTH FORK

A survey report of 15 January 1942 found that control of floods by means of storage alone, or in combination with irrigation, power, or levee and channel work was not economical. That report, printed as H. Doc 888, 77th Congress, 2d Session, did, however, find that work through both Pullman and Colfax was justified and Section 10 of the 1944 Flood Control Act (P.L. 534, 78th Congress, 2d Session) authorized the work. The approval was subject to local interests providing the necessary rights-of-way, modifying the bridges as required, holding and saving the United States free from damages due to the works, and maintaining and operating the project after construction.

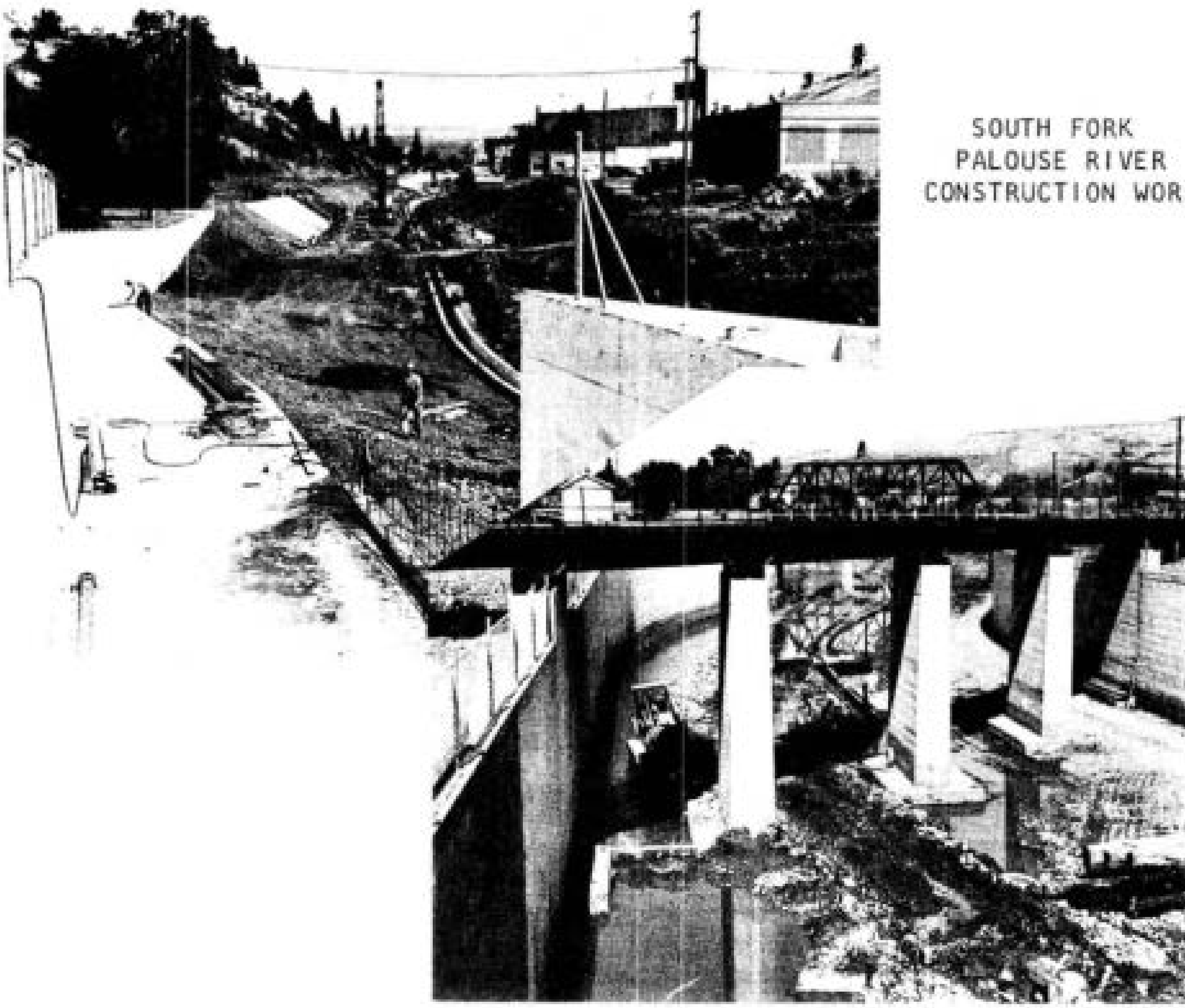
The first white settlement in the basin was in the early 1870s and the first townsite was plotted about 1882 at Colfax. The earliest flood of record was two years later in 1884, with several since. The floods in the spring of 1948 convinced the city something must be done and they raised $40,000 to improve the channel while awaiting a Federal project. Funds were approved in FY 1948 for a project report for protection of Colfax. The report which was actually prepared by the Portland District but submitted under the name of the Walla Walla District, was dated 15 October 1948. That report found that a complete project to protect the whole community from both the main stem and South Fork Palouse River, including Spring Flat Creek, would cost $1,694,000--about seven times the original estimate in the authorizing document. In addition, of this amount, the community would have to expend $71,000 for its responsibilities such as bridges and rights-of-way.

A restudy of the project in 1951 prompted an increase in the design flood and extensive modifications to the type of protection. A concrete-lined high velocity channel through the heart of the town was substituted as more economical and adaptable to the space available. That report increased the project cost to $2,309,000, of which $160,000 was the estimated cost to local interests. A subsequent study in 1955 attempted to evolve a more economical project, even with reduced degree of protection, but the full scope as developed in 1951 was decided to be best. The city and county agreed to the design and the requirements for their participation, but time was required for them to finance such an undertaking and to convince the populace they should support such an extensive project, which included 20,000 linear feet of channel work, half of which is the high velocity concrete structure. Eleven bridges were involved as well as 65 acres of urban property.

The Full Plan Evolves

Efforts were made all during the '50s to agree on a project, to work out the needs of local governmental agencies to meet their responsibilities, and to develop plans and specifications. Funds for contract plans were first allocated in 1956. Additional design funds were made available in 1958 and again in 1960. Model studies, hydraulic design analysis, and refinements in the channel requirements for confined spaces dictated a fourth design report on the project in June 1960 to solve more details. This report estimated the cost of the work at $3,842,000 for the Federal portion and $203,000 local cost. In the meantime the City of Colfax held an election in 1959 and voted to issue obligation bonds of $150,000 for their portion of the work.

The channel design for the South Fork provides for floodflows up to 14,500 cfs in a rectangular and trapezoidal shaped concrete channel designed for high velocity flows of 25 to 30 feet per second. The channel is 70 to 80 feet wide, with varying depths up to 10 feet. The main river upstream of the South Fork similarly is designed to provide for flows of 16,800 cfs with a rectangular and trapezoidal concrete-lined channel, as well as riprapped levees at the upper end. The velocities in the concrete channel will reach 30 feet per second. Widths vary from 60 to 80 feet, with depths of 10 feet or more. The main Palouse River below the confluence is generally 140 feet in width of trapezoidal section with earthen embankments and riprapped side slopes. The channel is approximately 20 feet deep carrying velocities up to 10 feet per second with a design discharge of 28,000 cfs.



SOUTH FORK
PALOUSE RIVER
CONSTRUCTION WORK

Construction

Additional design funds were allocated in FY 1961 and FY 1962 and a contract awarded in January 1962 for the first unit along the main stem of Palouse River. Bridge modifications were also undertaken, especially on two railroad bridges requiring extensive work. The first unit was complete in November of 1963 at a cost of $2 million. The second unit along the South Fork through the business district was put under contract in November 1963 at a cost of $2,750,000. The entire project was completed in December 1965. There were many trials and tribulations of putting a flood channel of this size around schools, through backyards, next to railroads and highways, under business buildings, and fitting it to existing major bridges! The total Federal expenditures since authorization are $5½ million and the local governmental agencies' costs are estimated at $298,000.

Twenty years of negotiations; detailed studies of intricate problems; waiting for the willing but financially limited local entities to work out their problems; continued development in the flood plain; the engineers' changing concepts and modifications to design; Federal funding; and just plain construction problems were all involved. Since removal of the flood threat was assured in the early '60s, the community has improved its image with spruced up and new buildings, and better economy. The advantage of an adequate channel was dramatically illustrated during the winter flood of 3 February 1963 when the main Palouse River went on a sudden rampage, taxing the new channel to its maximum capacity. School buildings, homes, stores, roads, and streets were saved very extensive damage. Damages did result from the South Fork portion of the flood where the construction work had not been started. The community has also been thankful for the structure since. Now they need to plant and beautify the lands adjacent to the channel and envelop it into the full life of the community of which it is a working partner.

THE POCATELLO PROJECT

The channel improvements in the vicinity of Pocatello provide flood protection along a reach of 6.5 miles of the Portneuf River above and below the community as well as through it. The realization of this project succinctly illustrates the evolution of both local and Federal planning and time factors that are required for fruition of major works to help a community and its citizens. The Portneuf River is a typical tributary to the Snake River, rising in the surrounding mountainous country, with floods originating primarily from snowmelt, sometimes aggravated by rain. In 42 years of record from 1911 through 1952 twenty-eight floods occurred with overbank flows greater than 600 cfs. The June flood of 1917 was 2,200 cfs. Two others had discharges of 1,500 to 2,000 cfs and five more ranged between 1,000 to 1,500 cfs. This experience, coupled with the community growth in the early '40s both as a railroad division point and with irrigated agriculture, prompted a Congressional resolution on 27 July 1946 requesting that the problem be investigated.

The regionwide flood of 1948 emphasized the need for protection and the 1948 "308" Report for the Columbia Basin recommended a project, subject to confirmation of economic feasibility by a subsequent study. This was funded and a review report on Pocatello and vicinity was submitted on 1 March 1953. That report found the need for over 8 miles of channel rectification, levees, and bridge modifications at a total cost of $732,000, of which $231,000 would be local expense for lands, bridge changes, and local drainage structures. Based upon this 1953 report, the project was considered fully authorized in 1954 and design funds were allocated, both in FY 1954 and FY 1955. In FY 1956 Congress appropriated $500,000 for a start on construction.

PORTNEUF RIVER THROUGH POCATELLO - BEFORE AND AFTER CHANNELIZATION - LOOKING UPSTREAM

Local Problems

The county and city governments were in general accord with the plan and had agreed on the local cooperative effort. Upon receipt of construction funds, details of local responsibility were spelled out and the City decided to raise the funds by a bond issue which was scheduled for a popular vote. Upon being drawn into the plans, the city attorney advised in 1956 that state statutes did not permit municipal bonding for flood control purposes. That monkey wrench halted activities, and the community went to the state legislature with their problem. The 1957 legislative session did not correct the problem, but the 1959 one did agree, broadening the act to permit bonding for flood control.

The best laid plans of managers and councilmen went awry again when later in 1959 the proposal for a bond issue was submitted to the voters. They turned it down, and local opinion was polarized to some extent with aspersions cast at the professional integrity of engineers. Because of the decision of the electorate in 1959, all funds were withdrawn and the project placed in an inactive status when little encouragement could be given by the local officials.

POCATELLO UNDER FLOOD SIEGE - 15 FEBRUARY 1962

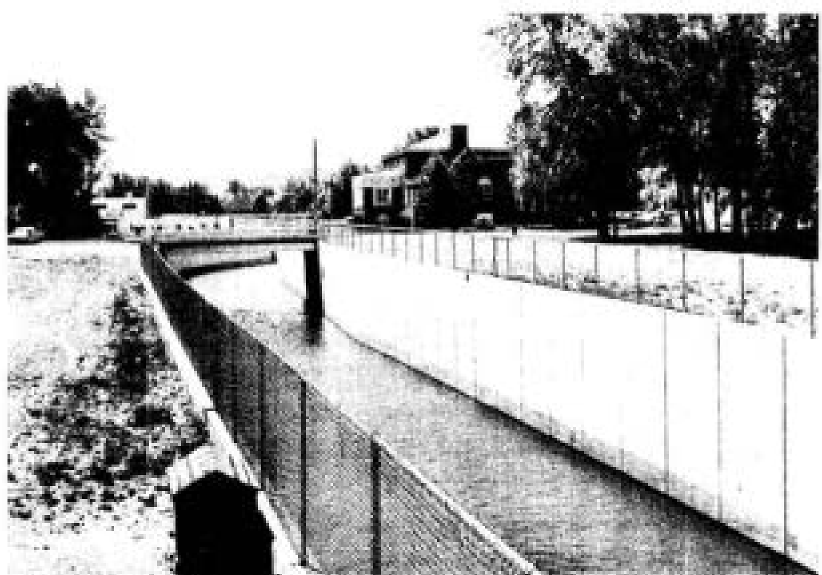
Nature was evidently dissatisfied with both the project design and the community's decision not to proceed with the construction work. Two of the largest floods of record occurred in February 1962 and February 1963, with discharges of 2,990 cfs and 2,470 cfs, respectively, in comparison to a design flow of 2,200, which was the record set by the 1917 flood. These floods, in addition to creating a major flood fight to contain them, forced the project back to the drawing boards. The city, stung by two expensive floods, immediately submitted the question of a bond issue to the people who, on 21 March 1963, voted by a substantial margin to approve one for $190,500. By letter of 10 April 1963, the city and county requested that the project be reactivated. With the shoe on the other foot, Pocatelloites then considered the project urgent and desired action. One wrote to Senator Church stating that - "It has been two months since the Army Corps of Engineers was advised that the City of Pocatello was prepared but thus far we have had no indication that any of the preliminary work has been completed...." Many letters and resolutions followed; funds were received to review the design flood and structural features; and the project was reactivated in a hurry.

Redesign Evolvement

By the end of 1964 the District had reviewed the project hydrology, and with recent flood experience and some new criteria had arrived at a decision that the design flood should be set at 6,000 cfs; wheels were set in motion to change the design accordingly by use of a rectangular concrete channel through the urban area. The project as revised by mid-1964 provided for a project length of 6.2 miles, having revetted levees and channel at either end of a concrete structure through the city. The upstream levee and channel system 3.1 miles long required a channel bottom width of 40 feet with levee heights of 15 to 20 feet. The reach through the city of 1.4 miles dictated a rectangular concrete channel 40 feet wide and 10 to 20 feet deep carrying flood velocities of 20 feet per second. Downstream of the city about .3 mile of levee and channel structure was needed, similar to that above town, with about 1.4 miles of enlarged channel to complete the work. Nineteen bridges cross the channel in the six-mile reach, seven requiring some modification. The estimated cost as developed in the general design studies in 1964 was $4,734,000 Federal and $316,000 non-Federal.

By mid-1965 the details of design and construction had been developed to where the necessary rights-of-way were staked out in the field. The agony of local officials going to individual landowners to obtain portions of their backyards and pieces of business properties ensued. Probably the most traumatic action, however, was the need for the county to approach the directors of the golf association to explain major revisions to the very popular golf course and elimination of the winding stream channel through it. Coupled with this was the new finding that three important bridges required major revisions, and a fourth removed in order to get the designed quantity of water through them, at local expense and strain to the local budget. There was much discussion and soul searching during the fall of 1965 by local governmental units as to whether they could, or wanted to, accomplish all of the detailed relocation and rights-of-way actions necessary. At one point detailed contract design effort by the District was stopped until decisions were forthcoming.

During this period the Corps was not immune to criticism, with assertions of highhanded tactics. Colonel McElwee made several visits to explain problems and assuage local fears. By dint of continued encouragement by the District's professional staff, struggling with details, and realization of the ultimate need, the difficulties were finally resolved by early spring of 1966. The local effort for rights-of-way involved paper work on 388 tracts of land under 198 ownerships. Permanent easements were obtained for much of the channel proper. This detail was completed and the green light for actual work given on 11 May 1966.



CONSTRUCTED WORKS
LEVEE AND RIPRAP
CHANNEL ABOVE TOWN
AND CONCRETE SECTION
THROUGH URBAN AREA

Construction

Construction funds had been allocated that fiscal year, so the project was advertised for construction and a contract awarded on 28 June 1966 for $5,760,000. When all the details had been settled, the project cost was estimated at $6,500,000 Federal funds and $482,000 non-Federal. The construction work was completed in November 1968 and the community furnished a formal channel, weaving through it with adequate capabilities of handling most any flood that should occur. In addition, the utilization and appearance of the lands along the river have been upgraded, the golf course remodeled to provide almost better facilities and landscaping, and the economy of the community enhanced by a well-structured project. As with the Colfax project, 20 years elapsed from authorization to fruition, with many forces of nature and man pulling at the reins or placing roadblocks. Experiences with other projects throughout the District describe similar problems of realization, particularly where extensive local contributions are involved. Possibly this process of action and reaction is a way of progress, insuring that well thought-out plans are evolved and actual need is established. These vignettes of history may help in charting better courses for the next generation.

The general discussion of the Pocatello project in the first part of this history reviews some of these development problems and one of the earlier attempts of the Corps to appropriately landscape a long, formal channel project such as this. With limited funds available, a cooperative effort was undertaken with the community to break down the stark features of the concrete structure by landscape treatment. Proper grading and regrassing of slopes was done; a planting plan for shrubs and trees developed; arrangements made locally for property owners and the city to plant materials furnished by the District; and arrangements made with the city for some maintenance. This cooperative effort was accomplished during the spring of 1969 and good results in city beautification are being realized. Such effort should spark other efforts in the community, resulting in a channel well enveloped into the overall scheme of things in a city which is becoming the largest in the state.

THE DISTRICT'S FLOOD CONTROL NEEDS

The first part of this history recounts in very brief form all through its text, depending on the time sequence, the extensive, year-after-year effort to control streams in the interest of reducing adverse effects of floods. The previous three sections of this chapter describe the comprehensive and extensive works constructed for Mill Creek at Walla Walla, the channel through the heart of Colfax, Washington, and the long reach of improvements for the Portneuf River at Pocatello, Idaho. These descriptions illustrate to some extent the Districtwide continuing demand for flood confinement, need for water areas for people, and the need for the best control and development of the many mountain and valley streams for optimum use by man.

Partial control has been accomplished on many of the District's streams over the past 20 years, either by formally constructed channel and storage works, or by sheer necessity of a flood fight and repair and restoration of some of the efforts of the local people. The control attempted by local effort has been very extensive for the smaller, more frequent flood actions. Much more is needed, and the inventory of vulnerable areas, and those needing better control for all purposes, reads like a recitation of the tributary streams of the Snake River Basin and lower Columbia.

Work such as described in this chapter for the three local projects, and for others recounted in the first part, needs to be considered to supplement what has been done already for valley areas and their communities all the way from Jackson Hole in Wyoming to the John Day in Oregon. These include:

- Henry's Fork and Rexburg, Idaho
- Willow Creek and Idaho Falls, Idaho
- Blackfoot River and Blackfoot, Idaho
- Portneuf River and Bancroft, Lava Hot Springs, Inkom, and Pocatello, Idaho
- The Mud Lake Basin
- The Big and Little Wood Basins and Carey, Ketchum, Bellevue, Shoshone, and Gooding, Idaho
- Boise River and the communities of the lower river
- Payette River and Emmett to Payette, Idaho
- Weiser River and the four communities of the lower basin in Idaho
- Malheur River and the communities of Vale to Ontario, Oregon
- Powder River and Baker Valley, Oregon
- Grande Ronde and La Grande to Elgin, Oregon
- The Upper Salmon River and Challis to Salmon City, Idaho
- Clearwater River and Kooskia to Stites, Idaho
- Palouse River and Moscow, Pullman, and Palouse, Idaho, and Washington
- The Tucannon Valley
- The Walla Walla Valley and Dayton to Prescott, Washington, and Milton-Freewater, Oregon
- Umatilla River and Pendleton to Hermiston, Oregon
- Willow Creek and Heppner, Oregon
- The John Day Basin

Much has been realized but much more is needed, including several unfinished, but authorized projects. On the other side of the ledger there are many small project success stories like Mill Creek and the Heise-Roberts levee system in eastern Idaho adding to the urban as well as rural environmental well being of people throughout the Inland Empire.

Literally hundreds of individual flood fight, repair and restoration, and small local projects have been undertaken in the District to control the flood action of streams and have them serve man better, recognizing all the time that the aesthetics of the natural stream are also highly important. Levees, riprap, channel lining, cleaning, diversions, and flood plain zoning have all been resorted to for control. This history cannot even enumerate the multitude of works, let alone describe them and their accomplishments. Some understanding of the overall scope of this facet of the District's workload--and local accomplishments--may be drawn, however, from a tabulation of the annual appropriation of monies just for these local efforts. Coupled with this summary of Federal funds is the realization that local effort is always involved, too, both in manpower and dollars.

DISTRICT EMERGENCY EXPENDITURES

Period	Code 516 1/	Code 517 2/	Code 518 3/	P. L. 99 4/
1949-1955	$ 197,000	$ 45,000	$170,000	$1,345,000
1956-1960	216,000	62,000	209,000	812,000
1961-1965	911,000	2,000	40,000	1,519,000
1966-1970	1,004,000	39,000	348,000	2,370,000
Totals	2,328,000	148,000	767,000	6,046,000

Total - all Emergency Expenditures - $9,289,000 - FY 1949-1970.

1/ Small Projects and Emergency Works - Sec. 205, 1948 F. C. Act.

2/ Emergency Protection for Public Works - Sec. 14, 1946 F. C. Act.

3/ Emergency Channel snagging & clearing - Sec. 13, 1946 F. C. Act.

4/ Extension, Repair, & Restoration of Flood Control Works - P. L. 99, 84th Cong. 1st Sess. amending Sec. 5 - 1941 F. C. Act.

Over $9 million in 22 years for combating and controlling floods on the local level, coupled with extensive additional local involvement, is a measure of the extent of the District's problem and its seriousness to the people of the Inland Empire; their overall environment; and their well being--a critical element in the overall program of the Corps.

PART III

DISTRICT ENGINEERS, STAFF, AND DATA

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PART III

WALLA WALLA DISTRICT

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THE COLUMBIA RIVER BASIN

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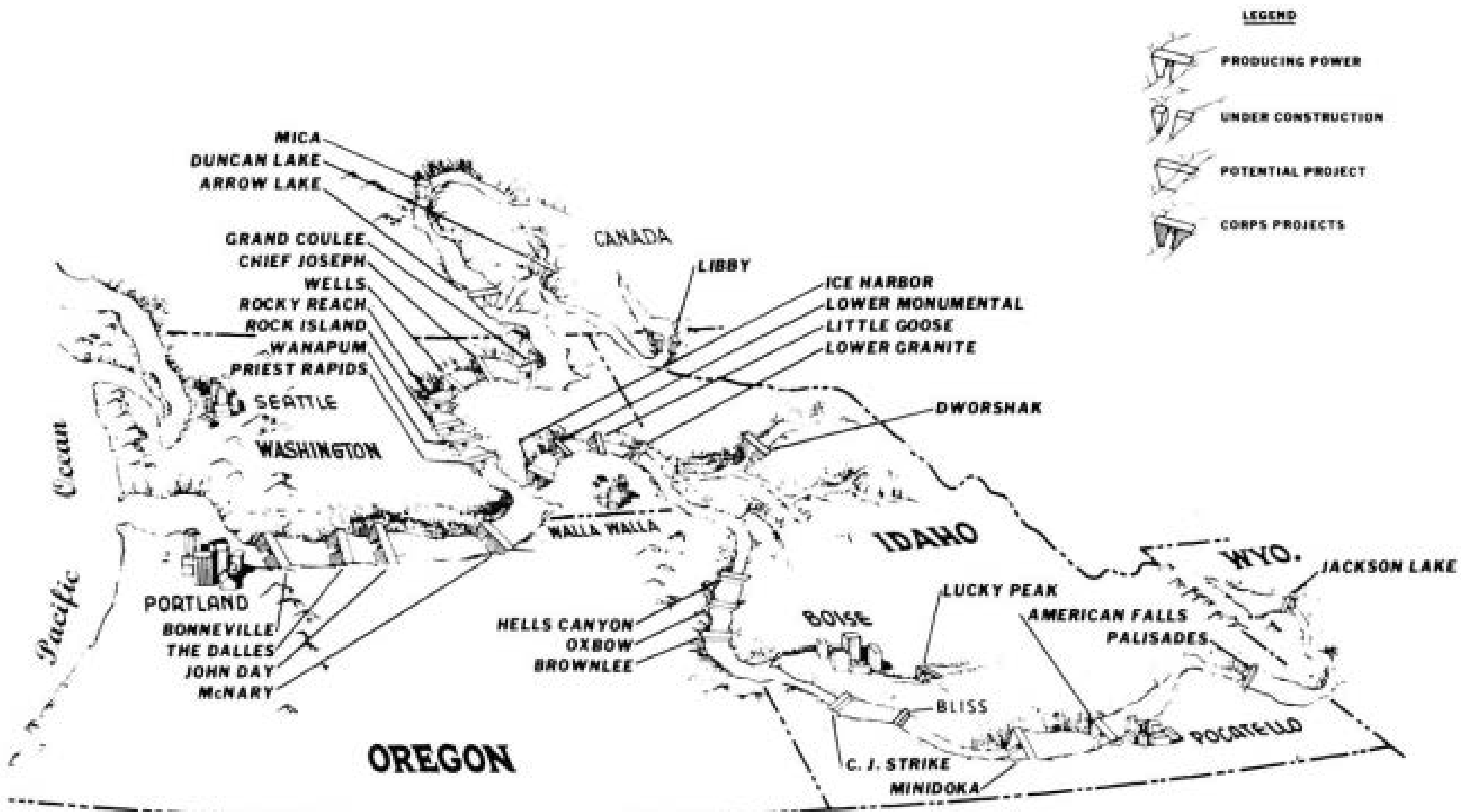

COLUMBIA RIVER BASIN

LOCATION OF MAJOR MAIN STEM DAMS IN THE BASIN

Corps of Engineers
Walla Walla District, Wash

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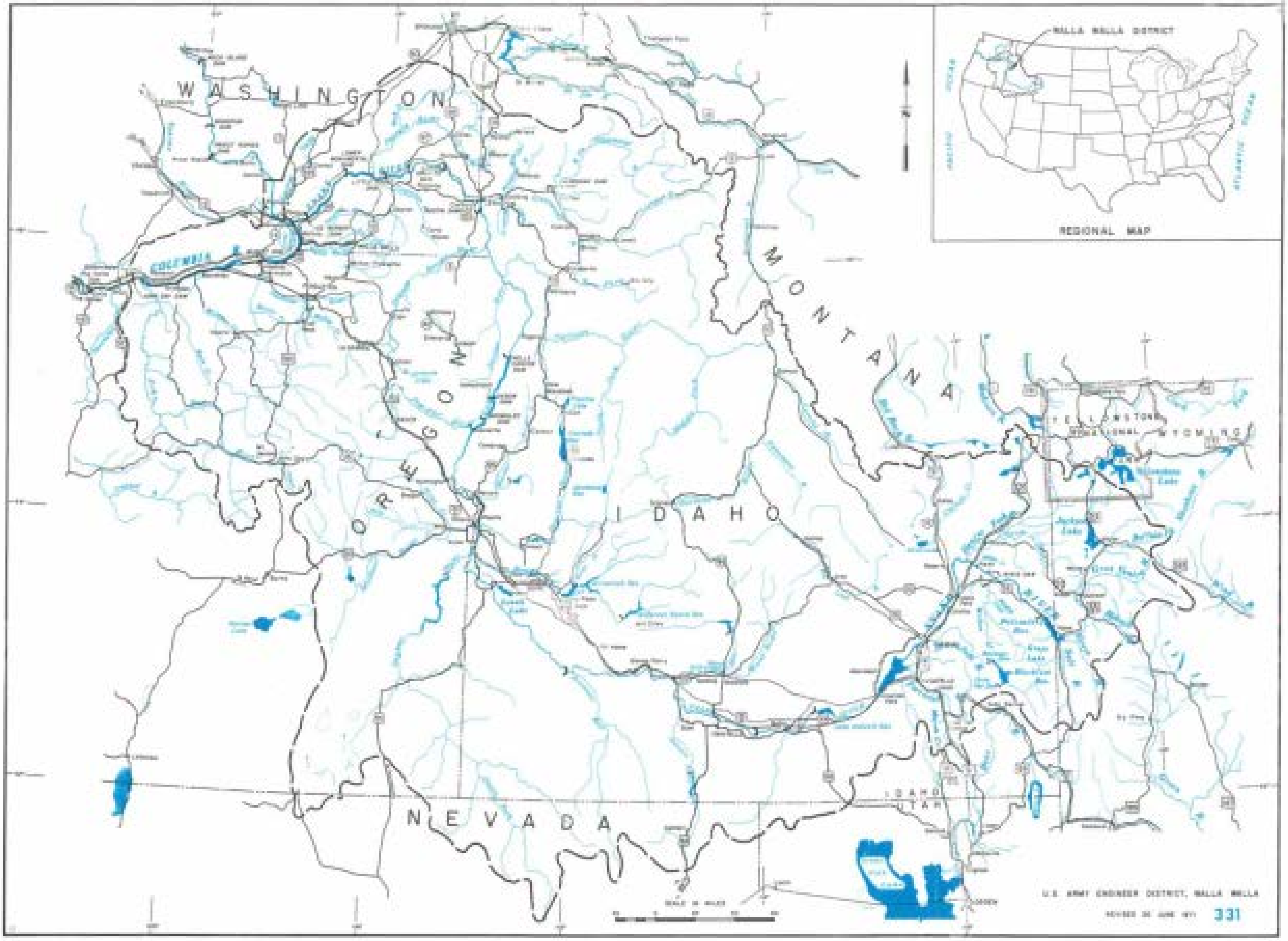
CORPS OF ENGINEERS

U.S. ARMY



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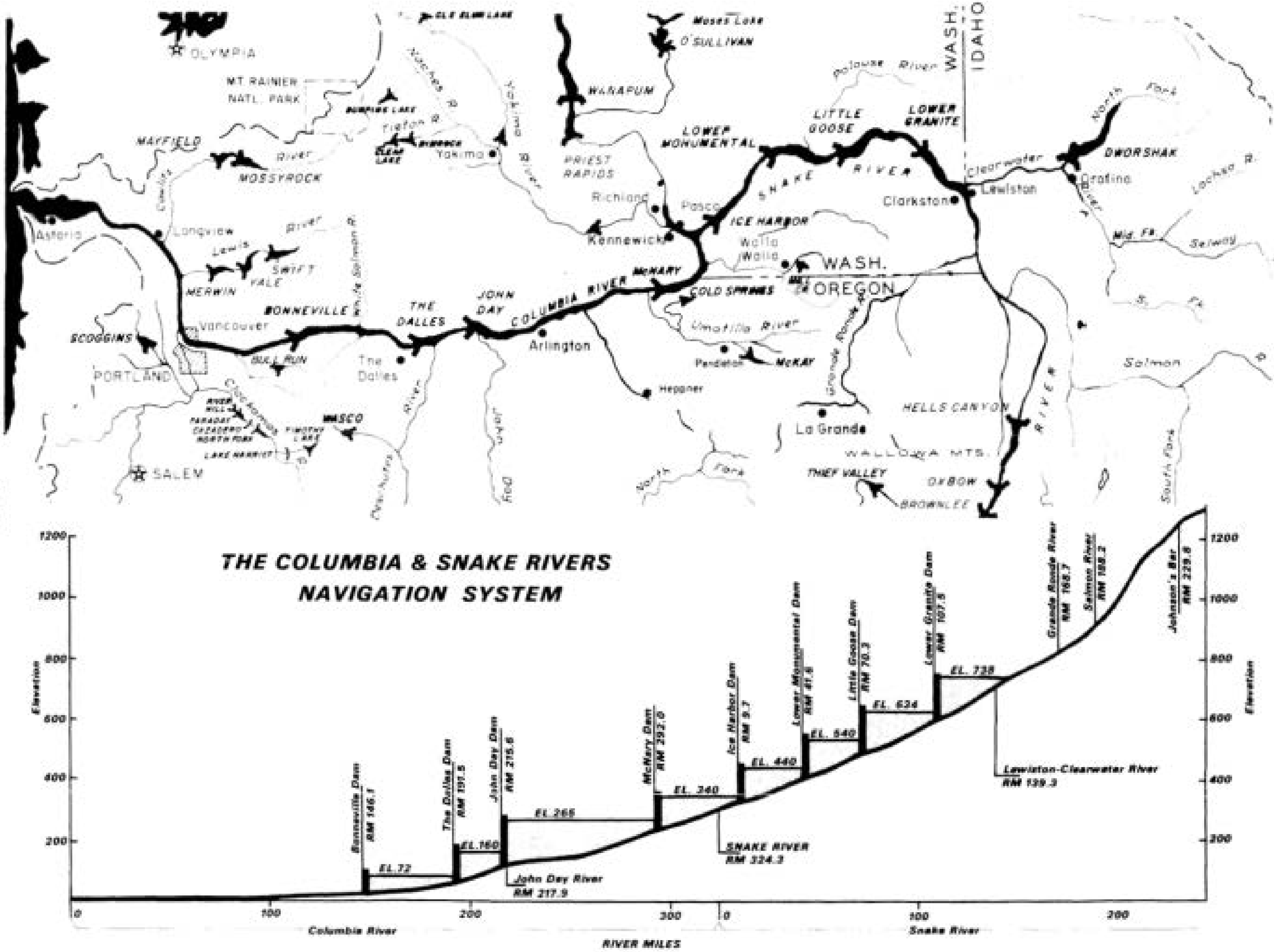
THE COLUMBIA & SNAKE RIVERS
NAVIGATION SYSTEM
OLYMPIA
MT. RAINIER NATL. PARK
MAYFIELD
MOSSYROCK
Astoria
Longview
Lewis River
SWIFT
YALE
MERWIN
BONNEVILLE
Vancouver
PORTLAND
SCOGGINS
BULL RUN
SALEM
WASCO
THE DALLES
The Dalles
JOHN DAY
Arlington
COLUMBIA RIVER
McNARY
COLD SPRINGS
Yakima
PRIEST RAPIDS
WANAPUM
Moses Lake
O'SULLIVAN
Richland
Pasco
Kennewick
ICE HARBOR
Walla Walla
WASH.
OREGON
Umatilla River
Pendleton
McKAY
Heppner
LOWER MONUMENTAL
LITTLE GOOSE
LOWER GRANITE
SNAKE RIVER
Palouse River
WASH.
IDAHO
Clarkston
Lewiston
Clearwater
DWORSHAK
Orofino
North Fork
Lochsa R.
Selway
Salmon
HELLS CANYON
La Grande
WALLOWA MTS.
THIEF VALLEY
OXBOW
BROWNLEE
Elevation
1200
1000
800
600
400
200
Bonneville Dam RM 146.1
EL.72
The Dalles Dam RM 191.5
EL.160
John Day Dam RM 215.6
EL.265
John Day River RM 217.9
McNary Dam RM 292.0
EL.340
SNAKE RIVER RM 324.3
Ice Harbor Dam RM 9.7
EL.440
Lower Monumental Dam RM 41.6
EL.540
Little Goose Dam RM 70.3
EL.634
Lower Granite Dam RM 107.5
EL.738
Lewiston-Clearwater River RM 139.3
Grande Ronde River RM 168.7
Salmon River RM 188.2
Johnson's Bar RM 229.8
0
100
200
300
Columbia River
Snake River
RIVER MILES

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CORPS OF ENGINEERS | U.S. ARMY

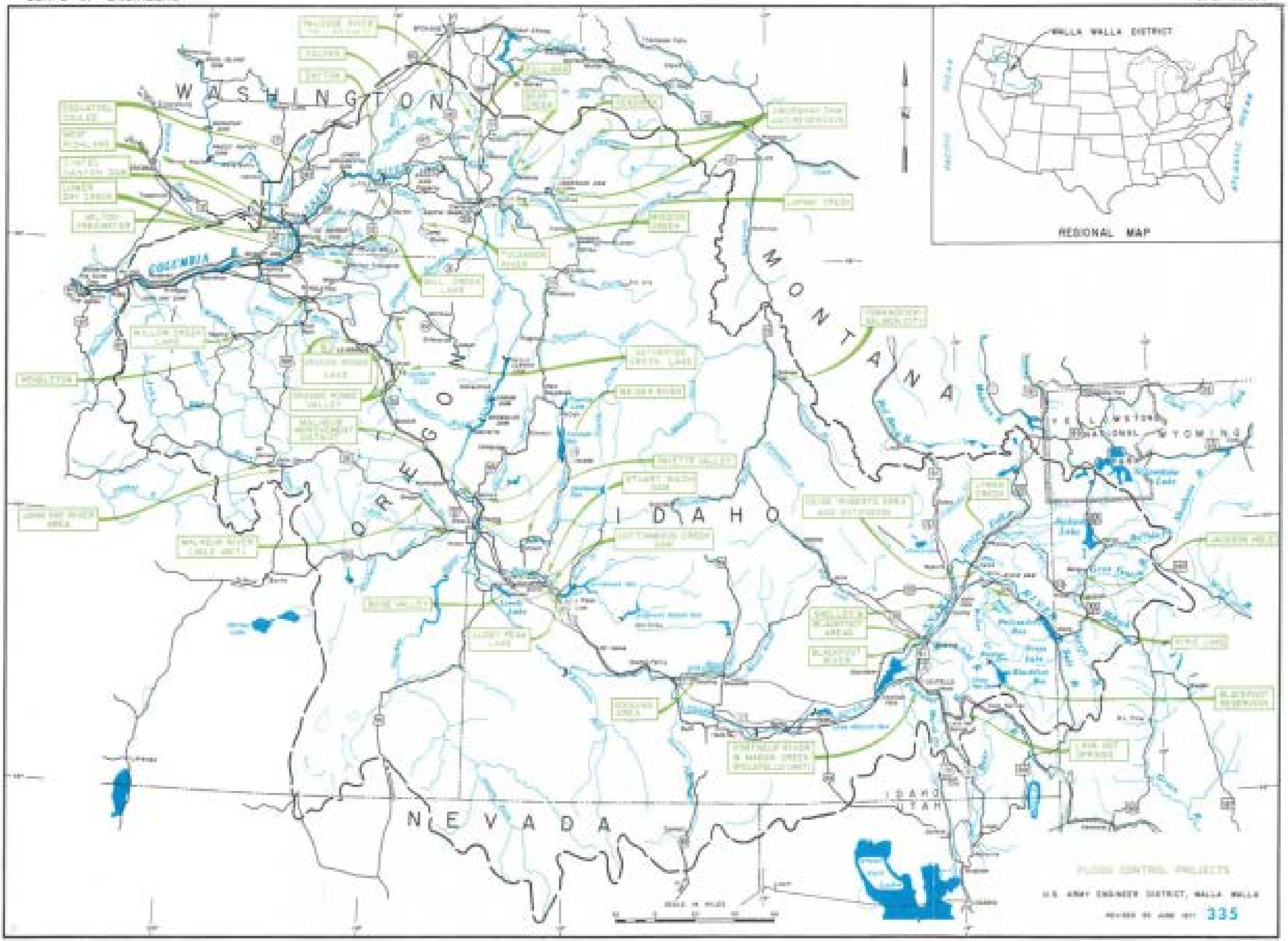

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TABLE 1

U. S. ARMY ENGINEER DISTRICT, WALLA WALLA

WORK PLACEMENT BY FISCAL YEARS

Fiscal Year	Civil Works	Military	Total
1949	$ 18,911,813		$ 18,911,813
1950	39,258,833		39,258,833
1951	44,793,284	4,565,700	49,358,984
1952	58,970,573	36,731,300	95,702,053
1953	55,563,162	9,376,690	64,939,852
1954	37,457,635	15,835,640	53,293,275
1955	27,911,400	18,473,500	46,384,900
1956	13,482,138	18,656,734	32,138,872
1957	16,118,491	20,613,968	36,732,459
1958	31,738,534	23,152,739	54,891,273
1959	30,572,223	42,361,993	72,934,216
1960	48,364,994	31,522,540	79,887,534
1961	62,006,584	21,531,190	83,537,774
1962	41,627,404	-	41,627,404
1963	51,068,256	-	51,068,256
1964	68,252,336	-	68,252,336
1965	93,809,281	-	93,809,281
1966	122,523,509	-	122,523,509
1967	114,069,306	-	114,069,306
1968	112,105,511	-	112,105,511
1969	91,372,607	-	91,372,607
1970	87,361,361	-	87,361,361
1971	110,430,642	-	110,430,642

TABLE 2

U. S. ARMY ENGINEER DISTRICT, WALLA WALLA

AVERAGE PERSONNEL STRENGTH

Fiscal Year	District Office	Field	Total
1950	584	476	1,060
1951	517	428	945
1952	590	480	1,070
1953	614	306	920
1954	433	327	760
1955	414	371	785
1956	529	381	910
1957	554	431	985
1958	497	468	965
1959	605	475	1,080
1960	568	577	1,145
1961	588	512	1,100
1962	585	435	1,020
1963	600	425	1,025
1964	610	420	1,030
1965	575	430	1,005
1966	578	437	1,015
1967	570	450	1,020
1968	565	415	980
1969	560	405	965
1970	510	440	950
1971	458	376	834

DISTRICT OFFICERS

COL William Whipple	Oct 48 - Aug 50	LTC Vincent "Tex" Frisby
		LTC W. P. Leber
COL W. H. Mills	Aug 50 - Mar 53	LTC R. N. Anderson
		COL A. H. Miller
COL F. S. Tandy	Apr 53 - Jul 54	COL A. H. Miller
COL Alex H. Miller	Aug 54 - Aug 55	LTC Edward C. Bruce
COL Myron E. Page, Jr.	Sep 55 - Aug 58	LTC Edward C. Bruce
		LTC William F. Hart
COL Paul H. Symbol	Aug 58 - Mar 61	LTC Walter J. Hutchin
		LTC Laurence L. Heimerl
COL James H. Beddow	Jun 61 - Jun 64	LTC Laurence L. Heimerl
		LTC E. J. Williams, Jr.
COL Frank D. McElwee	Aug 64 - Jul 67	LTC E. J. Williams, Jr.
		MAJ Homer J. Johnstone, Jr.
		MAJ Robert L. Lane
		MAJ Ronald A. Walton
COL Robert J. Giesen	Aug 67 - Aug 70	MAJ Ronald A. Walton
		MAJ Harold L. Matthias
COL Richard M. Connell	Sep 70 -	MAJ Harold L. Matthias
		MAJ Carlos W. Hickman

COL WILLIAM H. WHIPPLE

COL William H. Whipple
October 1948 - August 1950

COL Whipple, a product of Louisiana, attended the U.S. Military Academy, West Point, graduating in 1930. He was awarded a Rhodes Scholarship and studied at Oxford, England, in Economics and Philosophy. He later did graduate work at Princeton University obtaining a Master's Degree in Civil Engineering. During World War II COL Whipple was with SHAEF Headquarters during the invasion of Europe, and he stayed in Germany with the military government. Before coming to Walla Walla COL Whipple was Executive Officer in North Pacific Division. He was the first District Engineer, starting on 31 October 1948, serving until 13 August 1950. He attended the Industrial War College in Washington, D.C.; was assigned to the 3rd Army; and in 1953 went to the Office, Chief of Engineers in Washington. COL Whipple was with the U.S. Army, Europe, in France and in 1958 was appointed BG as Division Engineer, Southwestern Division, Dallas, Texas. He retired from active duty and in 1964 went with the Energy Corporation of America in New York. He helped plan for the New York World's Fair.

COL WILLIAM H. MILLS

COL William H. Mills
August 1950 - March 1953

A product of western New York State, he received his Civil Engineering degree from Cornell University in 1928. Upon graduation he went with an Engineer Topographic Unit in Texas with three years on the Nicaraguan Canal Survey, 1929-1931. COL Mills had several assignments during the 30s and was in Hawaii at the start of World War II. He subsequently spent three years in the Southwest Pacific Area (Australia, Phillipines and Japan). In 1946 COL Mills returned to Washington, D.C., serving three years with the Army Map Service and two years at the Industrial College of the Armed Forces. He was appointed District Engineer of the Walla Walla District on 14 August 1950, holding the post until 31 March 1953; the last few months of that time he also served as Acting Division Engineer. COL Mills was subsequently assigned to SHAPE Headquarters in Paris for three years. He retired from active duty in 1956 at the completion of that assignment.

COL FREMONT S. TANDY

COL Fremont S. Tandy
April 1953 - July 1954

A Californian, COL Tandy attended the U.S. Military Academy, West Point, graduating in 1924. After a short period of service he returned to Massachusetts Institute of Technology for an advance degree in Engineering in 1928. During the 30s COL Tandy had several duty assignments including that of District Engineer, San Francisco District. During World War II COL Tandy served with GEN Patton on desert training and later went overseas until 1946 when he returned to an assignment with the Army Map Service. In that he was involved in setting up the intercontinental and continental geodetic control system with 18 countries. In 1951 and 1952 COL Tandy was active in training, and directed the 32nd Engineer Construction group in Korea on rail and highway construction and repair. He was appointed District Engineer, Walla Walla District on 1 April 1953, serving until 31 July 1954, completing 30 years of military service. He retired from active duty and returned to California to work with Pacific Intermountain Express. COL Tandy died in the late 50s.

COL ALEXANDER H. MILLER

COL Alexander H. Miller
August 1954 - August 1955

A native Floridian, where he obtained his his professional training, he spent 13 years of continuous military duty before coming to the District. During World War II COL Miller served in Italy, Africa, and the Mediterranean area. After that campaign he became Deputy Engineer in Berlin for three years. He came to Walla Walla from duty with the Armed Forces Engineer School Staff at Fort Belvoir, Virginia. COL Miller had the distinction of serving as Executive Officer (Deputy) for two District Engineers before assuming the District Engineers' position on 1 August 1954 which he held until 31 August 1955. He retired from active duty on that date to return to the lumbering business in which he was brought up as Executive Assistant, Potlatch Forests, Inc., Lewiston, Idaho.

COL Myron E. Page, Jr.
September 1955 - August 1958

COL MYRON E. PAGE, JR.

A product of California, COL Page received his B.S. in Civil Engineering at the University of California in 1938 and a Master's Degree from California Institute of Technology in 1947. He also attended the Command and General Staff College, Fort Leavenworth, Kansas. COL Page received his commission upon graduation in 1938 and was assigned to the Philippine Islands, returning just before Pearl Harbor. He then served as Air Force Staff Engineer in Alaska, at Spokane, Washington, and at Robbins Field, Georgia; he was National Guard Instructor; had various assignments with the Ryukyus Command from 1950-53; and on the Fort Belvoir Engineer School Staff from 1953 to 1955. COL Page was appointed District Engineer on 1 September 1955, serving until 6 August 1958, when he was assigned to the Office, Chief of Engineers in Washington, D.C. Later he was appointed as Deputy Division Engineer, Missouri River, at Omaha, Nebraska, from which position he retired from active duty to return to California.

COL Paul H. Symbol
August 1958 - March 1961

COL PAUL H. SYMBOL

A native of the Inland Empire (Spokane, Washington) COL Symbol received his degree in Electrical Engineering at Washington State University in 1939. He was commissioned in the Corps and saw service during World War II on the Alcan Highway, with Engineer troops in Europe, and on occupation duty in Frankfurt, Germany. He returned to the states in 1947, entering Cornell University for advance study, receiving a Master's degree in 1948. COL Symbol was then assigned as Executive Officer with the Seattle District for two years and subsequently for two years at the Engineering Research and Development Laboratory at Fort Belvoir, Virginia. From 1952 to 1955 he commanded Engineer troops in Korea and at the Engineer Section in Japan. Prior to coming to Walla Walla, COL Symbol was Deputy Chief of Staff for Logistics. He was District Engineer from 7 August 1958 to 31 March 1961, retiring from active duty on that date to go into private consulting work in Seattle, Washington.

COL JAMES H. BEDDOW

COL James H. Beddow
June 1961 - June 1964

A West Virginian, he received his B.S. degree in Electrical Engineering from West Virginia University in 1938. He entered the Army after graduation as 2LT and served in the Mediterranean Theatre. Following World War II, COL Beddow received a Master's Degree in Civil Engineering from California Institute of Technology. He also studied Engineering at New York University; attending Command and General Staff College; and the Army War College at Carlisle Barracks, Pennsylvania. In addition to duties in World War II, COL Beddow served in Korea with the 8th Army and Advisor to the Japan Self Defense Forces; three years in the Office, Chief of Engineers in Washington, D.C.; Fort Carson, Colorado, as Commander of the 502nd Engineer Group; and U.S. Army in Hawaii. Prior to the Korean conflict, COL Beddow served as Chief of Operations Division of the Seattle District from 1947 to 1949. He came to Walla Walla District on 25 June 1961 and remained as District Engineer until 7 June 1964. He was then assigned to the Continental Army Command at Fort Monroe, Virginia. He retired from active duty on 1 August 1966.

COL FRANK D. McELWEE

COL Frank D. McElwee
August 1964 - July 1967

A native of Mississippi, he was commissioned in the Army in 1942 after receiving a B.S. Degree in Chemical Engineering from Louisiana State College. He later received his M.S. Degree in Mechanical Engineering in 1947 from the University of California and is a graduate of the Command and General Staff College, Fort Leavenworth, Kansas, and the Army War College, Carlisle Barracks, Pennsylvania. COL McElwee went to Europe during World War II with the 1106th Engineer Group and participated in the Normandy Campaign. In 1950 he was assigned to the Far East Command and saw service in Korea. In 1952 he returned for stateside assignments, as well as Area Engineer, Caribbean Area, in Puerto Rico. From 1958-1960 he was at the U.S. Military Academy, West Point, N.Y. as Engineer Instructor and subsequently was assigned to Supreme Headquarters Allied Powers Europe for two years. COL McElwee came to the Walla Walla District on 12 August 1964 as District Engineer and remained until 31 July 1967. He retired from active duty on that date and entered private consulting engineering work in New York. He is currently Construction Manager for Consolidated Edison Company of New York.

COL ROBERT J. GIESEN

COL Robert J. Giesen
August 1967 - August 1970

A Wisconsinite who like his predecessors was commissioned in the Army upon graduation from the University of Wisconsin in Engineering in 1942. He served at Fort Benning, Georgia, and with the 84th Infantry Division in Europe. His military duty also included service at Fort Ord, California; and Camp Century, Camp Tuto, Greenland. In 1962 COL Giesen received an M.S. Degree in Business Administration from Syracuse University. COL Giesen served two years with the Baltimore District, (1953-55) supervising military construction. He then went to Keflavik, Iceland, with the Corps as Chief of Construction. From 1948 to 1961 he was Assistant Director of Civil Works in O.C.E., Washington, D.C. Before coming to Walla Walla he was at the Army Materiel Command, St. Louis, Missouri, as Project Manager developing atomic powered electric power generating units for Southeast Asia. He reported for duty with Walla Walla District on 1 August 1967 and remained for three years. He retired from active duty on 30 August 1970 to take up private practice in the Puget Sound area of Washington.

COL RICHARD M. CONNELL

COL Richard M. Connell
September 1970 -

A product of Erie, Pennsylvania, he graduated from the United States Military Academy, West Point, N.Y., in 1949 and was commissioned in the Corps of Engineers. He received an M.S. in Civil Engineering from Massachusetts Institute of Technology in 1955 and is also a graduate of the Command and General Staff College and Army War College, Carlisle Barracks, Pennsylvania. COL Connell spent three years with the U.S. Army, Europe; a year at Fort Leonard Wood, Missouri; two years in Labrador; five years in Washington, D.C., on two assignments; three years in England on the staff of the Royal School of Military Engineering; a year in Vietnam in 1967; and his last military assignemnt was two years with the Office of the Chief of Staff, U.S. Army, Washington. He was appointed District Engineer of Walla Walla District on 1 September 1970.

Following is a summary list of the heads of the principal sections of the office over the 22-year period of this epistle.

Engineering Division

James E. Reeves	1948-1951
Edwin C. Franzen	1951-1965
Fred W. Sneddon	1965-1966
Harry L. Drake	1967-

Real Estate Division

Merle E. Lietzke	1948-1953
Max K. Tysor	1953-

Executive Assistant

Russell D. Whelan	1948-1951
VanNatta Baldwin	1951-

Supply Division

VanNatta Baldwin	1948-1951
Edward G. Wainwright	1951-1966
Orville F. Murray	1966-

Operations Division (Est. 1958)

Richard L. Earnheart	1958-1965
Duane M. Downing	1965-

Construction Division (Oper. 1948-1950)

Leo M. Buhr	1948-1951
William B. Watson	1951-1953
Samuel G. Neff	1953-1954
Oliver A. Lewis	1954-1959
Clarence C. Davis	1959-1961
Bertram W. Hoare	1961-1965
C. B. Olmstead	1965-1967
John E. Butler	1967-1968
Bertram W. Hoare	1968-

Personnel Office

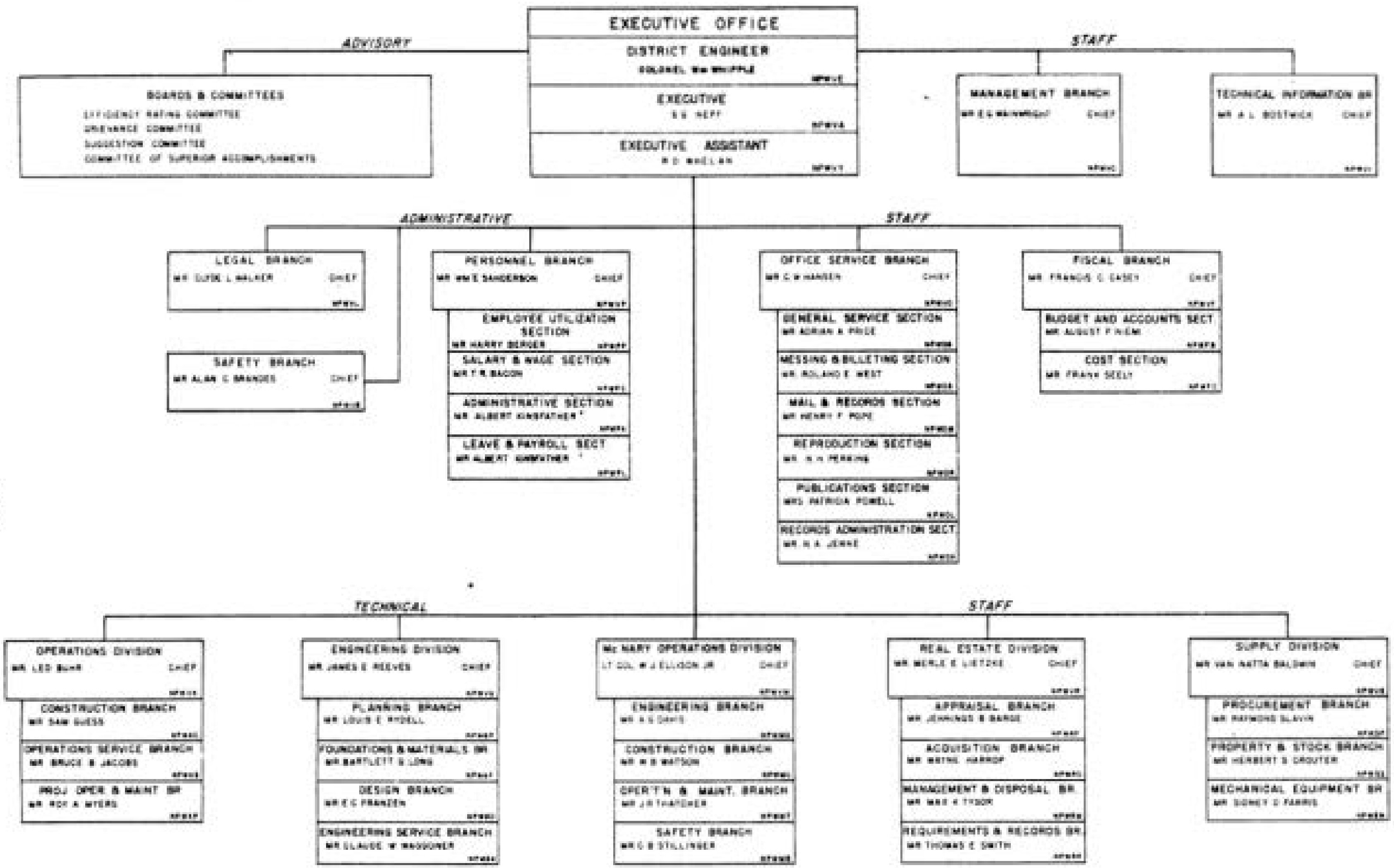
William E. Sanderson	1948-1959
Theodore R. Bacon	1959-1963
Bernard E. Stevenson	1963-

Fiscal Officer - Comptroller

Francis C. Casey	1948-1953
August P. Niemi	1953-1969
Herbert G. Lathrop	1969-

NOTE: See Organization Charts following for full staff composition.

ORGANIZATION CHART – OFFICE, DISTRICT ENGINEER
WALLA WALLA DISTRICT
19 E. POPLAR ST.
WALLA WALLA, WASH.
Tel 5310

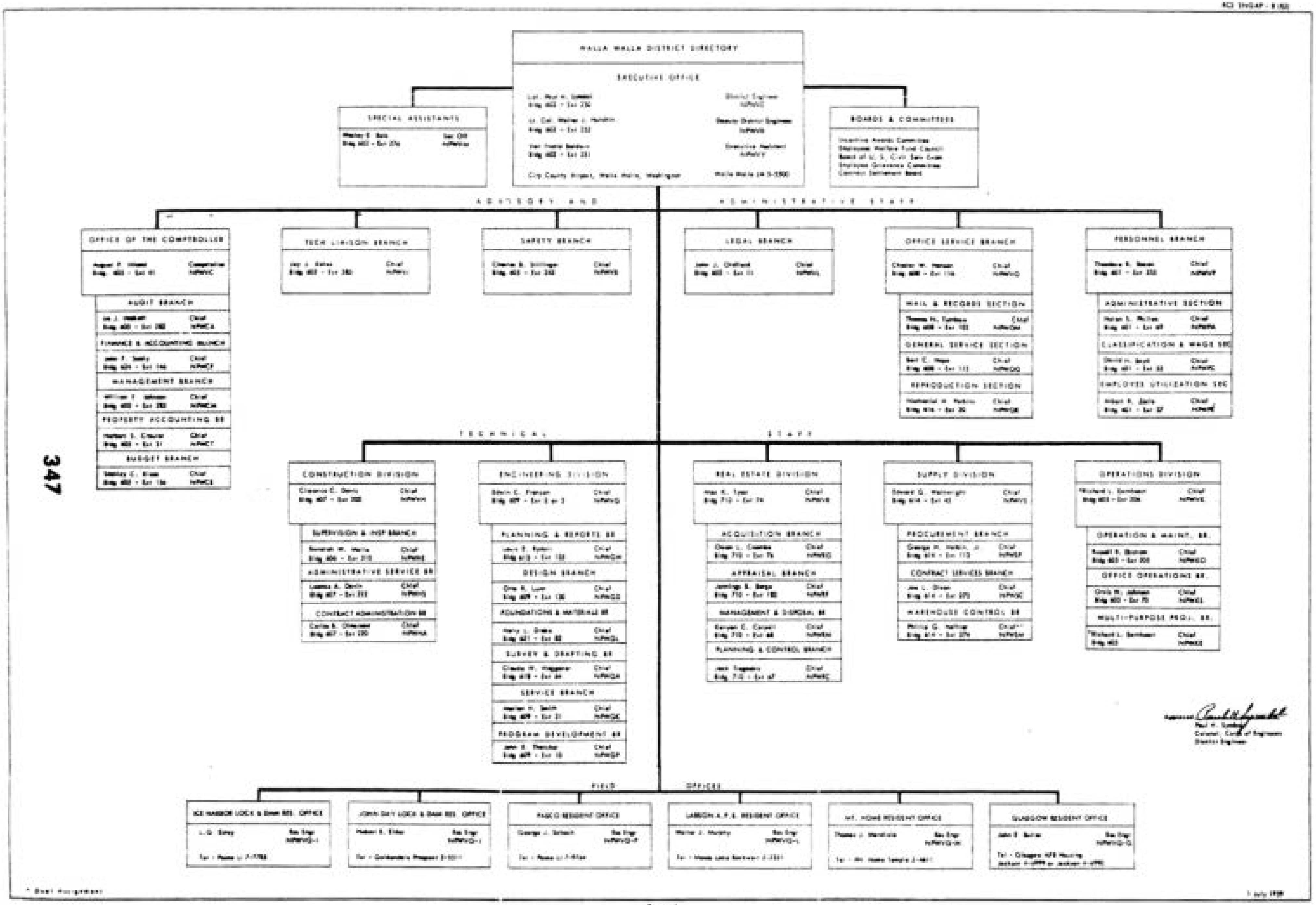


* DUAL ASSIGNMENT

ORGANIZATION CHART
OFFICE, DISTRICT ENGINEER
WALLA WALLA DISTRICT
WALLA WALLA, WASHINGTON
1 July, 1949

Submitted ______________
E G Wainwright, Chief Mgmt Br

Approved ______________
Col Wm Whipple, C of E, District Eng


WALLA WALLA DISTRICT DIRECTORY
EXECUTIVE OFFICE
SPECIAL ASSISTANTS
BOARDS & COMMITTEES
ADVISORY AND ADMINISTRATIVE STAFF
OFFICE OF THE COMPTROLLER
AUDIT BRANCH
FINANCE & ACCOUNTING BRANCH
MANAGEMENT BRANCH
PROPERTY ACCOUNTING BR
BUDGET BRANCH
TECH LIAISON BRANCH
SAFETY BRANCH
LEGAL BRANCH
OFFICE SERVICE BRANCH
MAIL & RECORDS SECTION
GENERAL SERVICE SECTION
REPRODUCTION SECTION
PERSONNEL BRANCH
ADMINISTRATIVE SECTION
CLASSIFICATION & WAGE SEC
EMPLOYEE UTILIZATION SEC
TECHNICAL STAFF
CONSTRUCTION DIVISION
SUPERVISION & INSP BRANCH
ADMINISTRATIVE SERVICE BR
CONTRACT ADMINISTRATION BR
ENGINEERING DIVISION
PLANNING & REPORTS BR
DESIGN BRANCH
FOUNDATIONS & MATERIALS BR
SURVEY & DRAFTING BR
SERVICE BRANCH
PROGRAM DEVELOPMENT BR
REAL ESTATE DIVISION
ACQUISITION BRANCH
APPRAISAL BRANCH
MANAGEMENT & DISPOSAL BR
PLANNING & CONTROL BRANCH
SUPPLY DIVISION
PROCUREMENT BRANCH
CONTRACT SERVICES BRANCH
WAREHOUSE CONTROL BR
OPERATIONS DIVISION
OPERATION & MAINT. BR.
OFFICE OPERATIONS BR.
MULTI-PURPOSE PROJ. BR.
FIELD OFFICES
ICE HARBOR LOCK & DAM RES. OFFICE
JOHN DAY LOCK & DAM RES. OFFICE
PASCO RESIDENT OFFICE
LARSON A.F.B. RESIDENT OFFICE
MT. HOME RESIDENT OFFICE
GLASGOW RESIDENT OFFICE
* Dual Assignment
1 July 1959

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DISTRICT OFFICE

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U. S. ARMY ENGINEER DISTRICT, WALLA WALLA

EXECUTIVE OFFICE

Col. Robert J. Gilsen — District Engineer
Bldg 602-Ext 100 — NPWDE

Maj. Harold L. Martilus — Deputy District Engineer
Bldg 602-Ext 101 — NPWDE-D

Van Natta Baldwin — Executive Assistant
Bldg 607-Ext 102 — NPWEA

City-County Airport, Walla Walla, Washington 99362
Com'l Tel 509-525-5500 — FTS 509-525-XXXX

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Total District Positions

	Civil	Military
Officers	3	0
Graded	737	0
Ungraded	143	0
Total	883	0

SPECIAL ASSISTANTS

*Henry F. Pope — Intg Off
Bldg 602-Ext. 109 — NPWSA-S

*Albert Klein — Emerg Op Plan
Bldg 605-Ext. 628 — NPWSA-EP

Joseph D. Baldwin — Value Engr Off
Bldg 602-Ext. 679 — NPWSA-VE

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BOARDS & COMMITTEES

Incentive Awd Com
Mgt Negotiating Com
Hist Screening Com
Engr-in-Tng Com
Examining Bd
Tng Com
Struc Insp Tm
Surv Bd
Mgt Info Sys Com
Contr Term Settlement Bd
Empl Wlf Fund Council
VE Review Bd
Mgt Com
Bd of Awards

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Approved:

ROBERT J. GILSEN
Colonel, CE
District Engineer

ADVISORY AND ADMINISTRATIVE STAFF

OFFICE OF THE COMPTROLLER

*Herbert G. Luttrop — Act Comptroller
Bldg 624-Ext 146 — NPWDC

AUDIT BRANCH
*Herbert G. Luttrop — Chief
Bldg 624-Ext 147 — NPWDC-A

BUDGET BRANCH
Stanley C. Kress — Chief
Bldg 624-Ext 149 — NPWDC-B

FINANCE & ACCOUNTING BR
Thomas W. Morse — Chief
Bldg 624-Ext 155 — NPWDC-F

MANAGEMENT ANALYSIS BR
William E. Johnson — Chief
Bldg 624-Ext 150 — NPWDC-M

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PUBLIC AFFAIRS OFFICE

Frank W. King — Chief
Bldg 607-Ext 143 — NPWPA

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AUTO DATA PROCESSING CENTER

*Cecil L. Ashley — Chief
Bldg 620-Ext 456 — NPWDP

PROGRAM AND SYSTEMS BRANCH
*Cecil L. Ashley — Chief
Bldg 620-Ext 447 — NPWDP-P

OPERATIONS BRANCH
*Masao Kojiro — Act Chief
Bldg 620-Ext 448 — NPWDP-O

Page 3

SAFETY OFFICE

Daniel F. Casey — Chief
Bldg 605-Ext 141 — NPWSO

Page 3

OFFICE OF COUNSEL

John J. Oldfield — District Counsel
Bldg 602-Ext 106 — NPWOC

Page 3

PERSONNEL OFFICE

Bernard E. Stevenson — Chief
Bldg 601-Ext 121 — NPWPO

MGT-EMPLOYEE RELATIONS BR
Michael V. Hall — Chief
Bldg 601-Ext 132 — NPWPO-E

RECRUITMENT & PLACEMENT BR
Mary L. Herring — Chief
Bldg 601-Ext 123 — NPWPO-R

POSITION & PAY MGT BR
John A. Cunnington — Chief
Bldg 601-Ext 124 — NPWPO-P

TECHNICAL SERVICES BR
Edward N. Morrell — Chief
Bldg 601-Ext 128 — NPWPO-S

TRAINING & DEVELOPMENT BR
Milton L. Bale — Chief
Bldg 601-Ext 122 — NPWPO-T

Page 3

OFC OF ADMINISTRATIVE SERVICES

Curtis E. Lindberg — Chief
Bldg 608-Ext 111 — NPWAS

GENERAL SERVICE BRANCH
Blair A. Jones — Chief
Bldg 608-Ext 110 — NPWAS-G

REPRODUCTION BRANCH
Virgil E. Long — Chief
Bldg 616-Ext 135 — NPWAS-R

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TECHNICAL STAFF

ENGINEERING DIVISION

Harry L. Drake — Chief
Bldg 613-Ext 300 — NPWEN

Willard E. Sivley — Asst Chief
Bldg 613-Ext 301

*Howard A. Preston — Asst Chief for River Basin Planning
Bldg 604-Ext 308

Lawrence V. Amesbury — Asst Chief for Flood Plain Mgt Svc
Bldg 609-Ext 311

PLANNING BRANCH
*Howard A. Preston — Chief
Bldg 604-Ext 308 — NPWEN-PL

SURVEY & DRAFTING BRANCH
James P. Fultney — Chief
Bldg 614-Ext 400 — NPWEN-SY

DESIGN BRANCH
Melvin L. Scott — Chief
Bldg 609-Ext 359 — NPWEN-DB

SERVICE BRANCH
Ruth Bradshaw — Chief
Bldg 609-Ext 353 — NPWEN-SV

FOUNDATIONS & MATERIALS BR
Charles J. Monahan — Chief
Bldg 621-Ext 420 — NPWEN-FM

PROGRAM DEVELOPMENT BR
Phillip B. Ekstrom — Chief
Bldg 613-Ext 302 — NPWEN-PD

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OPERATIONS DIVISION

Duane M. Downing — Chief
Bldg 605-Ext 676 — NPWOP

*Robert G. Kress — Asst Chief
Bldg 605-Ext 627

PROJECT OPERATIONS BRANCH
*Robert G. Kress — Chief
Bldg 605-Ext 627 — NPWOP-PO

PLANT BRANCH
Samuel D. Walker — Chief
Bldg 605-Ext 634 — NPWOP-PL

NAVIGATION & FLOOD CONT BR
Clarence L. Van Scotter — Chief
Bldg 605-Ext 631 — NPWOP-NF

OFFICE OPERATIONS BRANCH
*Albert Klein — Chief
Bldg 605-Ext 628 — NPWOP-OO

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CONSTRUCTION DIVISION

Bertram W. Hoare — Chief
Bldg 606-Ext 645 — NPWCO

John E. Butler — Asst Chief
Bldg 606-Ext 641

SUPERVISION & INSP BRANCH
Joseph F. Skidmore — Chief
Bldg 606-Ext 657 — NPWCO-SI

CONSTRUCTION SERVICE BR
Leonce A. Davis — Chief
Bldg 606-Ext 647 — NPWCO-CS

CONTRACT ADMINISTRATION BR
Kenneth C. Jones — Chief
Bldg 606-Ext 652 — NPWCO-CA

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REAL ESTATE DIVISION

Max K. Tysor — Chief
Bldg 710-Ext 600 — NPWRE

*John L. Batt — Asst Chief
Bldg 710-Ext 601

PLANNING & CONTROL BRANCH
*John L. Batt — Chief
Bldg 710-Ext 601 — NPWRE-PC

ACQUISITION BRANCH
Owen L. Coombe — Chief
Bldg 710-Ext 604 — NPWRE-AQ

APPRAISAL BRANCH
Evan E. Booker — Chief
Bldg 710-Ext 610 — NPWRE-AP

MANAGEMENT & DISPOSAL BR
Kenyon C. Coryell — Chief
Bldg 710-Ext 614 — NPWRE-MD

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SUPPLY DIVISION

Orville F. Murray — Chief
Bldg 614-Ext 174 — NPWSU

PROCUREMENT BRANCH
Nicholas R. Gall — Chief
Bldg 614-Ext 173 — NPWSU-PR

CONTRACT SERVICES BRANCH
Earnest H. Benton — Chief
Bldg 614-Ext 176 — NPWSU-CS

SUPPLY CONTROL & DIST BR
Calvin R. Porter — Chief
Bldg 614-Ext 181 — NPWSU-SC

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FIELD OFFICES

FIELD

JOHN DAY RESIDENT OFFICE

Sherman W. Williams — Res Engr
Rufus, Ore — NPWFO-J
Com'l Tel 503-739-2518

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DWORSHAK RESIDENT OFFICE

Donald H. Bogen — Res Engr
Orofino, Ida. — NPWFO-D
Com'l Tel 208-476-7741

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LOWER SNAKE RIVER RES OFC

Benalah W. Malle — Res Engr
Lacrosse, Wash. — NPWFO-L
Com'l Tel 509-549-3538

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*Dual Assignment

1 February 1970

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