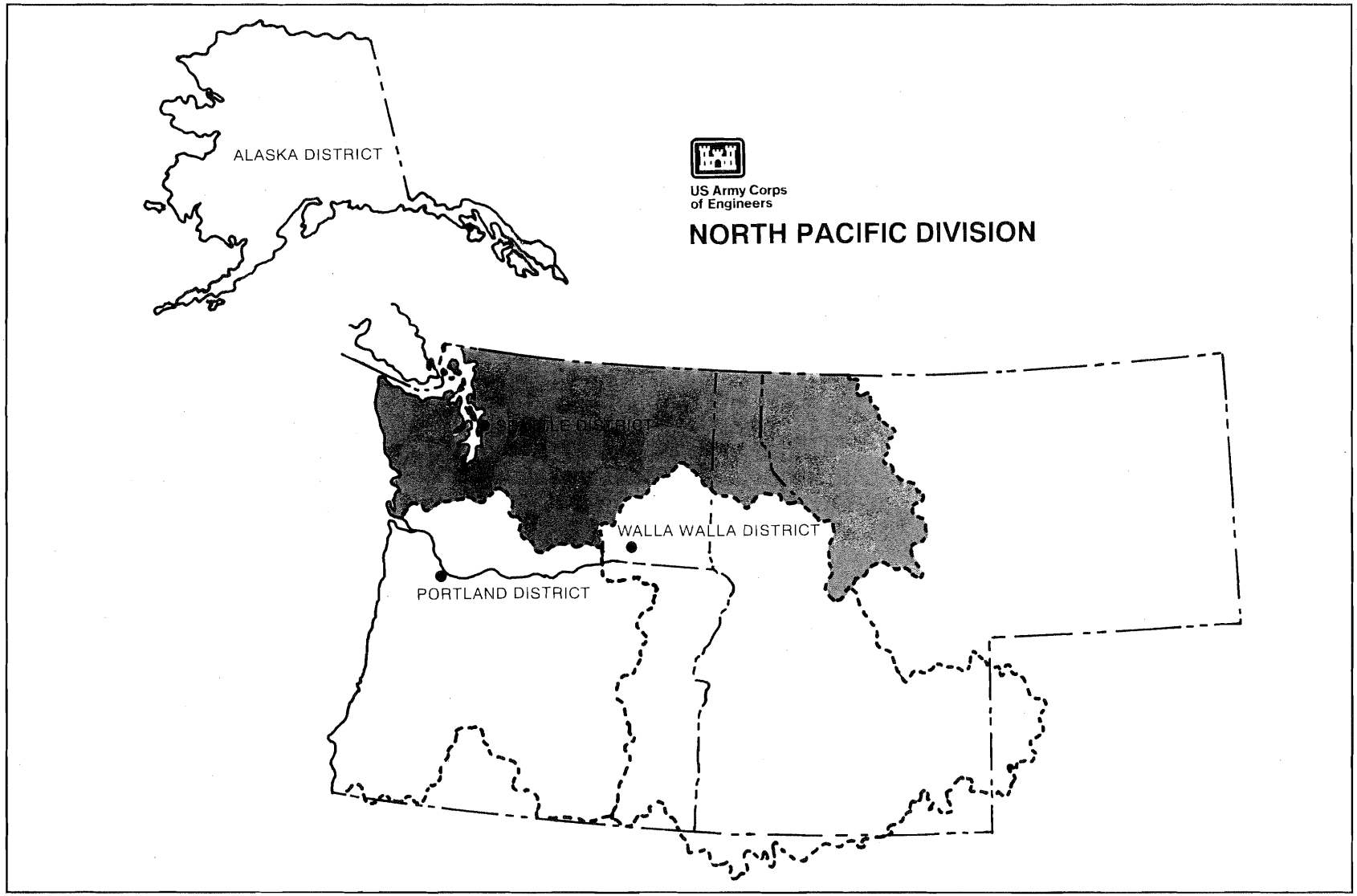
Northwest Passages:

A History of the Seattle District
U.S. Army Corps of Engineers, 1896



Seattle District is one of four districts within the North Pacific Division. Army Corps of Engineers.

Northwest Passages:

A History of the Seattle District U.S. Army Corps of Engineers, 1896 – 1920

written by William F. Willingham., Ph.D

based in part on research by Robert E. Ficken

1992

Chief Sealth, namesake of Seattle.

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Foreword

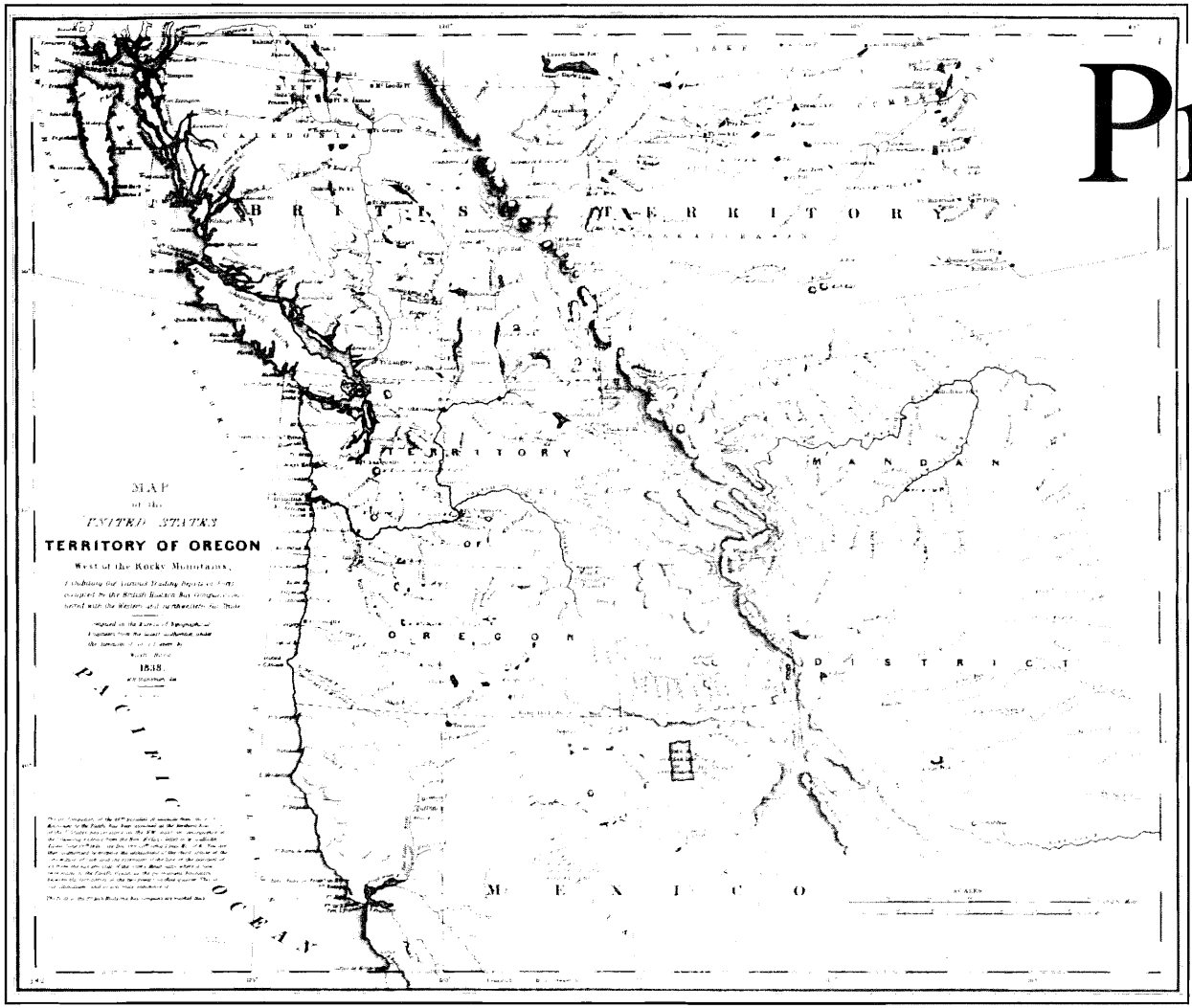
The United States Army Corps of Engineers is the preeminent public engineering organization in history. Its accomplishments include some of the greatest technical achievements of all time. From the beginning, the Corps was a major force in opening the various passages West. Since 1896 the Seattle District has been an integral element of the Corps performing service to the nation and the Pacific Northwest. This first volume of the Seattle District's history is offered to document the District's contributions to the development of the region.

At a time when the nation is concerned about its deteriorating infrastructure, this history is particularly important. It recounts the effort necessary to build important segments of that infrastructure. By understanding the vision and skill required to conceive and construct the many projects chronicled here, we will be better prepared to maintain or expand those projects in the future.

Finally, this history is a tribute to the women and men of the Seattle District. Their record of devotion to duty and service to the American people is unexcelled.

WALTER J. CUNNINGHAM
Colonel, Corps of Engineers
District Engineer

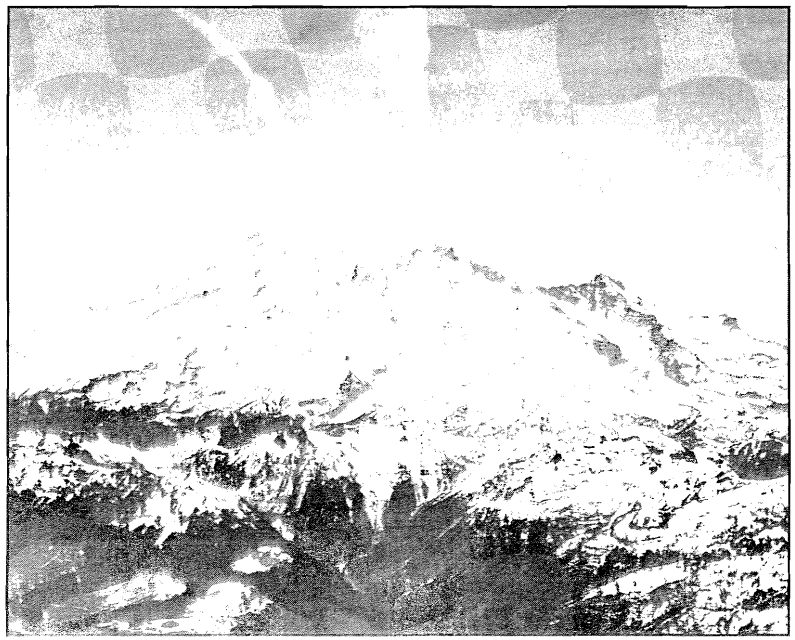
Preface



Map of the United States Territory of Oregon West of the Rocky Mountains, compiled in the Bureau of Topographical Engineers, 1838.

PHYSIOGRAPHICAL SETTING AND HISTORICAL FOCUS

The work of the U.S. Army Corps of Engineers in the Pacific Northwest transpired within a region rich in both natural resources and historical heritage. To facilitate development of these resources, Army Engineers explored and mapped the uncharted wilderness of the Pacific Northwest and devised and constructed various road and waterway improvements. Beginning in the 1890s, the Corps of Engineers had the added responsibility of regulating waterway activities such as bridge building, placement of fishing gear, and filling in waters that might obstruct navigation. These efforts, coupled with the engineering of coastal fortifications, encouraged the economic growth of the northwestern corner of the United States, while providing for its defense.



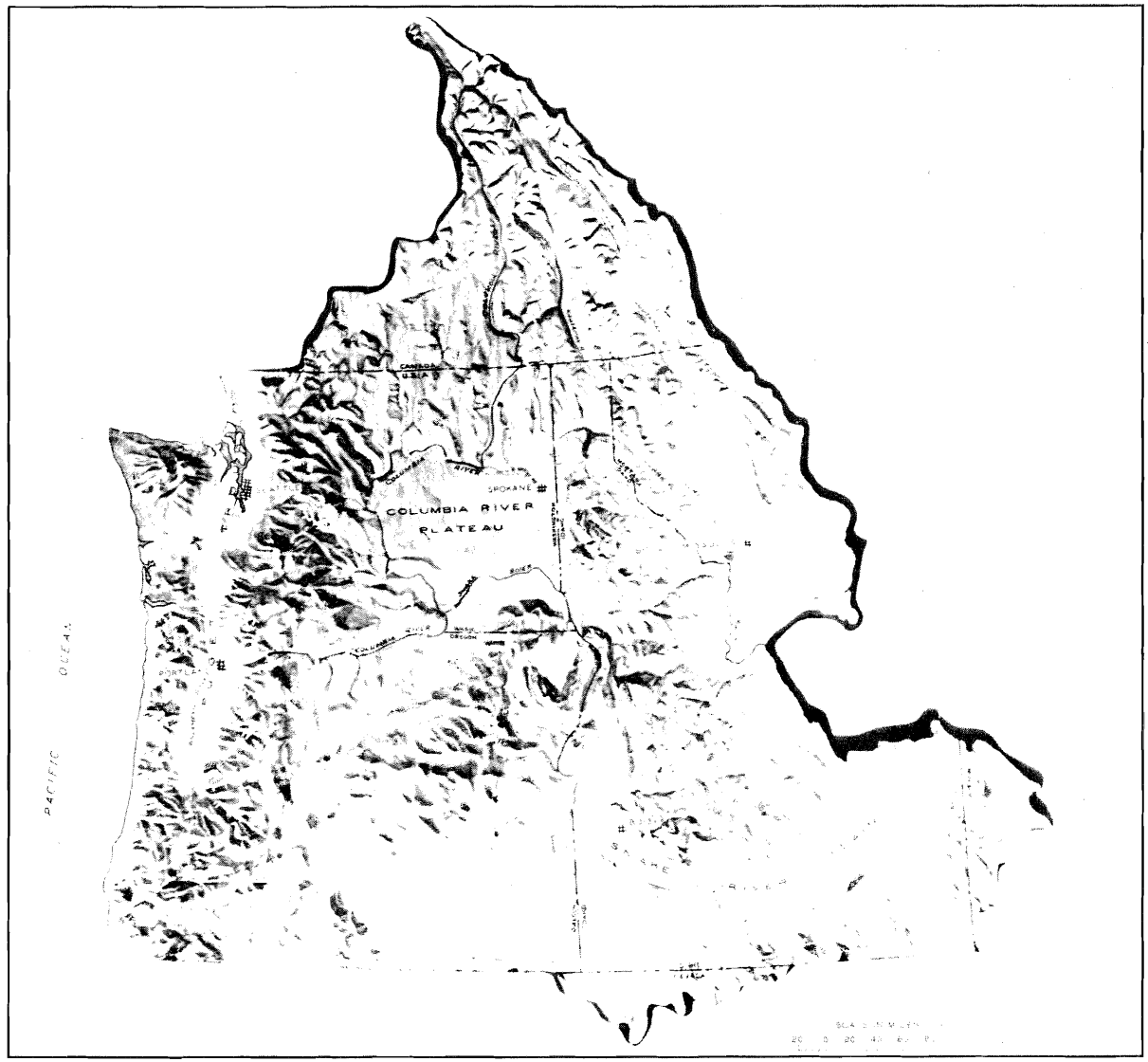
Mount Rainier, 14,411 feet above sea level, in Washington state.

The Corps' mission in the Pacific Northwest mirrored the evolution of its National responsibilities during the 19th century. Created by Congress in 1802, the Corps of Engineers pioneered the application of engineering science and comprehensive planning to Federal public works over the course of the 19th century. In 1824, Congress added waterway improvements to the Corps' traditional military responsibilities. The Corps also engaged in the surveying and exploration of the newly acquired western territories of the United States. In growing recognition of the importance of topographers within the Corps of Engineers, Congress established an independent Corps of Topographical Engineers in 1838. Topographical Engineers conducted mainly internal improvement projects over the next 25 years, especially canal and river and harbor surveys. Prior to the Civil War, Topographical Engineers also carried out numerous exploration, survey, and road building duties throughout the West. In 1863, Congress rejoined the Topographical Engineers to the older Corps of Engineers, which had continued to concentrate on military fortifications and some civil works improvements. In 1871, the newly unified Corps of Engineers established an Engineer Office in Portland, Oregon to execute its expanded waterway improvement mission in the Pacific Northwest. By the 1890s, the increasing work load of the Portland Engineer Office, coupled with a growing appreciation of the vast resources and unique waterway needs of the region north of the Columbia River, lead to further organizational changes. In 1896, the Corps established a separate Engineer Office in Seattle.

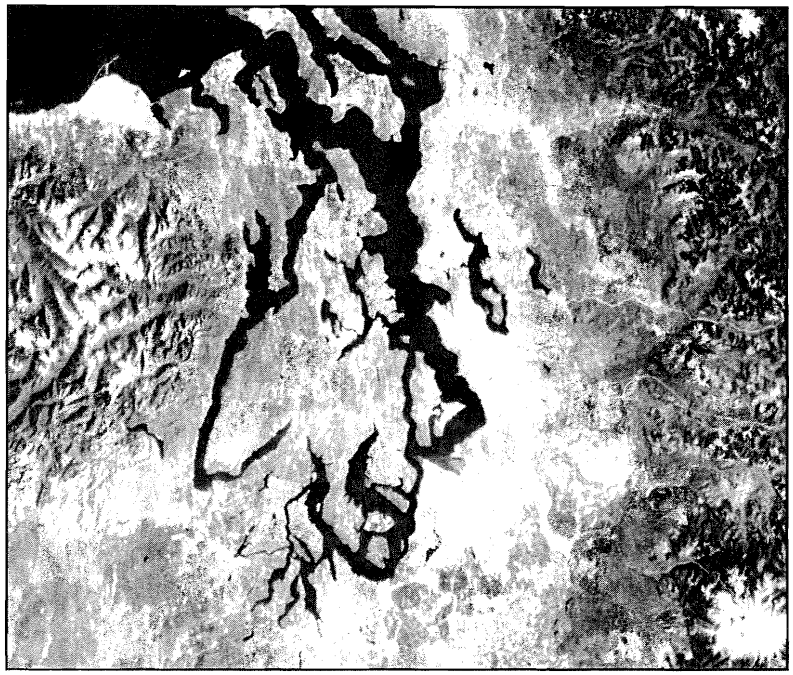
The natural environment of the region for which the Seattle Engineer Office had responsibility contained numerous impressive natural barriers to easy travel and communications. Challenging towering mountain ranges, nearly impenetrable forests, wild rivers, and treeless desert plains, Army Engineers attempted to bring the natural environment under human control.

The Pacific Northwest is a region of several distinct land forms and has a climate influenced by the eastward movement of wet marine air masses from the Pacific Ocean. The region stretches from British Columbia in the north to northern California in the south and from the Pacific Coast east to the Rocky Mountains of Idaho and Montana. A birds-eye view of the Pacific Northwest reveals a general north-south lineation of physical features. From west to east these include: the coastal ranges of Oregon and Washington (stretching from the Olympic Mountains of Washington at the north end to the Klamath Mountains near the Oregon-California border at the south), the Puget-Willamette Valley Trough, the Cascade Mountain Range, the Columbia Plateau (in east-central Washington and north-central Oregon), the Snake River Basin and the mountain ranges forming the western edge of the Rocky Mountains. The most conspicuous feature disrupting this linear arrangement is the extensive Columbia-Snake River system.

The coastal ranges run the length of the Pacific Coast from British Columbia down to northern California, creating a coastline of high cliffs interspersed with scattered beaches, sheltered bays, and a minimal coastal plain. As a result of the coastal terrain, many rivers entering the Pacific Ocean are relatively small streams, unnavigable to most seagoing vessels. Between the northern border of Washington



Major physiographic features of the Columbia-Snake River System.



Landsat satellite view of Puget Sound and environs.

Abundant rainfall combined with ideal soil conditions create a lushly forested country west of the Cascades Mountains.

and the southern border of Oregon, there are only two natural, navigable sea level passages through the Coastal mountains: the Strait of Juan de Fuca leading into Puget Sound, and the Columbia River.

In Washington, two mountain ranges make up the coastal ranges: the Olympic Mountains and the Willapa Hills. The coastal ranges attain their highest point in the Olympic Mountains of northwestern Washington, with Mt. Olympus reaching 7,954 feet. Extensive past glaciation created the rugged nature of the Olympic range. Due to their juxtaposition with the Pacific Ocean, these ranges receive copious amounts of precipitation. Exceeding 200 inches a year in places, rainfall combines with ideal soil conditions to make the country west of the Cascades a forested land. At the turn of the century, an eighth of the nation's standing timber was found in Washington. Ninety percent of this forest — Douglas fir, cedar, spruce, and hemlock — was concentrated in the western part of the State.[1]

The Willapa Hills, located in the southwestern corner of Washington, are low, gently rolling hills dissected by many streams. Two of these, the Chehalis and the Willapa rivers, form Grays Harbor and Willapa Bay, respectively. Although both of these embayments are large in areal extent, neither is of considerable depth; both have problems with shifting sands, making navigation difficult. Winding among shoals, uncertain channels offered early settlers difficult access to limited anchorage space.[2]

Between the coastal ranges to the west and the Cascade Range to the east lies the Puget Trough with its southern extension, the Willamette Valley. They form a long, northward trending depression of rolling and hilly terrain which extends from central Oregon into British Columbia. The northern end of this trough contains the marine embayments known collectively as the Puget Sound. These embayments connect with the Pacific Ocean through the Strait of Juan de Fuca.

Glacial ice completely buried Puget Sound several times during Pleistocene times, leaving it almost entirely covered by glacial debris. As the ice melted, the sea level rose and invaded the lower areas, creating the estuarine system existing today. This system covers an area that changes from 1,016 square miles to 899 square miles as the tide rises and falls. The deepest water in the Puget Sound is over 920 feet, with many passages more than 300 feet deep. The southern end of Puget Sound, with a mean depth of 120 feet, has the shallowest waters. The present land surface in the Puget Lowland is made up generally of low, flat-topped rolling hills and ridges separated by valleys and marine embayments. The land areas generally extend in elevation from 400 to 600 feet, and range in size from islands of less than a square mile to uplands of several hundred square miles. With its ample anchorages, mist-enshrouded islands and surrounding forest, the Sound appeals to both aesthetic and utilitarian sentiments. An 1891 account described the Sound as "the Mediterranean of the western hemisphere ... whose beauty is excelled only by its incalculable utility to the commerce of the world."[3]

From the east and south, a number of fairly large streams traverse the lowlands and enter Puget Sound. These streams cross low gradient flat-floored valleys, a situation causing periodic severe flooding and development of new river channels. Many of these rivers, including the Nooksack, Nisqually, the Puyallup, the Duwamish, the Snohomish, and the Skagit, enter the Sound through a complex system of crooked, shifting channels. Early charts of river mouths were notoriously inaccurate, depending upon whether surveyors visited at high or low tide and could distinguish one stage from the other.[4]

The Cascade Range, extending from British Columbia down to California, forms a formidable barrier between the western and eastern portions of both Oregon and Washington. This mountain range has a strong influence on the climate of both sections. Created by uplift and volcanic action, the Cascades have rugged, steep slopes and a main crest at elevations near 5,000 feet. Some of the higher volcanic peaks include Mt. Rainier (14,411.1 feet), Mt. Adams (12,307 feet), Mt. Baker (10,750 feet), and Mt. Hood (11,240 feet). All of the major rivers that enter the eastern side of Puget Sound rise in the Cascades. The Columbia River originates on the western slopes of the Rocky Mountains and flows to the Pacific Ocean through a deep gorge in the Cascades.

East of the Cascade Range, and lying in its rain shadow, is the high inter-montane Columbia Plateau area and its isolated mountain ranges. This region includes: the channeled scablands, the Palouse Hills and Yakima Folds, the Columbia Plateau, and the Blue-Wallowa Mountains. Successive ancient lava flows formed a plateau almost 4,000 feet thick, covering 200,000 square miles in Oregon, Washington, and Idaho. The plateau is semi-arid and a generally treeless territory. Although many important streams bisect the area, water is a scare and precious commodity.

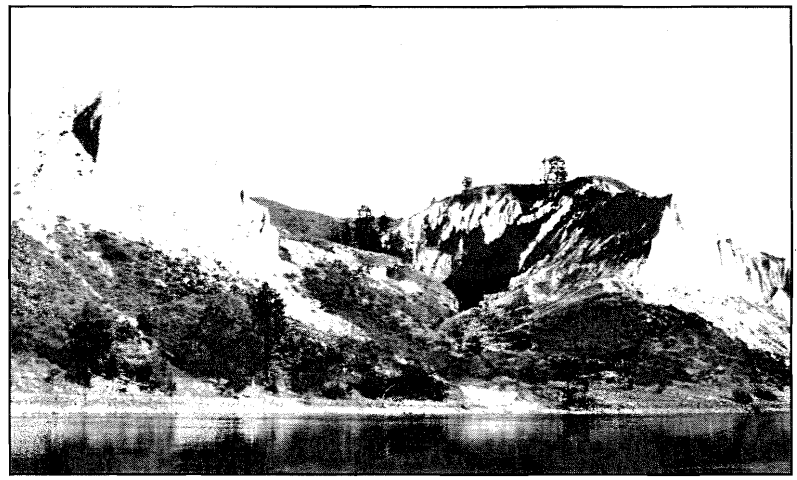
At one time, the channeled scablands of eastern Washington experienced floods of gigantic proportions. These vast floods exposed large, bare tracts of Columbia River basalt and left behind extensive stream channels called coulees. Individual coulees can be several hundred feet deep and as much as five miles wide. They cut the basalt plateau into a maze of inter-coulee buttes, mesas, and plateau tracts, varying in size from less than 40 acres to more than 40 square miles. Despite the great multitude of stream erosional features, the scabland region today has insufficient rainfall to fill most of these channels. The Palouse Hills southeast of the scablands comprise an area of dissected hills with an average relief of 200 to 250 feet. The Snake River flows through the Palouse Hills section and into the Columbia River. The Yakima Folds west of the scablands consists of a series of eastern

trending folded rock ridges that rise as much as 1,700 feet above adjacent troughs or valleys.

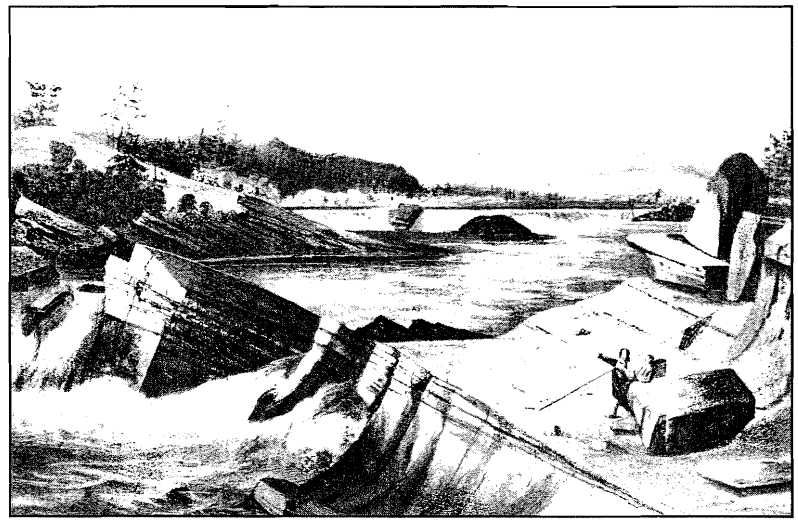
The northern Rocky Mountains dominate the eastern edge of the Columbia Plateau. Northern Idaho and western Montana are covered with numerous ranges of the Rockies and long, narrow river valleys. Elevations range from valleys at the 2,000 foot level to peaks at over 12,000 feet. The Snake River and tributaries flow through the southern portion of the area, while the northern part drains to the Columbia in Canada.

Originating high in mountainous British Columbia, the Columbia River flows 1,200 miles to its union with the sea below Astoria. Including its tributaries, the Columbia drains 250,000 square miles of the interior Pacific Northwest. Until recent times, the unbroken watery ribbon portrayed on generalized maps bore little resemblance to the actual Columbia. Oregon Country settlers, in fact, divided the stream into distinct rivers based upon the famous hazards of the Cascades Rapids and The Dalles, where the Columbia at its most terrifying passed the mountains. The lower river stretched from Astoria to the Cascades, the middle river from there to The Dalles, and all above encompassed the upper Columbia. The latter segment, moreover, contained additional subdivisions. One informed account listed 62 rapids between the Snake and international boundary, of which a dozen were regarded as "Great Rapids" restricting navigation.[5]

Of these fearsome places, the most famous were Priest Rapids and Kettle Falls. The former, 80 miles above the mouth of the Snake, consisted of seven rapids spaced along an 11-mile stretch of river. Here, the Columbia widened and coursed over jagged reefs and partially-exposed rocks. At Kettle Falls, 40 miles south of the Canadian border, the river divided into two channels and swept over a pair of falls with a combined low water drop of 33 feet. The falls formed a noted fishery, where Indians took in excess of a thousand salmon a day during the annual runs. For whites, though, they represented an insurmountable obstacle. Kettle Falls, recorded Captain Thomas Symons, Portland



East of the Cascade Range, the Columbia River winds through parched semi-arid lands.



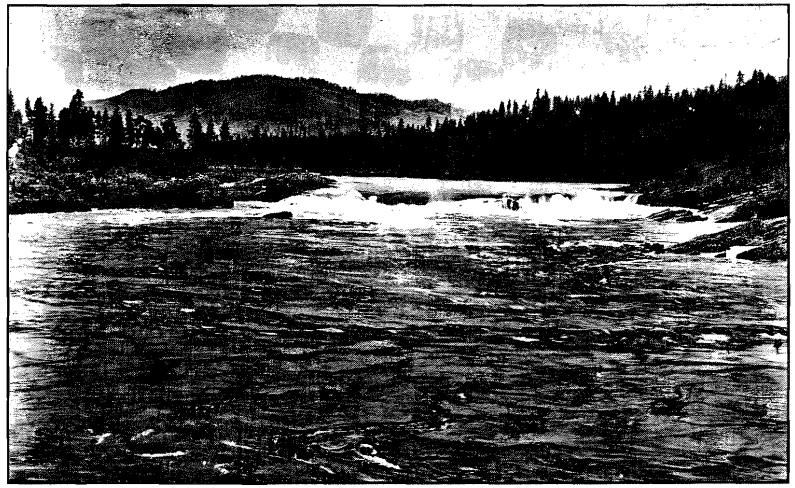
Artist's rendition of Kettle Falls, Columbia River, from Pacific Railroad Survey. Gustav Sohon, artist.

Engineer Officer, in 1893, "is the most complete and absolute bar to navigation at all stages in the river."[6]

On both sides of the Cascades, then, nature offered a challenging setting for human activity. Eastward, rivers periodically blocked by rapids flowed through canyons hundreds of feet below the parched landscape. On the western side, Puget Sound provided what a notable pioneer celebrated as "one vast harbor, safe and secure." The confused tidal maze of its tributaries, however, restricted access to the interior. On the coast, sand bars barricaded or shoals constricted potentially magnificent anchorages. The task of repairing these natural obstacles to transportation and settlement fell to the Army Corps of Engineers.[7]

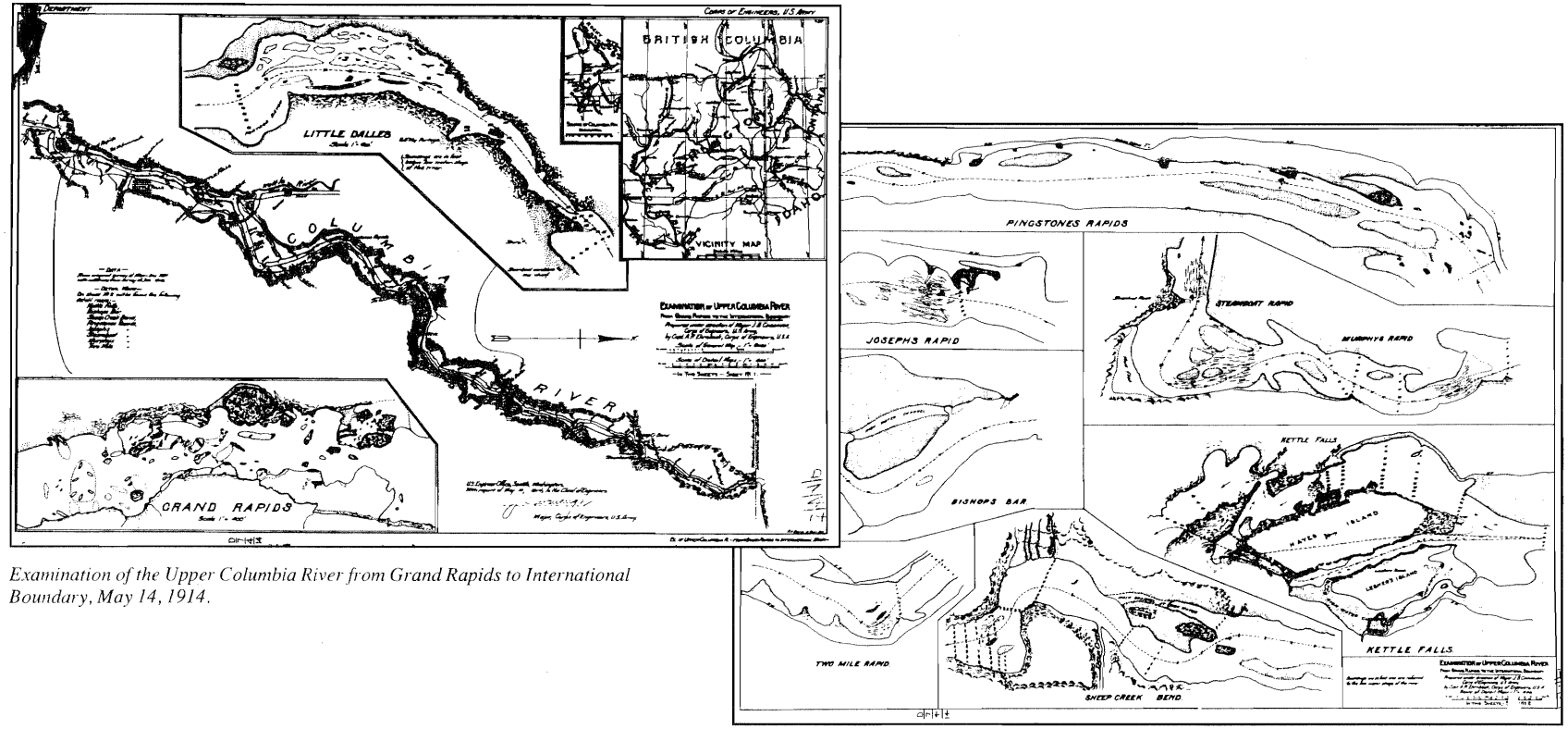
During the 19th century, Army Engineers, under various authorities, accomplished a variety of civil and military work that encouraged the economic growth and development of the far northwestern corner of the United States. Field reconnaissance by Army Engineers and multi-disciplinary teams of civilian scientists helped expand the geographical and scientific knowledge of the Pacific Northwest. Prior to 1920, the Army Engineers designed and built land and water improvements to facilitate transportation of goods and people. They also erected coastal fortifications to protect the Puget Sound area from foreign invasion.

With so much to describe and analyze, balanced coverage must necessarily be selective in its treatment of topics and personalities. This volume is not an encyclopedic account of all Army Engineers and Seattle District activities during the pre-1920 era. Rather, it presents and evaluates the Corps of Engineers' contribution to the growth and development of early Washington. It describes the key engineering and environmental problems the Corps faced and it recounts the technical capabilities and political climate that conditioned the Corps' responses to those problems. Wherever possible, the narrative highlights the personalities involved. This study concludes with 1920; a subsequent volume will carry the Seattle District story to the present.



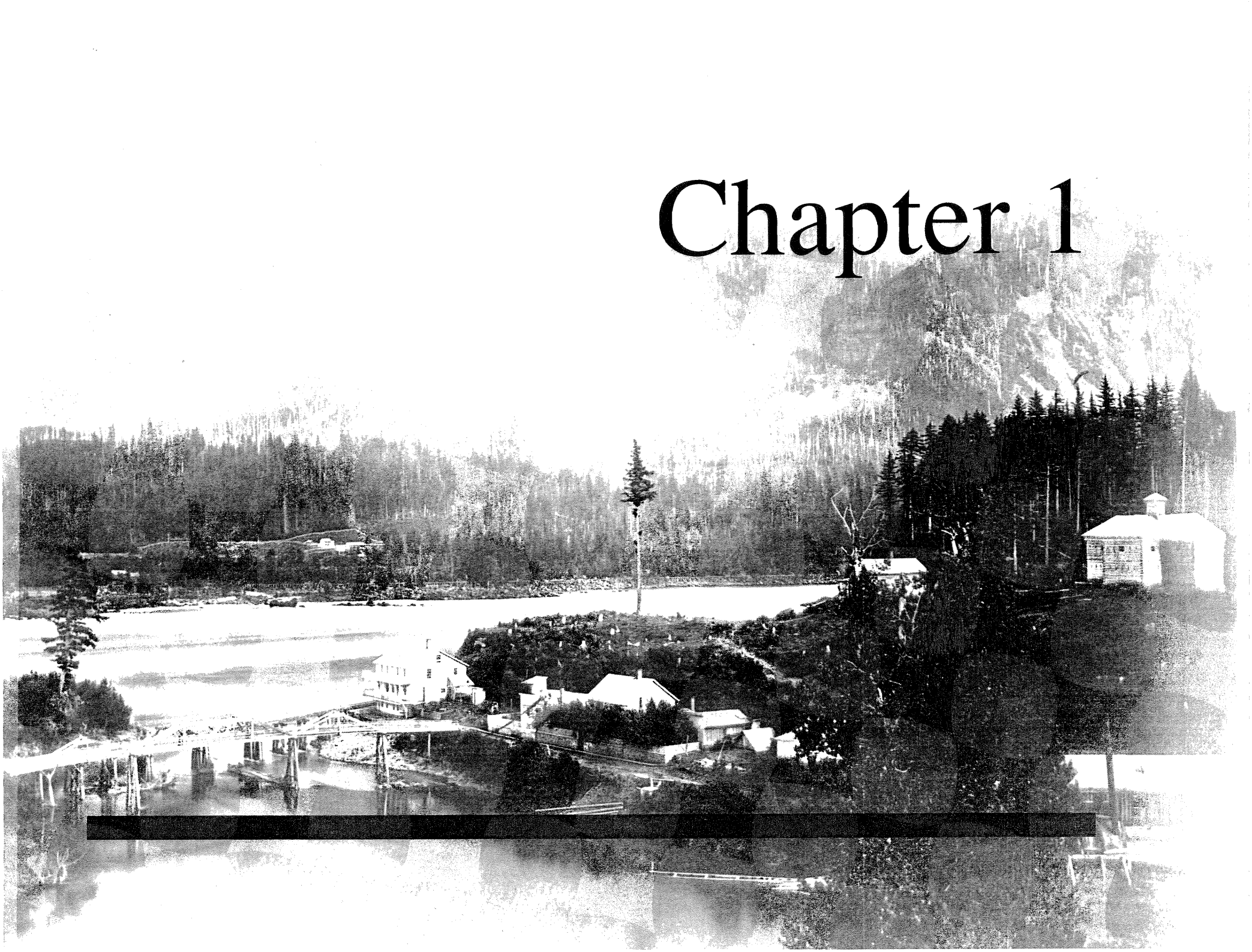
1891 photo of Kettle Falls, Columbia River, surveyed by Captain Thomas Symons, Portland Engineer Officer, who called the falls "...the most complete and absolute bar to navigation at all stages in the river."

The early boundaries of the Seattle District included Alaska, northern Idaho, and northwestern Montana. While the main activities of the Seattle District focused on the waterways of the state of Washington, important work also occurred on the geographic fringes of the District. Alaska developed a close relationship with Seattle during the gold rush of 1898, and the permitting process for fish traps in navigable waters of Alaska required the attention of Seattle District Engineers. The water resource needs of northern Idaho and western Montana also periodically claimed the notice of the Seattle-based Army Engineers. In particular, field reconnaissance and surveys conducted by Seattle District Engineers identified projects to improve navigation on the Pend O'Reille, Kootenai, and Flathead rivers. After 1920, water-power development in the region brought further Seattle District involvement in the outer portions of the Pacific Northwest.



Examination of the Upper Columbia River from Grand Rapids to International Boundary, May 14, 1914.

Chapter 1



EARLY FEDERAL ASSISTANCE

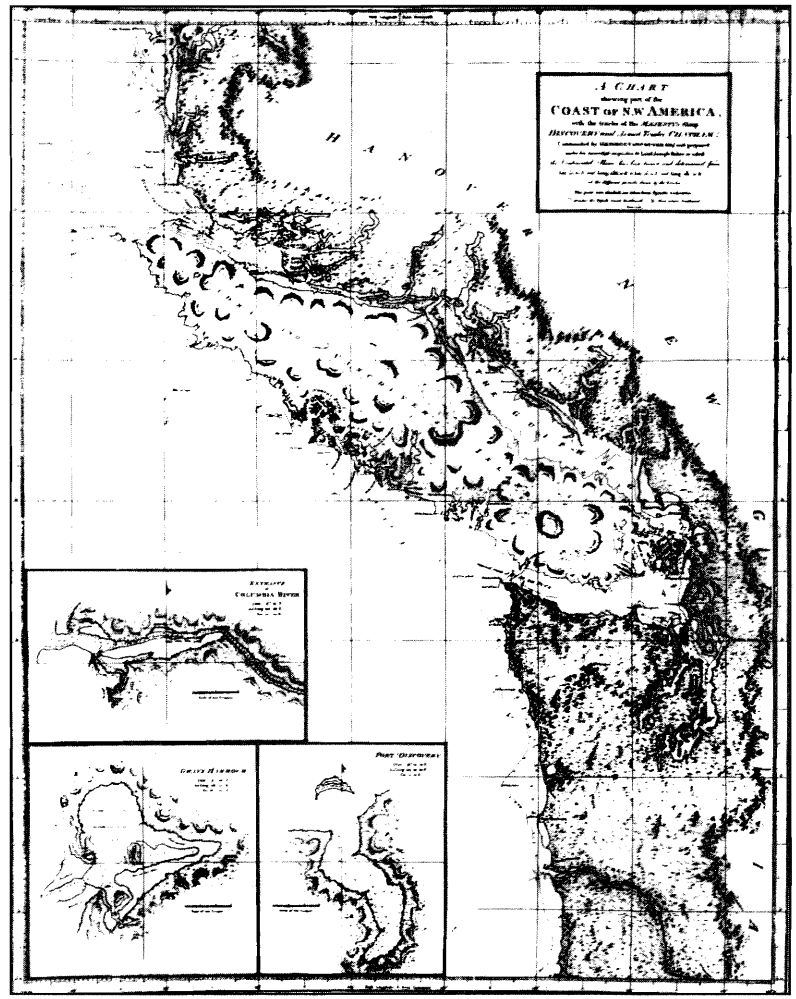
Federal government assistance proved essential to the rapid growth and development of the 19th century Pacific Northwest. Despite the prevalent myth of a West built by rugged individualism alone, Federally sponsored exploration, road building, and waterway improvements for navigation were key aids to opening up the region. The West has always depended on the Federal government to assist in identifying and utilizing its abundant natural resources.

Early Exploration

The British navigator and explorer, Captain George Vancouver, carried out the first major reconnaissance of the Pacific Northwest coastline. In 1792, while enroute to Nootka Sound to negotiate with Spanish representatives the respective rights of Great Britain and Spain in the North Pacific, Vancouver entered the Strait of Juan de Fuca. His crew surveyed all the surrounding waters of Puget Sound and inlets that appeared navigable. Vancouver and his men named the main geographic features they encountered, such as Puget Sound, Discovery Bay, Whidbey Island, Hood Canal, and Bellingham Bay. On 4 June 1792 Vancouver claimed the region for Great Britain.[1]

Vancouver was not alone in his exploration of Pacific Northwest waters. The American Captain Robert Gray had successfully traded at Nootka and China and claimed the honor of the first American to circumnavigate the globe (1787-90). Gray's second voyage to the Pacific Northwest was even more momentous. Commanding the *Columbia Rediviva*, Gray discovered and investigated Grays Harbor before turning south in search of the great river noted earlier by Spanish explorers. On 11 May 1792, Gray's ship became the first vessel to cross the treacherous bar at the mouth of a large river of fresh water. He then named the river Columbia, after his ship. Gray's discovery served to

opposite: Early photo of Fort Lugenbeal, Columbia River.



"A Chart Showing Part of the Coast of N.W. America with the Tracks of His Majesty's Sloop Discovery *and Armed Tender* Catham *Commanded by George Vancouver, Esq."*

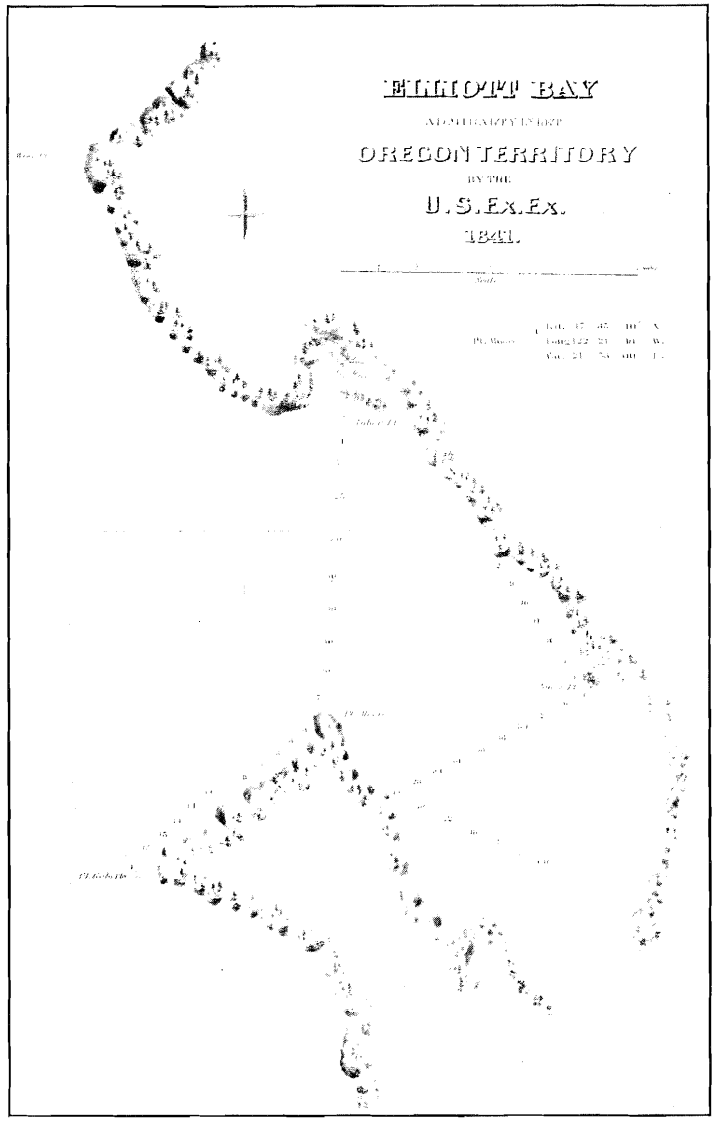
establish an American claim to the Pacific Northwest. Following Gray's brief reconnaissance, Americans retained a keen interest in the far distant Northwest coast. Over the next half century, numerous Americans trekked overland to explore the region.[2]

The passage west in 1804-1806 by Meriwether Lewis and William Clark, under the auspices of President Thomas Jefferson, secured the United States claim to the Pacific Northwest. Following up Captain Robert Gray's earlier discoveries on the Northwest coast, the two explorers left St. Louis in May 1804 and went up the Missouri River to its source, crossed the Main Divide of the Rocky Mountains, and descended the Columbia River to its entrance on the Pacific Ocean. After a dreary winter at their campsite south of the Columbia River, Lewis and Clark returned overland to St. Louis, arriving in September 1806. The expedition, one of the great 19th century "voyages of discovery," added greatly to the scientific knowledge of the interior North America and strengthened American claims to the Pacific Northwest.[3]

Between 1811 and 1846, activities by American fur traders, such as John Jacob Astor, government explorers, including Captain Benjamin Bonneville and Lieutenant John Fremont, and the U.S. Exploration Expedition under the command of Charles Wilkes provided detailed geographical and scientific knowledge of the region and reinforced American claims to the entire Northwest.[4]

Establishment of the Territorial Government

In 1818 England and the United States signed a treaty of "Joint Occupation," in which they agreed that both countries could trade and settle in the Oregon country for a period of ten years. This arrangement, renewed in 1827 for another 20 years, stemmed from the inability to agree on a boundary line west of the Rocky Mountains. While the treaty postponed setting the boundary, Dr. John McLoughlin, the Hudson's Bay Company factor in charge of the Oregon country, dominated the region for two decades. McLoughlin hoped that by diverting the



1841 map of Elliott Bay, today ringed by the city of Seattle.

increasing flow of Americans to south of the Columbia River he could at least hold the region north and west of the river for Great Britain, even if the United States should get the present-day State of Oregon.[5]

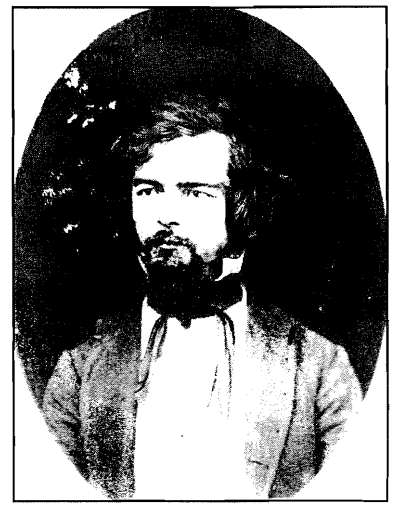
Under McLoughlin, Hudson's Bay Company headquarters at Fort Vancouver controlled the political, economic, and social life of the region. However, American missionaries and farmers began to flow into the region during the 1830s and early 1840s. These Americans wanted schools, roads, security, and a court system to regulate trade and land transactions. By 1843 the sentiment in favor of setting up some kind of formal government had reached the point of public meetings and the formation of a provisional local government. In that same year, the Hudson's Bay Company, seeing its influence wane, moved its headquarters north to Vancouver Island and found it expedient to join the provisional government. The American settlers had become so numerous south of the Columbia River that the Company needed an effective means of making them pay their debts and respect the land claims of the Hudson's Bay Company. In 1844 two groups of Americans defied McLoughlin and attempted to settle on Puget Sound. When the Legislature of the Oregon Provisional Government met in August 1845, it established Vancouver County in the land north of the Columbia.[6]

In 1846 Britain and the United States resolved the controversy over the boundary line dividing their respective portions of the Oregon country. They agreed to the 49th parallel as the boundary between western Canada and the United States. On 13 August 1848 Congress admitted Oregon as a territory, with Oregon City as the seat of government.

The flow of settlers north of the Columbia that began in 1844 resulted in the nucleus of a settlement at the south end of Puget Sound named Olympia. Growth proceeded slowly at first; in 1849 a census counted only 304 white people north of the Columbia. Census takers the following year, however, found 1,049 inhabitants. Villages soon emerged on the harbors and at river mouths around Puget Sound. These included Fort Steilacoom, Port Townsend, Tacoma, and Seattle. By 1851 the settlers scattered around Puget Sound felt the need for a government separate from that of the Territory of Oregon. Oregon Territory was too far away and too large for its government to give the northern section adequate attention.[7]

Inhabitants of northern Oregon called a convention at Monticello near the mouth of the Cowlitz River in August 1852. This assembly of settlers petitioned Congress to create a new territory called Columbia. Oregonians south of the Columbia River supported the request. The reduced size of Oregon would enhance its chance of becoming a state, since Oregon would then be smaller than the largest existing state. Congress quickly agreed, but changed the name of the new territory to avoid confusion with the District of Columbia and to honor George Washington. The territory began functioning in March 1853, embracing the land between the forty-sixth parallel and the Columbia River and stretching from the Pacific Ocean to the crest of the Rockies.[8]

Major Isaac I. Stevens became the first Governor of Washington Territory. President Franklin Pierce also appointed him Superintendent of Indian Affairs for the territory, and surveyor of the proposed northern transcontinental railroad route. Stevens had resigned from the Army as Chief Assistant in the U.S. Survey Office at the age of 35 to accept these assignments. The young, ambitious ex-army officer had graduated from West Point at the head of his class in 1839 and served with distinction in the Mexican War.[9]



Isaac Stevens, first Governor of Washington Territories.

Indian Relations

When Isaac Stevens arrived in Washington Territory in November 1853, he recognized that volatile Indian-white relations would make his responsibilities as Superintendent of Indian Affairs difficult to fulfill. Stevens was, nevertheless, determined to drive the scattered bands onto reservations and thus open the new territory to settlers and railroad builders. In his inaugural address to the first Territorial Legislature, Stevens noted that although Congress had provided an incentive to pioneer settlement with the Oregon Donation Land Claim Act of 1850, in fact no public domain existed from which homesteads could be legally carved. Once the government had extinguished Indian title to the vast reaches of Washington Territory, the land surveys could proceed, paving the way for orderly settlement and economic development.[10]

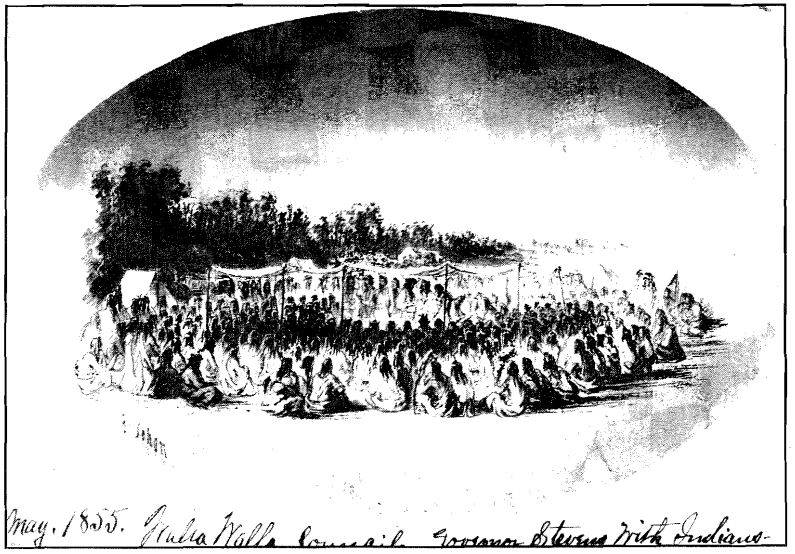
During the summer of 1854 Stevens returned to the nation's capital, successfully lobbying Congress for funds to cover the deficits incurred during the railroad survey and to conduct Indian treaty councils in Washington Territory. Stevens returned west in the fall with instructions from the Indian Bureau to keep the number of treaties and reservations to a minimum. To extinguish Indian title to the land encompassed by Washington Territory, Stevens planned to meet first with the Puget Sound and Western Washington Indians during the winter of 1854-55 and then to deal with the tribes to the east. Because of the many language differences among the tribes, Stevens, like traders and missionaries before him, relied on the imprecise hybrid Chinook jargon that proved insufficient for the complexities of diplomacy.[11]

Stevens summoned the tribes and bands of southern Puget Sound to a council at Medicine Creek near the mouth of the Nisqually River on the day before Christmas in 1854. After three days, the Nisqually and Puyallup Indians ceded 2.5 million acres, keeping 3,840 for their own use and the right of taking fish at all usual and accustomed grounds and stations. The treaty negotiations were fraught with problems. The Chinook jargon handicapped treaty negotiations. Treaty terms were translated into Chinook jargon and then reinterpreted into the various tribal tongues. The parties then reversed the process as the Indians' words were retranslated into English. However uncertain the means of communication, Stevens' goal remained clear. The Indians would surrender their traditional lands in exchange for land on reservations selected by the Federal government. The treaty, however, allowed the Indians to retain customary fishing grounds and methods.[12]

The Point Elliot Council followed for the tribes on the east side of Admiralty Inlet in January 1855. Chief Seattle of the Duwamish, and other chiefs of the Snoqualmie, Skagit, and Lummi Clans, signed a treaty with Stevens after only one day. Soon thereafter, on 25 January 1855, the governor met with 1,200 Clallum, Chimakum, and Twana Indians at Port Gamble, also known as the Point No Point Council. Stevens overcame Indian resistance to selling their lands and wrapped up a treaty after only a few days of negotiations.[13]

Hoping to complete his treaty efforts in Western Washington, Stevens summoned most other Indian leaders from the Olympic Peninsula and north of the Columbia River to a council set for 25 February 1855 on the Chehalis River near Grays Harbor. Stevens could not successfully complete negotiations with the Chinook, Lower and Upper Chehalis, Quinault, and other southwest tribes. The qualms first expressed at Point No Point began to harden into obstinate refusal to submit to the governor's demands that they leave their homelands. Thinking he had more important tribes to attend east of the Cascades, Stevens turned his attention there.[14]

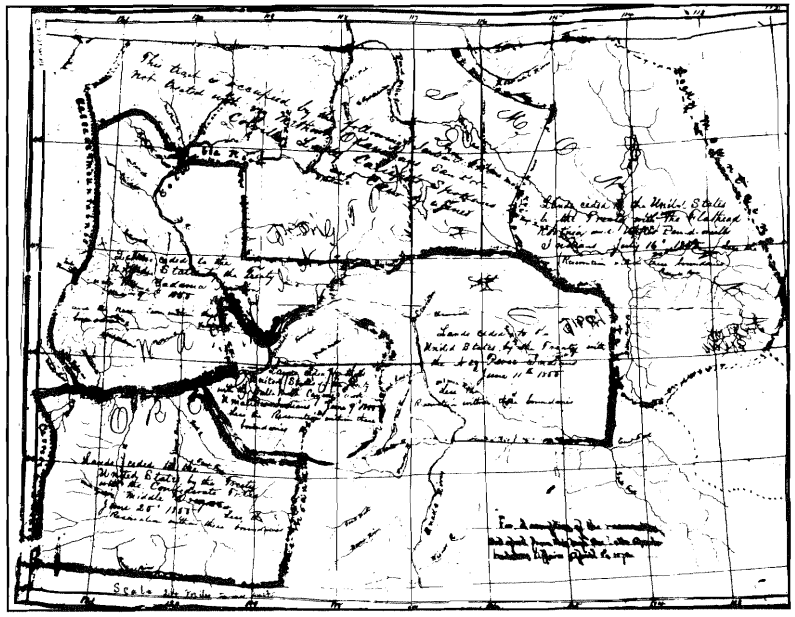
On 21 May 1855 Stevens, Oregon Indian Superintendent Joel Palmer, and 47 dragoons met with the Nez Perce, Yakima, Cayuse, Walla Walla, and Palouse Indians in what is known as the Walla Walla Council. Stevens and Palmer declared that Indian-White proximity had precipitated conflicts and urged the Indians to accept separate reservations before they were overwhelmed by the increasing number of settlers. Indians strongly resisted, but tribal rivalries played into Stevens plans. Stevens, choosing the locations of the reservations, left the Nez Perce and Yakimas, the most powerful tribes, on their own land. When



Artist's rendition of Walla Walla Council, May 1855, one of several meetings with Indian tribes of the Pacific Northwest, convened by territorial Governor Isaac Stevens to establish

Looking Glass, 70-year old war chief of the Lower Nez Perce, would not negotiate, Stevens simply appointed Lawyer, chief of the Upper Nez Perce and a Christian convert, as spokesman for all the Nez Perce.[15]

Under the treaty finally signed 11 June 1855 the Indians yielded title to 45,000 square miles and agreed to go onto reservations in exchange for cash, subsidies in goods, and training and medical services. The chiefs were provided houses and gardens. Stevens promised all would keep their lands until "our chief the President and his council sees this paper and says it is good, and we build the houses (for the chiefs), the mills, and the blacksmith shop." On 16 June, Stevens and his party headed to the northeast, intending to negotiate additional treaties with the Spokanes, Coeur d'Alenes, Pend d'Oreilles, and even with the Flatheads and Blackfeet on the upper Missouri. Although the Walla Walla Treaties had not yet been ratified, and would not be for four years,



Lands ceded to the United States by treaty with Indian tribes, 1855.

Stevens hastily requested newspapers to announce that his treaty now opened for settlement all ceded lands not set aside for reservations.[16]

During the summer and fall of 1855 roving bands of disgruntled Indians attacked white settlers around the Puget Sound. The Army sent in reinforcements to help pacify the hostile Indians. At the same time, a mining rush on the Columbia River near the Canadian border brought swarms of prospectors onto Indian lands east of the Cascades. Resulting hostilities, known as the Yakima War, went badly for the Army. On 6 October 1855 at the edge of the Yakima Valley, over 500 Indians surprised and routed an equally sized force of Army regulars and volunteers commanded by Major Granville O. Haller. Inconclusive skirmishing continued into 1856.[17]

General John Wool, U.S. Army

Although Indians briefly assaulted Seattle in early 1856, most of the fighting took place east of the Cascades. Efforts to end these hostilities, the so called Yakima War, at a second Walla Walla Council in September 1856, failed. Over the next two years, the Army established a strong presence at forts The Dalles, Walla Walla, and Simcoe and sent several expeditions against the Indians, breaking their resistance. With conflict at an end, Congress, in 1859, ratified Stevens' long delayed treaties. Throughout the fighting with the Indians, the white settlers, encouraged by Governor Stevens, complained that the Army, under General John Wool, failed to aggressively suppress the Indians. General Wool, for his part, concluded that greedy white settlers, goldseekers, and a grandstanding governor were more to blame than the Indians for the trouble.[18]

The Pacific Railroad Survey

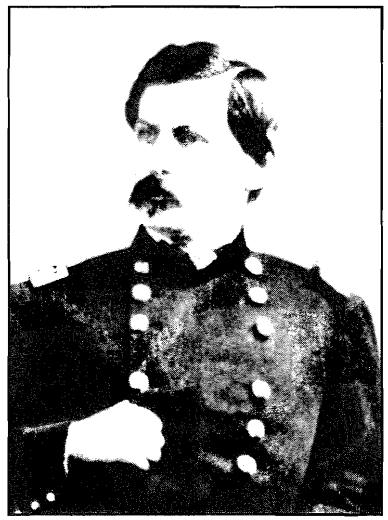
For the few thousand settlers living on Puget Sound in the early 1850's, the absence of roads was a galling hardship and a definitive bar to progress. Travel to the Columbia River required a hike or horseback ride from Olympia to the upper Cowlitz River, where a canoe could be engaged for downstream passage. Journeys on the Sound itself were limited to Indian canoes, a method requiring the exposure of life and fortune to the vagaries of weather and the supposed untrustworthiness of native paddlers. Pressure for transportation improvements combined with isolation from the center of political affairs in the Willamette Valley had fueled the drive to create Washington Territory in 1853.[19]

In that year, the regional demand for roads became temporarily subsumed within a larger federal enterprise. After much political controversy, Congress authorized the War Department to find the best route for a transcontinental railroad by examining all feasible corridors. To accomplish this task, the War Department created a new agency, the Office of Pacific Railroad Explorations and Survey. Under Engineer Officer Captain A. A. Humphreys, the office mounted four surveys from the Mississippi to the Pacific. Isaac Stevens conducted the northernmost examination. As a political ally of Senator Stephen Douglas — an ardent supporter of a northern railroad route — and as the new Governor of Washington Territory, Stevens was predisposed to report favorably on the northern route.

After intense lobbying by the scientific community, the Secretary of War transformed the surveys into a broadbased scientific reconnaissance. The exploring parties represented an early example of multi-disciplinary teams of civilian scientists, Army engineers, and military escorts designed to provide basic scientific information about the geography and resources of the American West. The northern expedition of Isaac Stevens comprised the most elaborate of the Pacific Railroad survey teams, consisting of 240 soldiers, scientists, and civilian helpers. Jumping off from St. Paul, the governor's expedition marched westward to the Rocky Mountains. The location of passes across these and the Cascades beyond, all informed persons agreed, was crucial to the success of the entire undertaking. "The practicable passes in these ranges," wrote Stevens, "determine generally the intermediate region to be traversed and the general route of the Rail-Road."[20]

As the best routes across the Rockies had been known since the era of the Missouri fur trade, the vital question rested on the unknown snowy passages of the Cascades. To search out these crossings, Stevens organized a subsidiary exploration under the command of Captain George B. McClellan of the Corps of Engineers, to start from the western end of the line. McClellan had the additional assignment of opening a military wagon road from Fort Walla Walla over the mountains to Steilacoom on Puget Sound. Providing a direct route to the

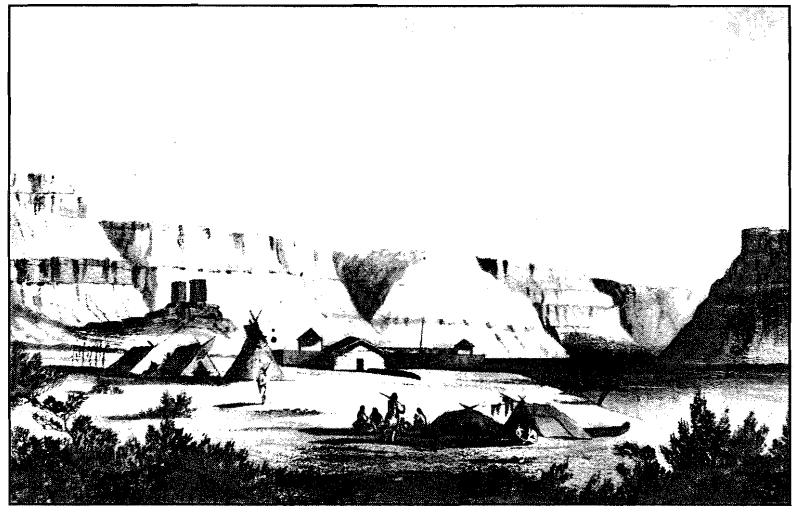
Sound, the road would stimulate settlement by diverting migrants from the mainline of the Oregon Trail.[21]



Major George B. McClellan, Corps of Engineers

Arriving at Fort Vancouver on the Columbia in June 1853, Captain McClellan set to work on his dual responsibilities. Determining from available intelligence that Naches Pass, on the headwaters of a tributary of the Yakima River, provided the most convenient mountain crossing, McClellan engaged a contractor to blaze the wagon road across the Cascades. Over the summer and fall, the Captain himself leisurely explored the eastern slopes of the mountains as the head of a party of soldiers and civilian scientists. When winter arrived, McClellan still had not crossed the Cascades. Again and again he approached prospective passes, only to retreat at the first sign of snow. Exhibiting the same over-cautious attitude that would later cost him Civil War victories, McClellan refused to test the snows in Snoqualmie Pass which were not as deep as generally thought. McClellan's hesitancy significantly weakened Steven's argument for a northern railroad, since it could only be built if practicable places existed to cross the Cascades.[22]

Meanwhile, Governor Stevens arrived with his main party in the Columbia Basin. During his time east of the Cascades, Stevens developed a new perspective on that region of superficial unattraction. Rather than the barren desert of popular imagination, the great plain of the Columbia River became in his mind the destined seat of a prosperous American civilization. The numerous rivers in the eastern reaches of the



Artist's rendition of Old Fort Walla Walla. Among Major McClellan's assignments from Governor Stevens was to open a military wagon road from Fort Walla Walla over the Cascades to Fort Steilacoom on Puget Sound.

basin, observed Stevens, offered particular attraction, "facilitating the progress of settlements, and rendering the whole at once available to the agriculturist." Even tracts directly along the Columbia, while of inferior quality, encompassed "farming land enough to make practicable the occupation of the whole country by stock raisers and wool growers." By opening up real possibilities for settlement of the region, Stevens made his most positive contribution to Northwest history.[23]

At last, after months of hard journey, Stevens reached the territorial capital of Olympia in late 1853. His report on the northern railroad route, prepared over the winter, made a poor impression when submitted to the War Department. Many readers in that office, aware of the Governor's political ambitions, distrusted his conclusions about the practicality and cost of the road. Secretary of War Jefferson Davis, a well-placed advocate of a southern transcontinental line, sharply inflated the funding estimates and passed on to Congress a negative recommendation. Despite the failure of Stevens' railroad proposal, his multi-disciplinary

survey team accumulated an enormous amount of valuable information about the region. McClellan's wagon track over Naches Pass provided a usable route for emigrants crossing the mountains. More substantial roads of military origin followed upon this initial work.[24]

Soon after the arrival of the first troops in May 1849, the Army asserted a vital Federal presence on the Pacific Northwest frontier. It established forts at the strategic locations of Vancouver, The Dalles, and Steilacoom and stimulated local economies through the purchase of supplies and employment of labor. The need to facilitate movement of men and supplies between the army forts became an early and obvious requirement. Roads, of course, would also meet the demands of settlers for transportation improvements. Congress, attuned to the civil implications, in 1853 and 1855 authorized construction of military roads in the territories of Oregon and Washington. To carry out these and other West Coast projects, the War Department created a Pacific Military Wagon Road Office in San Francisco under Major Hartman Bache, a veteran engineer officer. Lieutenant George Horatio Derby, in turn, was assigned to supervise work in the Northwest.[25]

Fort Vancouver to Fort The Dalles

North of the Columbia River, Congress authorized roads connecting Vancouver with The Dalles to the east and Steilacoom to the north. The Dalles connection was of major importance in view of the outbreak of Indian warfare in late 1855, and Derby looked first to that route. Although under War Department orders to blaze a road for the entire distance along the Columbia's northern bank, the Lieutenant found this an impossible task. The existing crude trail passed through swampy terrain, was blocked by at least one massive canyon and could be improved only at a cost far in excess of available funds. Derby could determine, moreover, no reason for going to such trouble and expense.[26]

Regular steamboat service, Derby found, already existed between Vancouver and the Cascades of the Columbia River and from that point to The Dalles. Although a series of rapids blocked navigation at the Cascades, a privately operated tramway enabled transshipment between the lower and upper boat landings. The Lieutenant proposed to limit construction to this segment. "Good steamboat navigation from Vancouver to the Cascades," he reported, "a good road across the Portage, and a continuation of steamboat navigation thence to The Dalles, certainly fulfill all the conditions of a Military Road ... and is moreover the only practicable route." Expensive planking was needed because of the "tenacious mud" churned up during the rainy season, but only modest additions to the existing appropriation were required.[27]

Upon approval of his plan, Derby set to work in the early spring of 1856. The aftermath of an Indian attack at the Cascades of the Columbia, however, impeded progress. The Irish workmen, noted Derby, "grumble at being compelled to do guard duty, ... and think they should receive higher pay as a compensation for the danger and nightly toil to which they are exposed." Only the willingness of the steamboat company to deny downstream passage to Portland prevented wholesale desertion. Repeated entreaties resulted in assignment of soldiers to protect the workmen and construction finally commenced in earnest. By fall, a serviceable wagon road — albeit without the recommended planking — linked the steamer landings.[28]

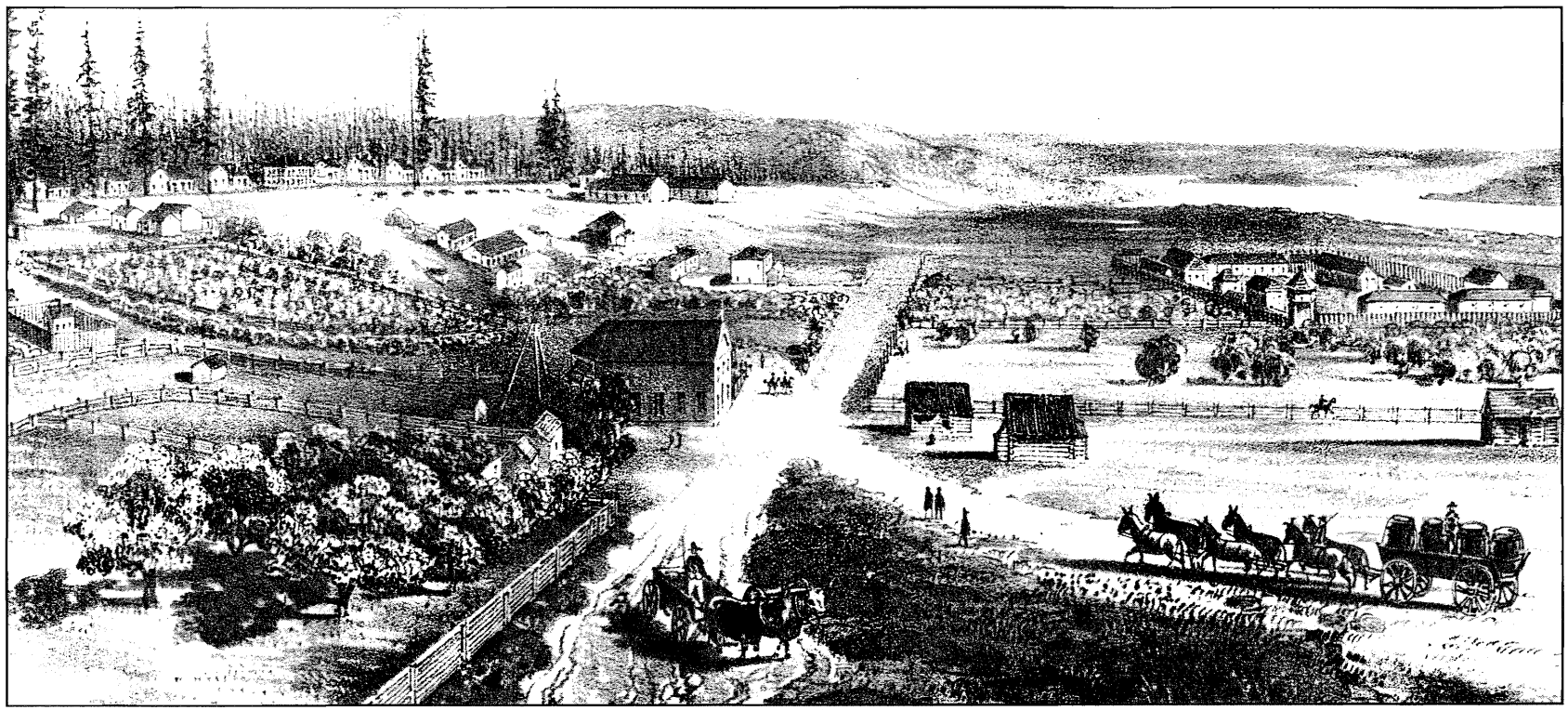
Fort Vancouver to Fort Steilacoom

While Lieutenant Derby devoted his personal time to the portage road at the Cascades of the Columbia, work also began on the Vancouver-Steilacoom linkage. In the fall of 1855, George Gibbs, a frontier jack-of-all-government trades who previously served as a scientist with the McClellan expedition and as an adviser to Isaac Stevens in the conclusion of Indian treaties, surveyed the route via the traditional Cowlitz passage. Relying on Gibbs and other informants, Derby concluded that steamboat travel downstream from Vancouver to Monticello at the mouth of the Cowlitz was cheaper and more convenient than land transit. Along the Cowlitz itself, settlers had

recently built a wagon track. Moreover, at the Puget Sound end of the road, local interests had connected Olympia with Steilacoom. This left the section north of the Cowlitz landing as the focal point of consideration.[29]

The Fort Steilacoom route presented numerous obstacles. For instance, tributaries of the Chehalis River flowed across this murky region, frequently inundating the surrounding lowland. Corduroyed roads connecting with causeways and bridges were required for year-round movement of freight and passengers. Derby therefore recommended that the initial construction effort deal with the stretch between the Cowlitz and Olympia, "as that portion ... is evidently the most important." As in The Dalles project, Derby was forced by local conditions to ignore departmental orders that a road be opened over the entire route.[30]

Although the recommendation received endorsement, much confusion developed before work got underway. Low bids submitted for the road and a bridge over the Newaukum River greatly exceeded available funds, and Derby therefore rejected them. To the self-confessed "mortification" of Lieutenant Derby, moreover, a reexamination in the



Artist's rendition of Fort Vancouver, ca. 1880, on the Columbia River, at present-day Vancouver, Washington.

spring of 1856 revealed that a different route was superior to that proposed in the initial survey. News that a switch to the new line was pending sparked, as Derby reported, "considerable excitement" among rival advocates hopeful of benefiting from location of the road adjacent to their properties. Eventually, the government let a contract to an association of residents along the route discovered in 1856. Enabled by local subsidies to submit a bid below the appropriation, this group completed the project by the end of 1857.[31]

Efforts began in that year to construct a secure road over the 30 miles between Cowlitz landing and Monticello. High water frequently rendered canoe navigation hazardous and washed out the existing settler-built track. The resultant excessive freight charges retarded commerce, while movement of troops was often impeded. To remedy matters, Lieutenant George H. Mendell, who succeeded Derby in the fall of 1856, called for construction of a military road on high ground west of the river. With funds left from the original appropriation and small additional increments, Army Engineers supervised completion of this segment of the Vancouver-Steilacoom route in stages between 1858 and 1861.[32]

Fort Steilacoom to Bellingham

While work on the other military wagon roads proceeded, Congress authorized an extension of the road to Bellingham Bay on northern Puget Sound. Among several generally ineffective actions taken to counter incursions by warlike Indians from British and Russian America, a military post had been established on the bay. The Army Engineers dispatched a civilian engineer to survey an overland route to the fort from Steilacoom in the summer of 1857. While the survey report was under consideration, Bellingham Bay's importance mounted in dramatic fashion. In early 1858, discovery of gold on the Fraser River in British Columbia set off a frenzy reminiscent of Forty-Nine in California. Thousands of expectant miners entered the gold country through

Bellingham, where ramshackle communities of tents and scrapwood shanties lined the bayshore.[33]

Reflecting on the difficulties of construction in terrain covered by heavy timber, Lieutenant Mendell concluded that the money appropriated by Congress was insufficient. He therefore determined to expend his funds upon the most vital sections. A territorial road had been built from Steilacoom to the Puyallup River to facilitate troop movements in the Indian campaigns of 1855 and 1856. This road could easily be extended on north to Seattle. At the other end of the route, Fort Bellingham had to be connected with the waterfront settlement of Whatcom, the principal landing on the bay.

As for the country between Seattle and Bellingham, lack of settlers, Indian hostility, and dense forest persuasively argued against construction. "Were a road of low standard to be made over this interval," observed Mendell, "it is safe to say, that a wagon would not pass over it for years." Through disuse, the route would soon be blocked at numerous points by fallen timber" and become but a trail." As a result, much of the money expended would be wasted in an unnecessary undertaking.[34]

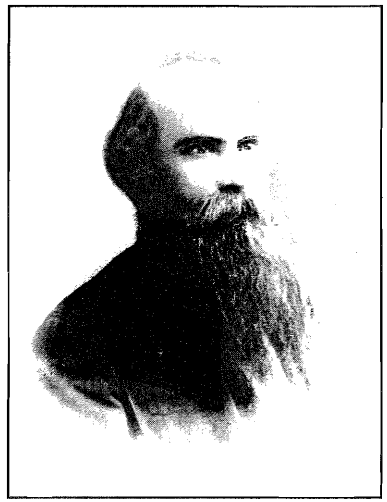
Acting upon these observations, Mendell let contracts in mid-1858 for the Fort Bellingham-Whatcom and Puyallup-Seattle segments. Unfortunately, prices were inflated by effects of the gold rush.

Contractors had completed the northern road and much of the southern by the time the War Department, reacting to Mendell's violation of instructions and to the cost, nullified the agreements. Mendell then devoted remaining funds to opening a trail between Seattle and Bellingham suitable for pack animals. Completion of this track during 1859 opened a land connection, albeit one seldom used beyond Seattle, along the entire eastern shore of Puget Sound.[35]

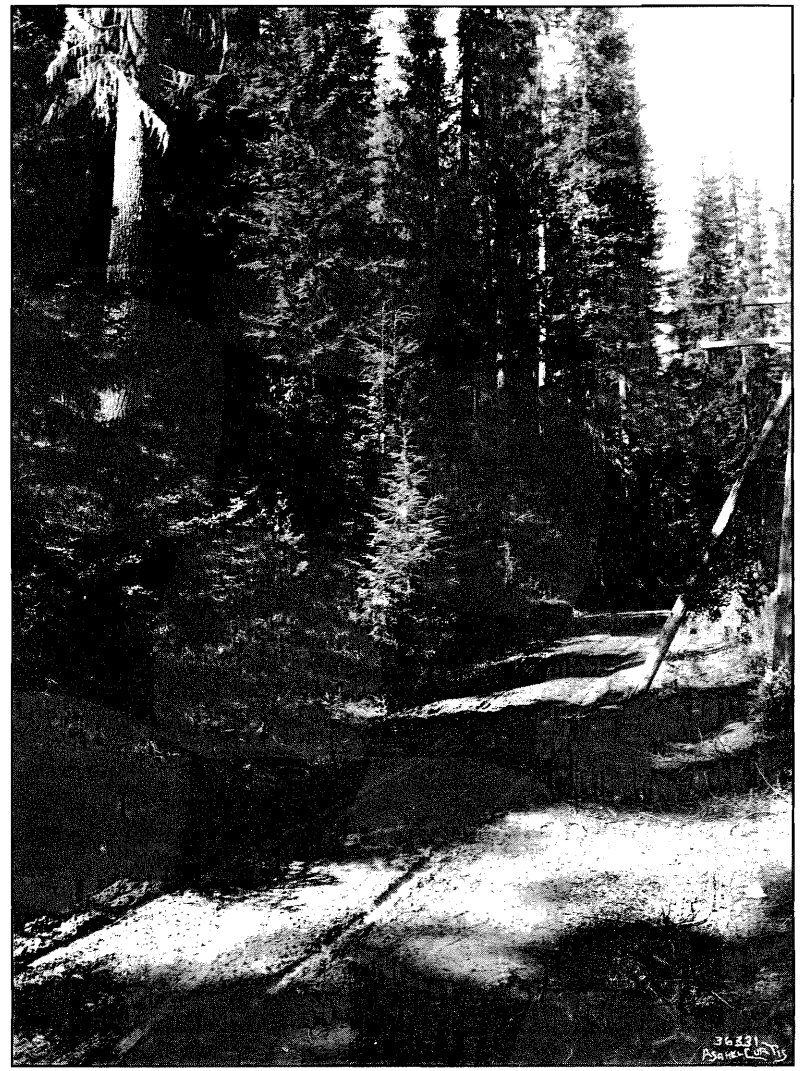
These mainline routes linking Vancouver with the Sound and with The Dalles responded to the needs of the military and the demands of transportation-poor settlers. The continuing logic of these twin imperatives sustained appeals for additional projects in the late 1850's. "There are other roads," reported Captain George Thom, successor to Hartman Bache in San Francisco, "which are highly essential to the interests of Washington Territory in opening up land communication between its different sections." But Congress, its attention diverted by the sectional conflicts leading to the Civil War, declined further outlays for roadbuilding in the Pacific Northwest, except for the Mullan Road.[36]

Mullan Road

To further improve transportation in the Pacific Northwest, the Army and settlers lobbied hard for a Federal subsidy to construct a wagon road directly across the northern Rocky Mountains. After several false starts, Congress appropriated funds in March 1859 to build a military wagon road between Fort Benton on the Missouri and Walla Walla in eastern Washington. This route would connect with the road



Lieutenant John Mullan.



The Mullan Road, named after the Army lieutenant selected to build a wagon route between Fort Benton on the Missouri River and Walla Walla, Washington, connecting with the existing road from Walla Walla to Puget Sound. Asahel Curtis photo, 1916.

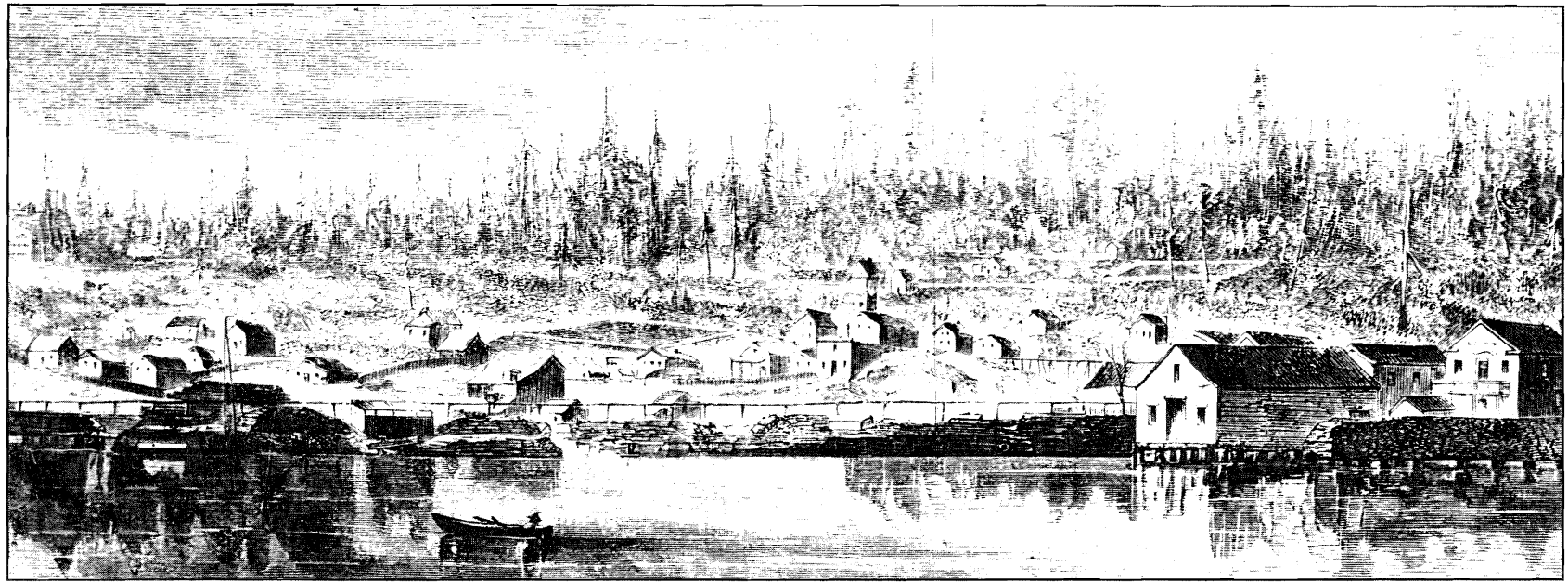
previously located by McClellan from Puget Sound to Walla Walla. The soldier selected to build this road, Lieutenant John Mullan, had first arrived in the Northwest in 1853 attached to the Pacific Railroad Survey of Isaac Stevens. Mullan had proved such a diligent explorer that Stevens later recommended him for the job of building the road across the northern Rockies.[37]

Although authorized to begin work in 1858 on the northern military road, Indian hostilities on the line of the proposed survey forced Mullan to suspend operations until the following year. When Mullan finally initiated work on 1 July 1859, his crew included 90 laborers and military escort of 140. His instructions required improvements on the most difficult sections of the route first, so that a passable road could be opened as rapidly as possible. Mullan's route followed a line northeasterly across the Spokane Plains, passing Lake Coeur d'Alene along its southern edge and then eastward through the valleys of the St. Joseph and Coeur d'Alene rivers to the Bitterroot Mountains. Much of the right-of-way required little improvement for wagons to use it. From the Coeur d'Alene Mission, however, the route passed through heavily forested areas which proved difficult to clear. After a trying winter camp at St. Regis Borgia Valley, Mullan resumed work in March 1860. The path from the Bitterroot River to Fort Benton followed several river courses eastward to a crossing of the Continental Divide at Mullan Pass and then northeast across Medicine Rock Mountain to the Missouri River. Except for several arduous mountain crossings, the route did not require heavy construction. Mullan and his men reached Fort Benton on 1 August 1860. They did not stop long at the eastern end of the newly developed road.[38]

Mullan returned west over his 624-mile road, making improvements as he went. During the next two years, Mullan continued to upgrade his road. When complete, the Mullan Road had cost $230,000, making it one of the more expensive pre-Civil War military roads. Although justified as a military road, the Army made little use of it. Emigrants wishing to settle in the Northwest and prospectors flocking to the newly discovered gold fields of Idaho and Montana, however, utilized the road

in the 1860s. Over time, the eastern and western portions of the road became major supply routes to the mines of the region. Pack trains rather than wagons, however, served as the chief means of freighting over the road. Although the Mullan Road never achieved continuous use as an overland route, it still represented an important Federal contribution to improving the transportation system of the Northwest prior to the railroad era. Subsequent railroads and modern highways followed the routes first surveyed and improved by Mullan and his men.[39]

The Civil War effectively terminated the first sustained involvement of Army Engineers in the Pacific Northwest. A half decade of work produced limited results. "Derby's road," one officer wrote of the Cascades portage a few months after its completion, "has proved an entire failure — all the deep cutting having washed away, down the river." Although the Army made repairs, a private railway soon superseded the road. As for the connection between the Columbia and



Seattle, 1855. Artist's rendition.

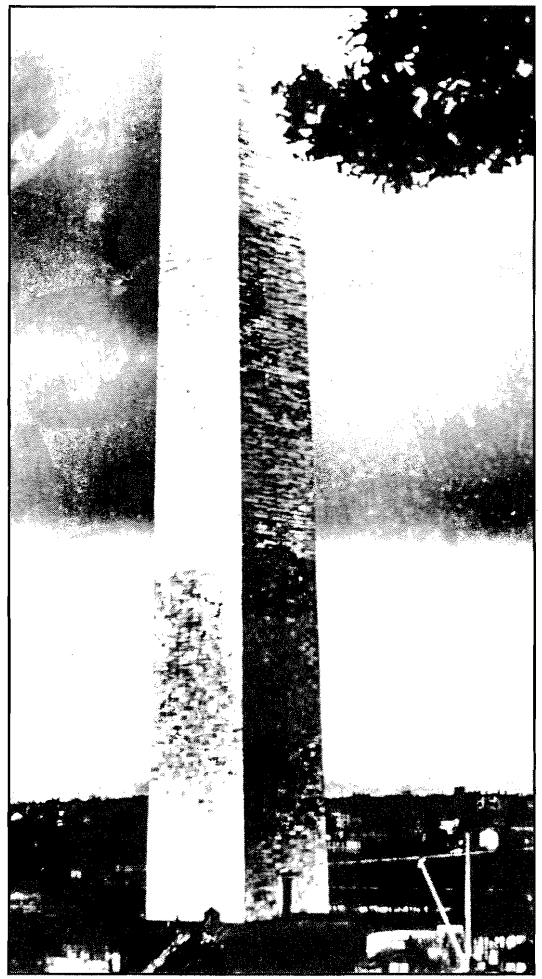
Puget Sound, it remained in use until the construction of a railroad spur in the early 1870s. The road, however, was described by a traveler as "rough beyond description," passing over numerous mud-encumbered grades and amounting to little more than "a path through the dense forest." Difficult terrain and climate, coupled with insufficient funding, severely challenged the ingenuity and determination of the Army Engineers constructing the military wagon roads of the Pacific Northwest. Though the roads achieved modest usefulness initially, they provided a long-term foundation for improved transportation facilities supporting the settlement and development of the region.[40]

Chapter 2

ARMY ENGINEERS COME TO WASHINGTON

From its permanent establishment in 1802, the Corps of Engineers positioned itself as the nation's premier engineering organization. Using the U.S. Military Academy at West Point as its base, the Corps provided the main source of technical training for engineers prior to the Civil War. When Congress, in 1824, ordered the Corps to assist transportation development through surveys, technical assistance, and waterway clearing operations, the Army Engineers responded with alacrity. From this point on, the Corps carefully nurtured its role as the key Federal agency for comprehensive planning of the nation's internal improvements. Applying its solid command of engineering science and technical expertise, the Corps developed the bureaucratic finesse to shape and supervise an emerging national program of internal improvement.

The debate over the constitutionality of Federal internal improvements and the vagaries of Congressional appropriations caused the national program of internal improvements to wax and wane prior to 1860. Despite wide swings in Congressional support, the Corps administratively employed a broad interpretation of law and its control of technical knowledge to dominate waterway, road, and harbor improvements and western exploration. From 1838 to 1863, an independent Corps of Topographical Engineers played a major role in those activities. A close military involvement with the nation's civilian life resulted from the early republic's limited administrative structure and the modest beginnings of American professional disciplines.[1]



Early photo of Washington Monument, Washington, D.C. Between 1865 and 1902, the Corps' civil works responsibilities increasingly overshadowed its military role.

The post-Civil War period initiated a new era for the Corps of Engineers. To fully understand the work carried out by the Corps in the Pacific Northwest in the late 19th century, it is necessary to examine the changed national environment for public works. Congress and the public viewed the Corps as an agency for developing the nation's economic potential. Between 1865 and 1902, the Corps' civil works responsibilities increasingly overshadowed its military role. While its main area of non-military activity involved inland and harbor navigation improvements, the Corps also planned and constructed lighthouses and all fixed aids to navigation, explored and mapped western territories, and supervised bridge construction across navigable waters. In addition, the Corps supervised the construction of public buildings, monuments, and a water supply system for Washington, D.C. and determined boundaries for use in diplomatic negotiations. The Corps also instructed cadets at West Point and served on the staffs of the commanding generals of military divisions and departments.[2]

After the Civil War, Congress responded to the public's demand for economic development by various direct and indirect subsidies to business

opposite: The City of Ellensburgh, *an 1880s steam boat that helped to open navigation on the upper Columbia River.*

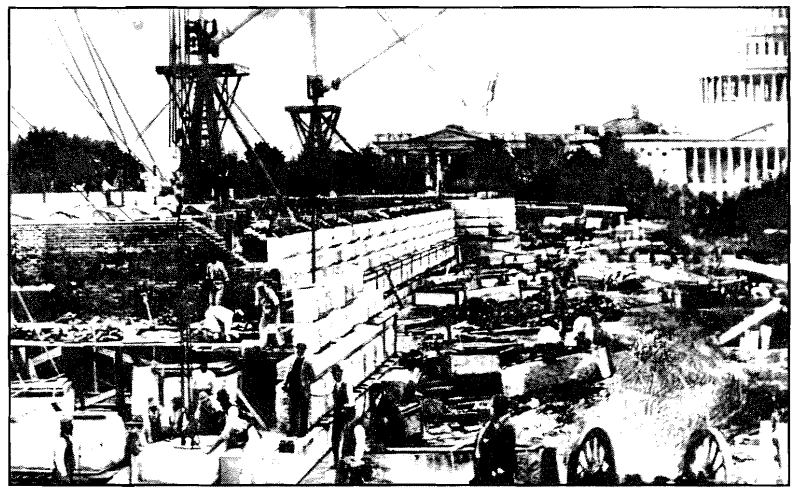
enterprises. These included land grants for transcontinental railroads, protective tariffs for various commodities and finished products, free or cheap public lands for agricultural and mining uses, and canals and channel clearing for cheaper alternatives to railroad transportation. In addition, the expenditure for public works increased dramatically between 1860 and 1882. Congress' rivers and harbors appropriations ballooned from $3.7 million in 1866 for 49 projects and 26 surveys to $18.7 million for 371 projects and 135 surveys in 1882. In the last third of the 19th century, Congress spent $33.3 million on waterways improvements. As expenditures mounted, Congress monitored ever more tightly the Corps' work. In order to tie the costs of a project to its benefits, Congress directed the Corps to include in each project or survey report a statement of the amount and date of all former appropriations and a full estimate for completion. Project reports also had to list the amount that could profitably be expended in the coming fiscal year and the amount of commerce and navigation that would benefit from completion of the project.

Over time, Congress increased the amount of information it sought on rivers and harbors work. In 1882, for example, it requested general commercial statistics for proposed work and required preliminary examinations to assess the public necessity of a proposed project prior to authorizing any survey. Political pressure and the lack of a national policy on internal improvements prevented Congress from objectively using the information contained in Corps reports. Congress continued to assess projects on a case-by-case basis, subject to lobbying by various special interest groups.

As the Corps expanded its role in public works, it aroused the concern of the rising cadre of private engineers who were just beginning to assert their professional competence. The vast technological advances of the 19th century created an increasing demand for engineers. In 1840, only two institutions besides West Point offered courses in engineering; by 1896 the number had increased to 110. As the new civilian engineers sought professional acceptance, they challenged the right of military engineers to direct public works.

Civilian engineers argued that the Corps' bureaucratic procedures led to inefficient and excessively costly projects. They also argued that military engineers lacked the necessary training and experience for supervising modern civil works. Critics questioned the quality of engineering education at West Point and argued that the actual work of Corps officers in the field did not involve them in practical application of engineering knowledge. Engineer Officers, critics charged, were little more than glorified disbursing clerks, heavily dependent on civilian engineers for the design and execution of the public works assigned to the Corps. The critics also complained that Corps officers rarely gave their civilian assistants credit for the works they accomplished.

Supporters of the Corps defended the quality of education and practical training military engineer officers received. Only the top of the West Point class became part of the Corps of Engineers, and received extensive post-graduate training and experience at the Engineering School of Application at Willets Point. Following study at Willets Point, Army engineers gained broad field experience at a variety of projects before receiving charge of major public works. Corps engineers denied



Library of Congress construction, Washington, D.C., 1888.

that they took credit for their civilian subordinates work, pointing out that the Chief of Engineers' *Annual Report* contained the names of civilians on public works projects and often reproduced their reports.

In a time of military manpower cutbacks and budget stringency, the Corps found itself hard pressed to carry out proper supervision of the public works under its responsibility. As Chief of Engineers, Brigadier General John M. Wilson wrote in 1897, "the immense work detailed to a few men is overtaxing" and an "urgent need" existed for an increase in Engineer Officers. While the authorized strength of the Corps — 109 officers — had not increased since 1866, its duties and responsibilities had. Corps projects increased from 34 in 1880 to over 500 in 1896, with average annual appropriations of $4.25 million in the 1870s and $20 million in the 1890s. Wilson proposed adding 18 engineer officers to handle the growing burdens. As a result of pro-military sentiment sweeping the nation in the wake of the Spanish-American War and America's increased overseas commitments, Congress embraced Wilson's proposal in 1898 and authorized a further expansion in 1901.

To cope with increasing river and harbor work, external challenges to its mission, and questions concerning its performance, the Corps underwent several administrative and organizational restructurings in the last half of the 19th century. The Office of the Chief of Engineers supervised the field offices through detailed reporting requirements. Corps officers had to prepare numerous monthly, quarterly, and annual reports. For each military or civil work, officers in charge had to submit an annual report giving the project's fiscal year-end condition, progress, and funds expended during the past year; operations planned for the next year; and amount desired for the next fiscal year. Officers also had to synopsize the information for the Chief's *Annual Report* and include their assistants' reports along with their own when appropriate. Monthly reports included a summary of operations, number of officers and hired men, personnel reports, abstracts of disbursement, and accounts current. Subordinate officers in charge of specific projects, submitted similar reports to the Engineer Officer in charge to serve as a basis for his reports.

To handle the increased workload the Office of the Chief of Engineers developed a field organization of Engineer Offices or Districts and Divisions. After 1866, Engineer Officers had responsibility for projects within a specific geographic area. The practice of referring to Engineer Offices as Districts evolved through practice rather than specific orders or legislation. Use of the term District Engineer to refer to all project officers does not appear in the *Annual Reports* until 1893.

To better supervise the expanding Engineer Offices, the Chief of Engineers, in 1888, created a Division structure. The Chief divided the country into five Divisions and placed a colonel over all the field offices within a Division. In 1901, the Office of the Chief of Engineers increased the number of Divisions to seven. The Division Engineers coordinated the activities of the Districts, inspecting works in progress once a year and giving advice on engineering matters. All District work products passed through the Division Engineer before reaching the Chief of Engineers. The Division Engineer had to scrutinize all project specifications, cost estimates, and actual expenditures to ensure that work was conducted according to the law and appropriate standards and regulations. In practice, Engineers Officers and their civil assistants exercised considerable discretion over the conduct of their projects.

In the late 19th century, the Chief of Engineers increasingly relied on the Board of Engineers to coordinate and supervise work of the field offices. The Board reviewed and revised projects for fortifications and river and harbor improvements and other matters assigned to it by the Chief. Beginning in 1902, the Board of Engineers reviewed all civil works projects before submission to the Chief. This step provided consistency to the recommendations produced by the review process.

As the Corps' civil projects expanded in numbers and cost, it relied heavily on private contractors to accomplish the work. The law required that all services and supplies purchased by contract be at the lowest responsible bid and guaranteed by sufficient bond. Engineer Officers submitted bids to the Office of the Chief of Engineers for approval. The law also allowed the Corps to use hired labor when it was to the

APPENDIX J J J.

ROAD INTO MOUNT RAINIER NATIONAL PARK.

UNITED STATES ENGINEER OFFICE,
Seattle, Wash., July 1, 1908.

SIR: I have the honor to forward herewith annual report for the fiscal year ending June 30, 1908, on road into Mount Rainier National Park.

Very respectfully, your obedient servant,

H. M. CHITTENDEN,
Major, Corps of Engineers.

The CHIEF OF ENGINEERS, U. S. ARMY.

ROAD INTO MOUNT RAINIER NATIONAL PARK.

This work has been in local charge of Mr. Eugene Ricksecker, assistant engineer, from whose reports the following extracts are taken:

The condition of this work on July 1, 1907, was as follows:

From west boundary of forest reserve, station 540, to station 428, 2.1 miles of road, no work was done; from station 428 to 420, 0.2 mile, road incomplete; from station 420 to "0" at Longmire Springs, 7.9 miles, road completed; from station "0" to station 72 above springs, 1.4 miles, road completed. Number of miles in use, 9.5; number of miles to construct (about), 15.5; total, 25 miles.

In addition to this the road was roughed out to station 92 above the springs, or four-tenths of a mile farther. Clearing done to station 129, seven-tenths of a mile farther, and the main camp of the season was being established at Van Trump Creek (station 157). Two hundred and sixteen men and 17 teams were engaged on construction.

Work was carried on from one camp from June 1 until close of season, September 29, 1907. During this period the following was accomplished:

Road completed from station 72 to 227, 2.9 miles, including one overhead hewed timber Howe truss bridge of 75-foot span across Van Trump Creek Canyon. Road nearly completed and open for travel from station 227 to station 266, ¼ mile. Road worked out but impassable for teams from station 266 to station 272, ¼ mile. Clearing completed from station 272 to station 330, 1.1 miles.

The average force employed was 160 men and 12 teams.

The work was done under Overseer E. Tivendell.

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Construction work was resumed on May 5, 1908, under Overseer Thomas Irving, camp being maintained at Copper Creek, 1 mile inside the forest reserve, until June 4, with a force of 45 men and 5 teams.

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On June 4, the snow having disappeared sufficiently to allow construction in the higher altitudes, the entire force was moved to camp near Nisqually

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Glacier (station 264) and took up the work where it was dropped at close of last season and the force increased to 130 men on the 17th.

The road is completed to station 278; the 100-foot span, wooden Howe truss bridge across the Nisqually River at this point is well along and the road roughed out beyond station 300. The number of miles of new road that will be in use June 30 is 14; number of miles on which some work is done, 1.5; number of miles to construct (about), 9.5; total (about), 25 miles.

This mileage marks the completion of the first highway in the United States to reach a great glacier.

The number of tourists who visited the park during the year ending June 30, 1907, is reported by the acting superintendent to be 2,068.

The number of vehicles that entered the park during season of 1907 is estimated at 1,010, of which 60 were automobiles. These machines were permitted to use the roads by the Secretary of the Interior, in conformity with approved rules, after urgent appeal had been made to him by owners of machines, for the first time, August 7, 1907. The privilege was much appreciated and automobilists were enthusiastic over the route opened to them. A neat lodge has recently been completed at the park entrance by the superintendent, where autos may obtain permits, and another is in course of erection at the Springs.

As bearing on the work of improvement in this park, the following extract is quoted from my indorsement of October 21, 1907, upon a report of October 18, 1907, by Mr. Ricksecker to the Secretary of the Interior:

5. The one great attraction of this park is the mountain that gives it its name. The first purpose of the improvement work should therefore be to make this attraction as accessible as possible to tourists. A great many visitors desire to ascend the mountain, and I thoroughly approve the suggestion to do some necessary work to provide for the comfort and safety of parties making the climb. Under present conditions it is necessary to spend one night on a bare rock, without a semblance of shelter or means of essential comfort. The next night is spent in the crater at the summit, where there is a degree of natural warmth but no shelter. At one point on the ascent, viz, at Gibraltar Rock, there is a dangerous passage that should be improved. There ought to be constructed a fairly good trail from the Camp of the Clouds up, and two shelters—one at Camp Muri, at the end of the first stage of the climb, and the other in the crater.

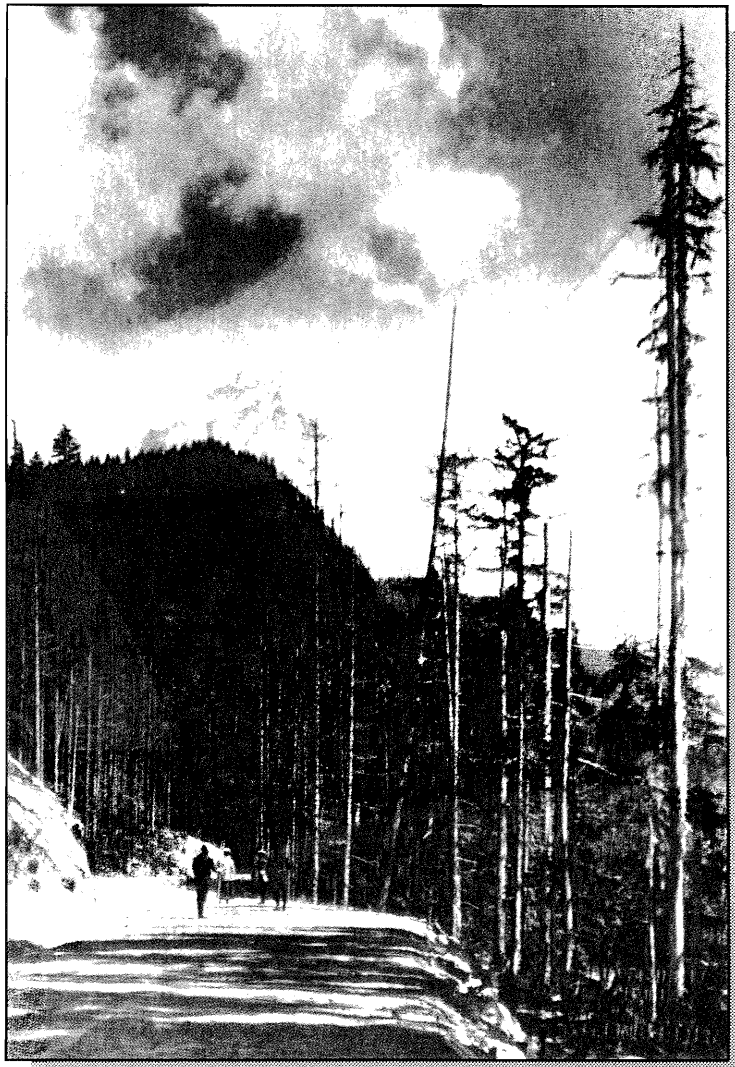
6. A bridle trail around the mountain just under the glacier line is absolutely essential to the proper policing of the park and very necessary for the convenience of tourists if they are really to have access to the attractions of the park. The trail should be so located that in time it may be enlarged into a wagon road.

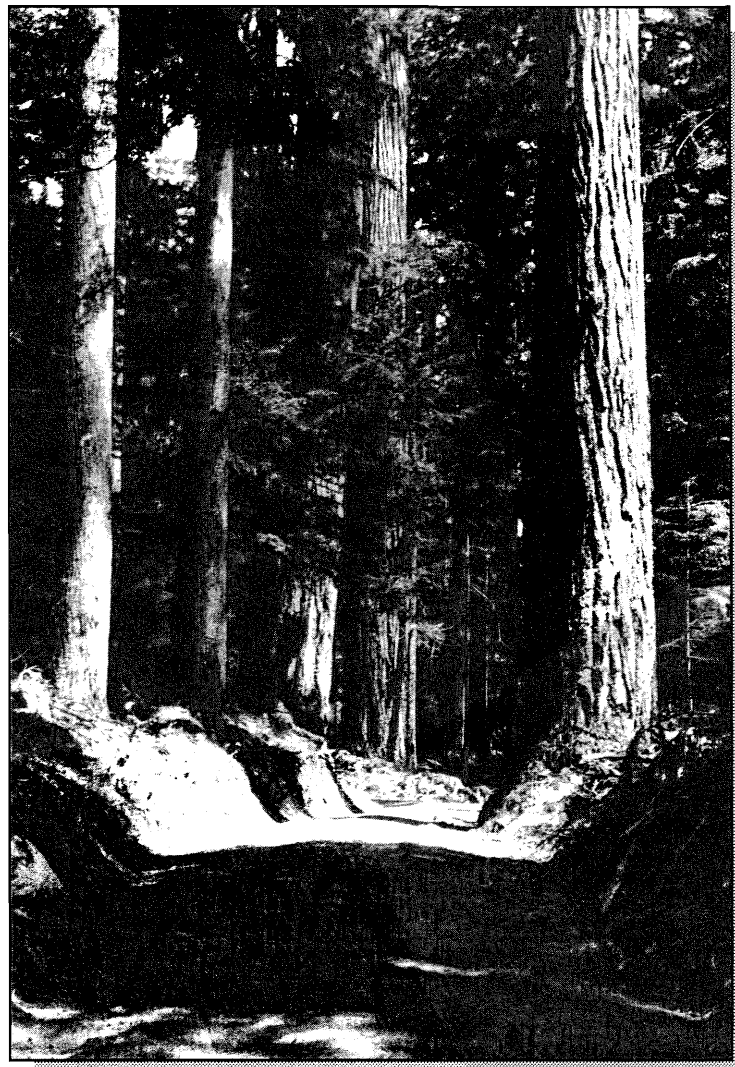
Three views illustrating the character of work and the scenery along the road already constructed accompany this report.

Money statement.

July 1, 1907, balance unexpended	$57,080.14
Amount appropriated by sundry civil act approved May 27, 1908	50,000.00
	107,080.14
June 30, 1908, amount expended during fiscal year for works of improvement	54,250.57
July 1, 1908, balance unexpended	52,829.57
July 1, 1908, outstanding liabilities	5,000.00
July 1, 1908, balance available	47,829.57
Amount (estimated) required for completion of existing project	25,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1910, in addition to the balance unexpended July 1, 1908:	
For works of improvement	$25,000.00
For maintenance of improvement	5,000.00
	30,000.00

This page and opposite: pages from the Chief of Engineers' Annual Report, 1908, for a project to build roads in Mount Rainier National Park. These pages exemplify the way Corps military engineers gave their civilian assistant engineers credit for their work on civilian projects and often reproduced their reports.





left: Government road above Longmire Springs, Mount Rainier in background; right: Government road below Longmire Springs, showing section of dense forest.

government's advantage. Some projects, such as the massive 20-year effort to build the Cascades Canal and Locks on the Columbia River, employed both methods. In either case, the yearly Congressional appropriation process often prevented efficient prosecution of a project.

While the Corps of Engineers relied heavily on civilian assistants and contractors to carry out its work, the Engineer Officers served as the key elements of the organization. These Engineer Officers constituted an elite within the Army. Their prestige came partly from the fact that only the top graduates of West Point were admitted to the Corps. Of the first 13 District Officers to serve in Seattle, for example, five graduated first in their class. Only one, from the 103 member class of 1909, ranked lower than seventh. Harry Taylor, the first to head the Seattle District, was the only officer finishing below the top 10 percent, a relative lack of distinction that did not prevent him from eventually becoming Chief of Engineers. Moreover, the curriculum at West Point ensured that Army engineers were men of science trained to view assignments in a comprehensive manner. When overseeing the work of a major project such as a jetty, a canal, or dredging operation, Engineer Officers actively involved themselves in the planning and design of the project. They viewed their work as extending beyond the technical aspects of narrow engineering problems, and the style and content of their published annual reports reflected this broad perspective.

According to Seattle District Engineer Hiram Chittenden, future officers absorbed important precepts from their years at the academy. They learned the value of merit. By setting aside special privilege and judging all alike, the most able and deserving invariably raised themselves to the top. The second principle involved the concept of duty, inculcated in all aspects of a cadet's training. "In the Engineer Department of the Army," observed Chittenden, "where the responsibility and character of work vary greatly, and it often happens that an officer of higher rank or pay (sometimes less) than another may be charged with more important duties, that fact makes not the slightest difference in his devotion to duty or efficiency in work."[3]

Despite their status, Engineer Officers of the post-Civil War era could expect neither rapid promotion nor public acclaim. For Chittenden, compensatory factors existed for the peacetime Engineer Officer. "War against physical nature and the evils of human nature," he wrote, "and their ultimate subjugation to the intellectual and spiritual dominion of man, constitute a struggle which will give ample scope to the energies of the race." Enlightened heroism, after all, lay not in the brief and bloody glory of the battlefield, but in overcoming nature. "So long," continued Chittenden, "as there are mountain barriers to be overcome, floods to be controlled, deserts and swamps to be reclaimed; ... man need not feel that war is necessary to call forth the best there is in him."[4]

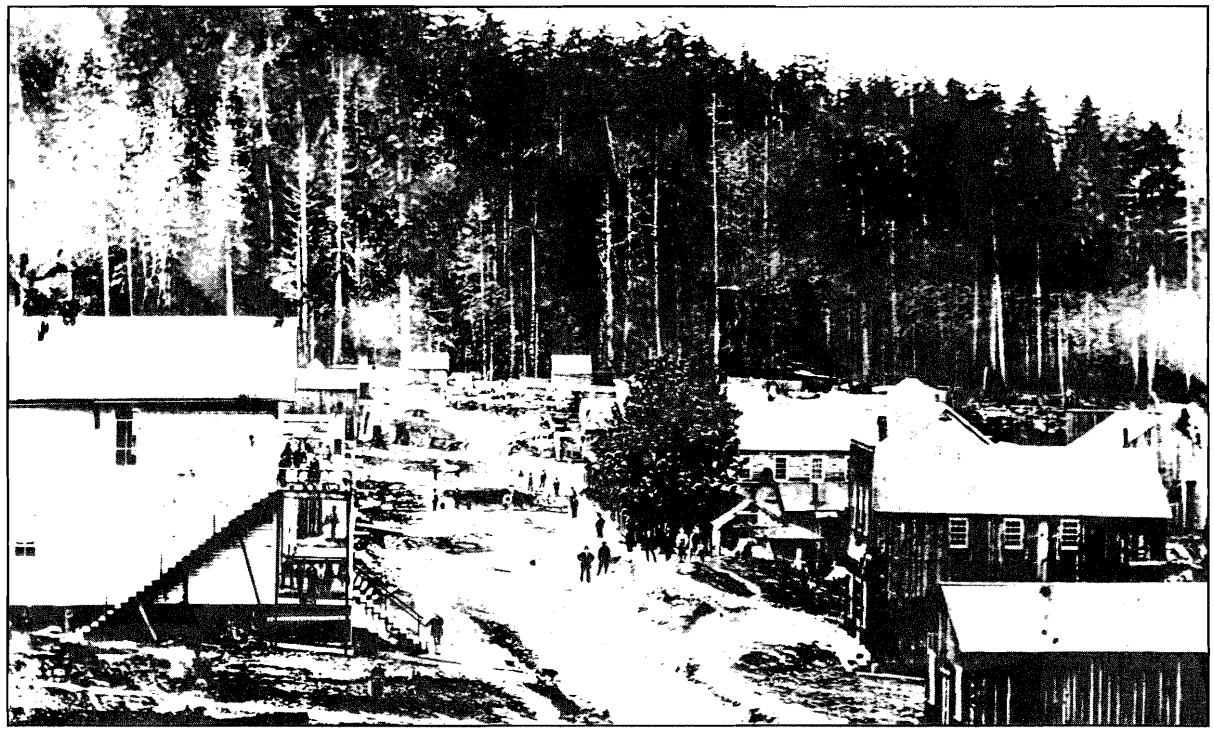
The rivers of the Pacific Northwest offered ample opportunities for Army Engineers to employ their talents to transform the natural environment for human benefits. At the close of the Civil War, the newly reorganized Corps of Engineers established a presence on the West Coast. In 1866, the Chief of Engineers assigned Major Robert S. Williamson to the western Engineer Office headquartered in San Francisco. Major Williamson's initial duties included improving navigation on the Willamette and Columbia rivers.[5]

Private and local efforts to overcome the obstacles to ocean-going vessels in the ten-mile stretch of the Willamette from Portland to its confluence with the Columbia had proved ineffectual. In 1866, Major Williamson conducted snagging and dredging operations to establish a safe ship channel from Portland to the sea. The following year, he turned his attention to improving navigation on the upper Columbia River. Population growth in the interior of the Northwest, sparked by mining booms and the development of extensive dry-land wheat farming, stimulated waterborne commerce on the Columbia. Numerous treacherous rapids, however, obstructed safe steamboat navigation. The Corps of Engineers conducted surveys and undertook rock removal at the worst Columbia River rapids. Major Williamson also initiated surveys and carried out improvements on the Willamette River above Portland to eliminate obstructions to navigation on that stream.[6]

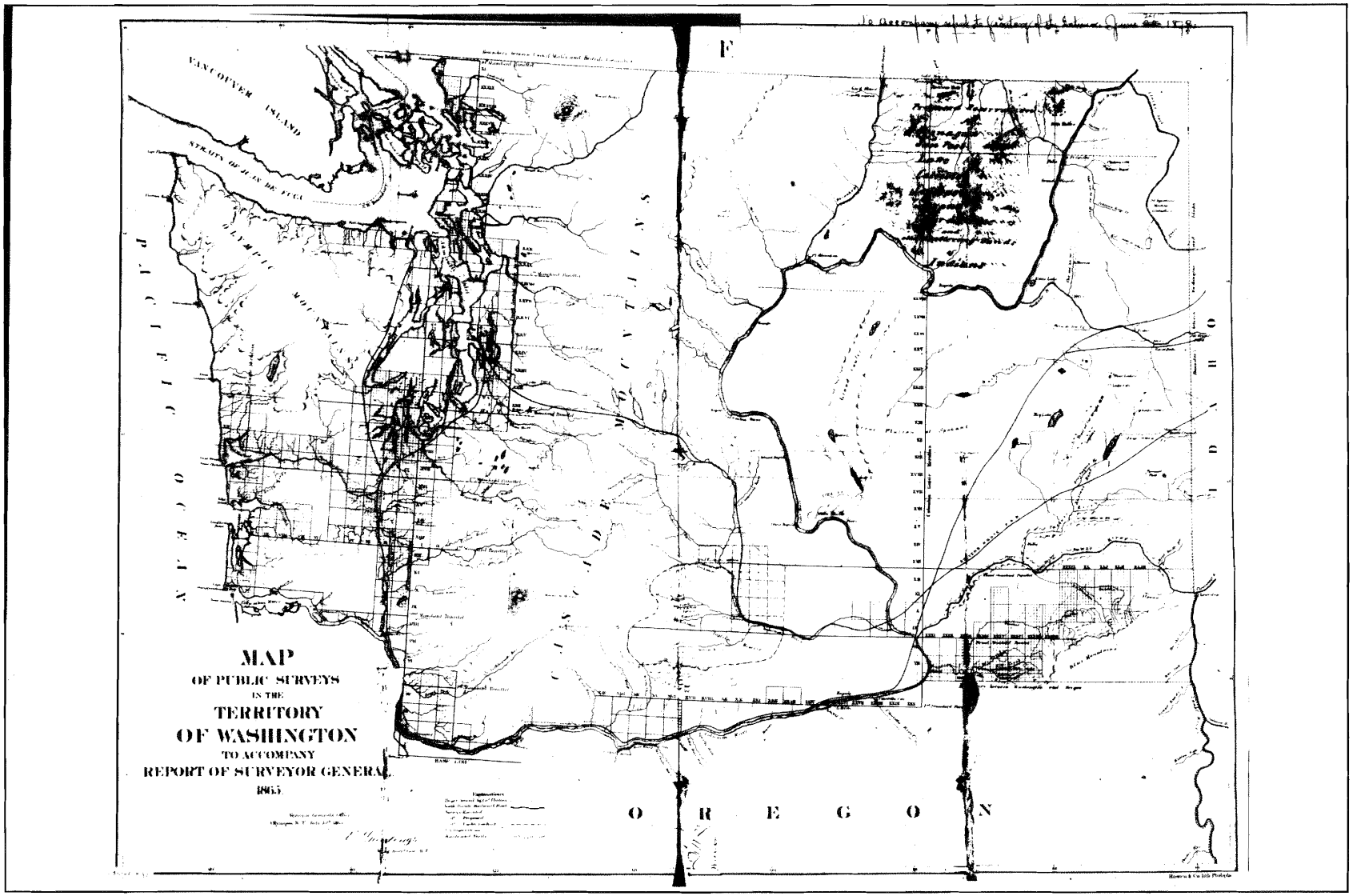
The Corps' growing workload on the Columbia and Willamette rivers led it to establish an Engineer Office at Portland in 1871. Portland, with a population of about 10,000, had emerged as the great commercial center of the region. It received vast quantities of grain and lumber from the interior destined for overseas markets and served as the entry port for the finished goods desired by Oregon's burgeoning population. Cheap, dependable river transportation was the key to the continued growth and commercial prosperity of Portland and the region it served. The Corps' role in supporting economic expansion required identifying and removing impediments to navigation. However, not all portions of the Pacific Northwest developed evenly or benefited from the Corps' efforts.[7]

Washington Territory stagnated in the first three decades of its existence. Dependent upon the production of lumber, which absorbed eight of every ten dollars invested in manufacturing during the 1870s, the regional economy was linked in unhappy bondage to the boom-and-bust markets of the Pacific Ocean. Demand in California, Hawaii, and Australia fluctuated erratically during the period, more often on the downward track than the upward. The output of Washington's wilderness mills mounted only slightly in the years after the Civil War. Reflecting the lack of prospects, only 37,000 people lived in the territory in 1870, and Indians confined to isolated reservations accounted for a third of these.[8]

West of the Cascades, Seattle, with 1,107 inhabitants in 1870, represented the nearest approach to urbanization. Despite its pretensions and broad bayfront, however, visitors dismissed the community as "a veritable mudhole." To the south, at Tacoma, another observer discovered that "streets, and squares, and wharves" had been platted by hopeful boosters: "Yet one sees merely a clearing in the forest — a few piles of lumber, one hotel, one store, two whisky saloons, and several unfinished buildings." Further south, Olympia had declined into relative squalor because of its peculiar harbor. Surging tides alternately exposed massive mudflats and flooded the town's streets. All that remained for the town, due to the retention of the seat of territorial administration, was what one traveler described as "the crumbs that fall from the government tables."[9]



"Yet one sees merely a clearing in the forest — a few piles of lumber, one hotel, one store, two whiskey saloons, and several unfinished buildings." Tacoma, Washington, 1871.



Map of public surveys in the Territory of Washington to accompany report of Surveyor General, 1865.

In its relative importance and rate of growth, the State of Oregon naturally served as the focus of Federal undertakings in the Pacific Northwest. The Corps' early efforts centered, according to calculations of maximum public benefit, on the area south of the Columbia River. The stirrings of growth in Eastern Washington, however, soon required attention to the adjoining territory.

A long-standing article of faith among those regarded as experts on the Pacific Northwest held that the Columbia River could function as an avenue of commerce. Lewis and Clark contended that the river could serve as the key connection in the future exchange of Missouri furs for the silver and silk of Asia. Isaac Stevens, grasping at all arguments that would boost his proposed northern railroad, readily adopted this view of the region as the pathway to the Orient. The Governor was also one of the first to propose actual navigation improvements on the Columbia. Construction of locks and canals at the Cascades, The Dalles, "and probably at Priest's Rapids," he asserted, would make the river "continuously navigable from its mouth to Kettle Falls, a distance of 735 miles." Other figures of the 1850s, while laying more stress upon the natural obstacles and the necessarily heavy expenses, also regarded the subject as worthy of future study.[10]

Steamboats, in fact, provided regular service on the Columbia River by the early 1850s, running between Portland and the Cascades Rapids and from the head of those rapids to The Dalles. In 1858, R. R. Thompson built the steamer *Venture* with the intention of running The Dalles and opening navigation on the upper river. At the launching, a band played and local dignitaries lined the rail as the captain cast off without remembering to start the engine. Caught in the swift current, the powerless vessel was swept downstream and dashed against a rock in the Cascades. The following season, Thompson launched the *Colonel Wright* — named for the hero of the Eastern Washington Indian Wars — at the mouth of the Deschutes. During the season of 1859, the shallow-draft boat steamed to the Walla Walla River, up the Columbia as far as Priest Rapids, and for some 50 miles upstream on the Snake River. The Army successfully shipped supplies to the Palouse crossing of the Snake for overland passage to Fort Colville.[11]

Competition on the Columbia came to an end in 1860 when entrepreneurs combined the Thompson operations, which included The Dalles portage, with the boats of the middle and lower river and the Cascades portage to form the Oregon Steam Navigation Company (OSN). Through its monopoly of the strategic places of transshipment, the firm quickly drove other vessels from the river and became the great business enterprise of the early American Northwest. On well-appointed steamers, passengers traveled upstream from Portland to the desolate river towns of Umatilla and Wallula, where wind-driven sand piled ankle-deep in the streets. From Wallula, a wagon road and, in later years, a railway linked the Columbia with the inland center of Walla Walla. Critics thought tariffs excessive — the fare from Portland to Wallula in 1879 was $15 — but all agreed that service was excellent and dependable.[12]

Coincident with the formation of the OSN, prospectors discovered gold in the Idaho country. Thousands of miners rushed to the diggings centering on the vast Nez Perces Reservation. The OSN soon commenced its most profitable venture: the shipment of passengers and supplies up the Snake River at the proper stages of water to Lewiston, first capital of the newly-established Idaho Territory. With additional discoveries of gold and silver throughout the Columbia Basin, the company expanded its operations during the course of the 1860s. It began steamer service on the upper Snake, placed three vessels on the Clark Fork above Pend O'Reille Lake, and initiated business on the Columbia itself between Colville and the mining regions north of the international boundary. Wagon roads were traced out to bypass unnavigable portions of the Columbia and the Snake.[13]

With its vast monopolistic interests, the OSN naturally became the prime mover for navigation improvements on the upper Columbia system. Urged on by company president John C. Ainsworth, Lieutenant William Heurer of the Corps of Engineers surveyed the hazards above

The Dalles and began removal of an obstructing rock at John Day Rapids in 1867 and 1868. Ainsworth pointed to the needs of the country, rather than just to the prospective benefits for his firm. "Every available house in Wallula," he reported in November 1871, "is now filled with wheat" that would have to be held until spring because the river could not be safely navigated during low water months. Construction of the mainline of the Northern Pacific Railroad from Pend O'Reille Lake to the mouth of the Snake, moreover, demanded that a dependable year-round water connection be made available for downstream passage to Portland.[14]

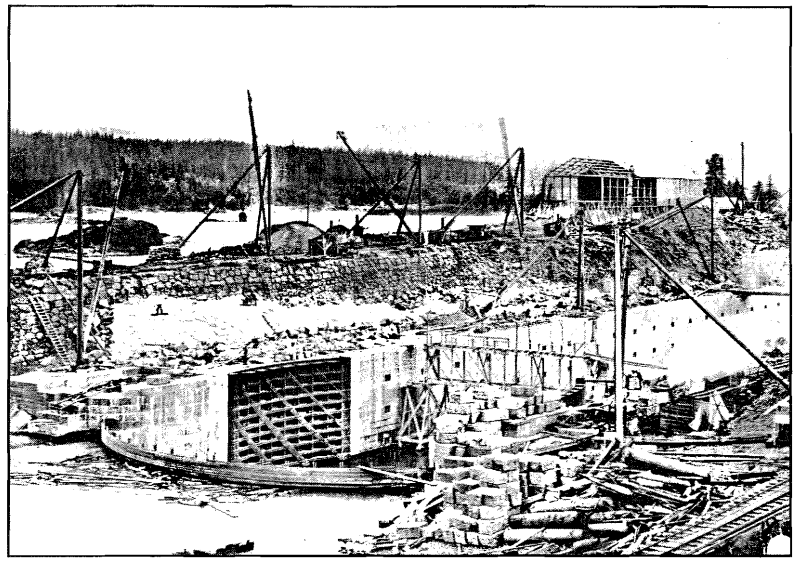
Working in mutual reinforcement, the development of an extensive railroad network and the rapid expansion of wheat farming transformed the land east of the Cascades after 1870. Branching south and southwest from the new interior hub of Spokane, the Northern Pacific and its regional competitors opened land to cultivation, brought in settlers and hauled away the mounting agricultural produce. The grass-covered country of the Palouse, stretching from Spokane to the Snake, proved especially suitable to raising wheat. Wherever a railroad depot or water tower was thrown up, a town would soon appear. Across the plain, farmland of little previous value doubled and doubled yet again in price. The railroads brought to an end the heyday of the steamboat on the upper Columbia and the OSN transformed itself into a railway operation in the late 1870s. At the same time the subject of navigation attained a heightened importance.[15]

Every addition of railroad track and every new section of country brought under cultivation produced a corresponding need for river improvement. The rail network constructed by the Oregon Railway and Navigation Company — corporate successor to the OSN — during the late 1870s and early 1880s linked the Palouse and the valley of the Walla Walla with landings on the Snake. Steamers operated between the various river points served by the railroad, making navigation an increasingly important component of the new transportation system east of the Cascades. Forecasts that commercial output would double every two years implied a growing need for waterway transportation on the Snake and the Columbia.[16]

Despite the railroad expansion, the Corps of Engineers would play an influential role in the future of Eastern Washington. Navigation works both responded to current pressure and stimulated further growth of population and trade. The two great rivers, recommended Portland Engineer Officer Major George Gillespie in 1880, "should be improved more and more, each year, by the removal of their isolated rocks and reefs, so as to ... keep pace with the growth and development of this rich agricultural country, which has just started in its career of development."[17]

In the Engineer Officers' optimistic accounts of the region's potential, navigation assumed more than a complementary role to the railroad. Heavy construction and operation costs combined with the control of strategic passes and stream crossings to limit competition among the region's rail lines. In the opinion of its critics, the railroads used their monopolistic position to assess high and unjustified tariffs upon freight and passengers. If properly developed, the Columbia and the Snake rivers offered a powerful counter-vailing force of competition. "The greater the population," reported Major Gillespie, "the more important become the navigable rivers as corrections to excessive transportation rates."[18]

Reflecting the wheat boom on the bench lands above the Columbia and lower Snake rivers, Portland Engineer Officer Major Nathaniel Michler devised a development plan for the rivers in 1875 and a Board of Engineers in 1877 elaborated upon it. The ultimate goal was to provide unobstructed navigation from Astoria to Lewiston on the Snake. The historic barriers of the Cascades and The Dalles provided the obvious keys to successful implementation. Construction of canals at these points, the Board of Engineers estimated, would require a sum in excess of $5 million. All efforts upstream to Lewiston, in contrast, would cost no more than $150,000. The building of the Cascades Canal began in 1878, although numerous controversies and delays prevented



Cascades Canal and Locks, a massive 20-year effort begun in 1878 on the Columbia River, now inundated by the reservoir behind Bonneville Dam.

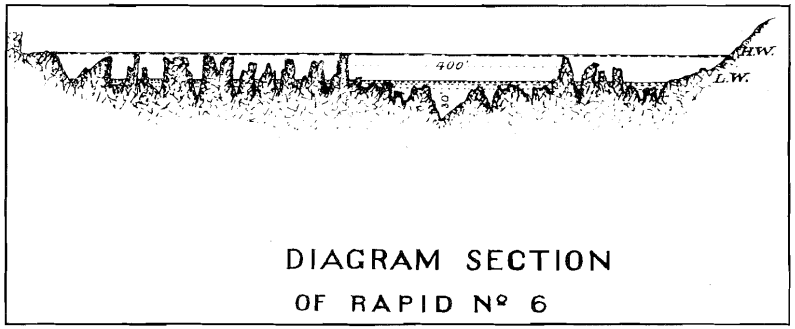
its opening until 1896. Contractors also began removal of the numerous rocky obstructions between The Dalles and the Snake.[19]

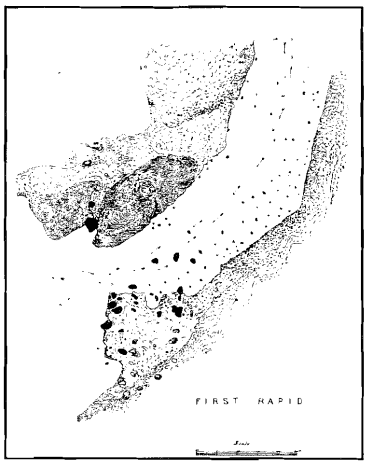
Except for the terrifying rapids at the Cascades and The Dalles, the Snake portion of the river passage attracted the most attention. Like the Columbia, the Snake flowed initially from distant snowy mountains through deep basaltic canyons. In the Snake's lower course, extensive grass-covered plains flanked it. Since navigation was practicable for only a small portion of the year, much of the fall wheat harvest had to be held over in riverside storage during low water months. "If farmers could only be certain of getting their grain to market in the fall," reported Portland Engineer Officer Major John Wilson in June 1877, "the vicinity of the Snake River would soon be fully settled, and extensive wheat fields, ... would cover the whole country." So urgent was the perceived need that work began in that year, without an advance survey, upon the major blockages: Five Mile, Fish Hook, Pine Tree, Monumental, Palouse and Texas Rapids.[20]

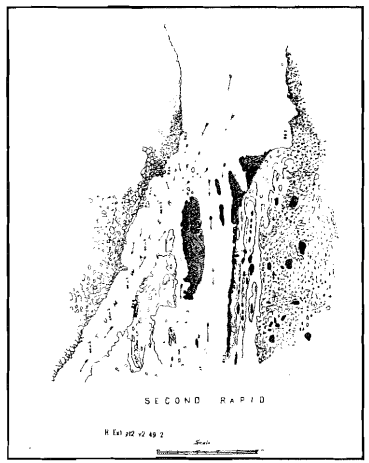
At first, contractors conducted the actual work on these obstructions. This method of operation often proved frustrating on account of the inadequate equipment and inexperienced personnel of winning bidders. To remedy these shortcomings, the Corps built a large government scow, complete with crew quarters and drilling platform, at Lewiston in 1887. Standard procedure involved anchoring the scow over the particular rock selected for removal. Workmen drilled holes and filled them with cartridges of giant powder. After removal of the boat and crew to safety, other workers fired charges by time fuse. Various implements were used for removal of larger fragments from the river, while small pieces were left to be washed away by the current.[21]

Laborers engaged in channel clearing work faced harsh and dangerous conditions. Because low water was required for maximum exposure of rocks, activity was limited to the chill months of the Eastern Washington winter. Ice-flows swept past the scows, freezing gales blew out of the canyons, and the thermometer often dropped below zero. A serious and mounting toll of death and injury reflected the dangers inherent in rivers and explosives. At Umatilla Rapids in March 1876, for example, an explosion on board the drill scow killed 13 of the contractor's 16 employees. Ten years later, the superintendent at another rapid drowned with three of his men when a small boat overturned in turbulent water.[22]

Despite these and other obstacles, the Corps accomplished much on the upper rivers by the middle of the 1880s. On the Snake, navigation successfully operated for 70 miles between Lewiston and Riparia, where freight and passengers transferred to the cars of the Oregon Railway and Navigation Company. Steamers fully loaded with wheat operated on this stretch in comparative safety. "All the bars," reported Major William A. Jones of the Portland Engineer Office in July 1889, "have been improved to the extent of being no longer dangerous to competent navigators who are acquainted with them." Subsidiary work also allowed vessel traffic to Asotin, just above Lewiston, and on the Clearwater



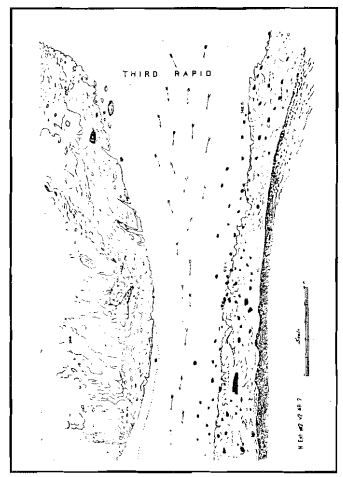


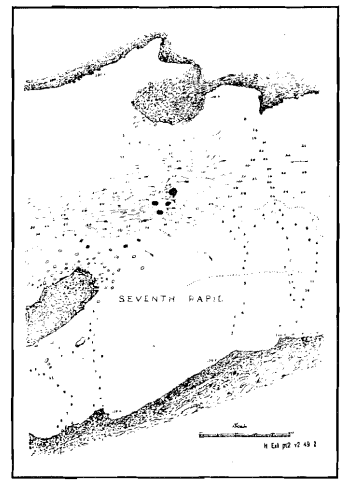


River to open up the farming and timbering country to the east. Major Jones therefore recommended that in the future, aside from modest tasks of maintenance on the Snake, "our efforts be directed to the Columbia River from and above Priest's Rapids." With this recommendation, Army engineers focused their attention on the upstream stretch of the Columbia.[23]

Making use of the observations gathered in his 1881 survey, Lieutenant Thomas Symons devised the first detailed proposal for improvement of the Columbia above its union with the Snake. For Priest Rapids and the turbulent waters of the Nespelem canyon, he advised building boat railways as a less costly alternative to canals. Special carriages would take steamers from the river and haul them around the obstructions to calm and deep water. To pass the other rapids, he recommended some combination of rock removal and lining — by which steamboats were attached to the bank and warped through the current — while experienced pilots could negotiate downstream passage at most stages of water. Except for native canoes, however, Lieutenant Symons encountered no river traffic on his exploration. Despite his regional boosterism, he admitted that the

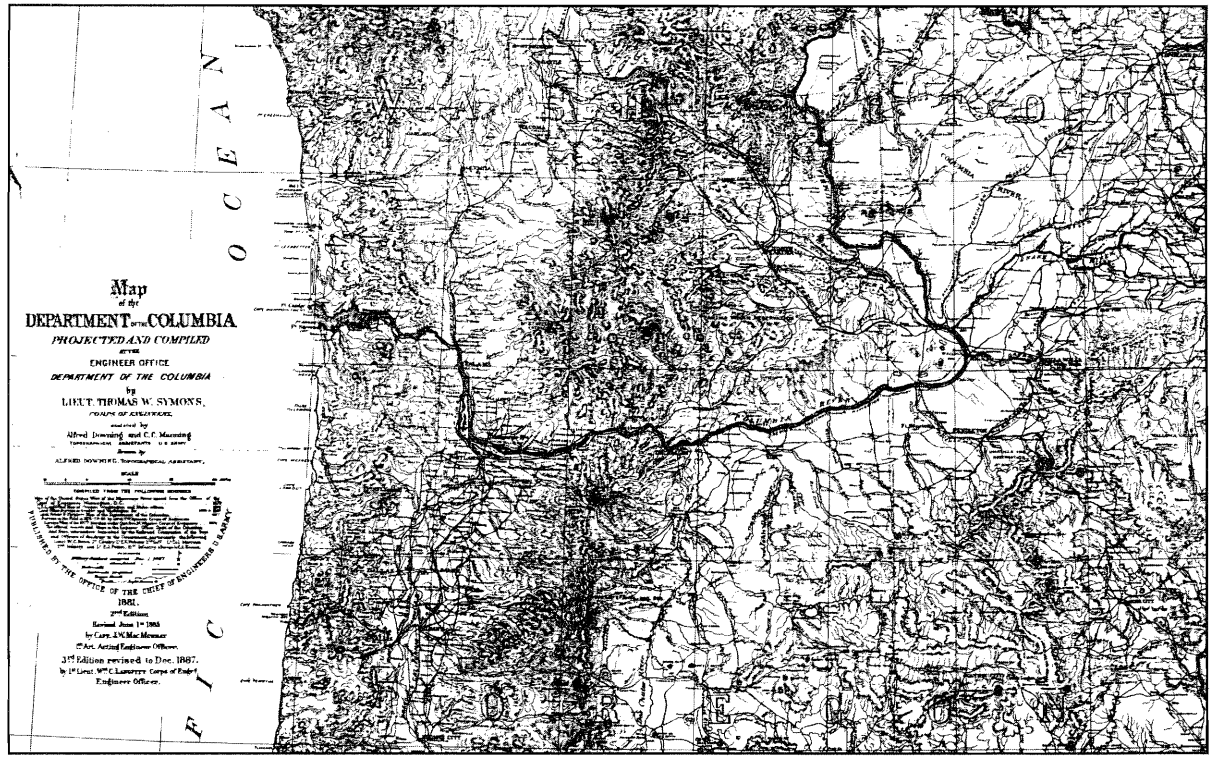
Priest Rapids, upper Columbia River. Consisting of seven rapids altogether, reproduced here from the Annual Report of 1886 are diagrams of three of the lower rapids, two of the upper rapids and diagram section of rapid No. 6.





proposals comprised matters for future consideration only.[24]

That apparently distant future soon became the present. Between 1880 and 1890, rail lines snaked west from Spokane into the heart of the Big Bend country and set off a mania of speculation and settlement reminiscent of the previous decade in the Palouse. Land agents asserted that the nearby Columbia was navigable. According to a report of the Oregon Railway and Navigation Company, a mere 23 miles of inexpensive portage construction would suffice to open the river from Kettle Falls to the mouth of the Snake. Confronted with the unpleasant reality, newly settled wheat farmers, orchardists and grazers called on the government to make good the claims of the land speculators.[25]



Map of the Department of the Columbia, Lieutenant Thomas W. Symons, 1881.

During the spring and summer of 1885, the Portland Engineer Office expended a $6,000 appropriation on a study of Priest Rapids, the initial great obstacle to the opening of the upper river. The examination got off to a shaky start when Indians living in the vicinity refused the offer of "good wages" to work on the survey. The natives objected, recorded the surveyor, to "the prospect of having the river improved, as they are afraid it will spoil the fishery." Residents of the nearby Yakima reservation had no such objections to the project, and the surveyor engaged sufficient laborers to allow work to proceed. Based on the survey, Major William Jones in Portland recommended spending $153,000 on removing rock among the seven rapids on this stretch of the Columbia.[26]

All informed persons realized that extensive work beyond this point would also be necessary to provide an open river. The sheep and cattlemen of the Yakima Valley, the wheat farmers in the Kittitas country, and the settlers at Wenatchee and in the Okanogan all required access to river transportation. In 1887, the steamer *John Gates*, testing the upriver's navigability, successfully negotiated Priest Rapids only to be stymied at Rock Island Rapids, where a lengthy island divided the Columbia into turbulent channels. The first success came in the following year when the *City of Ellensburgh* maneuvered upstream

through Priest Rapids in 11 days, passed Rock Island at high water, and opened regular service between Wenatchee and the Okanogan.[27]

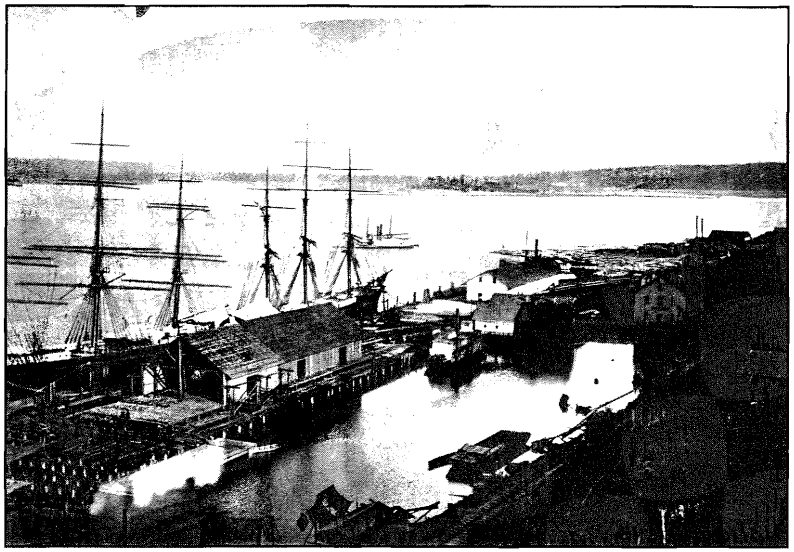
To encourage the expansion of steamboat traffic, the Corps requested an appropriation sufficient for a survey of the Columbia from the head of Priest Rapids to Foster Creek above the mouth of the Okanogan River. The resultant funding, though, was adequate only for an examination of Rock Island Rapids in the summer of 1889. Suggestive of the existing obstacles to navigation, the survey crew had to ship its boats by rail from the Snake to Ellensburg and from there by wagon to the worksite below Wenatchee. Major Jones's subsequent report captured the chaos of rocky ledges and boulders at Rock Island: "The result is a waterway so much restricted at all stages as to dam up the waters to such an extent that they escape over lines of very steep slope and amidst great masses of reef, rocks, and high projecting islands." The solution, according to Jones, required removal of large quantities of rock and anchoring a scow with a steam capstan at the head of the rapids to winch vessels through the dangers of upstream passage.[28]

A special engineering office established in Portland in the early 1890s eventually implemented the projects recommended in these surveys. Although much work had already been accomplished on the Columbia and the Snake, thoughtful officers raised significant questions about the course of river improvement. Captain Thomas Symons, the most experienced observer of Columbia matters, noted in 1892 that the Corps had expended all of the funds estimated in 1877 as necessary for work above the Dalles. And yet, because new boulders were constantly deposited, "the rivers are no nearer a state of permanent improvement than they were at the time of beginning operations." Wise steamboat masters still maintained up-to-date logs on the shifting channels and levels of water. Such navigation works, Symons pointed out, were not permanent in nature. The engineers needed careful calculation of maintenance costs in order to determine if these projects actually constituted worthy undertakings.[29]

Symons also doubted the wisdom of allocating money to the upriver works that could otherwise be devoted to completing the long-delayed Cascades and The Dalles projects. "No amount of work on the upper rivers," he contended, "...will relieve the interior of the thralldom of the railroads until means are found of carrying the products borne, or which may be borne, on the upper rivers past these great obstructions." Finally, Symons argued that the practice of treating the Columbia and the Snake "fractionally" — made necessary by the limitation of congressional appropriations to specific rapids — prevented a thorough study of the entire basin. Such an examination, bringing together all information of relevance to the future development of the country, would permit objective judgements on the actual need, cost, and impact of navigation improvements.[30]

West of the Cascades, the railroad also served as the great transforming agent of the region. After years of frustrating postponement, the Northern Pacific opened its direct line across the Cascade mountains to the Puget Sound terminus of Tacoma in 1883. James J. Hill's Great Northern entered Seattle a decade later, providing a second transcontinental connection with the East. Westbound trains deposited settlers and wealthy investors on the welcoming shore of the Puget Sound, increasing Washington's population by 375 percent between 1880 and 1890. Lumber production mounted by a factor of eight during the decade, and the territory's vital industry became one of the nation's leaders. A bustling fleet of at least 100 steamboats plied the waters of Puget Sound and its tributary streams. The grant of statehood to Washington in 1889 — along with Montana and North and South Dakota — affirmed the astounding progress of the preceding years.[31]

Those returning to Puget Sound after an absence of a few years marveled at the changes. Seattle, founded in the frontier era of the early 1850s, seemed from the hustling enthusiasm of its citizens to be a newly created community. Close to 43,000 persons resided in the town in 1890, a twelve-fold increase over the previous decade. Tacoma, so inconsequential in 1880 that the census failed to record its population, now contained 36,000 residents. Under the expansive auspices of the



Railroad Wharf at Tacoma, Washington, 1882.

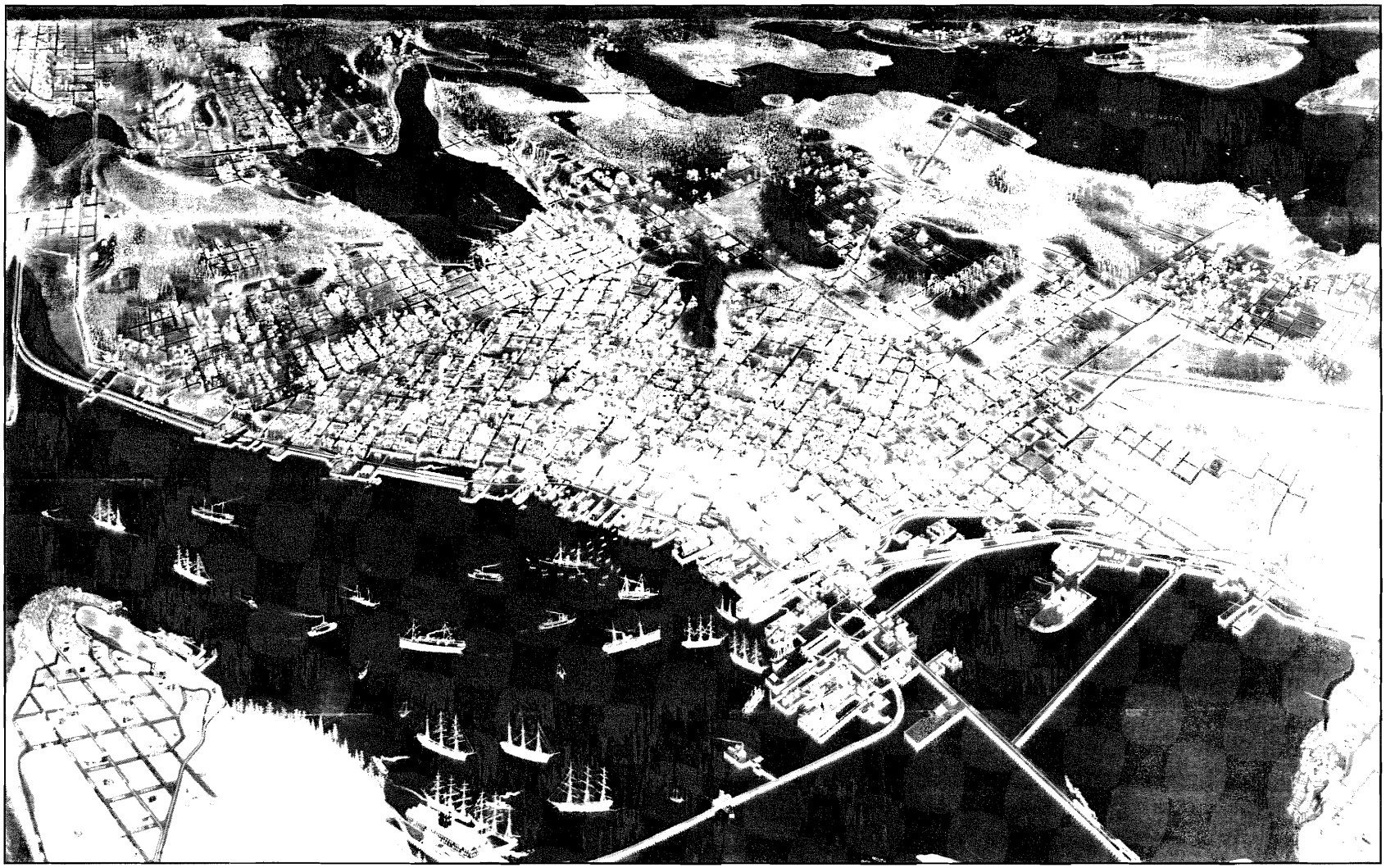
Northern Pacific land department, the city appeared "smitten by a boom" in the view of Rudyard Kipling, a tourist of 1889. Visitors and inhabitants alike agreed that the growth of the past 10 years was but a faint preview of the expansion sure to come in the century's final decade.[32]

Responding to the new importance of Western Washington during the 1880s, the Portland Engineer Office began to work in the region. The Corps studied in detail the problems at Grays Harbor, where California and Great Lakes lumbermen commenced building a major manufacturing industry. The Army Engineers also carried out snag removal in the lower Chehalis River, at the head of the harbor, throughout the decade. On Puget Sound, the problem of Olympia's lowtide mudflats received serious study. The Corps also examined possibilities of a canal linking Lake Washington on the eastern bounds of Seattle with the Sound. These activities, however, were subsidiary to the principal Corps of Engineers involvement west of the Cascades.[33]

Draining the western slopes of that range, the rivers of Puget Sound provided the only practicable means of interior transportation in a rugged and tree-covered land. "There are no railroads in this part of our country," reported Major George Gillespie of the Portland Engineer Office in 1880, "and as it is not probable that any will soon be built, the settlers ... must depend upon their small rivers for getting their products to market." Unfortunately, over the years trees and other debris, washed away by floods, had blocked all of the streams. On the Skagit River, for example, a jam 1,700 feet long extended 10 miles above the mouth; and a second of even larger dimension existed further upstream. In addition to blocking navigation, these drifts contributed to flooding of adjacent farmland at times of high water. These obstructions to navigation retarded the steady advance settlement and cried out for corrective measures.[34]

Settlers took up claims on the Skagit after the Portland Engineering Office recommended in 1874 that money be appropriated to remove the jams. When nothing had happened after three years, local residents took upon themselves the task of removal. Using axes and saws and $4,000 in donated funds, volunteer laborers overcame considerable hardship — one worker drowned and another was permanently disabled — to open a steamboat channel through the obstructions by 1880. Similar efforts on the Nooksack River of northern Puget Sound made it possible for light draft steamers to ascend the lower reaches of that stream.[35]

Responding to continued demands from settlers, Congress authorized in 1880 the expenditure of $2,500 for the removal of snags — the skeletal remnants of trees floating in the river or lodged in the bottom during freshets — in the north fork of the Skagit. At a point above the major obstructions, work crews assembled a log raft for carrying a derrick and capstan. They floated the raft downstream over a 30-mile stretch to the mouth of the river pulling snags from the water as they proceeded. However, neither the funding nor the rude apparatus proved sufficient to the task on the Skagit.[36]

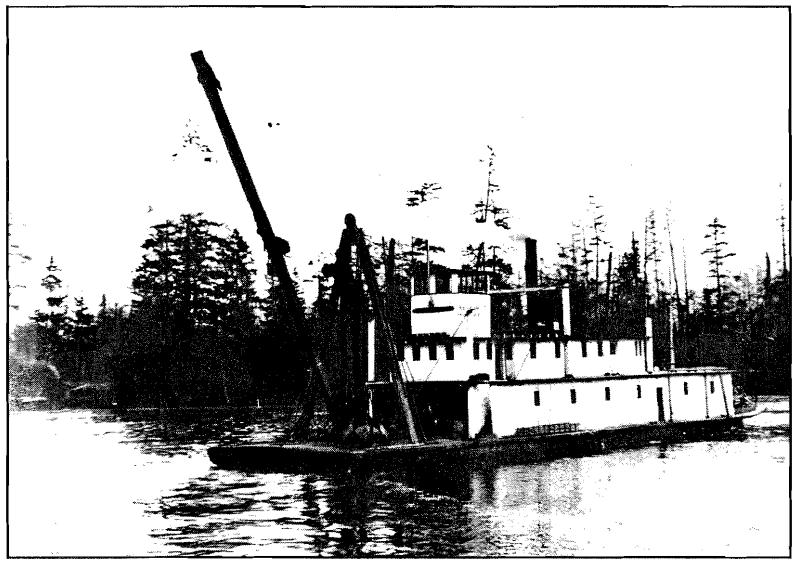


Lithograph, "Bird's Eye View, Seattle and Environs, Eighteen Months After the Great Fire," 1891.

To accomplish the necessary work, the Portland Engineer Office recommended constructing a special snag-boat for use on Puget Sound. "One snag-boat, well equipped," contended Major Gillespie, "will be able to clean out all these rivers and keep them in a good navigable state, ... for the small steamers which carry out the commerce of the valleys." In response, Congress appropriated $20,000 in 1882, and the sternwheeler *Skagit* was ready for service by the end of the following year. Unfortunately, the lack of operating funds forced the engineers to lay up the craft after its first trial run.[37]

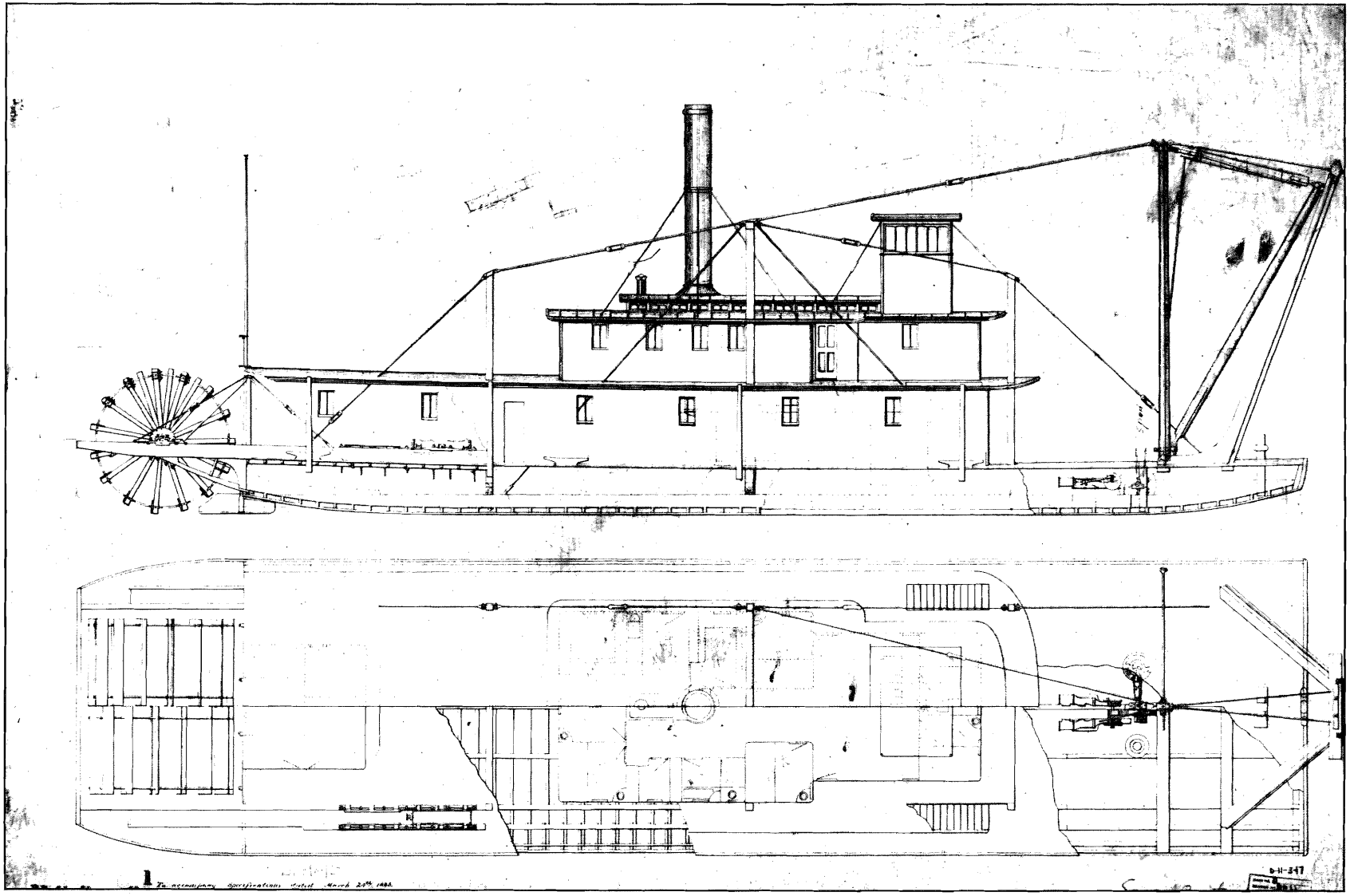
Although the *Skagit* engaged in snag removal in the fall of 1884, lack of money again kept the vessel at its Seattle dock from December of that year until September 1886. Thereafter, to the dismay of local settlers, limited appropriations restricted operation. The Corps also carried out work in these early years on the Nooksack, Stillaguamish, and Snohomish, but most of the *Skagit's* time was spent on its namesake stream. Draining 2,800 miles of northwestern Washington and southwestern British Columbia, the Skagit was, in the opinion of one pioneer resident, "the *big river* of the Sound country." Settlement expanded rapidly during the 1880s, especially on the fertile lowland of the delta. Upstream, loggers in the dense forest assembled rafts of fir timber for floating down to the tidewater sawmills.[38]

Crews conducted snagging work between the late fall and early spring, the period of most suitable water conditions. E. H. Jefferson, the master of the *Skagit*, concentrated his operations "at points on the different rivers where most needed and where the greatest benefits would be derived by the steamers engaged thereon." Consultation with steamboat captains allowed for rational allocation of effort and accounted for the focus on the Skagit. Moving from place to place on the river, workmen blasted, sawed, and chopped the larger snags and hauled the pieces from the muddy channel bottom with the *Skagit's* steam capstan. "The next



Photographs of sternwheeler snag-boat, Skagit...

...and crew.



Drawings of snag-boat, Skagit, *March 24, 1883.*

occurring freshet," as Jefferson noted, "would sweep the whole mass downstream and out."[39]

As settlement expanded along the river valleys, transportation needs correspondingly increased. By 1890, many of the newly developed communities on the Sound had rail connections. The rivers, observed Thomas Symons, "must ever, if kept in navigable condition, exercise a marked influence on railroad rates throughout the country traversed by them." A demonstrated need existed, in the view of Symons and other engineering officers, for a greatly expanded snagging program. Increased funding would expand the scope of the *Skagit's* work, allow engaging of land parties to remove log jams, and even make possible construction of a second snag-boat. These views, as well as the demands that produced them, carried over into a new administrative era for the Corps of Engineers in the Pacific Northwest.[40]

During the regional transformation of the 1880s, the Portland Engineer Office found itself overwhelmed by its expanding responsibilities. The extent of his present and prospective duties, reported Major Thomas H. Handbury in April 1890, amounted to "more than I can give proper personal attention to" and immediate relief was necessary. Following the Major's recommendation, the Chief of Engineers established a second Portland office to supervise all works north of the Columbia-Snake line, except for The Dalles, the Cascades, and the tributaries of the lower river. The territories given over to the office, noted Handbury, were "at such a distance that the time that would be consumed by me in visiting them could not well be spared without detriment to the larger works in my charge."[41]

This action amounted to the creation of an embryo Seattle engineering district. Under Captain Thomas Symons, the second office commenced the most important early projects of the subsequent Seattle District. Congress appropriated the first money and the Corps devised the first plans for the construction of a canal connecting Lake Washington and Puget Sound. Work began on a jetty at the entrance to, and on the removal of the restrictive shoals within, Grays Harbor. The initial attempts to eliminate the navigation obstructions on the upper Columbia River also got underway.[42]

Major Handbury predicted in 1890 that "at some future time it may be desirable to establish an engineer office at some point in Seattle, on Puget Sound, to which these works would naturally belong." The subsequent acceleration of Corps activities confirmed this prognostication. Thus, in April 1896, the Chief of Engineers created a Seattle Engineer Office out of the Washington portion of the two Portland offices. The new District also included Alaska. Captain Harry Taylor, who had served in the second Portland Engineer office from 1892-1896, became the first Engineer Officer in Seattle.[43]

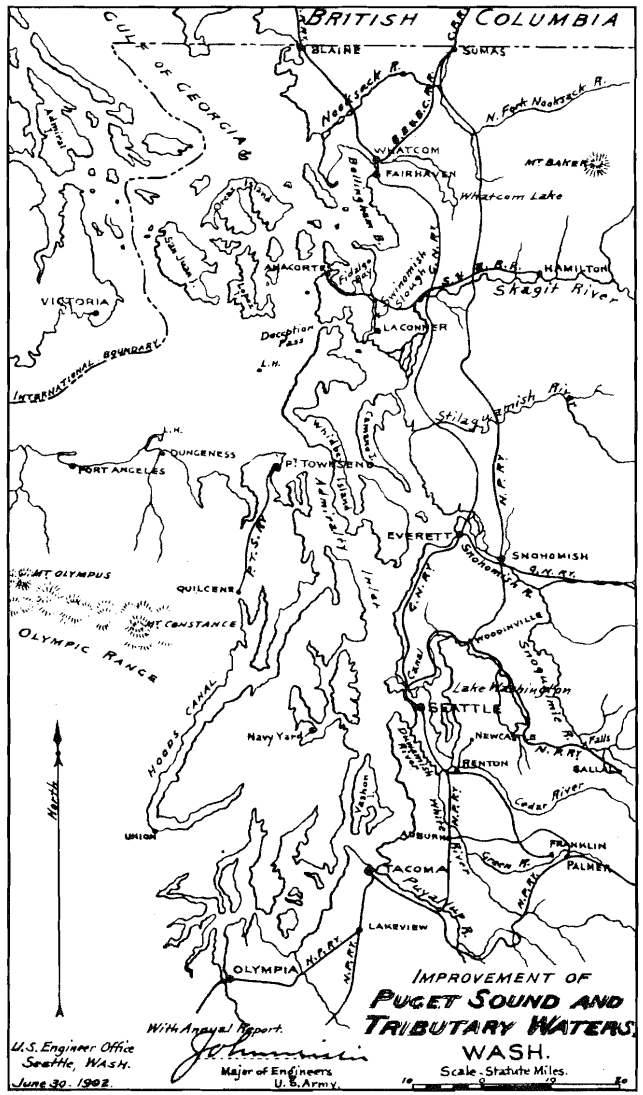
Captain Taylor and his immediate successors in Seattle shared certain characteristics. All of the early District Engineers had an eastern background. Taylor was the only one with extensive service on the Pacific coast prior to his Northwest assignment. Of the remainder, only Hiram Chittenden, with his years on the Missouri and in Yellowstone National Park, had served west of the Mississippi. Most had considerable experience with the construction of fortifications. Many of those who headed the District between 1910 and 1930 had served as military engineers in the Philippines during the War of 1898 or the subsequent bloody insurrection.[44]

Captain Harry Taylor, first Seattle District Engineer, 1896–1900.

Newly designated District Engineers arrived with a basic lack of familiarity concerning the geography and needs of the Pacific

Northwest. Although the expertise of the permanent civilian staff compensated for this unfamiliarity, District Engineers still found it difficult to achieve complete understanding of their District prior to reassignment. When informed in late 1896 that funds had been appropriated for the improvement of the North River, a tributary of Willapa Harbor, Captain Taylor found only one stream of that name on his map of Washington and informed the Chief of Engineers of his hope that work had been started at the correct location. Another District Engineer reported that Hood Canal, the extensive waterway between the Kitsap and Olympic peninsulas, was "an arm of Puget Sound." Time barely existed in an officer's term of appointment, according to tradition, for him to learn to correctly distinguish between the Skykomish and the Skokomish rivers.[45]

In the early days, Army Engineers regarded a posting to Seattle as something less than the highlight of an officer's career. The District Engineer worked in an isolated part of the country without the companionship of military colleagues. "The principal disadvantage of Engineer officers on this part of the Pacific Coast," wrote Colonel John Biddle in January 1909, after an inspection tour, "is the lack of opportunity to see other Engineer officers, and on account of distance to visit the works of other Districts." The Seattle engineer suffered professionally from his virtual exile to Puget Sound. The problems dealt with

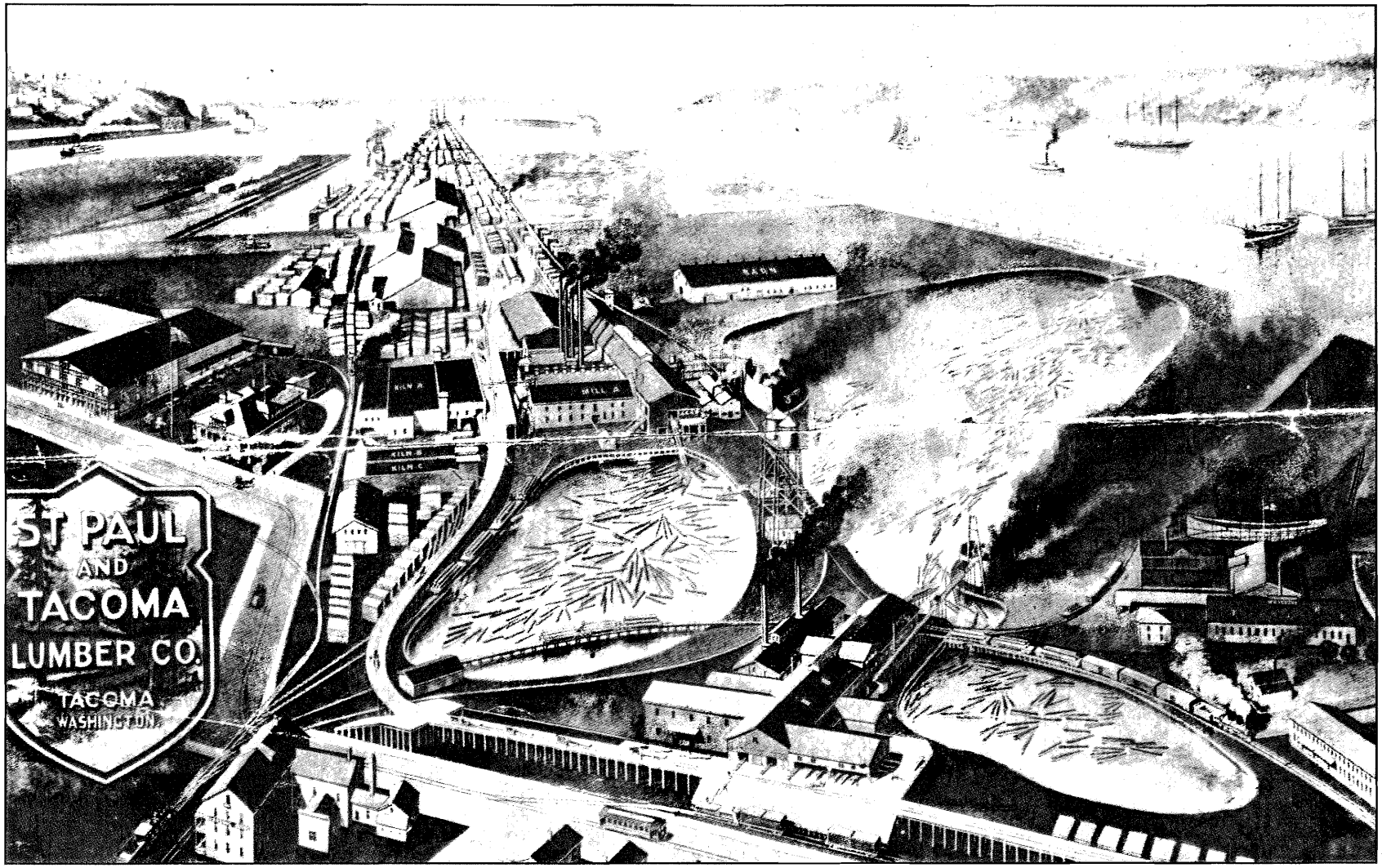


Improvement of Puget Sound and Tributary Waters, Washington, from Annual Report, 1908.

resembled those encountered in Oregon and California, but the expense of travel in times of strict public economy restricted exposure to projects in those states.[46]

Difficulties with the civilian staff also confounded the Engineer Officer. Although the early Seattle District employed only a half dozen civil engineers, it was still considered difficult to secure men of the proper caliber. "Every man who ever held a rod or a chain on a cheap railroad survey," observed Captain Taylor in October 1896, "calls himself an engineer and it is quite a puzzle to get a man of any intelligence and experience." Those engaged represented the best of the available lot, but Taylor still found it necessary to expend "much more than the regulation office hours" on the personal drafting of construction plans to insure quality. The work habits of employees attuned to the ways of the non-military world compounded the management problems of the Seattle District Engineers. "Even the best of men," lamented Taylor, "do not catch on to the ways of the Army Engineer without a good deal of looking after."[47]

Civilian employees, viewing matters from a different perspective, had their own grievances. The onerous demands of record keeping and the blizzard of required reports could exasperate the most dedicated employee. Those who chose to ignore orders and guidelines could expect prompt and blunt chastisement. In April 1898, for example,



Tacoma, Washington. Artist's rendition.

Captain Taylor discovered that J. M. Clapp, supervisor of the Grays Harbor jetty project, had exceeded his authority by engaging extra employees. "This is not the first time that you have disobeyed instructions," Taylor wrote to Clapp, "and as it seems necessary to impress upon your mind the fact that instructions are to be followed, I have disapproved the payrolls and you can settle with the men you have hired, as best you may." The Captain also warned that in the event of further transgressions, "I shall dispense with your services entirely and immediately."[48]

Dealings with the public also produced frustration, for officers and civilian employees alike. The public had the disconcerting habit of failing to correctly inform itself about the detailed provisions of Corps of Engineers projects. Much time had to be devoted, as a result, to explaining matters to unhappy individuals and organizations. "Even supposing," wrote Captain Harry Taylor of his ventures in local diplomacy, "I am willing to stand the kicking of the interested public who think all the ... works in the District ought to be started at once, it is not very satisfactory."[49]

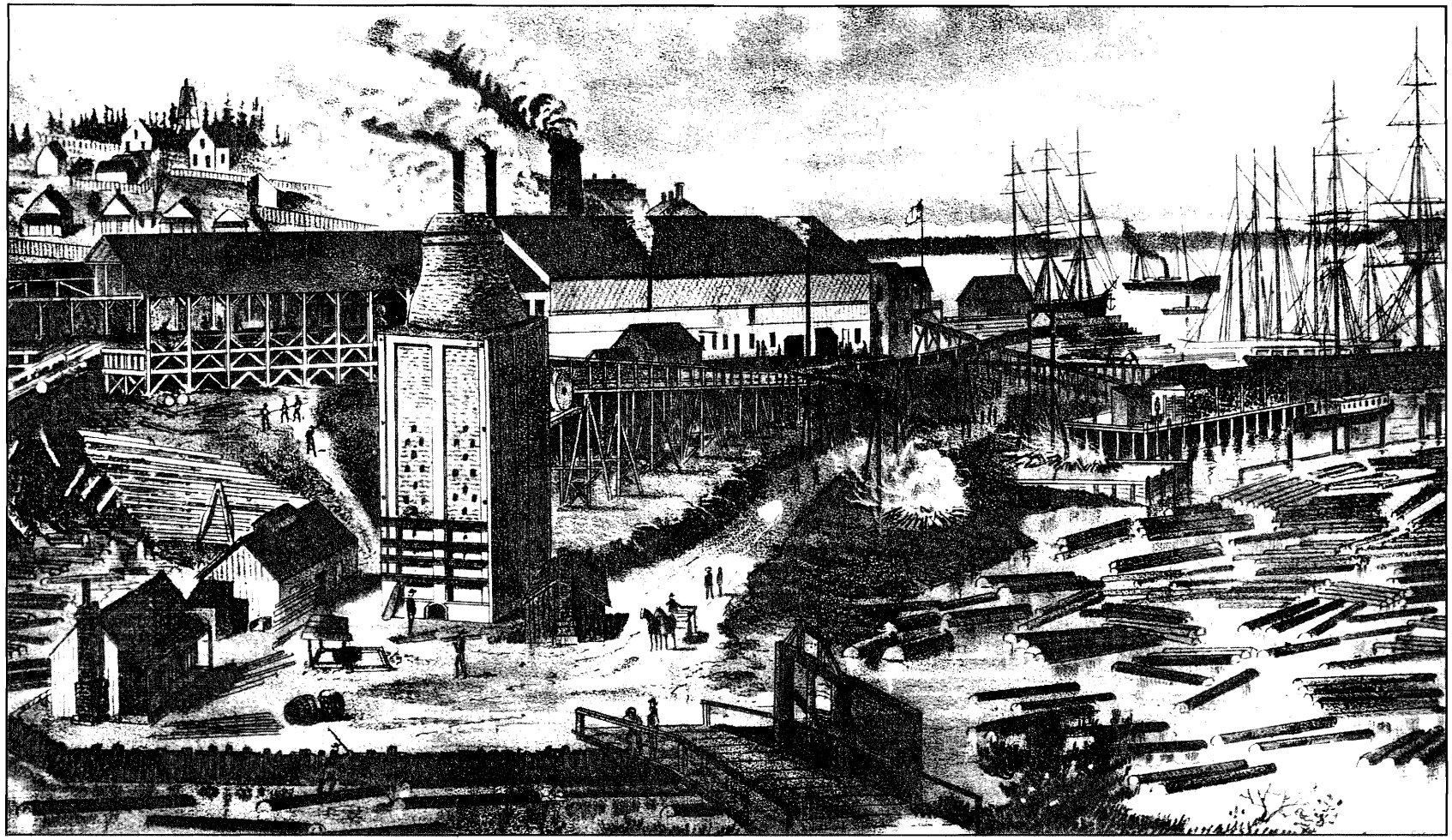
Considering the procedures by which Corps' projects gained authorization, public confusion was understandable. The formal process began when Congress called, usually at the request of local interests, for a preliminary examination of a specific project. After performing a field reconnaissance and data compilation, the local District prepared a report which was submitted for endorsement, in order, by the Division Engineer, an Engineering Board, and the Chief of Engineers. Eventually the War Department submitted the report to the appropriate congressional committee. In theory, a favorable examination resulted in authorization of a second study known as the survey. Presenting the District Engineer's detailed plans and cost estimates, this document proceeded through the same channels and, if affirmative in its recommendations, led to the actual appropriation of construction funds. Such a lengthy process meant that several years might pass between the original proposal and the commencement of work.[50]

Within the Corps, the local engineer district — such as Seattle — occupied the central position in the process. Until the 1930s, the Division Engineer, while submitting a separate report, rarely did more than summarize his District subordinate's findings. In only one major instance, the original Grays Harbor jetty work, did the Division submit a contrary recommendation. Higher authority eventually resolved the dispute in favor of the local officer. With few exceptions, the Chief of Engineers, moreover, was disinclined to do more than pass on the basic views of the District. Under these circumstances, the Engineer Office in Seattle possessed considerable influence.[51]

When evaluating proposed projects, the Corps could find itself caught between the competing perspectives of local interests and the Congress and its own independent engineering judgement. When the Corps submitted a favorable recommendation, there would be no difficulty. When the report was negative, however, Congress had to choose between accommodating the needs of influential constituents and acceding to the objective conclusions of the military. The Corps of Engineers, as a result, sometimes found itself instructed to undertake projects over its own expert opposition.

This process pointed to a fundamental and enduring problem. On the one hand, the Army Engineer was dedicated by training and tradition to hard factual analysis. On the other, the Corps of Engineers depended upon congressional appropriations and the processes of political life. With reconciliation occasionally difficult, these twin demands provided frustration for the Corps and its officers.[52]

Whether stationed in Seattle or elsewhere, the Army Engineer reflected in his professional conduct major tendencies in American life at the turn of the century. A significant aspect of that era involved the effort — at national, state, and local levels — to recreate an orderly society out of the chaos of industrialization and urbanization. One means of accomplishing this task called for establishing within the government expert agencies capable of studying problems and devising the proper methods for their correction. According to this belief, society could



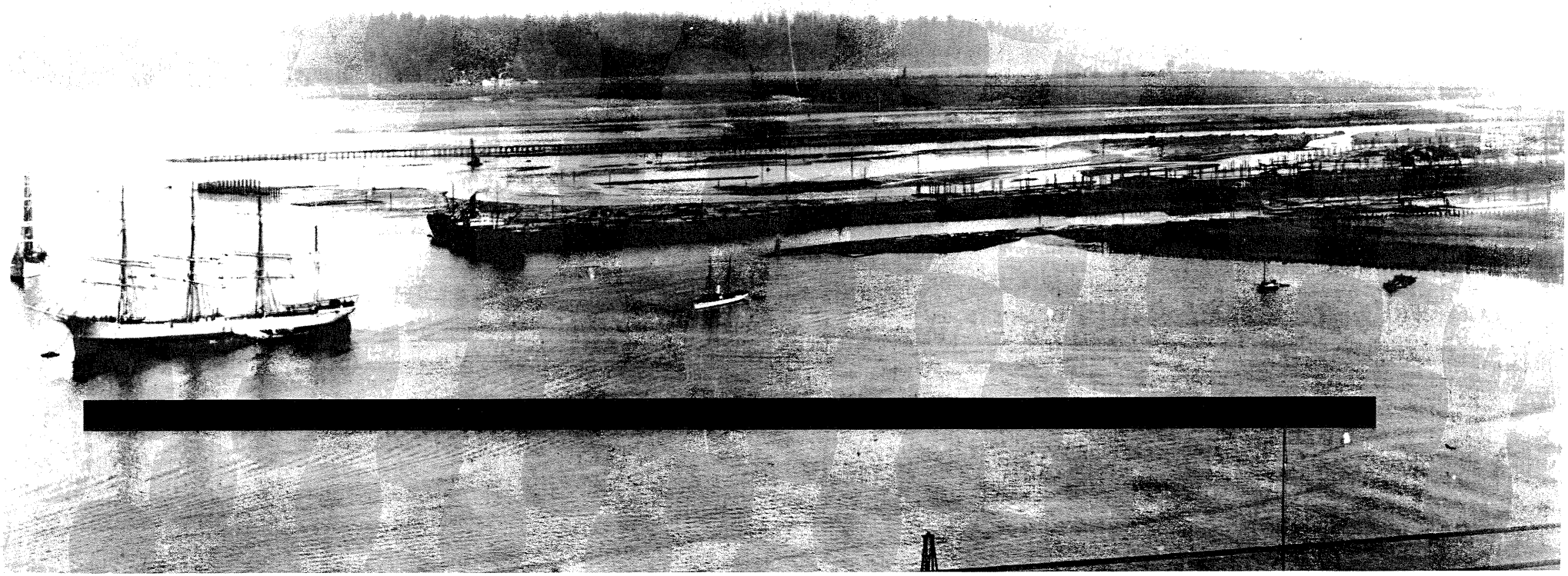
Hanson and Company Sawmill at Tacoma, Washington. Artist's rendition.

overcome its shortcomings through the application of energy and intellect. The engineering profession, in general, and the Corps of Engineers, in particular, with its dramatic achievements, both contributed to and benefited from this conventional wisdom.[53]

Through its engineering procedures, the Corps of Engineers represented efficient administration. The Corps emphasized in its examination and survey reports the gathering of all information — facts of geography, economy, population, and politics — pertinent to rendering a favorable or unfavorable recommendation. The Corps applied the old engineering dictum that, if given five minutes to accomplish a task, the first three should be spent on planning. In addition, the proposed details of construction often seemed a secondary aspect of the reports. Apparently, virtually anything could be built under the proper conditions of time and money. The real question centered not upon whether a given project could be constructed, but whether or not it was objectively determined a worthwhile undertaking in the interest of national commerce. Despite the occasional interference of political considerations, this remained the standard of the Corps: to base operations on informed calculation of the public interest.[54]

During the last quarter of the nineteenth century, the civilian role of the Corps of Engineers in the Pacific Northwest expanded along with the population and commercial life. East of the Cascades, works of navigation facilitated the settlement of the vast plain of the Columbia. To the west of the mountains, Army Engineers developed plans for remaking rivers and harbors to the benefit of economic growth. Building upon these initial undertakings, the newly created Seattle District began in 1896 the building of a region.

Chapter 3



WATERWAYS IMPROVEMENT

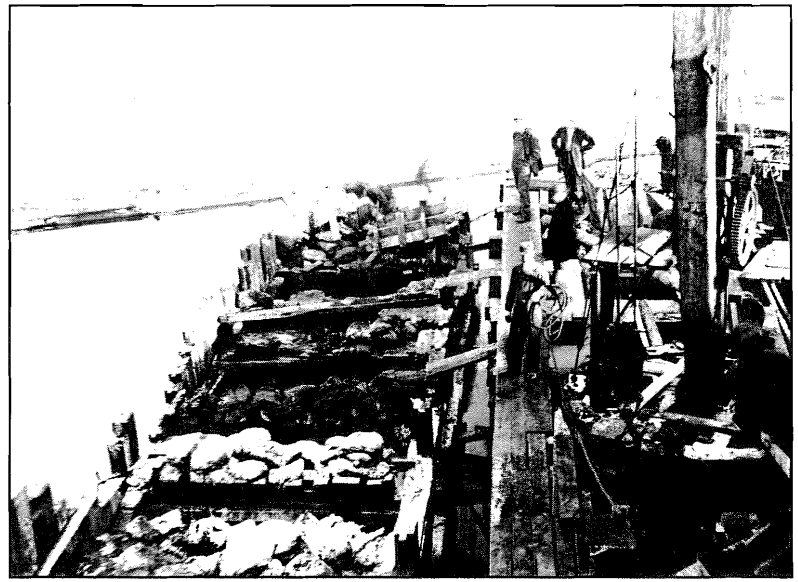
Grays Harbor

For near 6,000 feet a wooden trestle extended westward from Point Chehalis into the grayish infinity of the Pacific. Without warning, a great windstorm — "one of the most severe ... that has occurred in this vicinity" according to the report of Seattle District civilian engineer J. M. Clapp — blew off the ocean to strike Grays Harbor on a late May afternoon in 1900. Caught at the exposed end of the jetty trestle, workmen barely had time to lash their pile driver to the tracks before sprinting to the safety of the distant shore. Sheets of rain enveloped the scene, lifting for only a moment to reveal the dashing of the pile driver and several hundred feet of trackage into the sea. Driven by the westerly gale, waves swept the machinery through the harbor mouth and onto a mudbank a mile to the east. As the storm passed, the laborers rescued the stranded driver and resumed extension of the timbered way. Nature's sudden fury was an unpredictable element in the Northwest work of the Army Engineers.[1]

In western Washington before 1900, lumbering served as the chief stimulus to settlement and development. California interests developed mills on Puget Sound during the 1850s, but unfortunately, the California market proved unpredictable. Until the completion of the transcontinental railroad in 1883, Washington Territory's prosperity followed the boom and bust cycles of California. Still, between 1860 and 1880, lumbering absorbed 80 percent of the dollars invested in Washington industry. Lumbermen wishing to exploit the timber resources of the Grays Harbor region faced special problems.[2]

Flowing from the Puget Sound divide, the Chehalis River and its tributaries — the Satsop, Wynooche, and Wishkah — drain an area in excess of 2,000 square miles. At its mouth, the stream becomes the

opposite: Harbor at Tacoma, Washington, 1909.



Jetty construction at Grays Harbor, Washington, ca. 1903.

eastern portion of Grays Harbor. Two channels, one to the north and the other to the south, reach through shoals for a dozen miles toward the sea. Although broadening in its western extremity, much of the harbor is exposed at the lowest extent of tide. Grays Harbor, noted Hiram Chittenden, "is really a vast mud flat."[3]

Like other ocean ports of the Pacific Northwest, a drifting sand bar obstructed its entrance. Three passages existed in the early 1880s, the deepest offering transit to vessels of 21 feet draft. "For depth, permanency, and facility of access," reported Portland Engineer Officer Captain Charles F. Powell, "the channel compares favorably with entrances to all harbors as far south as San Francisco." The problem, Powell's assertion aside, was that the channel underwent constant and

confusing relocation. Moving with the current, it shifted to the south by an estimated thousand feet between 1862 and 1881 alone. In some seasons it was straight, in others crooked, and at all times the depth varied by several feet. Mariners had to have their sailing vessels towed to sea and could be barbound for weeks due to adverse winds and tides.[4]

These conditions slowed the development of the Grays Harbor country. Three thousand persons lived in the valley of the Chehalis in 1880, most occupied in dairying and other agricultural endeavors on the rich bottomland. A water-powered sawmill at Montesano, county seat and the head of tidal influence on the stream, represented the region's entire industrial activity. On Grays Harbor itself, only a few had settled; and, according to one account, no business establishments of note existed during the 1870s. Navigation consisted of a mailboat and a small San Francisco steamer calling six times a year at Montesano.[5]

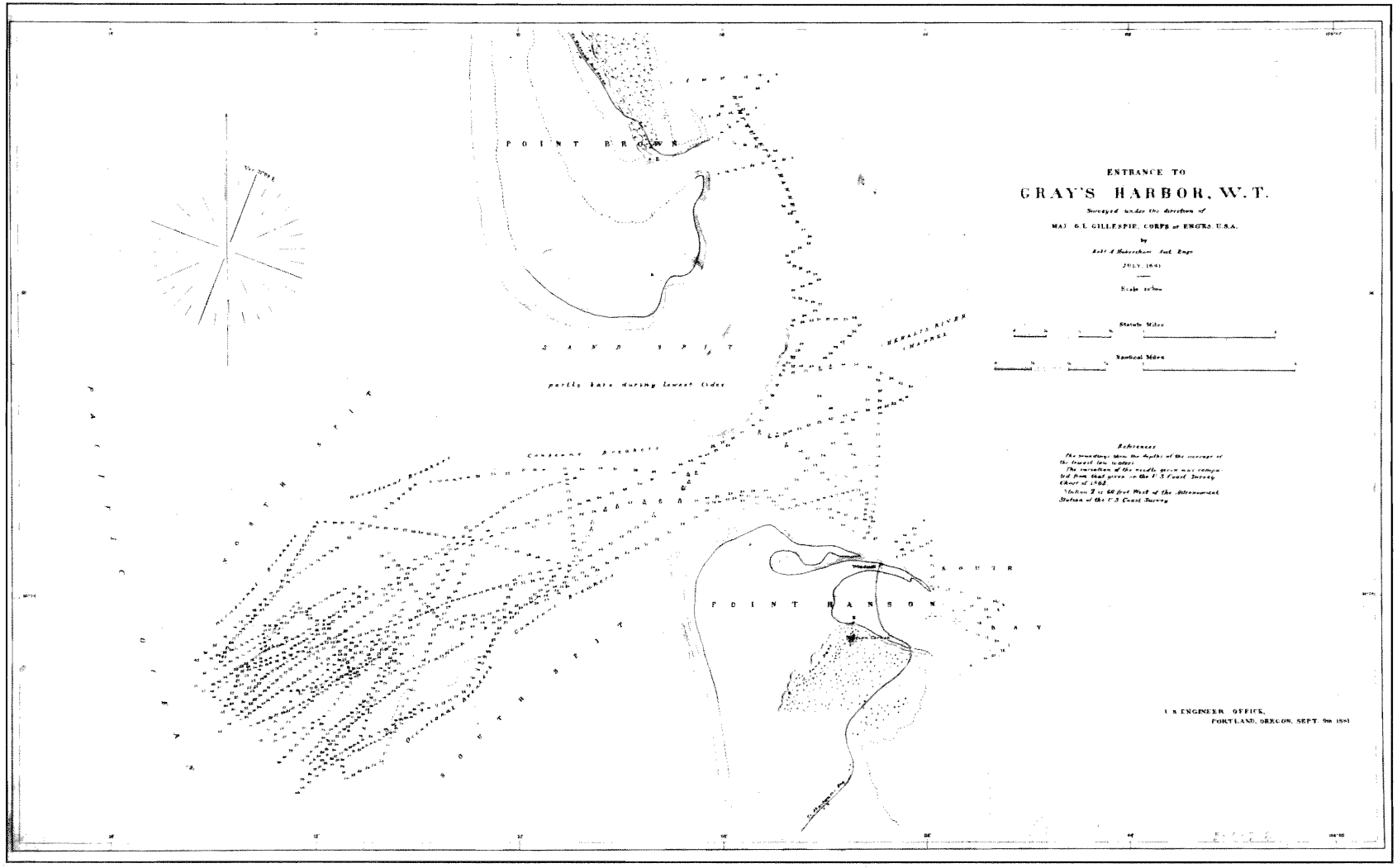
Conducted by the Portland Engineer Office in 1881, the first Corps of Engineers study of Grays Harbor produced recommendations reflecting the area's limited population and economic need. All that was required at the harbor entrance, advised Captain Powell, was installation of a signal buoy and channel markers. Powell suggested some snagging work for the lower Chehalis, and in 1882 Congress extended a modest appropriation for this activity. Over the remainder of the decade, workmen operating from the shore and from chartered boats removed snags each fall on the dozen miles between the mouth and Montesano.[6]

In the meantime, the interest sparked by the government's 1881 survey transformed the situation on Grays Harbor. George Emerson, agent of the San Francisco lumbering magnate A. M. Simpson, arrived in that year to erect the plant of the North Western Lumber Company at Hoquiam. By 1890, that community and Aberdeen and Cosmopolis to the east had become major manufacturers of lumber. Nine thousand people lived in the county, and the harbor became a major industrial rival to the older settlements on Puget Sound. Schooners designed for the bar crossing carried away timber to California, and lumbermen looked to the impending arrival of a Northern Pacific branch for the opening of markets beyond the Cascades.[7]

Harbor boosters proudly claimed that their prosperity developed in spite of the lack of significant navigation improvements. Still, the benefits of such works appeared so obvious that in 1890, local commercial interests petitioned Congress for the expenditure of a million dollars on the bar and the interior obstructions. Application of even a portion of this sum, the locals contended, would enable Grays Harbor to realize its full economic potential. "The current of public sentiment respecting the improvement of our Harbor," wrote George Emerson, "is deep and wide and strong, with no ripples on its surface." Following a new examination of conditions, Captain Thomas W. Symons pressed the worthy nature of a major Federal undertaking on the harbor.[8]

Work began first on the inner harbor, in large part because a local mill company reneged upon its promise of a boat for the survey of the bar in early 1891. At two points in the northern navigation channel, one between Aberdeen and Hoquiam and the other two miles below the latter town, shoals limited low tide depth to eight feet. "To remedy the evil," reported Captain Symons, "it is proposed to put in works which shall cause a stronger flow in the principal or north channel, and to depend upon this stronger flow to scour out the shoals." Dikes of brush and stone at the two locations, the lower one closing a connecting link between the channels, would divert a greater portion of the Chehalis northward and achieve the desired result. As for the river itself, the dredging of shoals and the closure of sloughs would provide more water in the main channel upstream to Montesano. The result of both projects would enable vessels of 16-foot draft — the standard for loaded lumber carriers of the time — to have ready access to both the harbor and the Chehalis.[9]

Construction of the dikes began in April 1893 with a $50,000 Congressional appropriation secured the previous year. Driven into the sandy harbor bottom, piling served as the foundation for layers of brush



Map of Grays Harbor before improvements, July 1881.

fascine. Workers placed rocks upon this mattress and secured the whole with timbers. At the upper, or Cow Point, shoal, they extended a brush sill for a thousand feet between segments of dike to allow continued, if reduced, flow of water into the south channel.[10]

Completed in the summer of 1894, the dike system's initial impact proved satisfactory. "The velocity of both the ebb and the flood tide in the north channel," observed supervising engineer J. M. Clapp in June 1895, "has wonderfully increased." With depth substantially enhanced, vessels previously able to pass over the shoals only at the highest stage of the tide could now do so in the early portion of the incoming flow. Unfortunately, the washing away of sand revealed an underlying layer of clay resistant to the action of the current and prevented achievement of the intended 16-foot channel.[11]

Completion of the Northern Pacific to Grays Harbor in 1893 greatly reduced the commercial value of the Chehalis River. The rapid growth of the mill towns on the harbor, moreover, meant a corresponding decline in the importance of Montesano. Finally, the countless snags embedded in the river bottom — "a network ... which will prove a menace to navigation for all time" in the view of Clapp — made the provision of a 16-foot passage impracticable as well as unnecessary. Even so, the Corps dredged the shoals by June 1895, and 1,500 feet of dike construction closed off the sloughs. This work created a much-improved channel in the lower Chehalis, albeit far short of the project depth and requiring continued snag removal.[12]

The Corps' river improvement ended a colorful era on the Chehalis. Over the years, those engaged in the theft of logs from upstream booms had used the sloughs for concealment and rebranding prior to sale to sawmills. One supposed thief actually threatened, during construction, to sue the government for destroying his livelihood. In December 1895, an unknown party destroyed one of the dikes in order to run logs into a slough. "Some think it was such a person," wrote Clapp, "while others think it was another and others think it was done with the knowledge of all who live along the slough." Prosecution was impossible, but increased vigilance thereafter prevented further damage and terminated log thievery on the Chehalis.[13]

Engineering work on the harbor also had an unintended side- effect. The deepening of the north channel insured a prosperous future for the fortunately-located towns of Hoquiam and Aberdeen. In contrast, Ocosta, situated near the harbor mouth on the now-diminished southern channel, faced an uncertain future. The residents of Ocosta viewed the government project as "the most one-sided and flagrantly partial affair that could have ever been proposed." It certainly meant defeat for Ocosta in the previously even struggle for commercial dominance of Grays Harbor.[14]

Business section, early Aberdeen, Washington, on Grays Harbor. Engineering work on the harbor, such as deepening of the north channel, insured a prosperous future for the fortunately-located towns of Hoquiam and Aberdeen.

Meanwhile, planning for the works at the entrance to Grays Harbor got underway, with the goal of allowing vessels of appropriate draft for the inner channel to pass to and from the ocean in safety. The Corps' plan to direct the outflowing waters, estimated at velocities up to nine miles per hour, to provide a deep and stable channel across the bar. Studying the matter during the winter of 1894, Captain Thomas Symons concluded that the proper means involved construction of a jetty seaward from Point Hanson — as Point Chehalis was then known — at the southern tip of the harbor mouth. His recommendation, noted Symons, was based upon the apparent success of single Corps' jetty at Coos Bay and the mouth of the Columbia. The latter project, while designed as the first of a converging pair, had "been successful in maintaining a bar channel permanent in position and of greatly increased depth." The details of Symons' plan drew heavily on the Corps' experience in building the Oregon jetties.[15]

Reviewing the Symons plan, Colonel George Mendell, the Division Engineer in San Francisco, rejected the captain's calculations as insufficient. The actual effectiveness of the Coos Bay and Columbia works, he pointed out, could only be assessed after years of operating experience. With only a single jetty at Grays Harbor, moreover, "the discharge is likely to occur in two or more partial channels — not unlike the existing conditions." Thus the project as conceived would fail to achieve any worthwhile outcome. The proper course, in the colonel's view, called for building two jetties, one at the north and the other at the south, thereby further restricting the channel.[16]

In response, Symons noted the danger posed by directing the enhanced flowage through the interval between the jetties envisioned by Mendell. The resultant velocities, he wrote, were "incompatible with safety when they result from the artificial contraction of a waterway by comparatively frail structures built upon shifting sands and exposed to the wave action on a very stormy coast." The matter of cost also figured in the evaluation: the south jetty, the captain estimated, would require an expenditure of $1 million, while the Mendell proposal inflated necessary funding to $2.3 million. And the second jetty could always be built at a later date if the original did in fact prove ineffective. This reasoning proved persuasive, and the Symons' approach won the approval of the War Department and of Congress.[17]

In its first major undertaking, the newly-established Seattle Engineer Office implemented Symons' plan calling for a jetty three-and-a-half miles seaward from the harbor side of Point Hanson. Rock would be dumped from a trestle constructed in advance of the jetty to form a structure standing above the level of high tide. "The success of this plan," pointed out Captain Harry Taylor in July 1896, "depends to a very large extent upon the rapid completion of the work after it is once begun, and before the trestle has deteriorated enough to make it unsafe." This factor meant that the project must be completed within three years of start-up. Actual work became possible, after Taylor privately urged Grays Harbor interests to "stir up your representatives," when Congress appropriated $350,000 in the spring of 1897.[18]

To Taylor, the key matters in construction included the availability of suitable rock and the speed with which material could be transported to the worksite. Upon receipt of bids in August 1897, the captain found that the two lowest proposals were based upon supplies of stone "absolutely worthless for the purpose." The Hale & Kern firm, in contrast, operated the Columbia River quarry used for the works at the mouth of that stream, but its estimate was 40 percent above the figure of the low bidder. The Seattle District readvertised the project, with Hale & Kern this time advancing to second ranking and securing the contract. The work of preparation finally began in March 1898. Reinforced barges carried rock from the Columbia River quarry to a receiving wharf inside Point Hanson. Four derricks enabled unloading into railroad cars. Laborers extended the double-tracked trestle westward across the sandspit to highwater mark on the ocean beach. Completion of these tasks allowed commencement of the jetty itself in mid-summer.[19]

At the end of a year's work, the Corps had built the trestle to a point 5,152 feet west of the highwater line, with the jetty following behind. Workers carefully lowered from the trestle a foundation mattress of

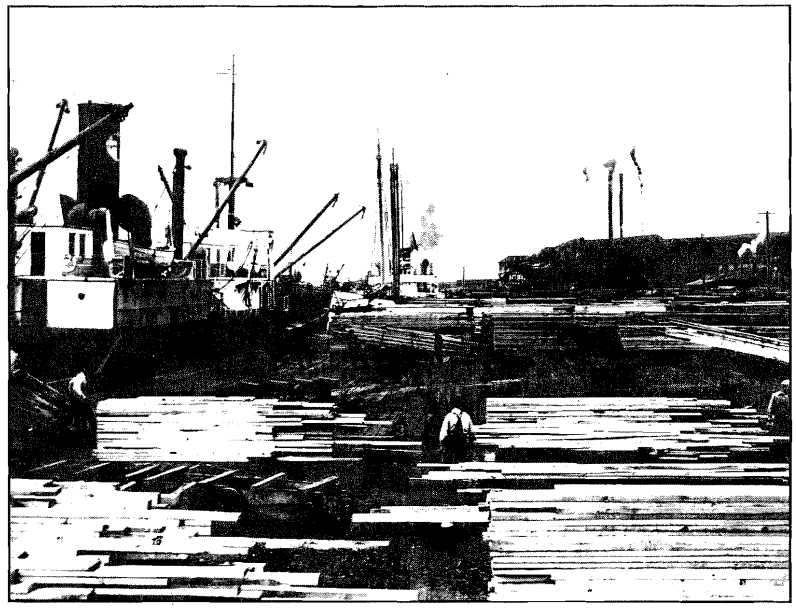
woven brush two-and-a-half feet thick and 40-feet wide. They then laid small rocks to hold this mass to the seabed. The placement of large pieces of rubble completed a section of the jetty. Construction trains busily hurried back and forth as workers needed 30,000 tons of rock per month during the peak of operations.[20]

A common problem in jetty works became evident as the project continued on to the west. Changes in the current caused by enrockment scoured out the ocean bottom in advance of the trestle. The increased depth meant that greater amounts of stone and other materials were required than contained in the original calculations. The initial three-and-a-half mile extent of the jetty was based upon an estimate of how much could be accomplished with the authorized funding of $1 million. When the Corps expended that amount by September 1902, the jetty had attained a length of 13,784 feet, over 4,000 feet short of the project figure. Its height, moreover, reached only the line of high tide, rather than the planned extreme high tide level.[21]

With funding exhausted, the Corps of Engineers regarded its Grays Harbor work complete in the fall of 1902. Local interests, however, vigorously differed. The lumber industry's changeover from sailing schooners to large steamships, some carrying in excess of a million feet of timber, meant that neither the existing harbor channels nor those contemplated in the Corps' project met the needs of commerce. Restricted to smaller vessels, mill owners believed themselves at a competitive disadvantage with other ports and blamed the government for this unhappy situation.[22]

In apparent confirmation of Colonel Mendell's fears, moreover, the jetty failed to achieve its objective. The main channel across the bar continued to shift with the current and the season. By 1906, available water at the lowest stages of the tide reached a depth of only 12 feet. Obscured at highest tide, the jetty actually amounted to a navigation hazard, as evidenced by a ship striking on its westerly extent in November 1904. Harbor businessmen pressed the government to complete the project to its original dimensions and to build the companion jetty proposed by Mendell. The initial Symons-Taylor project, they contended, "suited the times at the time it was made," but was "now inadequate to the proper care of the shipping interests of Grays Harbor."[23]

Responding to these demands, the War Department ordered the Division Engineer, and the Seattle and Portland District Engineers, to study the matter. The panel held two days of hearings at Hoquiam in September 1903, but failed to inspect the jetty due to adverse weather. That project, according to the boards's subsequent report, should be completed as originally planned, at an estimated cost of $50,000. In addition, planning should be authorized for a north-side jetty. "Such work," the Pacific Northwest officers noted, "would have for its objects

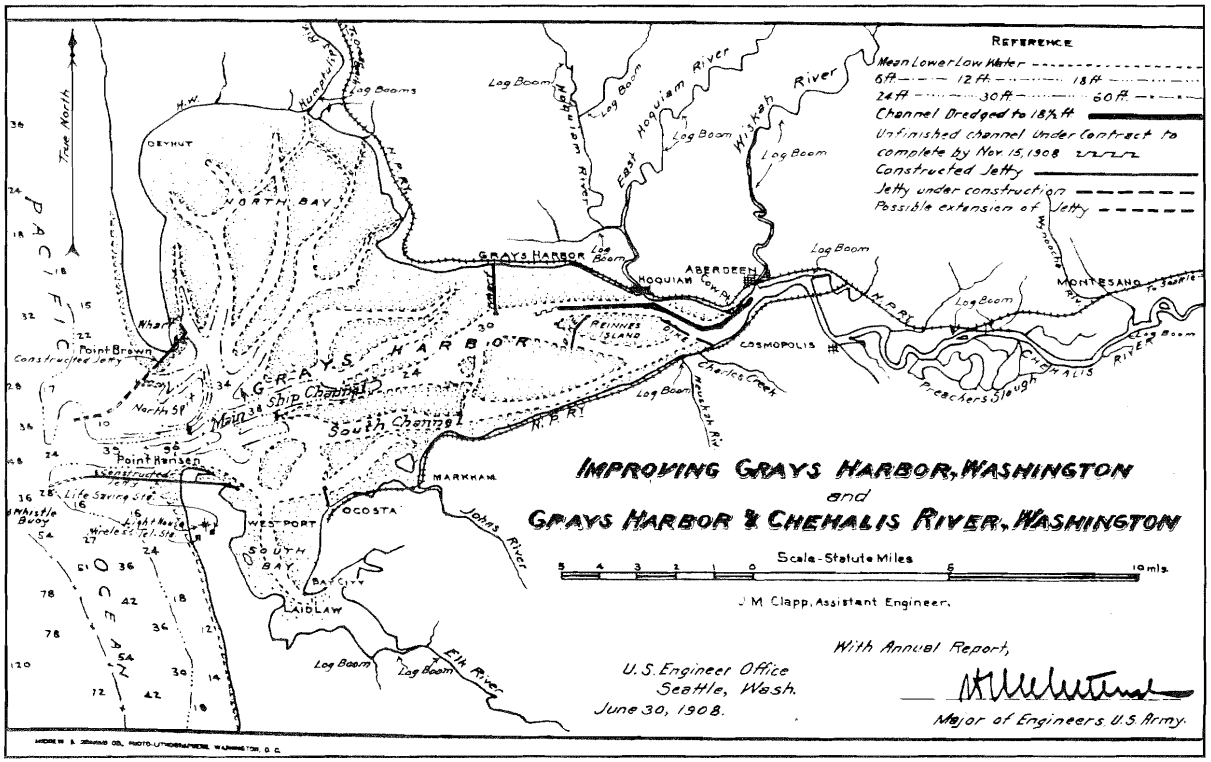


With the lumber industry's changeover from sailing schooners to large steamships, area businessmen pressed the government for improvements that would meet the needs of shipping interests of Grays Harbor.

the checking of any marked tendency of the harbor throat to enlarge or widen northward, and the further localization of tidal action on the bar." The new model lumber carriers would thereby be provided with a dependable passage.[24]

Considering this proposal, the Board of Engineers in Washington, D.C. calculated that the cost of the two complete jetties would be $3 million. Dredging experiments underway at the mouth of the Columbia River, though, raised the possibility of a relatively inexpensive alternative to additional construction. An expenditure of $400,000 for plant and $50,000 a year for operation might, in the board's view, produce a superior channel. Until the Corps had fully assessed results of the work on the Columbia, the board recommended postponing action on Grays Harbor.[25]

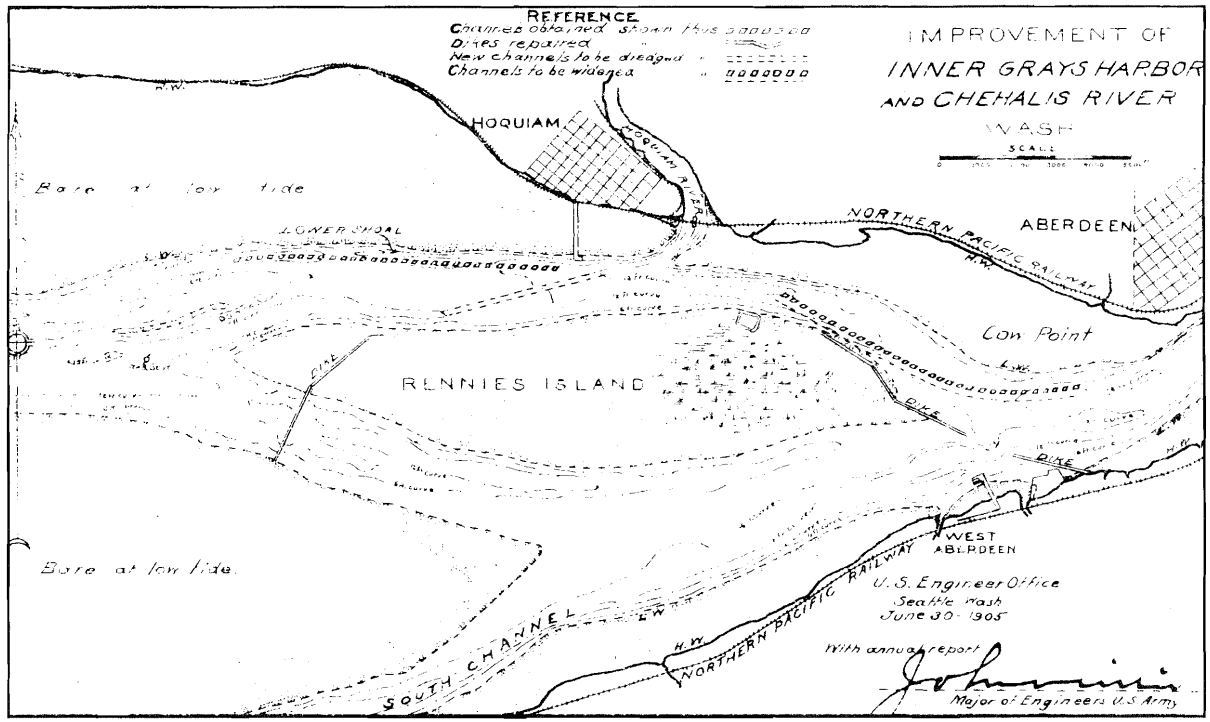
Because only limited financing was required, the Corps of Engineers did agree to undertake new work on the inner harbor. Under a project authorized in 1903, the Corps dredged the shoals at Cow Point and below Hoquiam to the originally-intended depth of 16 feet. By 1906, however, serious deterioration returned at both locations. A thorough investigation determined that the operation of splash dams on the numerous tributary streams flowing from the timbered foothills of the Olympic Range contributed to the problem. Large quantities of silt and other material washed out when loggers removed these dams allowing movement of logs to tidewater. Under such circumstances, only continuous effort would keep the harbor open to shipping.[26]



Grays Harbor improvements, Annual Report June 30, 1908, showing north jetty under construction at Point Brown and possible extension of south jetty from Point Hanson.

A new project adopted by Congress in March 1907 called for an 18-foot channel from above Aberdeen to deep water west of Hoquiam. The contractor completed work by the summer of 1908, although insufficient funds forced a narrowing of the projected width of the passage. Over an extent of 31,000 feet, the channel at first maintained a depth in excess of that required. Within a year, though, significant shoaling once again obstructed vessel movement.[27]

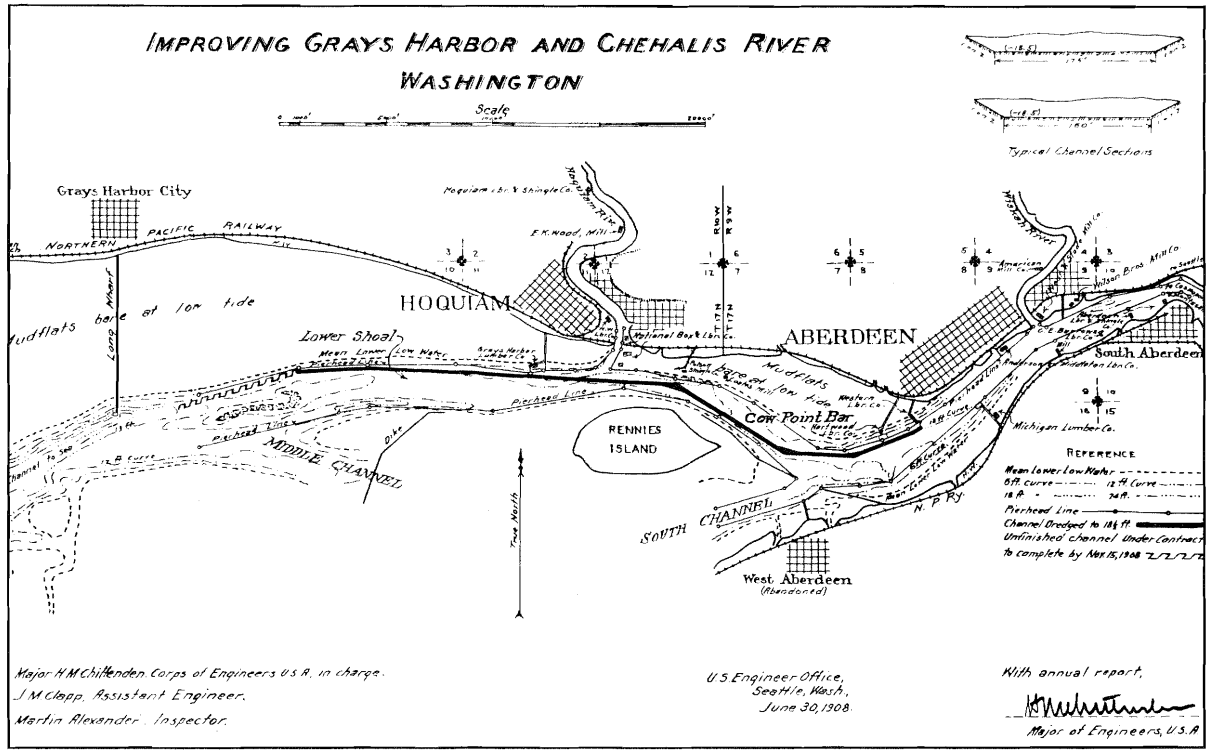
Beginning in 1911, the Corps and the newly-formed Port of Grays Harbor cooperated in an annual program of channel maintenance. Local interests had organized the Port District for the purpose of providing money for dredging. Using local funds for the cost of operation, the Seattle District borrowed the hydraulic dredge *Oregon* each year from the Portland District for a month or two of work on the harbor. In 1917, for example, the dredge removed 190,000 cubic yards of material below Hoquiam. Because of the refractory harbor bottom and continued deposition of silt, the natural currents proved unable to accomplish the scouring originally contemplated. Under a project approved in July 1910, the *Oregon* also maintained a six-foot channel in the Chehalis River upstream to Montesano.[28]



Improvement of Inner Grays Harbor and Chehalis River, Annual Report June 30, 1905.

Meanwhile, conditions at the harbor mouth combined with the disappointing results of dredging on the Columbia to produce a decision in favor of the long-discussed north jetty. "So large is the section ... available for ingress and egress of the tides," reported Major Hiram Chittenden in December 1906, "that the tidal action is not concentrated sufficiently to maintain a channel of the required depth." To achieve the necessary concentration, he proposed building a 9,000-foot mid-tide structure from Point Brown on the northern entrance to Grays Harbor. The growing commercial importance of the harbor mandated rapid construction of the project in the major's view. Agreeing with the remedy and the need, Chittenden's superiors quickly endorsed the proposal.[29]

Work on support facilities began in October 1907 and construction of the jetty itself commenced in May 1908. A contractor supplied jetty stone while local lumbering interests provided the necessary right-of-way. The engineers employed methods of operation identical to those used on the southern project. At Chittenden's recommendation, however, the work proceeded as a direct Seattle District undertaking. The rate of progress reflected the efficiency of public management. By July 1910, enrockment approached the end of a 10,000-foot trestle. "Thus," reported a satisfied Major Charles W. Kutz, "nearly 1,000 feet more of jetty has been completed than called for by Colonel Chittenden's project." And the actual cost, compared to the $600,000 estimate, was only $505,000.[30]



Improving Grays Harbor and Chehalis River, Annual Report June 30, 1908.

This did not mark completion of the project, however, for a decision had been made to extend the jetty on to a point opposite its southern counterpart and to increase its height to the level of high tide. The result, the engineers hoped, would be a further restriction of tidal flow and final achievement of the desired bar crossing. "The proposed extension," noted Major Kutz, "is the next logical step." In June 1910, Congress authorized an extra 7,000 feet of length for the north jetty and made the first appropriation of the estimated million dollar cost of the new construction.[31]

Extension of the jetty commenced as soon as the Seattle District completed the original work in 1910. Bad weather repeatedly delayed the project. For example, in 1912 a storm washed away the only available pile driver and caused the loss of an entire working season. The Corps of Engineers finally completed the jetty to its full length in January 1916. At that point, surveys revealed a main bar crossing a depth of 19 feet, substantially less than the desired level. "It is not probable," concluded Major James B. Cavanaugh from the initial evidence, "that the jetties alone with their present lengths will be sufficient to secure and maintain the project depth of 24 feet."[32]

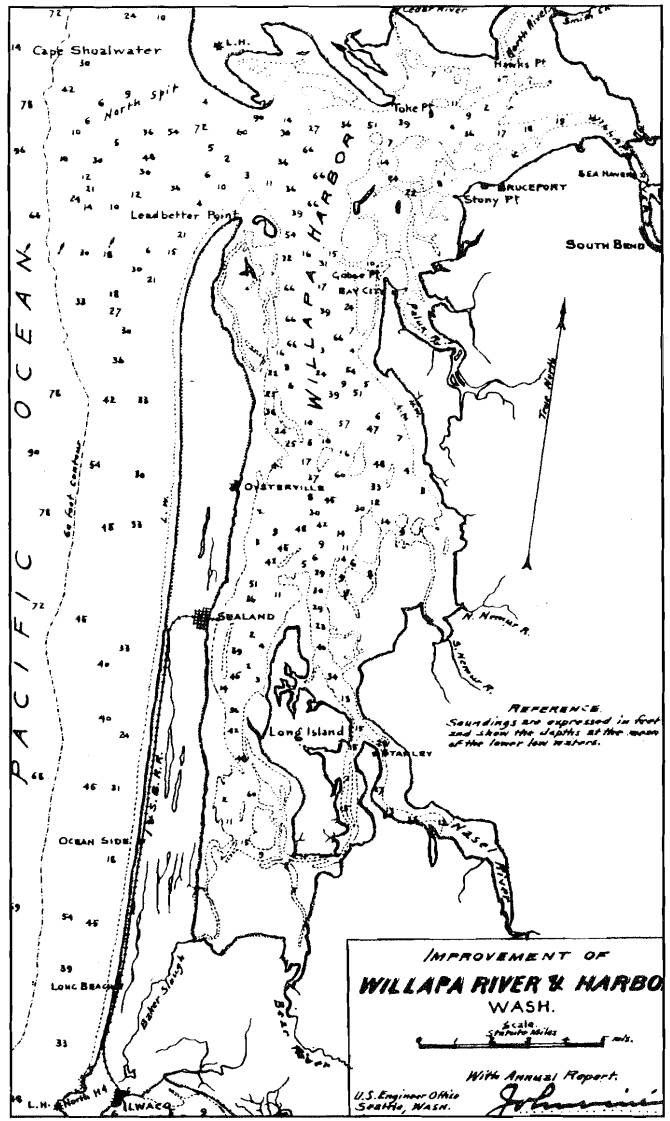
Two decades of effort on Grays Harbor thus concluded with the achievement of mixed results. The various works constituted a marked benefit, as local businessmen affirmed, to the expansion of lumber-oriented commerce. The early faith in the power of redirected nature, however, had been only partially repaid. To maintain depth in the interior channels of navigation the engineers had to employ continual dredging. The old southern jetty, Major Cavanaugh reported in July 1913, "throughout most [of] its length has been beaten down by the sea ... the outer end being below ordinary low water." Engineers considered expensive repairs and further extensions of both structures imperative. Even then, annual assignment of a dredge to the bar would be necessary. The Grays Harbor project had only reached the termination of its initial phase.[33]

Willapa Bay

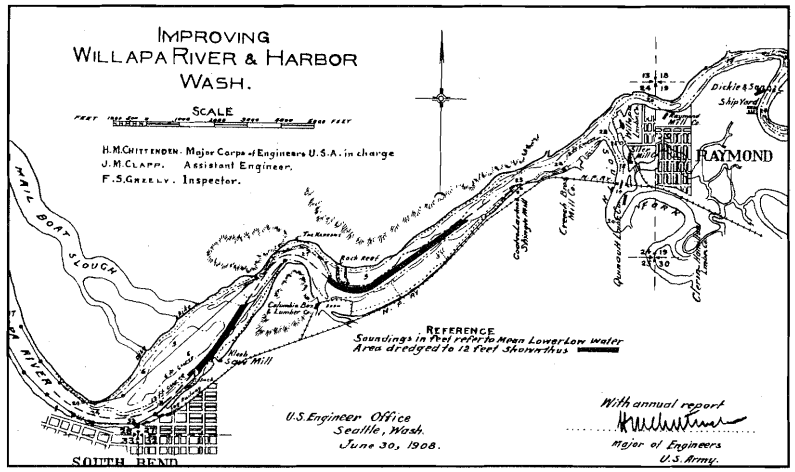
Separated from the sea by an extending finger of sand, Willapa Bay spread its shallow way over the south-western corner of Washington. The bay's bar entrance was so stable and deep — 23 feet at low water according to an 1890 survey — that Willapa enjoyed a reputation as the safest harbor between San Francisco and Puget Sound. Within, however, much of the surface became a dank mud flat at the retreat of the tide. The surrounding and potentially rich lands, moreover, were often inundated at high tidal stages. As a result, commercial life on the harbor proper appeared all but nonexistent following the demise of the early oyster industry. As of the 1880s, the only vessel in service on the bay consisted of a small steamer engaged in hauling supplies brought across a trail from the Columbia River.[34]

Settlers based their hopes on development of the tributary streams. From origins in the coastal mountains, these rivers flowed through narrow valleys to emerge on the bay as tidal estuaries. In the absence of suitable roads, they offered the only means of moving logs and agricultural produce to market. The Willapa River, entering the bay at its northern extremity, provided the best opportunities for commercial expansion. A deep-water channel stretched for a dozen miles from its mouth to the ocean bar. Although partially obstructed by shoals, the stream could be navigated upstream for several miles past South Bend. At that town, another of A. M. Simpson's North Western Lumber Company mills commenced operation in the early 1880s. By the end of the decade, South Bend had 1,200 residents, a second sawmill, and two canneries. And the Willapa's name had supplanted the traditional Shoalwater Bay as the common designation for the harbor.[35]

Reporting upon local conditions in late 1890, Captain Thomas Symons noted a definite need for improvement work on the Willapa River. The captain's opinion received strong endorsement from the manager of the North Western sawmill, who contended that lumber carriers could sail only at the highest tide because of shoaling and then they had to anchor in the bay to await a second flood before crossing the ocean bar. "Had



Willapa Bay improvements, Annual Report June 30, 1903.



Willapa Bay improvements, Annual Report June 30, 1908.

we but a few feet more on these shoals," he observed, "the same vessels could leave our mill dock ... and tow out to sea direct."[36]

Following a detailed survey in May 1891, Captain Symons recommended providing a navigable channel with a low water depth of eight feet to the head of tidal influence on the Willapa. Three shoals near the upstream extent could be removed by limited dredging. The main effort was required just above and just below South Bend, where shoaling resulted from diversion of a portion of the stream through Mail Boat Slough. "It is believed," wrote Symons, "that by closing Mail Boat Slough at its upper end, both these shoals will be removed by the natural actions of the currents." Closure would be accomplished by building a dike across the slough's entrance. Then, concluded Symons, "let nature take its course in the main channel." Rivers and harbors legislation approved by Congress in August 1892 authorized the Symons project.[37]

Refractory material in the river bottom stymied efforts to dredge a suitable channel on the upstream segment of the Willapa. Completion of a Northern Pacific branch line to South Bend in early 1894, though, ended river traffic above that point. At South Bend, the Corps of Engineers attained the required depth over the shoal at the head of Mail Boat Slough shortly after completion of the dike in May 1893. The closure, however, failed to produce a sufficient reduction in the shoaling at its exit point. In the meantime, engineers discovered another significant shoal in the bay itself, caused by the turbulent mingling of the Willapa and the North River, another tributary stream. Dredging, it became clear, would be required to allow unimpeded passage of ships between the Pacific and South Bend.[38]

Several years passed before the Seattle District undertook new work on the Willapa. This lack of attention stemmed from the relatively slow expansion of the river's timber commerce. Nevertheless, some economic growth had occurred. In 1902, the town of Raymond was founded upstream from South Bend at the junction of the forks of the Willapa. Within three years, the community contained a half dozen saw and shingle mills. Responding to this development, the Corps of Engineers dredged a 12-foot-deep channel between South Bend and Raymond in 1908.[39]

Lumbermen of both towns complained that they were confined to low-profit domestic markets because deep-draft vessels used for foreign shipments could not reach their wharves. Agreeing with this assessment of matters, Seattle District Engineer Major Charles Kutz recommended in 1910 that a channel 18 feet deep and 200 feet wide be dredged from deepwater in the bay to Raymond. A narrower passage of the same depth would also be provided, according to this recommendation, up both forks of the Willapa to reach mill company docks. Authorized by Congress with a proviso for local financial assistance, the Corps completed this project in January 1913.[40]

Major Kutz contended that greater channel depth was not required by the needs of trade. Mill owners, however, thought otherwise, especially because the Panama Canal, when completed, would likely result in introduction of much larger vessels. Kutz's successor, James Cavanaugh, accepted the latter argument and submitted a project for a 24-foot

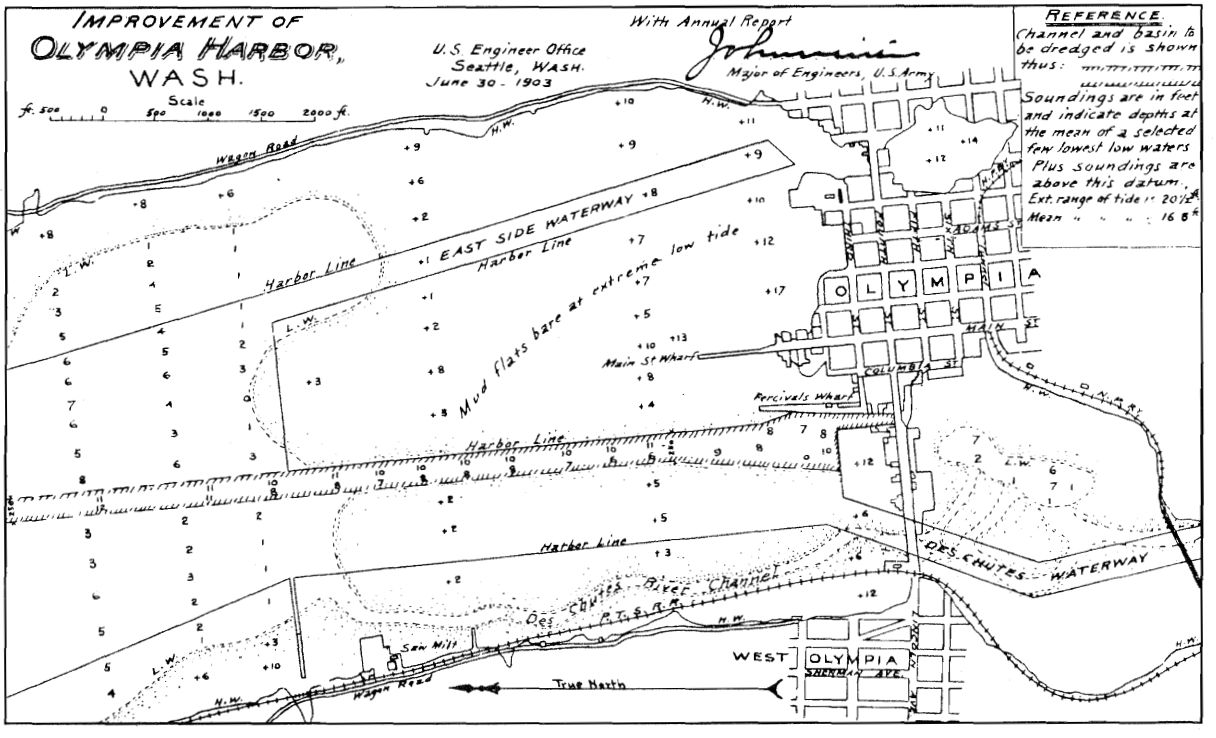
channel in 1916. Unfortunately, Cavanaugh made the "regrettable mistake," according to the Chief of Engineers, of wording his report so as to require local interests to contribute the entire $143,550 estimated cost, rather than half of that sum as intended. Congress authorized the project on this mistaken basis and nothing could be done, barring local willingness to undertake the inflated obligation. Congress eventually corrected the error, but lack of sufficient funding prevented commencement of dredging until after the First World War.[41]

Although differing ocean bar conditions prevailed, engineering work on the Willapa resembled that undertaken on Grays Harbor. The Corps of Engineers developed and implemented projects to meet the needs of an expanding lumber industry, the economic mainstay of the forested Washington coast. At first, the engineers believed that construction of relatively inexpensive dikes would focus the natural energy of the current and scour out suitable navigation channels. Imperfect results, though, mandated introduction of dredging programs. Complex environmental forces transformed the Corps of Engineers' efforts from purely fixed construction to annual maintenance dredging.

On Puget Sound, the Seattle District concentrated on the planning and construction of the Lake Washington canal. The Seattle District undertook other projects of significance to the region, however. Snag removal, for example, continued as an important endeavor. River interests vied for the *Skagit's* attentive presence to enable continued and unobstructed passage of small steamers and log rafts. As in the past, the Corps devoted most of the boat's effort to the Skagit River. Ninety percent of the snags, drift, and trees removed from the Sound's tributaries in 1898 came from that stream.[42]

Olympia Harbor

Snag removal, though, was of secondary importance in comparison with new and more costly works of navigation improvement. Reflecting the changed emphasis from snagging to permanent navigation works, the Seattle District constructed, in 1910-1911, dikes and mattress sills on the



Olympia Harbor improvements, Annual Report June 30, 1903.

lower Skagit River to produce a dependable channel at the stream's mouth. At Olympia on the southern Sound, Army Engineers struggled to remove the obstructions in the State capital's peculiar harbor. Tortuous channels winding over a two mile stretch of mudflat in Budd Inlet provided the only low tide access to the waterfront. Vessels "drawing 2½ feet and upwards," reported Philip Eastwick of the Portland District in 1884, "are very frequently compelled to remain below the town until the tide rises — much to the discomfort of passengers and the detriment of the trade." Local commercial interests built at considerable expense a long wharf in a vain attempt to encourage shipping to call at the port. Unable to share in the prosperity of Puget Sound, Olympia residents looked to the Federal government for a remedy.[43]

In 1892, Congress authorized dredging a channel 12 feet deep and 250 feet wide through the flats. By decade's end, the Corps of Engineers had opened a passage with a depth varying between eight and 10 feet. This provided, in the view of Captain Harry Taylor of the Seattle District, facilities appropriate to the shallow draft steamers trading between the various points of the Sound. "There are practically no boats plying in these water," observed the captain, "with a draft between that of the boats now running to Olympia and that of the deep-draft coasting vessels, 20 feet or more." Thus there was no point in completing the channel to its projected dimension.[44]

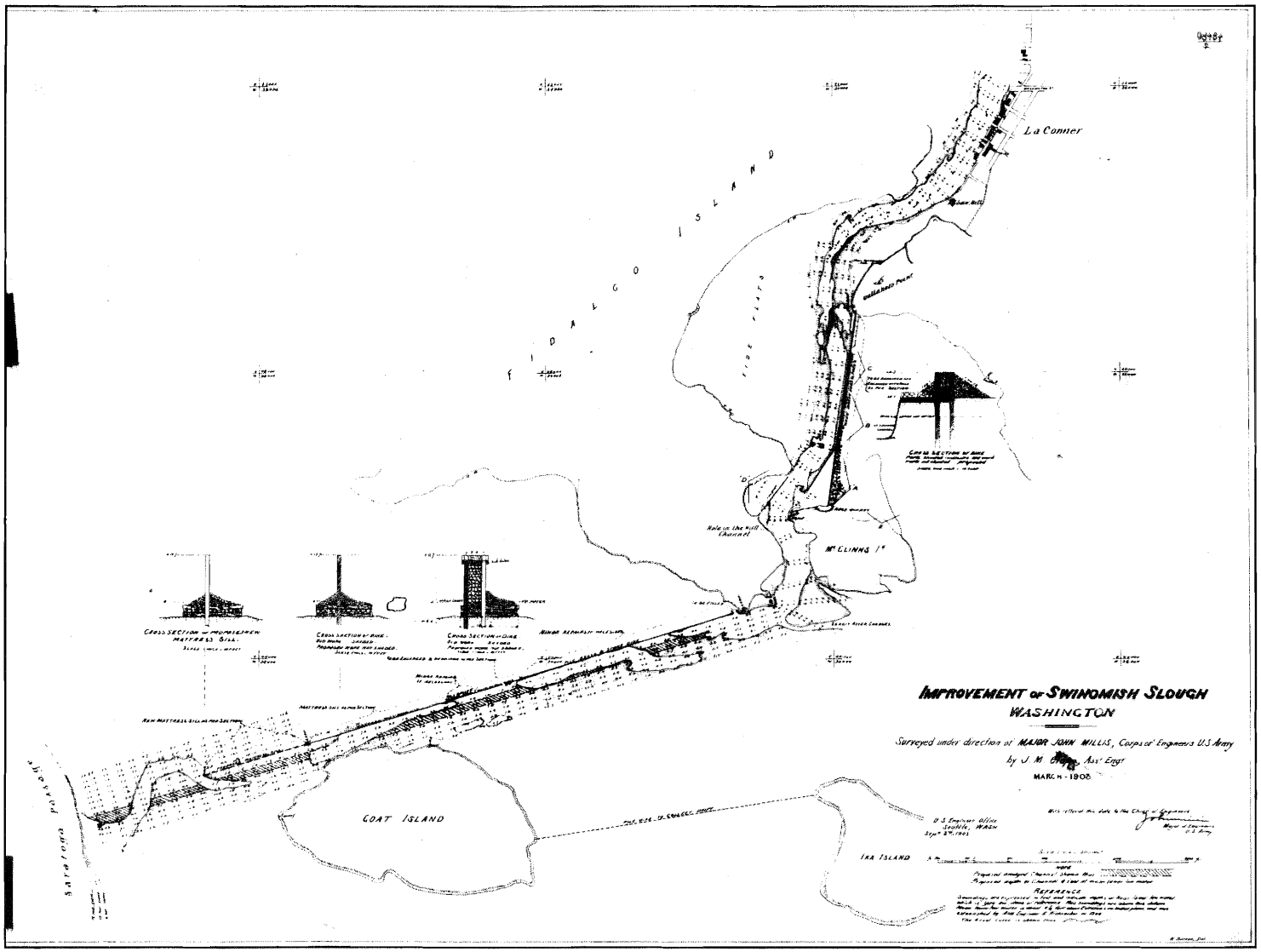
Olympia businessmen, however, wanted a major harbor capable of handling ocean-going lumber carriers. Completion of the originally-planned 12-foot passage in 1910 did not satisfy those hoping to regain the early importance of the community. Responding to demand, the Seattle District submitted a project in 1916 for dredging a channel with a depth of 22 feet. The Board of Engineers, though, concluded that there was "not sufficient commerce present or prospective" to warrant the necessary expenditure and rejected the proposal. Mill owners, the board noted, could always load larger vessels at high tide by deepening the slips alongside their wharves. In the absence of such effort, they would simply have to limit their commercial activity to the interior of Puget Sound.[45]

Swinomish Slough

Vessels and tugs trading between such points as Olympia and Bellingham Bay often confronted dangerous tides and winds at the entrance to the Sound, particularly during the winter. Concerned boatmen knew that a potentially safe inside passage existed via Swinomish Slough, a narrow six-mile-long waterway between the mainland and Fidalgo Island. Extensive flats in Skagit Bay to the south and Padilla Bay to the north, as well as a twisting channel within the slough — especially in the vicinity of the "Hole in the Wall" at its southern end — limited usage of the route. In addition, the commercial prospects of the town of La Conner, outlet for much of the dairy and farmland in the lower Skagit valley, were as restricted as the slough passing its waterfront.[46]

Major Charles W. Kutz

Congress approved a Corps of Engineers project for dredging a channel of four feet depth at low water through Swinomish Slough in 1892. The plan also called for constructing dikes between the slough's southern entrance and deepwater in Saratoga passage. This would prevent wave action and the outflow of the Skagit River from refilling the channel with sand. The Corps expended $205,000 by 1909, achieving partial construction and limited benefit. Rebuilding and expansion of the dike system prior to and following 1909 produced only a modestly-improved passage to La Conner. The expense of these efforts and of straightening the channel inside the "Hole in the Wall," moreover, forced indefinite postponement of work on the Padilla Bay segment. All that could be reported of a



Improvement of Swinomish Slough, Washington, surveyed under direction of Major John Millis, March 1903.

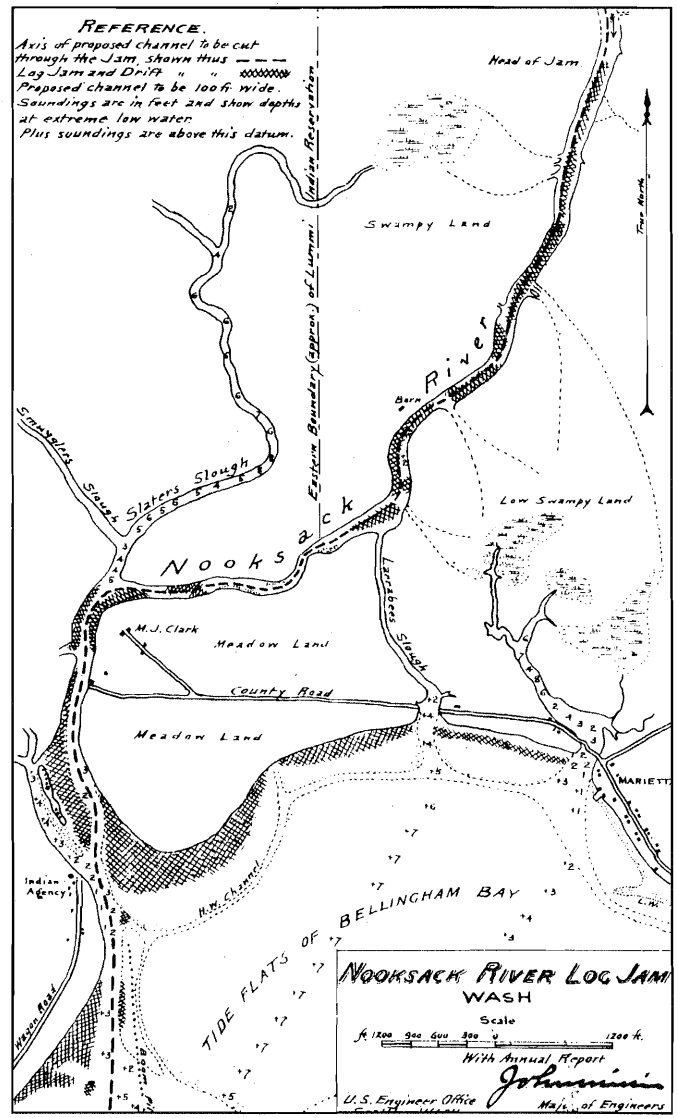
positive nature, wrote Major Charles Kutz, was that much of the work to date "is of a permanent character and will form an essential part of any modified project."[47]

Bellingham Bay

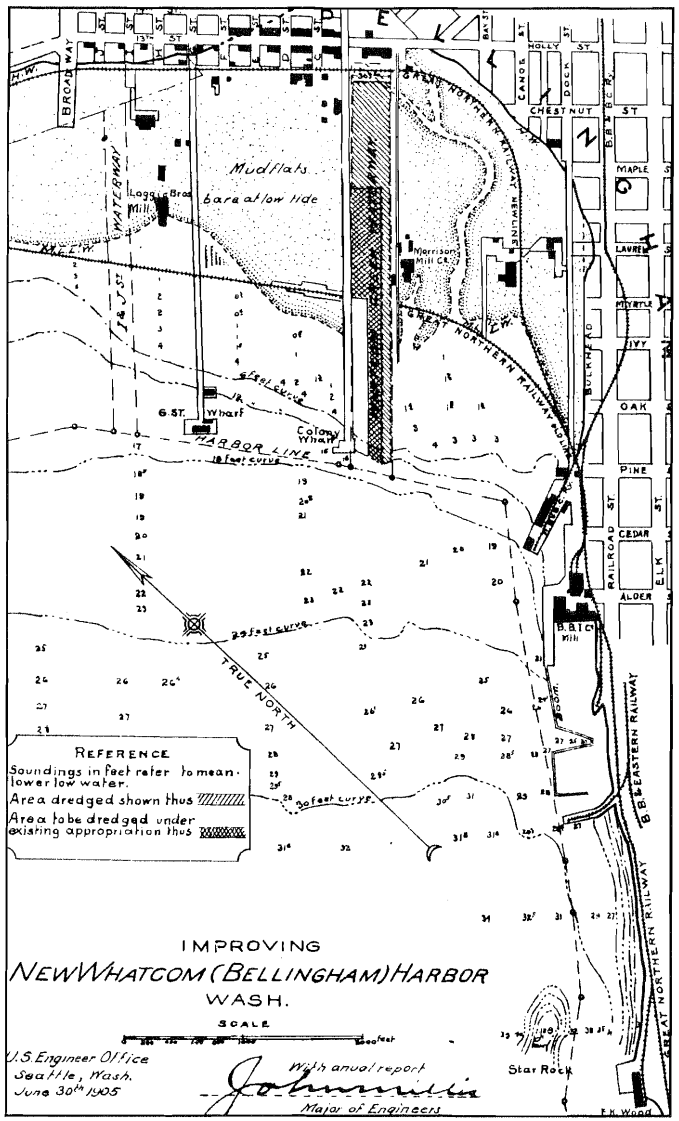
Bellingham Bay, the intended destination for vessels hoping to use the inside passage, served as the center of economic life on the northern Sound. Vast stands of timber sweeping away toward the Cascades enabled the region to share in the commercial expansion of the late 19th century. The old bayside villages of Whatcom and Fairhaven merged to form Bellingham, a city of 22,000 inhabitants in the early years of the new century. Despite their emergent prosperity, mill owners and other businessmen asserted that the flats produced by centuries of silt deposition from the Nooksack River prevented full realization of the Bay's potential. Although the situation was far more favorable than at Olympia, the same argument prevailed: large lumbering trade vessels preferred to call at other ports in the absence of deep water.[48]

Under a plan formulated by Captain Harry Taylor at the turn of the century, the Seattle District dredged a channel with a low water depth of 12 feet through the bay to the mouth of Whatcom Creek on the southern limits of Bellingham. Taylor deemed the Whatcom Creek Waterway ample for the needs of existing commerce. Local interests, though, desired to attract shipping of greater draft and therefore pressed for further work. Based on further surveys by the Corps of Engineers, Congress authorized in 1910 deepening the waterway to 18 feet in its inner portion and 26 feet in its outer reach. Completed in 1913, the project facilitated the continued economic growth of Bellingham.[49]

If the Bellingham project was important, however, works at two other locations — one as new as the latest mania of speculation and the other nearly as old as the earliest period of American settlement — represented even greater significance. The former entailed work on the



Nooksack River Log Jam, Annual Report June 30, 1903.



New Whatcom (Bellingham) Harbor improvements, Annual Report June 30, 1905.

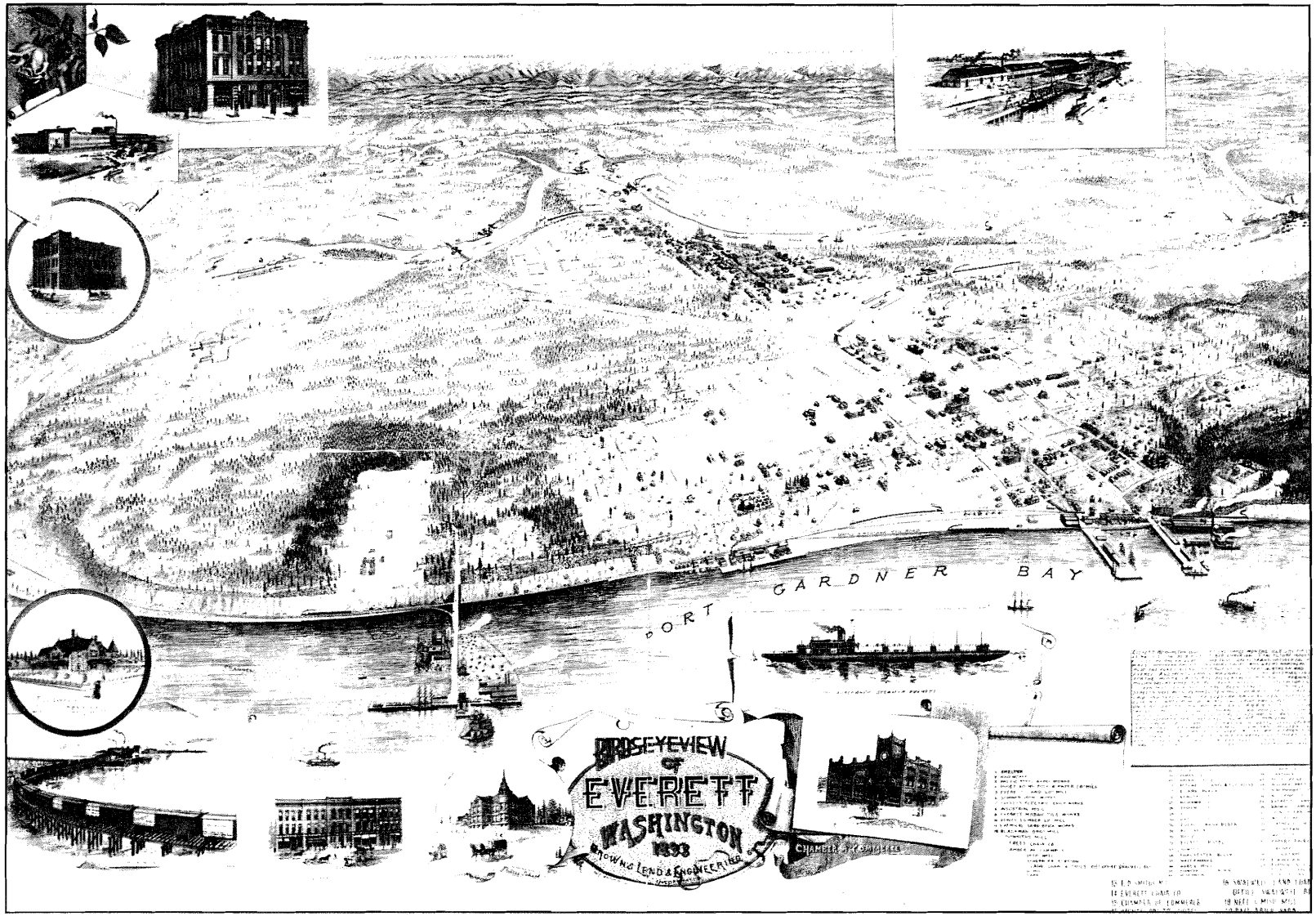
harbor at Everett, while the latter required improvements for Tacoma's harbor.

Everett Harbor

Formed by the juncture in the Cascade foothills of the Skykomish and the Snoqualmie, the Snohomish River bends its muddy way northwestward, finally looping around a stubby peninsula to enter Port Gardner Bay on the central Sound. In its tidal reaches, the stream splits into several sloughs. Above Lowell, Ebey Slough branches off through delta lands to the right. Lower down, the Snohomish divides again, this time into three channels. To the east, Steamboat Slough offered the main 19th century access for vessels transporting farm produce and towing log rafts. Union Slough, in the center, was too shallow for navigation. On the west, debris and the works of boom companies clogged the Old River channel. Silt from the combined outflow of these passages spread over several thousand acres of bay at the mouth of the Snohomish.[50]

Here, with the river to the east and the north and the Sound to the west, entrepreneurs established a great venture in urban promotion. Organized by Henry Hewitt, Jr., a group of investors believed that James J. Hill would make Port Gardner Bay the terminus for his Great Northern Railway. The presence of nine miles of potential harbor-front, three on the bay for ocean-going shipping and six on Old River, offered an attractive incentive to the railroad builder. The proximity of heavily-timbered regions and of the Monte Cristo mining district in the Cascades to the east added to the location's allure. In 1891, Hewitt's syndicate founded the city of Everett. "It is given out by the projectors of the enterprise," wrote Captain Thomas Symons after a visit in the following year, "that here is to be established a 'city of industry.'"[51]

Great progress certainly occurred in the first year of the town's life. Industrialists erected several sawmills, a nail factory, and a bargeworks, while a rail line linked the Cascade mines to Everett. "A number of very handsome buildings have been and are being erected,"



"Birds Eye View of Everett, Washington, 1893."

observed Symons, "some of them in the most substantial manner of stone and brick." Disappointment, however, soon dashed local ambitions. Although reaching the Sound at Everett, the Great Northern built on south to Seattle. The severe depression following upon the Panic of 1893, moreover, ruined the Hewitt syndicate. Nevertheless, the community managed to survive. By decade's end, Everett attained third rank among Puget Sound ports behind Seattle and Tacoma.[52]

Everett Harbor, Washington, ca. 1880-1890. Asahel Curtis photo.

Prior to their fiscal demise, Everett's founders developed what Symons described as "some vague and indefinite plans about converting the Old River, and possibly some of the sloughs, into tidal basins, and ... [also] dredging out a channel or channels across the tide flats." According to the captain, the syndicate desired Corps of Engineers assistance in preparation of plans, but otherwise intended to develop the project as a private venture. "They did not wish," he reported, "to await the slow action of the Government in the construction thereof."[53]

Working in close cooperation with the Everett Land Company, corporate developer of the city, Captain Symons prepared in 1894 a plan for creation of a major freshwater harbor. He proposed dredging a basin 5,300 feet long with a sure depth of 23 feet on the western side of Everett. A 29,000-foot channel carrying six feet of water at low tide would connect this excavation with the Snohomish and continue up that stream to the confluence of Old River and Steamboat Slough. This channel would divert sufficient freshwater into the harbor and open the river to commercial development. Finally, a 17,000-foot dike, composed of dredged material deposited behind a bulkhead, would enhance diversion of the Snohomish and prevent saltwater from entering the harbor.[54]

In August 1894, Congress authorized the first expenditure on what was conceived as a joint venture between local interests and the Federal government. The collapse of the Hewitt syndicate, however, transformed the project into a public undertaking. "It appears that the plan under which the work is being carried on," reported Captain Harry Taylor in February 1900, "was gotten up entirely by the Everett Land Company, and with the understanding that the work was to be carried out at the expense of that company, but up to the present time, ... the Everett Land Company has never expended a dollar towards the improvement." Taylor considered as "open to question" the fact that all work to date had been accomplished with government funding.[55]

Engineering aspects of the project came under railroad attack from the beginning. Diversion of the Snohomish River, claimed the Great Northern, which planned to develop shipping facilities on the Everett waterfront, would actually fill the freshwater basin with silt. "It would be a pity if the harbor location would be ruined," warned James J. Hill in January 1900, "which would certainly be the result of the plan proposed." Captain Taylor protested that Hill's view was "based on misinformation." Although advising that the Great Northern be consulted on possible modifications, Taylor successfully urged proceeding with the Symons plan.[56]

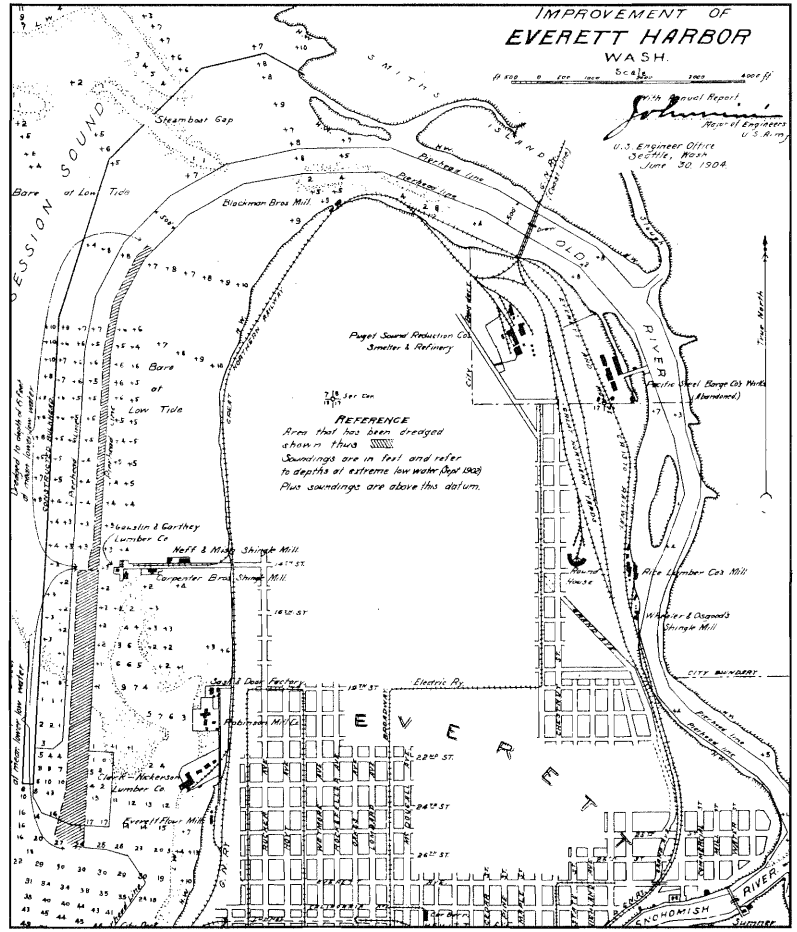
By this time, work had been underway for several years. Initial delay resulted from the Congressional appropriation of 1894, which specifically limited expenditure to dredging. From an engineering standpoint, however, construction of the bulkhead merited priority to

protect the excavation and provide a site for dumping dredged material. Subsequent legislation in early 1895 cleared up the confusion and allowed construction to commence. The Seattle District built eight thousand feet of dike in the first season, making it possible to begin dredging. Unexpected problems thereafter caused additional delays. Inspecting the bulkhead in the fall of 1900, a Seattle District civilian engineer found that most of the structure's brush filling had been eaten away by marine organisms: "Nothing was left of it but a mass of dead sticks lying on the bottom." To restore the structure, the Corps had to undertake expensive repairs.[57]

As James J. Hill had feared, moreover, the initial deepening and diversion of Old River threatened to fill the harbor basin with sediment and ruin the entire project. Local interests demanded abandonment of the river dredging. In early 1902, the contractor voluntarily suspended operations pending investigation of the matter. "The work thus far done," reported Colonel William H. Heuer of the San Francisco Corps of Engineers office after an inspection in May of that year, "has been of very little benefit to commerce and navigation." The complete Everett project, he advised, "might be advantageously modified."[58]

Studying the situation over the remainder of 1902, Major John Millis determined that the Corps should "definitely abandon the dredging and improvement of Old River and the original scheme of a 'fresh water harbor' at this place." He proposed instead completion of the Port Gardner basin to its planned depth of 26 feet and increasing the bulkhead in height to improve protection against wave action. In addition, he recommended widening the gap left in the bulkhead to allow passage of steamboats to and from Old River to encourage outflow by that route and reduce silt deposition in the harbor. Although the Seattle District completed dredging of the harbor in July 1903, it did nothing further to implement the Major's recommendation.[59]

To date, Millis reported in June 1905, the government had expended $413,000 upon the achievement of scant commercial benefit. No usable channel existed to connect the westside harbor with the eastside river,



Everett Harbor improvements, Annual Report June 30, 1904.

where most of Everett's sawmills were located. As for the harbor itself, considerable shoaling had recently become evident. "But since the ... basin has remained practically unused," observed Millis, "...the extent of the filling is not definitely known." In fact, a project designed to encourage rapid expansion of harborfront activity had failed to result in a

single new mill. The dredged basin, moreover, lay so far from shore that construction of lengthy and expensive wharves would be required if such manufactories were ever constructed.[60]

Having rescued the Lake Washington canal from near-oblivion, Major Hiram Chittenden accomplished a similar task at Everett. The key to the situation, he contended in reports submitted during 1907 and 1908, required linking Old River and the western basin, thereby creating "one continuous harbor for the city." Chittenden reasoned that if lumbermen could transport logs from freshwater storage, they would certainly build mills on the harbor to service deep-draft steamers. He therefore proposed dredging a channel eight feet deep up the river from the basin to Steamboat Slough. Closure of the various sloughs and construction of a new training dike at the mouth of Old River would restrict the flow and keep the channel open. Based on his studies, the major concluded that annual deposition of sediment in the harbor was actually "quite small" and capable of removal "within a justifiable outlay for purposes of maintenance."[61]

Chittenden's solution to the Everett problem received Congressional authorization in 1910. The Seattle District carried out work on the dikes and the dredged channel, after initial delay due to insufficient funding, between September 1911 and May 1914. Within months of completion, however, a survey revealed that shoaling was taking place in the river-harbor connection. A project originally conceived with the confident expectation that the Snohomish River could scour out a harbor for ocean-going vessels had produced little more than frustration. The silt-carrying properties of the river simply proved too powerful. Here, as elsewhere, decades of rethinking and readjustment would be required of the Seattle District.[62]

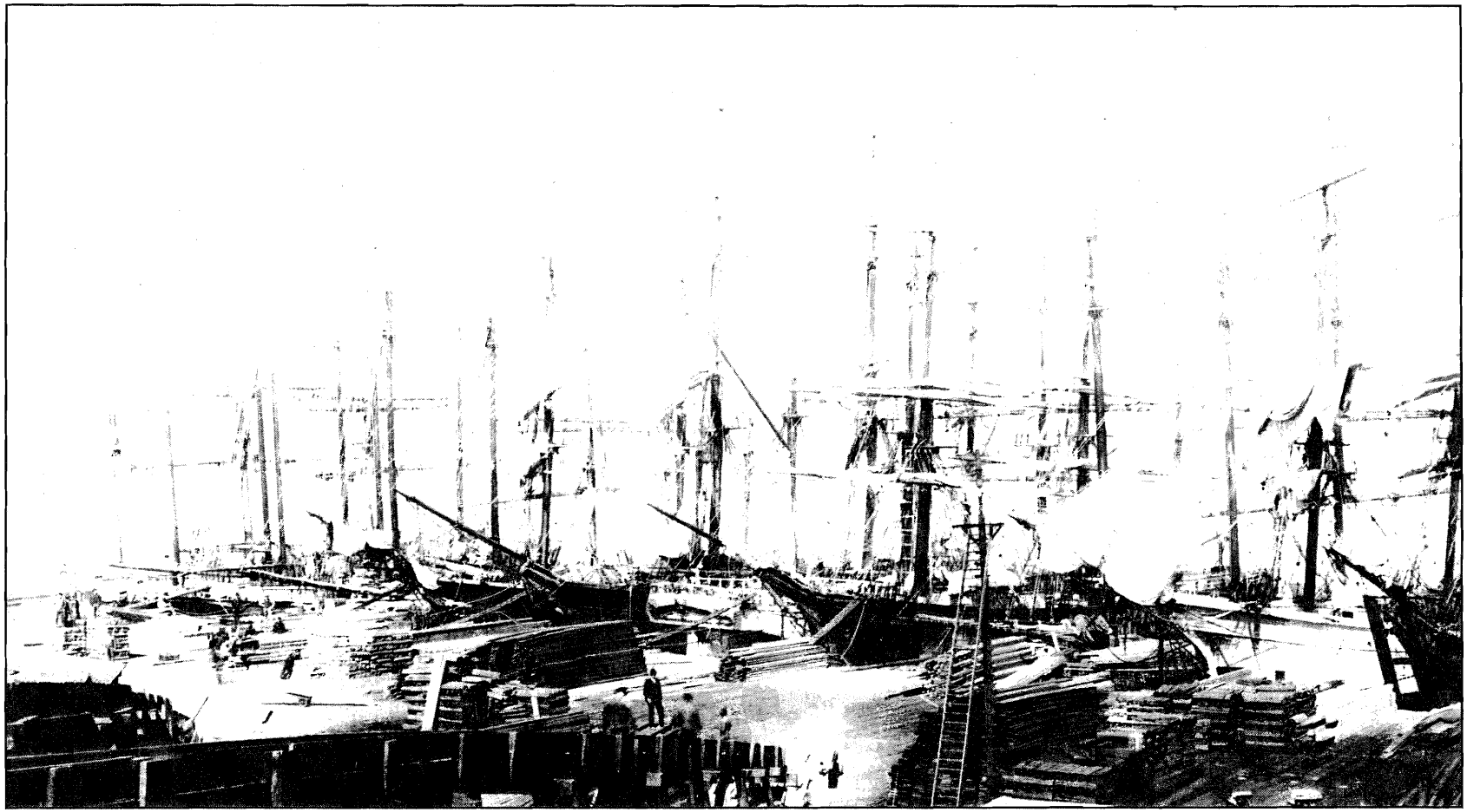
Tacoma Harbor

Beneath high tree-lined bluffs, Commencement Bay makes a three mile long indentation in Puget Sound. Despite the bay's wide expanse, early residents of Tacoma had what a visitor described as "a novel complaint." Early settlers found depths in excess of 200 feet just beyond the shoreline, greatly reducing the area available for anchorage of shipping. Wharves, moreover, had to be built parallel to the narrow strip of land beneath the bluffs to avoid excessive construction costs. Commencement Bay, in other words, was too deep for efficient commercial navigation. As a result, the initial years of Tacoma's history produced limited economic growth.[63]

Tacoma boosters believed that the obvious solution to their plight required development of the vast tideflats — "lying level as a floor" in the view of one observer — at the southeastern end of the bay. The Puyallup River, a stream flowing for 80 miles from the glacier slopes of Mount Rainier created these flats. A mountain torrent in its upper reaches, the river wound through rich farmland in its lower course. "Its current is swift, its shoals changeable, and its bends tortuous," reported Captain Harry Taylor in early 1898, "all of which tend to make navigation for any kind of craft slow, tedious, and hazardous." Snags and other debris, swept into the stream by frequent floods, added to the difficulty. Indians traveling to the annual Puyallup Valley hop harvest left their canoes on the bay and reached the fields by wagon. The first Corps of Engineers survey of the river, conducted in 1875, could only be made by parties walking along the bank.[64]

Near its mouth, the Puyallup divided into two delta channels. The easternmost carried the heaviest volume, while the one to the west flowed past the Tacoma harbor-front. Neither, however, carried more than six inches of water at low tide. Early studies by the Portland Engineer Office recommended closing one of the channels to increase flowage in the other, enabling light draft vessels to enter the river. This would allow needed expansion of local wharf facilities and initiate utilization of the flats. The Corps of Engineers, though, played no part in Tacoma's rapid growth at the end of the 19th century.[65]

Completion of the Northern Pacific to Commencement Bay made Tacoma the great boomtown of Puget Sound in the 1880s. The

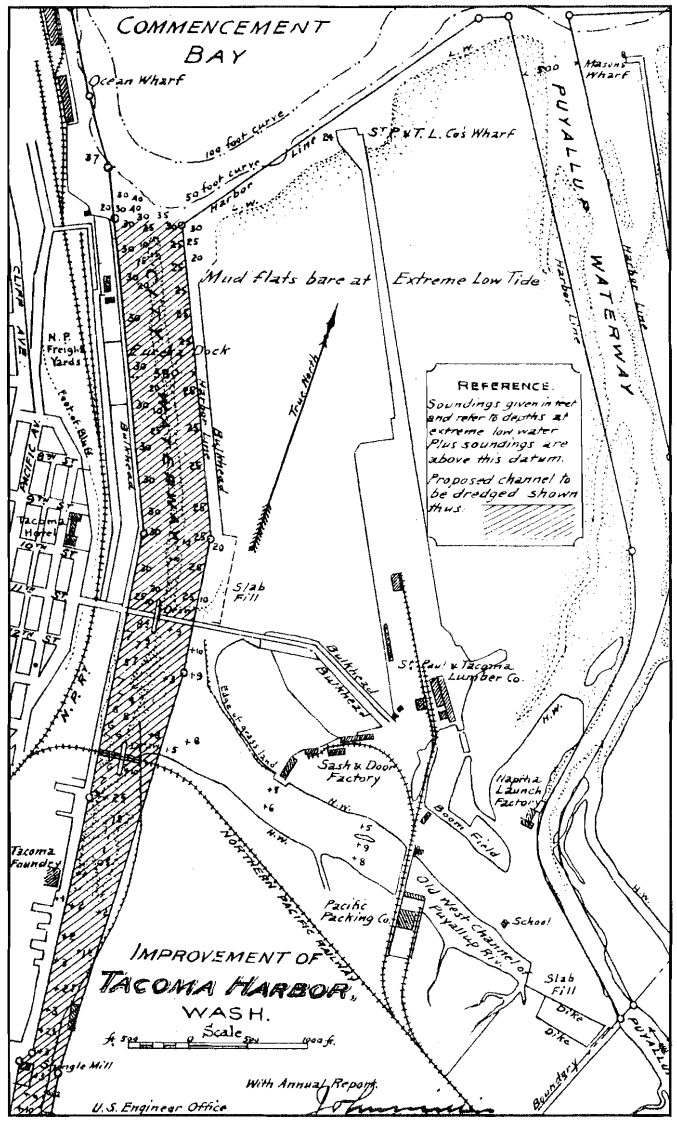


Tacoma Harbor, ca. 1885. Completion of the Northern Pacific Railroad to Commencement Bay made Tacoma the great boomtown of Puget Sound in the 1880's.

population reached 36,000 at decade's end and attained, according to local claim, 52,000 by 1893. The building of the giant sawmill of the St. Paul & Tacoma Lumber Company on the tideflats made the city a major lumber manufacturing center. New railroad lines linked the upper Puyallup and the hop fields of the lower valley with the bay, eliminating need for navigation improvements on the river. In possession of the transcontinental terminus, a deep-water port and the industrial sites on the flat, Tacoma styled itself the City of Destiny. Local boosters possessed such faith in the city's future that they spurned Federal assistance in developing the harbor. Captain Harry Taylor advised the Chief of Engineers in December 1897 that no demand existed for federal works at Tacoma: "I have inquired several times as to what improvement was desired and have not found that anything in particular was wanted."[68]

The Northern Pacific and its real estate subsidiary, the Tacoma Land Company had the capability to conduct engineering works necessary to develop the tidal flats. Early in the 1890s, the railroad dammed the westside channel of the Puyallup, diverting the entire flow of the river and its accompanying sediment to the east beyond the current harbor margin. Dredging in the old channel then began to form the City Waterway. At the turn of the century, private developers excavated the Middle Waterway to enable ocean-going vessels to reach the dock of the St. Paul & Tacoma mill.[67]

Citing the "peculiar" state of land ownership at Tacoma, Captain Taylor endorsed the emphasis on private development. He reported in November 1900, that either the railroad or the land company owned "practically the entire available water front at the present time." Thus, any government improvement at Tacoma "would ... be [al]most entirely for the direct benefit of these two corporations." Further harbor work was needed, conceded Taylor, "but who should make the improvement is doubtful." Navigation projects, in Taylor's view, should encourage public usage of rivers and harbors, not enhance the earnings of waterfront monopolists.[68]



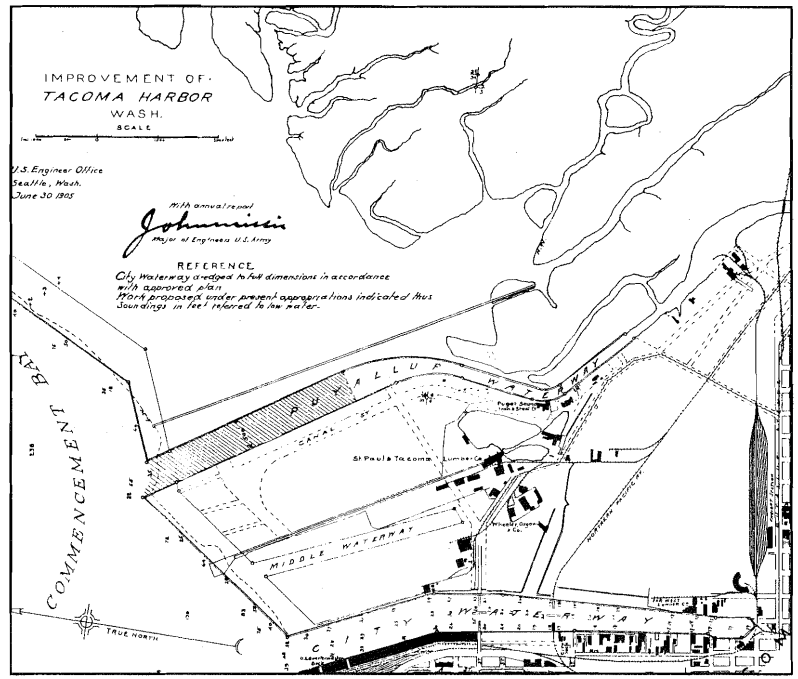
Tacoma Harbor improvements, Annual Report June 30, 1902.

By that time, however, fiscal reality in the form of the Panic of 1893 and its aftermath had overwhelmed Tacoma's pretensions. Within a year of the panic, two-thirds of the city's banks failed and a fourth of its population left in search of better opportunities. The continued hearty growth of rival Seattle, especially after discovery of gold in Alaska in 1897, thwarted Tacoma's ambition for economic dominance on the Sound. Tacoma leaders surviving the depression, shaken in their belief that progress was a sure matter of destiny, now eagerly petitioned for Federal harbor improvements on Commencement Bay.[69]

Tacoma's Chamber of Commerce developed a plan for no less than seven waterways: City, Middle, Puyallup, Central, Skagit, Nisqually, and Hylebos. Each would extend — "somewhat as the fingers project from the hand" in the description of Seattle District staff engineer Eugene Ricksecker — between 4 and 6,000 feet from deep water in the bay across the flats. Pointing out that Tacoma produced 300 million feet of lumber a year and accounted for most of the wheat and four exports of Puget Sound, the Chamber argued that its proposed development "belongs to that class of work which has always been done by the United States Government for the purpose of promoting [the] commerce of the Nation."[70]

Congress initiated Corps of Engineers involvement with Tacoma in 1902 by appropriating $175,000 for completion of City Waterway. Referring to the earlier Seattle District doubts over expending public funds to benefit the Northern Pacific's waterfront properties, Major John Millis observed that this action settled "the question of the general policy of the Government in respect to public work of improvement in the harbor of Tacoma." The Seattle District completed excavation in April 1905, at which point minimum depths of 25 feet in the lower reaches and 15 to 18 feet in the upper were available to shipping using the waterway.[71]

Local supporters regarded completion of City Waterway as only the first step in rapid expansion of harbor facilities. The key to the entire situation, they believed, involved transformation of the lower Puyallup

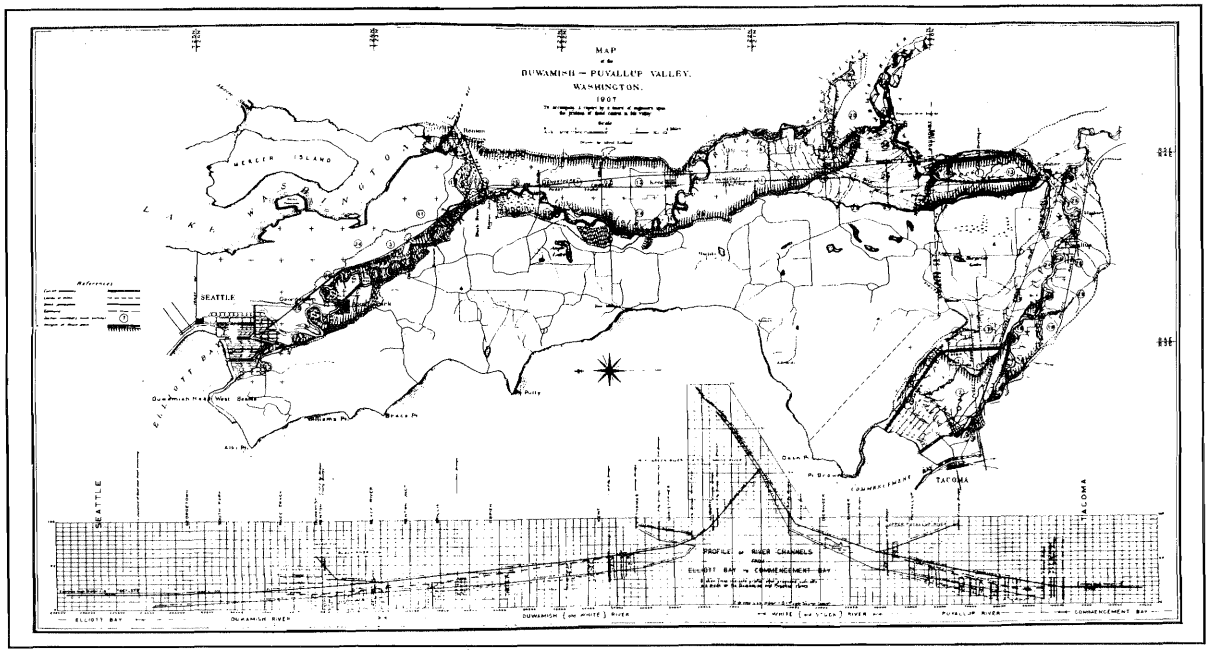


Tacoma Harbor improvements, Annual Report June 30, 1905.

River into a freshwater anchorage with easy access to downtown Tacoma. Since the Northern Pacific did not own its banks, development of small scale industries and wharves would be encouraged. The problem, as all observers recognized, centered on how to prevent refilling of the dredged waterway with sediment. The developers proposed diversion of most of the river's flow eastward to Hylebos Creek and thence to the bay.[72]

Reporting upon this proposal in October 1903, Assistant Engineer Eugene Ricksecker calculated that four million cubic yards of excavation would be required and that even this effort "will not, ... suffice to create a permanent navigable waterway." At times of flood, he noted, enormous amounts of sediment lodged against obstructing debris,

making for extremely unstable channel conditions. "In a few days," wrote Ricksecker, "what was formerly the centre of the stream becomes dry land fringed with a weird misshapen mass." Barring diversion of the Puyallup, expensive bulkheads would be required to maintain the waterway's banks. Based upon Ricksecker's assessment, the Corps of Engineers initially advised against improvement of the river.[73]



Map of the Duwamish-Puyallup Valley, Washington, 1907.

Continued economic growth, however, soon produced an altered recommendation. In 1905, the Corps endorsed expenditure of $240,000 for a waterway 500 feet wide and 28 feet deep in the lower Puyallup. Local interests, though, would have to provide the necessary bulkheads; and the city of Tacoma would have to maintain the channel after excavation. Congress thereupon authorized the project, riverside property owners formed an association to finance the bulkheading, and the city accepted responsibility for maintenance. The Seattle District let a contract in September 1907, and work on the waterway began in the following month.[74]

By then, a foreboding event imperiled ultimate success of the project. During a major flood in the fall of 1906, the White River diverted from its normal northward-flowing course into the Stuck River, a tributary of the Puyallup. "This," reported Major Hiram Chittenden, "more than doubles the quantity of water which the Puyallup has to take care of." Enough sediment had washed downstream in the 1906 flood to fill the waterway had it already existed. Because residents of the Duwamish valley near Seattle, relieved of much of their own flooding problem, resisted any restoration of the White, the diversion had to be considered as permanent. According to Chittenden, Tacoma's burden of maintenance had thereby "probably doubled and perhaps trebled." The only solution involved the old proposal for diverting the Puyallup to Hylebos Creek, a costly undertaking that would require substantial assistance from the Federal government.[75]

Pending a decision on this matter, work on the waterway went forward. By November 1910, contractors had completed half the required excavation and most of the bulkheading. In that month, however, heavy rainfall combined with snowmelt from unexpected warm temperatures to produce three separate floods in the expanded Puyallup watershed. "The silt brought down by them," wrote Seattle District Engineer Major Charles Kutz, "practically destroyed the

dredged cut in existence at that time." An estimated 1.2 million cubic yards of material had been removed to date, but a million cubic yards were filled in by new deposits of sediment. Another freshet in March 1910 obliterated the results of dredging in the months since the original flooding. These circumstances made it, according to Kutz, "absurd to continue work under the existing project."[76]

Despite antagonism produced among local interests, the Corps of Engineers recommended in April 1910 that the Puyallup work be abandoned until such time as the river was diverted from the waterway. Termination of the dredging contract in the following month concluded the first phase of Seattle District involvement in development of modern harbor facilities at Tacoma. Resumption of effort on Commencement Bay would await further expansion of the city's commerce and a demonstrated need for more of the waterways contained in the original Chamber of Commerce proposal. Clearly, the powerful current of the Puyallup River presented an insurmountable obstacle to the engineering effort the Corps felt economically justified to carry out.[77]

Upper Columbia River

Although most of the Seattle District's effort between 1896 and the First World War focused on major new projects west of the Cascades, Army Engineers also completed navigation improvements on the Columbia River. A variety of factors restricted both the location and the value of this work in Eastern Washington. Bluffs a thousand feet high or more blocked easy transportation of wheat and other products from the great Columbia plain to riverside landings. The expanding railroad network, moreover, limited the commercial value of the river. The Great Northern, building west from Spokane, reached the Columbia at Rock Island Rapids in 1892 and was then extended on north to cross at Wenatchee. Each year, branch lines reached further into the tributary valleys. "It is not probable," reported Captain Thomas Symons in July 1892, "that this river for its whole length ... will ever be used as a through highway of commerce. Ten years earlier, Symons had expressed a more optimistic view of the navigation possibilities on the upper Columbia River.[78]

The great plain of the Columbia offered the potential for agricultural settlement if transportation facilities could be developed to market the crops and supply the settlers. One portion — the rolling Palouse of southeastern Washington — possessed rich soils, well-suited to dry land wheat farming. As Lieutenant Thomas Symons noted in his examination of the upper Columbia River in 1881, the Palouse consisted of "an area of about four hundred square miles, a great part of which is the finest quality of agricultural land." The Big Bend country stretching westward from the Grand Coulee of the Columbia, also had fertile soil but lacked water for farming unless artesian wells or irrigation could be developed. Again, Symons described the Big Bend country as "about thirteen hundred square miles, of which a large portion is arable and grazing land of excellent quality."[79]

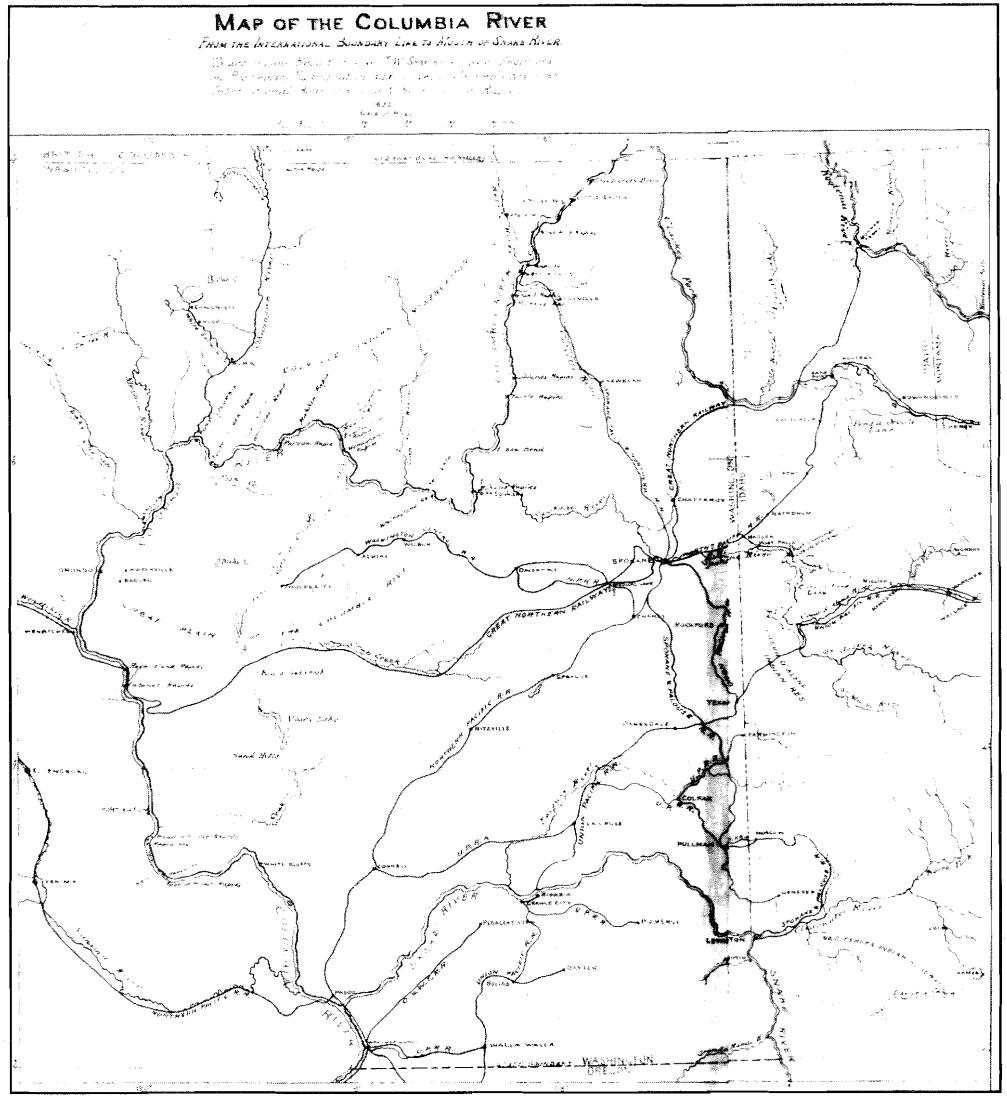
Symons held as a given that "in the early development of a country its navigable rivers play[ed] a very important part, furnishing natural highways for travel and trade." In applying this maxim to "the great country drained by the Columbia River," Symons urged that "the whole river, or as much of it as is practicable, be opened to free navigation."[80]

Spurred on by the success of dryland wheat farming in the Walla Walla Valley in the late 1860s, settlers began trickling into the neighboring Palouse in the 1870s. Lured by the Northern Pacific Railroad, they poured into the region during the 1880s. By the mid-1880s, wheat production reached 7.5 million bushels a year. Promotional literature from the Northern Pacific attracted thousands of would-be farmers to Eastern Washington, and by the end of the decade many pushed into the southeastern fringe of the Big Bend country. While river traffic on the Snake and lower Columbia carried some grain to Portland for overseas shipment, the railroads transported the bulk of the region's ever-expanding grain production. Fearing monopoly rates, however, farmers were reluctant to rely solely on the railroads for shipping their crops. Instead, hoping to benefit from competition among

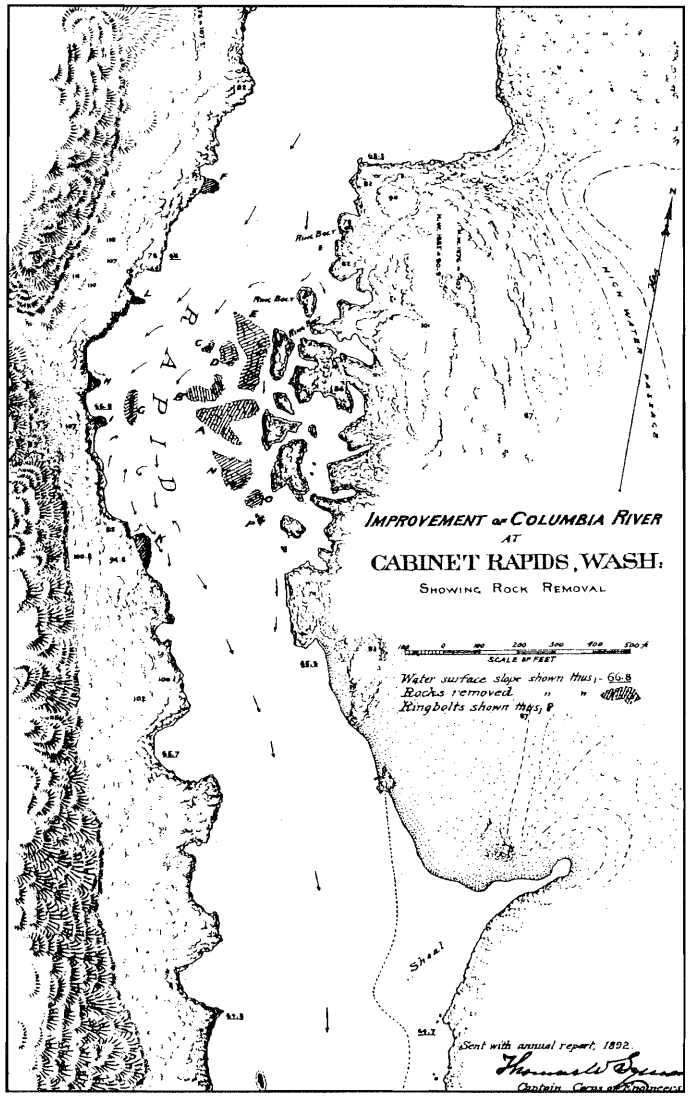
carriers, wary farmers urged improvement of the Columbia and Snake for year-round steamboat navigation.[81]

Although steamboat interests demanded that the entire Columbia River be opened to navigation, Congress restricted both the scope and the location of work. Congressional instructions for examinations and surveys deliberately excluded such obstacles as Kettle Falls. "I would rather ... cover that part of the river upon which we could get a favorable report," explained Senator Wesley Jones of Washington, "than to have the report made on a proposition that I am satisfied ... would be reported on unfavorably." According to Jones, a powerful force for development of Eastern Washington during his four terms in the Senate, the same consideration limited authorized work to provide open river navigation. If Army Engineers were allowed to "take into consideration the matter of locks and canals around the rapids," he noted, "they would send in an adverse report." Negative recommendations could endanger funding for river improvements.[82]

Under the direction of Captain Thomas Symons, the Corps of Engineers began improvements on the upper Columbia River in 1890. Congress appropriated in October of that year, the first money for removal of the hazards at Priest and Rock Island Rapids. At the end of the initial working season, however, Symons successfully advised abandonment of the effort at Priest Rapids. Given the barrenness of the surrounding country, he doubted that significant commercial activity would result. Moreover, the captain questioned the project's feasibility. "To improve a river like the Columbia at Priest Rapids," he reported, "with a fall of 72 feet in ten miles, a river with a bed of the hardest and roughest basaltic rock, full of ledges, jagged boulders, and islands, with precipitous, sharp, rocky banks, by the method of regularization, to give practicable navigation, has never been



Map of the Columbia River from the International Boundary Line to mouth of Snake River, to accompany report of Captain T. W. Symons, 1892.



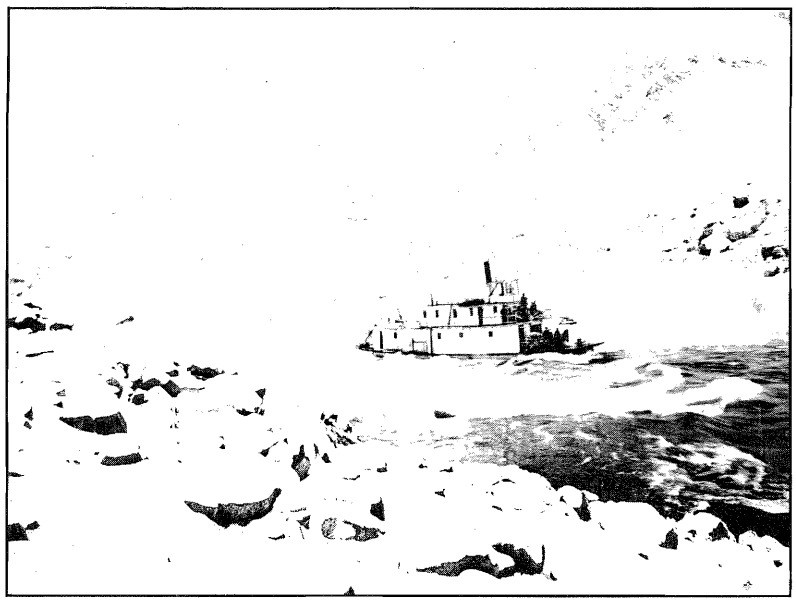
Improvement of Columbia River at Cabinet Rapids, Washington, showing rock removal. Drawing sent with Annual Report, 1892.

undertaken before, ... and it is not possible for me to believe that it can be successful."[83]

Citing the pending arrival of the Great Northern at Rock Island, as well as reports that a Northern Pacific branch would be built to that point, Symons transferred his drilling scows 50 miles upstream to Cabinet Rapids in mid-1891. Over the ensuing winter, crews blasted obstructing rocks away. This work had questionable value, however, due to the presence just above Cabinet Rapids of the broiling Rock Island Rapids. There, the Columbia fell 10 feet in the course of a thousand treacherous yards. "The bed of the river is so rocky and hard," wrote Symons, "that regularization to spread the fall over a greater length is practically impossible." Were it not for the plans of steamboat operators to link up with the railroad at Rock Island, there would be no sense in attempting improvement.[84]

Workers removed the most dangerous rocks by blasting during the early spring working seasons of 1892 and 1893. Ringbolts installed along the right bank allowed ascending vessels to line through the rapids. Navigation became relatively safe for any steamer willing to make the attempt. The situation changed when the Great Northern abandoned its original plan to bridge the Columbia at Rock Island and instead built north to Wenatchee, making that town the transfer point for river trade. "As the improvement of this river [between Priest Rapids and Rock Island] ... appears to be chimerical," reported Symons, "and as there is no navigation of the river, no further appropriation is suggested for this work." To date, $62,000 had been expended on the Columbia above the mouth of the Snake.[85]

Upstream from Rock Island, however, the Great Northern's arrival at Wenatchee sparked a sustained period of genuine navigation. The *City of Ellensburgh*, tied up for much of the time since its cruise through the rapids in 1888, at last began profitable service. Adding three more vessels, the Columbia & Okanogan Steamboat Company operated on a regular basis along the 80-mile stretch between Wenatchee and Bridgeport. New wagon roads reaching the river from the fields of the

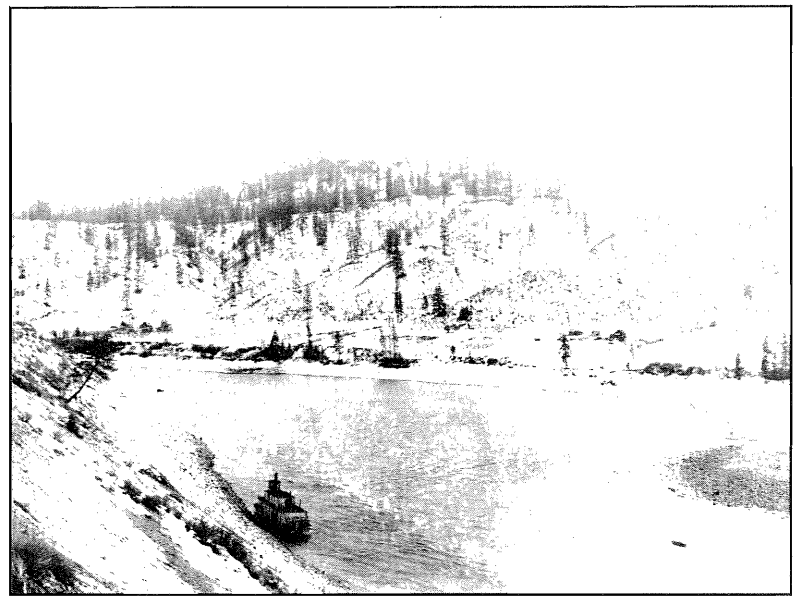


Upper Long Rapids, Columbia River, January 1908.

Big Bend enabled shipment of wheat to the railroad. Steamers also called at lower points on the Okanogan River, carrying supplies for the mining country along the Canadian border. Although Colonel George Mendell in San Francisco advised Captain Symons that "the wish[es] of the steamboat people" should not be allowed "to determine action," the Corps developed plans to assist navigation interests on this segment of the Columbia.[86]

Following a survey in the spring of 1895, Symons reported that the Columbia from Bridgeport to Wenatchee "has ample water for all purposes of navigation and the only impediments consist in the swift currents, combined in some instances with rocks ... which render maneuvering difficult and uncertain." Except for hazards at three places, experienced pilots could safely navigate the river. Lofty banks at the mouth of the Methow River, on the outer elbow of the Columbia's bend to the south, constricted the current and made for dangerous conditions at high water. Gravelly islands at Entiat Rapids divided the Columbia into several tortuous channels at lower stages of flow. And at Rocky Reach, 10 miles above Wenatchee, numerous boulders strewn along the riverbed obstructed low water navigation.[87]

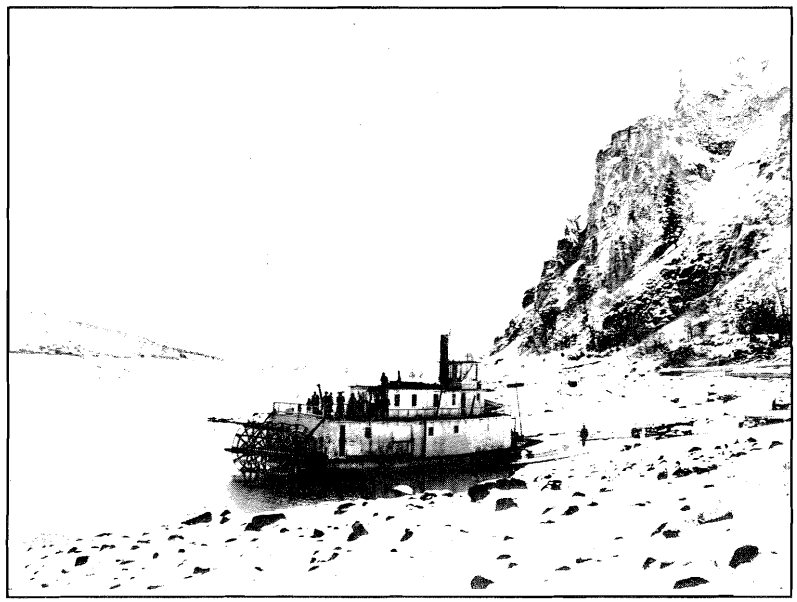
To remove these obstacles, Symons proposed to dredge and blast away the most dangerous rocks. In addition, installation of "deadmen, or other suitable anchorages" would enable vessels to line up through the rapids at Entiat and Methow. A 600-foot boom was also required at Entiat Rapids so that lines could be carried from streamers to anchoring posts on one of the islands. The Seattle District completed all work under this proposal in early 1896, although most of the boom soon broke away and was swept downstream past Wenatchee.[88]



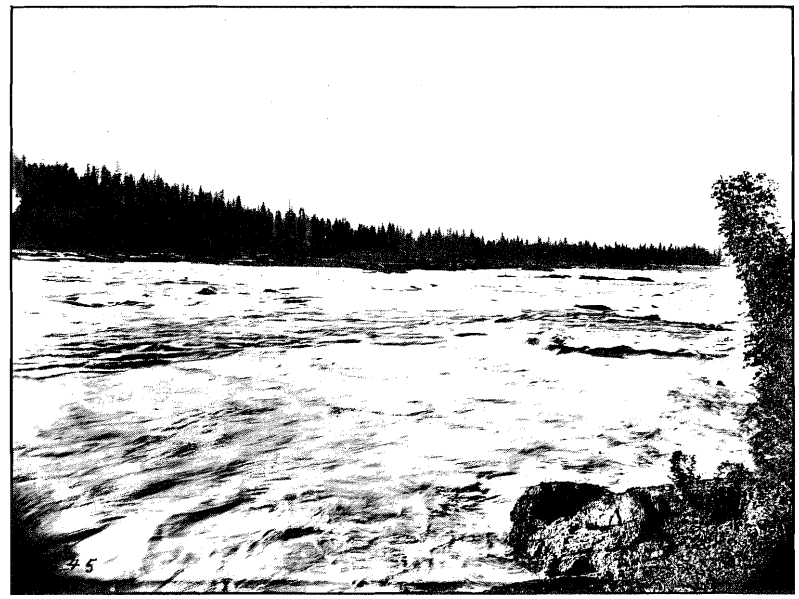
At beach on the upper Columbia River showing orchards.

Continued pressure from the steamboat interests resulted in additional work at this stretch of the Columbia in 1907. New plans called for rock removals in the rapids and a gravel bar below the mouth of the Chelan River. Engineers designed a system of wing dams to close subsidiary channels at Entiat, increasing depth in the main passage. Declining navigation caused by further railroad expansion, however, resulted in abandonment of the project in 1910 prior to building of the dams. Destruction of the entire fleet of the Columbia & Okanogan Steamboat Company in a July 1915 fire on the Wenatchee waterfront ended the era of water transportation between that point and Bridgeport.[89]

Meanwhile, local interests demanded improvement of the long and desolate stretch of the Columbia upstream from Bridgeport to Kettle Falls. Although agricultural production was increasing and a large portion of the Colville Indian Reservation had been thrown open to



Up river from mile 142, upper Columbia, January 1908.



Early photo of Grand Rapids, upper Columbia River.

settlement, railroads had no plans for lines adjacent to this segment of the river. "All who have travelled through that part of the State," contended Senator Levi Ankeny of Washington in 1907, "realize the great handicap which is imposed upon settlers by the lack of adequate transportation facilities." The expenditure of what Ankeny described as "a few thousand dollars" would, promoters claimed, enable this uppermost region of the Columbia to become a new center of farming and ranching.[90]

Under harsh conditions in January 1908, Eugene Ricksecker of the Seattle District carried out a survey of the river above Bridgeport. An experienced hand advised the veteran of District operations to "get a pair of three button arctic overshoes to wear over your ordinary shoes with warm woolen socks, warm mittens, cap with flap for ears and a heavy overcoat, fur preferred." Ricksecker spent a week traveling upstream

aboard a chartered steamboat for 168 miles to Grand Rapids, just below Kettle Falls. "The great length of time," reported Ricksecker, "[was] due principally to poor fuel, wet wood picked up along the river and [the] inadequate power of the small steamer." In contrast, the return voyage with the current required, even with several stops to gather data, only 25 hours.[91]

Reporting upon his study of the river, Ricksecker wrote that he had been "agreeably surprised to note that the obstructions were fewer, far less dangerous and that the worst places will be easier to improve than I imagined from hearsay and reports read." Except for places where high bluffs constricted the Columbia, making portages necessary during much of the year, there would be little difficulty providing for safe navigation.

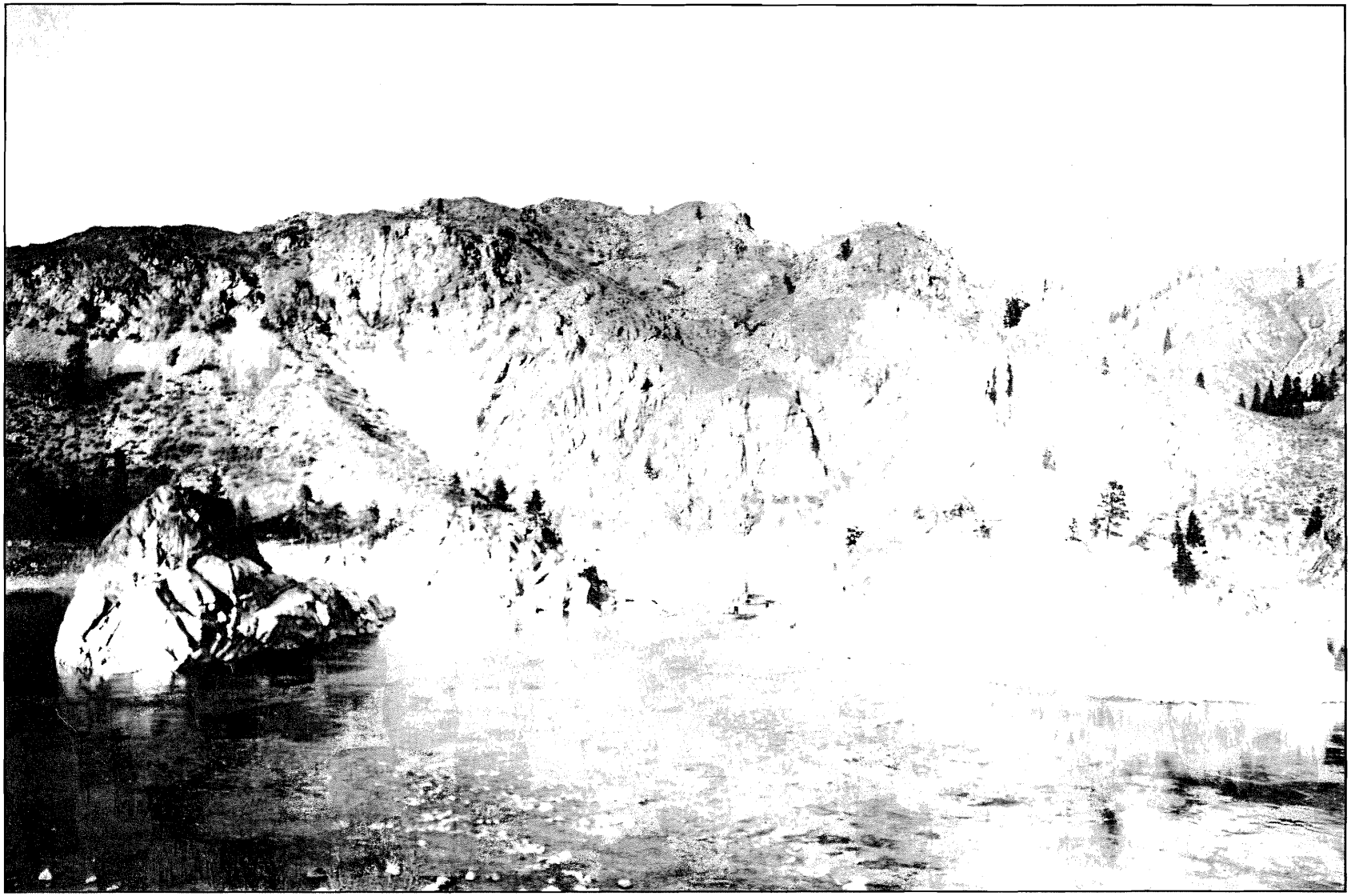
Submitting Ricksecker's findings, Major Hiram Chittenden recommended that $99,600 be appropriated to remove boulders and ledges of rock between Bridgeport and Grand Rapids. Congress authorized the project in 1910 with the proviso that the State of Washington contribute its steamer *Yakima*, which had been engaged in work below Kettle Falls, to the undertaking.[92]

Delays by the State in turning over the *Yakima*, and the need to make expensive repairs once the boat was in hand, prevented operations until early 1911. The initial plan called for beginning work at Foster Creek Rapids near Bridgeport and then working upstream, but this angered residents of the upriver commercial town of Kettle Falls. Although the Corps soon agreed to reverse this order of approach, boosters of Kettle Falls became permanently antagonized when the Corps limited the project's northern extent to the foot of Grand Rapids. As a result, the navigable channel would not reach their community, located midway between Grand Rapids and the namesake Kettle Falls. "I have jollied them along about as long as possible," reported Major James Cavanaugh of the resulting unhappiness, "and if I fall down ... in actually accomplishing something substantial on the part of the river in which they are interested I am up against an explosion that will certainly reach Washington."[93]

The Seattle District carried out work at widely scattered locations between 1911 and 1917. The refurbished but still ramshackle *Yakima* towed drill scows up and down the river and hauled supplies until the Corps abandoned it in April 1915 in favor of a gasoline launch. The small amount of rock removed at each place, along with the danger of handling boats in rapid and treacherous currents, made for astronomical unit costs in the view of Army Engineers. The cost was so great as to call into question the value of the project.[94]

The Columbia between Bridgeport and Grand Rapids was, according to the January 1917 report of Major Cavanaugh, "cleared of the worst obstructions and made reasonably safe and easy for navigation throughout the greater part of the year." Further improvement, however, required locks and canals at the Nespelem Canyon and at Kettle falls. No possibility existed, in the Corps' calculations, that commerce would ever develop to the extent justifying the funding required for such projects. "All fair-minded men," observed Cavanaugh, "must recognize that the very large expenditures required ... cannot be justified as sound business for the United States." Residents of Kettle Falls protested, but the Seattle District halted work in early 1917 and sold the government plant as surplus.[95]

This action brought to an end a quarter century of effort on the upper Columbia. The Corps undertook no work of improvement for purposes of navigation after 1917. Aside from a small steamboat placed in service on the 25-mile run from Pateros at the mouth of the Methow to Bridgeport, no commercial traffic took place between the Snake and the Canadian border. The availability of relatively efficient and inexpensive railroad shipment — and of the first roads of the new automotive era — precluded the likelihood of future development of such trade. "It is impossible," as Colonel Edward Schulz of the Seattle District summed up the situation in 1922, "for vessels navigating the Columbia to compete with the railway transportation owing to the excessive cost of upstream navigation."[96]



Hell's Gate on the upper Columbia River. Dwarfed by rocks, a boat (barely visible just below right of center) steams down river.

In a 1930 report to Congress, Major General Lytle Brown, the Chief of Engineers, noted that the Corps had expended to date $9.4 million on Columbia River navigation projects, including the Cascades and The Dalles canals. This money, wrote the general, had produced "very disappointing results so far as concerns development [sic] of commerce." The absence of any significant waterborne business above the Snake testified to the aptness of this conclusion. Except for the early periods of settlement, when the works helped link isolated ranches and farms with the railroad, the return upon investment could readily be seen as insignificant.[97]

As a result of the Seattle District's work on the upper Columbia River navigation projects, Army Engineers became aware of the river's potential for purposes other than commerce. In late 1906, the Hanford Irrigation and Power Company engaged Hiram Chittenden as a consultant to study the possible generation of electricity at Priest Rapids. Following receipt of the major's report, the firm excavated a diversion canal and erected a small plant as the initial step in a reclamation project. Plans were subsequently developed for a high dam that would obliterate the rapids. Other private interests advocated the merits of a similar development at Rock Island Rapids. Some in Eastern Washington even talked of a dam on the Columbia near the mouth of the Snake.[98]

Major Charles Kutz gathered all possible information of these various undertakings while studying the river between the Snake and Wenatchee in 1910 and 1911. His subsequent report stressed the implications of power development. Opening this stretch of the Columbia to effectual navigation, Kutz pointed out, would require locks and canals at Priest Rapids and Rock Island. The estimated cost of $4.9 million was prohibitive when measured against the commerce likely to result. If built in conjunction with power facilities, the total expenditure would mount to just over $7 million. Sales of electricity, though, would mean that "the net investment in the interest of navigation is reduced to $1,925,000." The United States, suggested Kutz, might even build the dams and market the power.[99]

Any development, whether undertaken by the Federal government or by private interests, had to be carefully planned and gradually implemented to reflect the demand for power. Moreover, the scant impact of existing navigation works made it clear to Major Kutz that the true importance of the Columbia lay in the production of electricity. "The power created," he reported, "will do far more to develop the country and increase its prosperity than will the providing of a navigable channel." Although Kutz concluded that the greatly reduced cost of the navigation component still did not justify Federal involvement at the time, his report was of great significance. Recognizing the pending transformation from a preoccupation with river-borne commerce to an emphasis on electric power, it provided one of the origins of planned multipurpose development of the Columbia. This constituted the enduring legacy of the first era of engineering on the upper Columbia river.[100]

Outer Reaches of the District

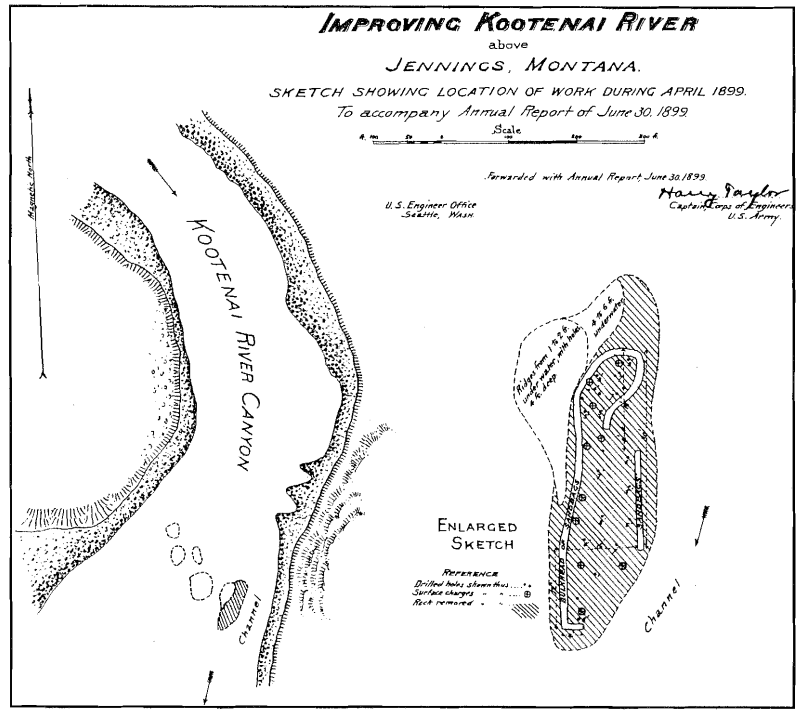
The Seattle District carried out a number of small navigation projects at the far reaches of the District. These included work in Idaho, Montana, and Alaska. Farmers and miners sought these navigation improvements to enable them to ship their crops or minerals to distant markets and to receive essential supplies in return. This work involved comparatively small sums and proved of marginal value. In several instances, the arrival of the railroad drove steamers off the adjacent stretch of water, rendering the recently completed Corps improvement unused. In other cases, the actual waterborne commerce never lived up to original projections.

Between 1899 and 1910, the Corps removed 26,125 cubic yards of material from the Pend O'Reille River in Idaho and Washington at a cost of $42,500. The project required blasting points and removing submerged rocks in Box Canyon and dredging bars between Newport, Washington, and Box Canyon. Completion of a railroad along the river in 1910 led to a cessation of further navigation improvements by the

Corps. Based on surveys by Captain Symons in 1892 and 1895 and by Captain Taylor in 1897, Congress appropriated a total of $10,000 in 1896 and 1897 to improve navigation on the Kootenai River between Bonners Ferry, Idaho and the International Boundary line and above Jennings, Montana. The project on the Idaho portion of the Kootenai involved snagging and removal of overhanging trees on the river banks for a distance of 60 miles, while the Montana segment required rock removal and cutting off rocky points to increase channel width and reduce current velocity. The Corps removed 560 snags on the Idaho portion between 1896 and 1898 and 2,159 cubic yards of rock on the Montana segment in 1897 and 1899. The extension of a railroad into the country adjacent to the Kootenai River ended commercial navigation on the stream and any further work by the Corps.[101]

The Corps undertook minor river work on the Flathead River and Flathead Lake in Montana. Based on Captain Symons favorable report, Congress appropriated $10,000 in 1896 to remove snags on 27 miles of the Flathead River. The Corps carried out the snagging operation between 1898 and 1901, removing 2,185 snags. In 1910, Congress allotted $6,000 to remove rocks obstructing the approach to wharves in the town of Polson on Flathead Lake. In carrying out this work in 1911, the Corps removed approximately 1,000 cubic yards of mud and 1,800 boulders and provided a channel 6 feet by 100 feet with a turning basin near the wharves. The main commerce benefiting from the project was log towing.[102]

While the Corps carried out eight preliminary examinations and surveys in Alaska between 1900 and 1920, only three resulted in projects. One project involved deepening and straightening the channel between St. Michael and Norton Sound. Between 1908 and 1912, the Corps spent $391,000 dredging 291,505 cubic yards of material to create a channel 100 feet wide, 6 feet deep, and 2.6 miles long. Commerce served by this project included inbound supplies for the mining industry and outbound shipments of gold dust. In 1912, Congress appropriated $130,000 to create a channel 6 feet deep and varying from 150 to 300 feet in width for 7 miles at the Apoon mouth of the Yukon River. After



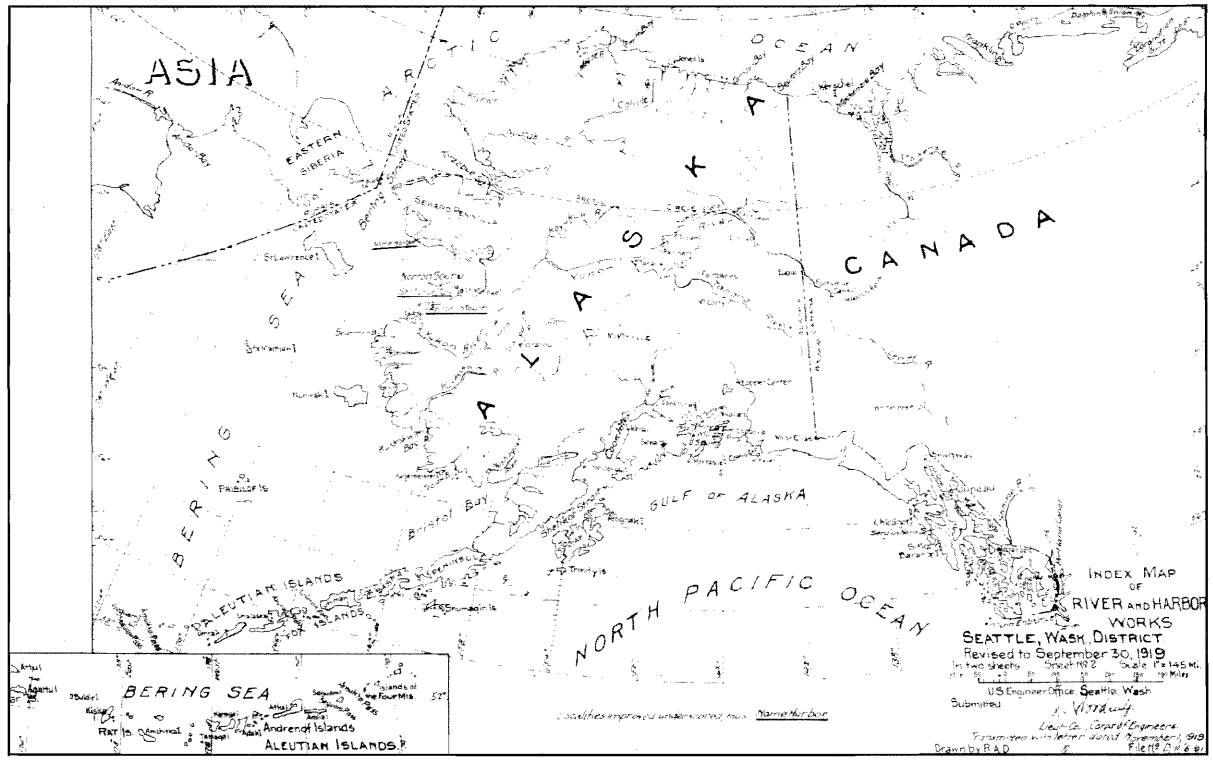
Kootenai River improvements, above Jennings, Montana, Annual Report June 30, 1899.

dredging 119,545 cubic yards under contract in 1912 and 1913 and 35,030 cubic yards in 1915, the Corps obtained project dimensions. The boats using the Apoon mouth of the Yukon River consisted of stern-wheel river steamboats transporting canned fish, fuel oil, machinery, and general merchandise.[103]

Another Alaska project undertaken by the Seattle District prior to 1920 involved work at Nome Harbor. Located on the Seward Peninsula at the mouth of the Snake River on Norton Sound, Nome served as a transshipment point for the export of gold bullion. The value of these shipments averaged $1 million a year between 1912 and 1916. A sand bar at the Snake River's mouth and shallow depths constricted the Nome

Harbor. The project provided for the excavation of a basin in the Snake River and a channel 75 feet in width and 8 feet deep to connect with Norton Sound. The plan also required reveting the banks of the Snake River and constructing two timber and concrete jetties at its mouth.

Congress had appropriated $105,000 for the improvement in 1917, but the Corps did not initiate work until after World War I. By 1920, the Corps had completed the revetment, east jetty, and 75 percent of the dredging. New estimates to complete the project increased costs to $253,000. Nome served as a distribution point for various ports on the Bering Sea, the Arctic coast of Alaska, and northeast Siberian ports.[104]

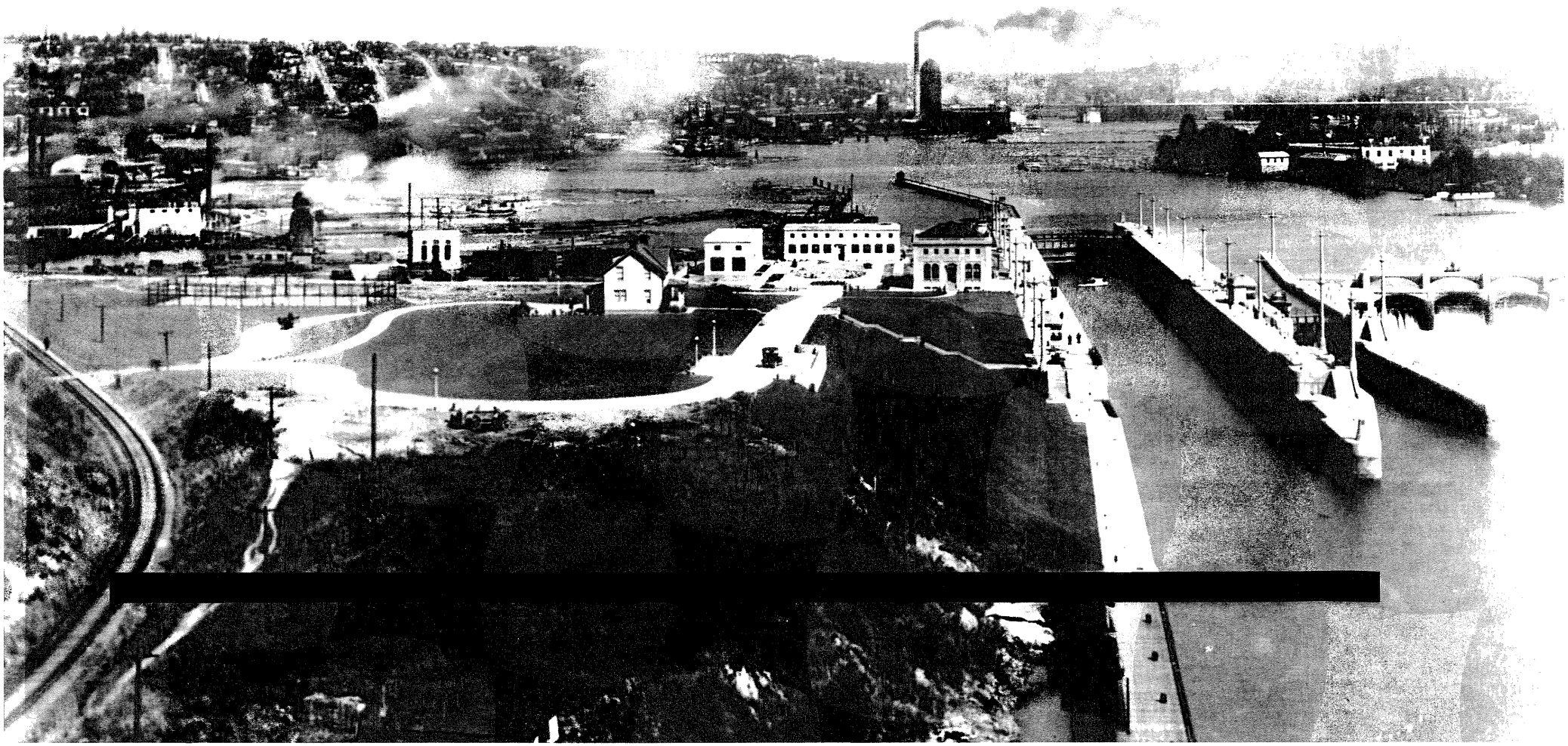


Index Map of River and Harbor Works, Seattle District, showing Alaska work., September 30, 1919.

The Corps of Engineers accomplished a wide-ranging mission in the Seattle District between the early 1890s and the 1920s. The amount of energy expended on navigation improvements, considering the small number of District employees, was enormous. The typical civilian engineer might spend the winter amidst the frozen bluffs of the Columbia, the spring on the windy and rainy expanse of Grays Harbor, and the summer and fall dredging up the muck of harbors-in-the-making on Puget Sound. The Engineer Officers from Captain Taylor through Major Cavanaugh — and the earlier pioneering labors of Captain Symons should not be overlooked — kept busy supervising far-flung projects and filing numerous reports. East or west of the Cascades, the various works shared a common focus: to reshape in the most cost-effective manner possible the force of nature to serve the needs of humanity. Although some projects proved faulty in conception and uncertain in initial benefit, together they made a vital contribution to the economic growth of the region.

Army Engineer floating plant, Scow "D," *3 December 1914.*

Chapter 4



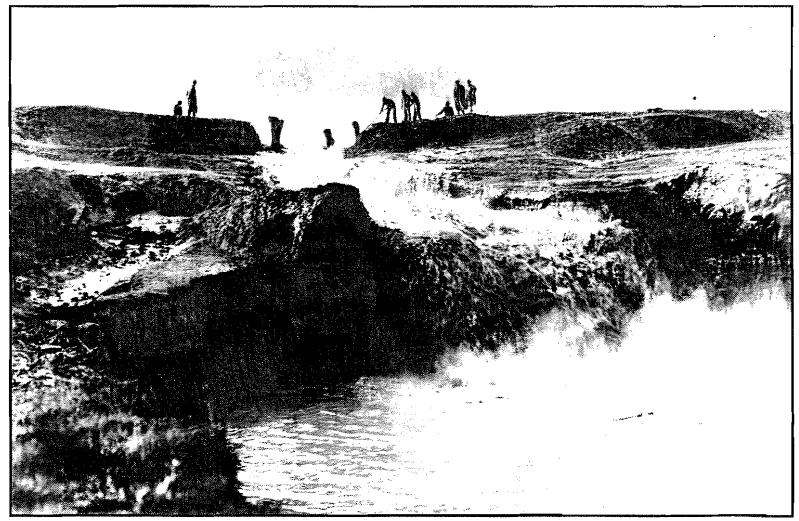
THE LAKE WASHINGTON SHIP CANAL

Several thousand people gathered, on a late August afternoon of 1916, along the slopes at the southern limit of the University of Washington campus. All suffered in the summer mugginess as a slight breeze carried in scant relief from the northwest. Among the crowd stood Hiram Chittenden, long retired from the Army Engineer duties that led to the day's celebrated event. Major James B. Cavanaugh, present commander of the Seattle District, sat on the grass and declined the requests of newspaper correspondents for an interview. He did observe that the foolish young men cavorting on the rickety dirt and timber structure below might soon expect to find their lives at hazard.

Upon removal of these idlers, workmen shoveled away key sections of earth and then fled before the advance of Lake Union. "In constantly widening stream," wrote one of the spectators, "the waters ate their way into the earthen cofferdam, and in a few minutes the flow was roaring with the sound of a cataract." Within the hour, the current subsided, according to this account, from a "mountain torrent" to that of a "large sluggish stream" and the entire stretch eastward to a second dam on the shore of Lake Washington was filled with water. A wreckage of logs, timbers, and boards choked the course from one end to the other. Over the remainder of the summer and into the fall, the eastern gates were gradually removed to merge the lakes and achieve the dream of decades in Seattle.[1]

Eleven months later, half the city's population attended a Fourth of July celebration of America's involvement in the First World War. The dedication of the government locks at Ballard to the north of downtown formed the centerpiece of the affair. The steamer *Roosevelt*, famed for the rescue of Peary's North Pole expedition, led a small flotilla from Puget Sound into the larger of the two locks. There, after the locking operation raised the decorated vessels upon flower-strewn waters to the level of the inland lakes, prominent figures delivered speeches of the day. Those who could hear over the cries of barkers for sporting events learned that the great engineering works attested to the superiority of the American way-of-life, a superiority that would soon be made manifest to the foreign enemy. The flamboyant oratory completed, the *Roosevelt* sailed on with its escort to tour the lakes. After long and vexing years of controversy, the Lake Washington Ship Canal, local pride of the Corps of Engineers, at last officially opened to business.[2]

Moving over the ridgeline behind their Elliott Bay landing, Seattle's first settlers encountered the freshwater expanse of Lake Washington and named it Duwamish after the local tribe of Indians. Nineteen miles long and an average of two in width, the lake combined with Puget Sound to compress the development of the city into a narrow corridor.



"...the waters ate their way into the earthen cofferdam, and in a few minutes the flow was roaring with the sound of a cataract." Breaching the cofferdam, Lake Washington Ship Canal, ca. 1916.

opposite: Government locks at the Lake Washington Ship Canal, Seattle, 1916.

Until 1916, the outlet was at the southern end, where the sluggish Black River exited through marshy lowlands. Joined by the Cedar, the Black then merged with the White, a turbulent stream originating in the glaciers of Mount Rainier, to form the north-flowing Duwamish River. The latter's winding course eventually brought it, through numerous tideflat channels, to the waterfront of Elliott Bay. Frequent floods occurred throughout this complex region of potentially valuable farmland, those of especially high extent actually reversing the Black's flow into the lake.[3]

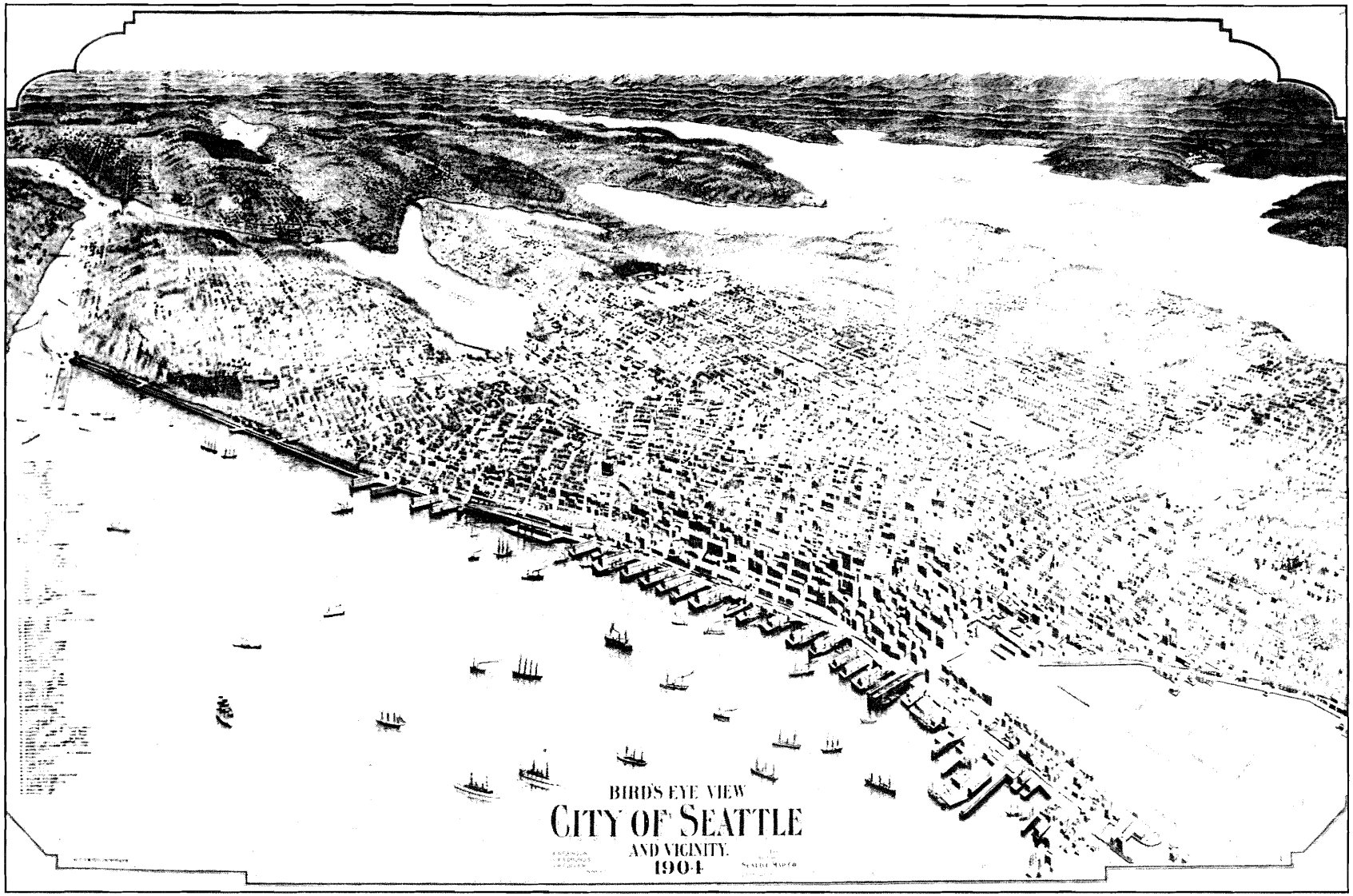
From its earliest days, Seattle's boosters sought a canal between Lake Washington and the Sound. Local advocates claimed that George McClellan — a "gallant soldier and great military engineer" in the view of Chamber of Commerce literature — recommended such a project to the War Department in the winter of 1853-1854. Although Hiram Chittenden proved this assertion to be false, the canal had legitimate early origins. At an 1854 Fourth of July picnic, pioneer Thomas Mercer called for the construction of a canal. A few years later, John McGilvra, a prominent investor in local real estate, pointed to the implications for the value of lakeside landholdings. In 1869, H. L. Pike platted a claim on the portage between Lakes Washington and Union and announced plans for his Union Canal. He sold lots and excavated a shallow ditch before failing financially.[4]

The Corps of Engineers became involved with the prospective canal undertaking at an early date. Studying Puget Sound defense needs after the Civil War, engineering officers concluded that Lake Washington represented an ideal site for a naval station. It had secure waters and its adjacent territory contained sufficient timber and coal to provide ship's stores. In late 1871, Lieutenant Thomas H. Handbury proposed the expenditure of $4.7 million on the excavation of a channel through the Washington- Union divide and on the construction of locks at the southern end of the latter body of water to carry vessels to and from Elliott Bay. Lake Union drained to the west through a creek to the tidal harbor of Salmon Bay, but Handbury advised that his route offered greater security from storms and enemy attack. Although the government eventually decided that Port Orchard Bay on the western shore of the Sound was a better location for the base, local enthusiasm for the opening of a canal continued to mount.[5]

In 1881, David T. Denny, John McGilvra, Thomas Burke, and other Seattle investors formed the Washington Improvement Company to develop the interlake portage. Hard times delayed operations until 1885, when a predominately Chinese workforce completed a 16-foot-wide passage between the lakes. Known locally as the Portage Canal, it contained two locks to raise and lower vessels. Operators soon added an adjacent log raceway because of damage done to the locks by rafts of timber. Over the years, the project served primarily as a means of transporting logs from the interior to the burgeoning sawmill industries on Lake Union. Throughout, Denny and his associates made no secret of their main desire to sell the works to the Federal government as part of an expanded linkage with saltwater.[6]

Those predicting that the transformations of the 1880s represented but the hint of things to come in Seattle proved correct. Neither the great fire of 1889, which destroyed much of the original business district, nor the National economic crisis following the Panic of 1893 dampened the enthusiasm of the community's boosters. James J. Hill's Great Northern Railroad entered Seattle in the latter year and soon connected with the Northern Pacific's Commencement Bay terminus at Tacoma. With its diversified economy, Seattle continued to grow in spite of the depression of the 1890s, nearly doubling its population to 80,871 during the decade.[7]

In the aftermath of the 1889 fire, Seattle's lumber mills relocated from the increasingly expensive Elliott Bay waterfront to Lake Union and especially to Ballard, an independent community north of the city limits. In Ballard, the mills turned out 40 million feet of lumber each year in the early 1890s, most at the Stimson Mill Company plant. Ballard also became the leading manufacturer of shingles in the world. Tidal conditions forced vessels to anchor near the mouth of Salmon Bay and take aboard their cargoes from barges. The mills on Lake Union,



"Bird's Eye View of Seattle and Vicinity, 1904."

meanwhile, sent their production over a rail line to Elliott Bay for loading upon lumber schooners.[8]

These developments greatly increased interest in building a canal. Freed from the inconvenience of the tide by a lock, ships could tie up at the Salmon Bay mills and load in efficient fashion. The plants on Lake Union and the coal mines near Lake Washington, moreover, would be released from dependence on railroad transportation. Freshwater anchorages also would avoid the damage done to wooden vessels by the shipworm, teredo. Above all, the shoreline of Lake Washington would become available for industrial development, making possible Seattle's economic expansion for decades to come.[9]

In response to mounting demand, the Corps of Engineers assigned in 1891 a special Army board consisting of George H. Mendell, Thomas Handbury, and Thomas Symons to study five possible canal routes. The first was the natural Black-Duwamish outlet, the second and third consisted of the Lake Union-Elliott Bay passage, and the fourth and fifth led from Lake Union westward to Salmon Bay. From that bay, a canal could either be continued to the west to Shilshole Bay on the Sound or built south to Smith Cove on Elliott Bay. The board rejected the Black River option as impracticable, while the two from the southern end of Lake Union were eliminated due to the greatly inflated value of land since the 1871 Handbury survey. Either of the remaining possibilities were, however, "entirely feasible" in the opinion of the board.

Both routes required a lock at Lake Washington to prevent lowering of the lake. A second lock was needed at the outlet of Salmon Bay to transform that harbor into a deepwater anchorage. With these features, the estimated cost of a canal using the Smith Cove route was set at $3.5 million, or $600,000 more than if the passage went by way of Shilshole Bay. The board concluded, however, that the former would result in a closer linkup between the elements of Seattle's harbor system and be secure against naval attack. Therefore, advised the officers, "the Smiths Cove route is to be preferred." To many observers, the report containing this recommendation marked the real beginning of the canal project.[10]

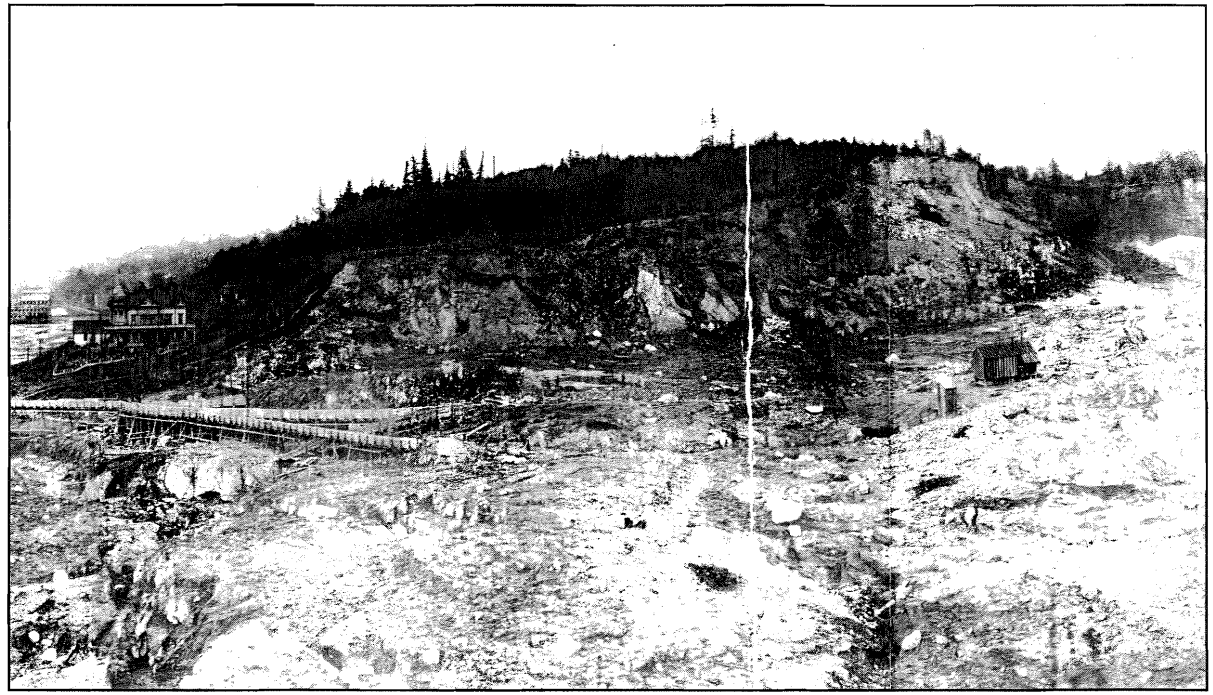
Due to the lack of support from beyond the city — outsiders derided the canal as the "Seattle Ditch" — the Corps eliminated the project from its recommendations for the 1892 rivers and harbors bill and left it to the designs of private interests. Foremost among those taking up the local challenge was Eugene Semple, a former governor of Washington Territory. Semple proposed to excavate two waterways at the mouth of the Duwamish and to build a canal through Beacon Hill and the Rainier Valley to Lake Washington. The millions of cubic yards removed in these excavations would be used to reclaim the tideflats on Seattle's southern bayfront. Semple secured the necessary authorization from the State legislature in 1893, and in the following year he obtained financial backing from eastern capitalists.[11]

Semple also engaged the services of Captain Thomas Symons of the Portland District as consulting engineer for his project. According to the captain, it was permissible for active duty officers to "act as Consulting Engineers either with or without the permission of the Secretary of War, depending upon the particular circumstances of the case and its magnitude." The present circumstances appeared so important, at least in personal terms, that he declined an appointment to the government's Nicaraguan canal commission in order to work with Semple.[12]

In June 1894, Symons submitted his views on the practicability of both the canal and the waterways. Presenting this report as a "plan," Semple made continued use of the captain's name in promoting investment in the scheme. The title page of Semple's main promotional tract reprinted a quotation from the report, and within the tract Semple portrayed the report as representing the official endorsement of the Corps of Engineers.[13]

Forming the Seattle and Lake Washington Waterway Company, with Captain Symons listed in the directory of officers as engineer, Semple began work at the mouth of the Duwamish in July 1895. Within a year, he had dredged two thousand feet of waterway and filled and readied for sale 70 acres of tideland. Although Semple delayed work on the Lake Washington connection, known as the south canal, the implications of

this successful beginning were clear-cut. "If there be a sufficient argument for one Canal," Colonel Mendell reported from San Francisco, "no reason for two Canals to be urged is known to me." The Semple project meant, as far as the colonel was concerned, that no need existed for the government to construct the canal surveyed in 1891.[14]



Former governor of Washington Territory, Eugene Semple, began work on a "South Canal" in 1901. Requiring a cut through Beacon Hill from the Duwamish River to Lake Washington, the "southern venture" later had to be abandoned.

This sentiment, had it become known, would have devastated the advocates of the Salmon Bay route. Judge Thomas Burke, Daniel Gilman, John McGilvra, and other influential persons owned extensive tracts of land in and around Ballard and near the Lake Washington end of the proposed north canal. "There will be a tremendous boom around Smith's Cove and Salmon Bay," wrote Gilman of the certain result of construction, "a boom that will lift us out of want." Raising the bay would provide an added windfall, according to Gilman, as the various waterfront properties "would level up in very good shape for technical purposes." Fearing that reliance on private financing would place their project at the perpetual mercy of fiscal calamity, the northern group decided to secure Federal funding.[15]

In 1894, Congress approved a new Corps of Engineers study of the north canal. The Corps assigned the task to Captain Symons of the Portland District, placing that officer in an untenable position: he was now in charge of a government project while at the same time serving as engineer of the undertaking's private rival. Boosters of the Salmon Bay route protested this conflict-of-interest and demanded the captain's removal. The War Department, apparently in response to this protest, transferred Symons to Buffalo, New York in mid-1895, ending his long years of service in the Pacific Northwest.[16]

Prior to his transfer, Symons completed the survey that would lead to direct government involvement in the northern project. In a decision that assumed considerable significance, he limited the study to the route reaching saltwater at Shilshole Bay west of Ballard. Although maintaining as his personal opinion that the Smith Cove alternative retained its superiority, the terms of the 1894 legislation constrained him. "The language of the law," he pointed out, "speaks of the whole project as enlarging the existing waterway or improving the waterway connecting the waters of Puget Sound with Lakes Union and

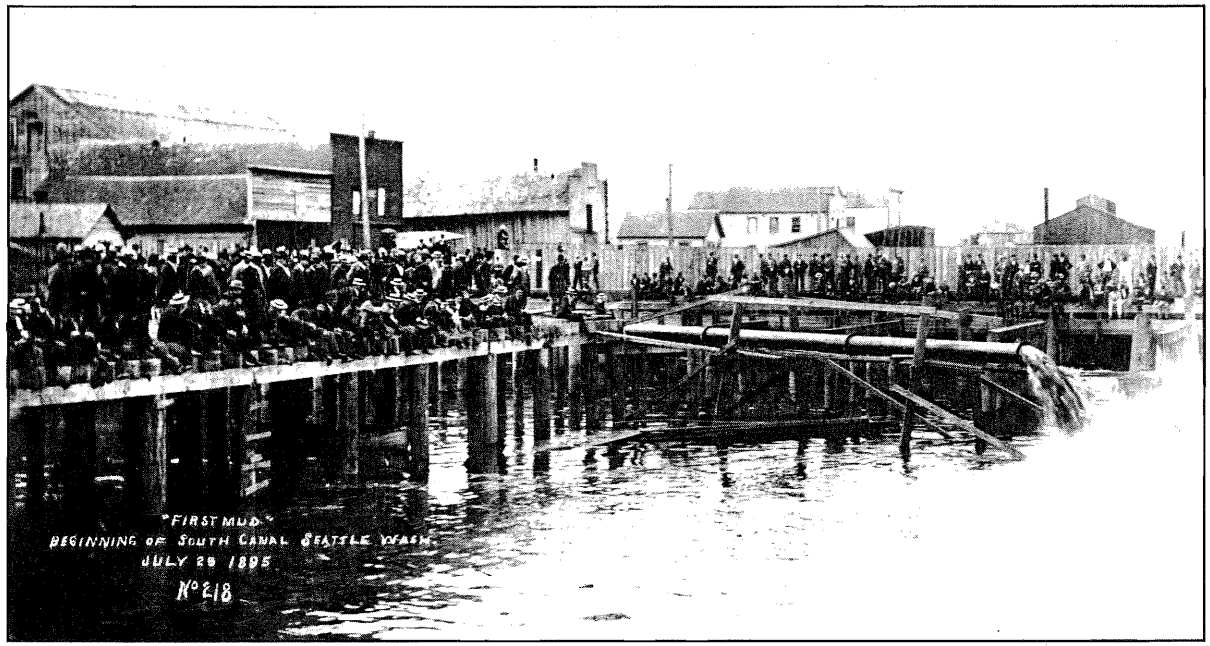
Washington." However restricted at low tide, the only such passage extended westward from Salmon Bay.[17]

Aside from some changes to provide straighter and more convenient channels, the Symons report followed the basic line of the 1891 Mendell Board survey. A dam and lock at the mouth of Salmon Bay would raise the level of the harbor to that of Lake Union. This would provide a deepwater basin for the industries of Ballard, although many of these manufactories would have to relocate on higher ground. The plan called for a second lock at Lake Washington to maintain its normal elevation of seven feet above Union. The estimated cost of the entire project, as of June 1895, came to $1.4 million, suggesting the deflationary impact of the depression on prices. This figure would increase by a million dollars within a year.[18]

With the survey complete, King County began to assemble the right-of-way as required by the 1894 act of Congress. Inflated land values, difficulties in locating absentee owners and the need to bring numerous suits of condemnation presented serious obstacles. Delay in final selection of the saltwater connection added to the problem. Not until June 1900 was the entire right-of-way in hand and turned over to the United States. Prior to that date, the War Department refused to authorize the expenditure of funds on preparation of construction plans, even though Congress had appropriated $150,000 for the purpose in 1896.[19]

A final decision emerged during these years on the linkage between Salmon Bay and the Sound. Local supporters of the project urged the selection of the Shilshole route studied by Captain Symons. The Great Northern Railway entered Seattle through the flats adjoining Smith Cove. Thomas Burke, leader of the north canal forces, and Puget Sound attorney for James J. Hill, opposed any dislocation of the railroad's operations. Other residents of the city having obligations to the Great Northern also worked for the Shilshole connection. Any deviation from that route, observed a Seattle banker, "would, I fear, imperil the whole project."[20]

Nevertheless, Captain Harry Taylor, in one of his first acts as head of the new Seattle District, advised the selection of Smith Cove as the terminus for the canal. Recent private excavations in the cove and wage reductions resulting from the National depression of the 1890s narrowed the funding differentials submitted by the Mendell Board. "The



"First Mud" at the beginning of work on the later aborted "South Canal" dumping into bay, Seattle, Washington, July 29, 1895.

Lake Union (foreground) and Lake Washington (background) as they were before the Lake Washington Ship Canal.

difference in cost of the two routes," reported Taylor, "would be materially less now than was originally estimated, and ... the reasons for preferring the Smiths Cove route are no less strong now than before." Accordingly, the War Department announced at the end of 1896 that the canal would be built through the cove to Elliott Bay. District employee Eugene Ricksecker commenced a survey of the route and county acquisition of the right-of-way got underway.[21]

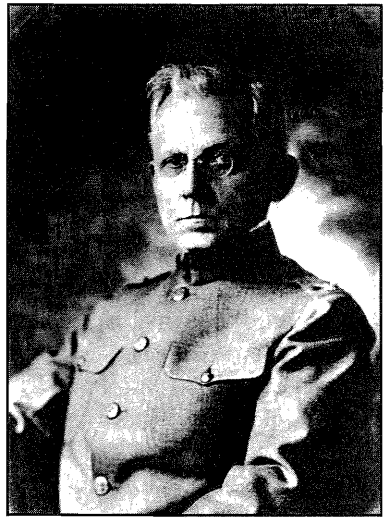
In response, the Great Northern filed a strong protest with the Corps of Engineers in February 1898. The building of a canal to Smith Cove, it insisted, would so disrupt its business as to force abandonment of Seattle. Moving in swift fashion, the Chief of Engineers suspended survey work at Smith Cove and assembled a special board of officers to meet with representatives of the railroad and conduct a public hearing. In mid-April, the board recommended the Shilshole route. According to A. A. Mackenzie, the Assistant Chief of Engineers, the changeover was based solely "upon representation ... by the Great Northern Railway Company that its property interests would be seriously interfered with if the waterway be constructed by the Smiths Cove route."[22]

Detailed planning for the canal began once the right-of-way was deeded to the government in the early summer of 1900. Seattle's commerce had expanded at such a rate that major alterations were required in the specifications submitted by the Mendell Board. Of special significance, observed Captain Taylor, "the size of the vessels visiting Puget Sound has also very materially increased and there is a prospect of a still greater increase in the near future." Hence, the original lock dimensions no longer proved sufficient. In Taylor's new plan, the locks would be nearly 800 feet long — twice the old length — and 100 feet wide, with a depth capable of passing ships of 30-foot draft. The plan also required a corresponding expansion of the connecting navigation channels.[23]

Excavation commenced in the spring of 1901 when the Seattle District let two contracts. The first provided for cutting a passage between the Sound and the mouth of Salmon Bay. With extension on to the Ballard wharves, this allowed for greatly improved vessel access. The second contract directed the digging of a channel from Salmon Bay to Lake Union to replace the latter's natural outlet creek. Workers completed these segments of the canal in early 1903.[24]

Meanwhile, Eugene Semple began work on the canal portion of his southern venture in 1901. High pressure hoses sluiced away the sides of Beacon Hill, and a gravity flume carried debris to the tideflats below. Visiting the site in mid-1902, Division Engineer Colonel William H. Heuer was impressed by the level of effort, especially in contrast to the progress of dredging on the northern route. Nevertheless, the sizable boulders encountered within the hill and the gradual reduction of angle for the flume portended great difficulty. "It seems improbable," reported Heuer, "that the company will ever complete a ship canal and lock to Lake Washington at its own expense."[25]

Semple hoped to overcome this obstacle by taking advantage of a major development: the cost of the government canal had mounted beyond all expectation. The newly-expanded dimensions of the locks, noted Major John Millis, the new District Engineer, at the end of 1901, "are just about twice those first proposed, and will make the locks cost at least four times as much." With other increases, Millis calculated that the project would require an expenditure of $6.3 million, or three times the highest previous estimate. This conclusion represented an obvious threat to continued Federal support. Semple, on the other hand, promptly offered to sell his canal, when completed, to the government for a relatively modest $2 million.[26]



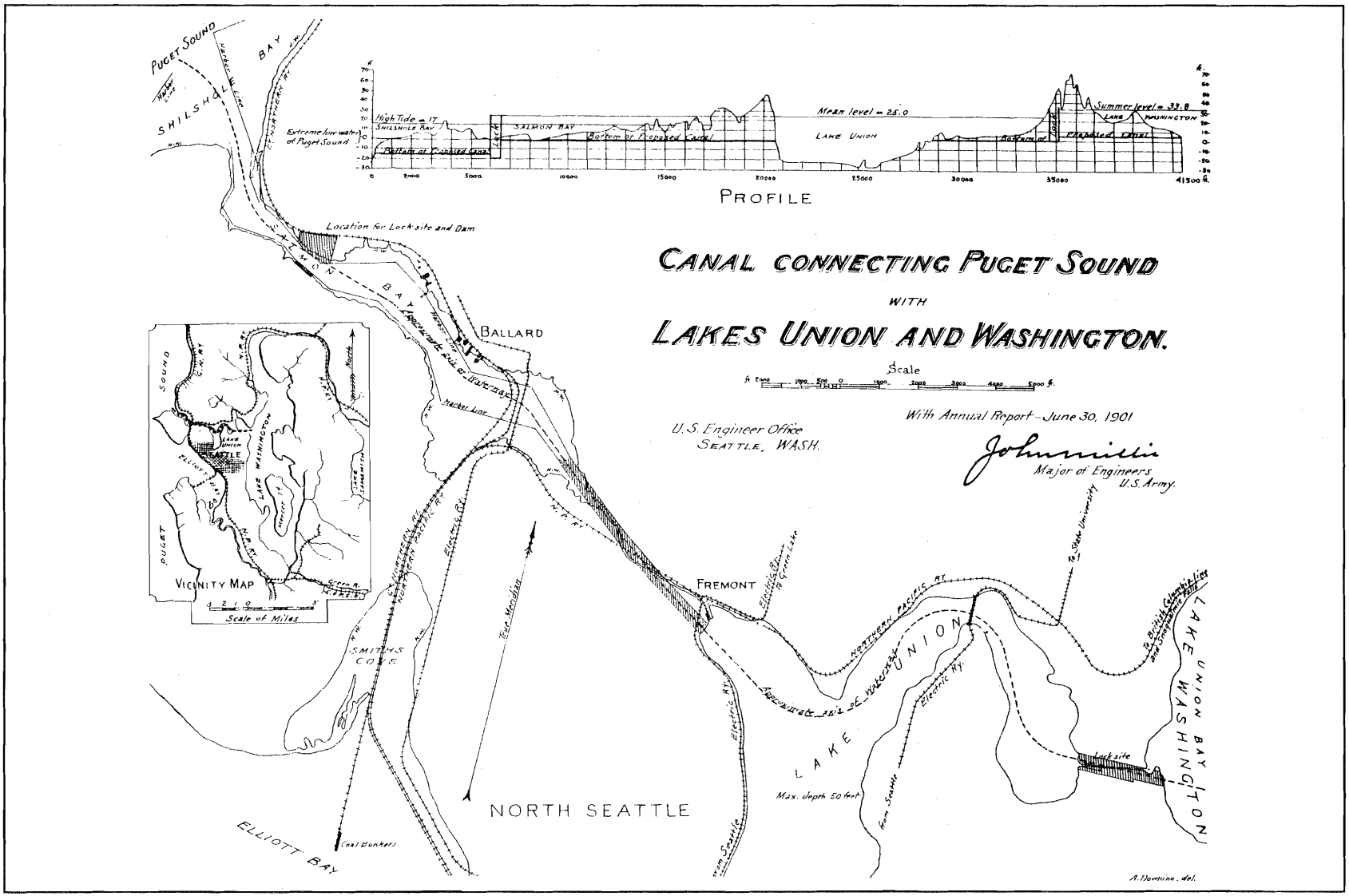
Major John Millis, appointed District Engineer in 1901; photo 1919.

With a critical moment at hand, representatives of the rival projects testified before Congress in early 1902. Advocates of the northern route hoped to secure additional funding and thereby inflict a serious defeat on Semple. For his part, the former governor pressed for the transfer of Federal backing to his canal through agreement for post-construction purchase. Amidst contrary assertions, Congress declined to resolve the dispute. Rather, Congress authorized a new Corps of Engineers study to determine the merits of the two canals.[27]

Chaired by Colonel William Heuer, a special engineering board visited Seattle in August and again in November 1902 for hearings and convivial meetings with the principals of both groups. The board had little difficulty in dismissing the prospects of the south canal. Because of the height of Beacon Hill and the ridge to the east, it would be necessary to remove five times as much material as required on the Shilshole Bay route. The resultant cut would be 300 feet deep and slice through streets, water mains, and railroad lines. Landslides and silt at the mouth of the Duwamish would be expected to obstruct the passage. "While the Board deems this route 'feasible' in the broad sense of that term," concluded Heuer and his colleagues, "it considers the difficulties and objections are so great as the make it almost impracticable as that word is ordinarily employed in business."[28]

As for the north canal, the board expressed complete confidence in the "entire feasibility" of the project from an engineering standpoint. However, they questioned whether or not the benefits would meet the annual charges of operation, maintenance, and interest on the Federal investment. Examining the various supporting arguments, the Army Engineers found them exaggerated. Although Seattle's harbor facilities would likely be strained in the future, no evidence existed that this was presently the case. The cheap cost of timber for repairs offset the damage done to wooden ships and saltwater wharves by marine organisms. While the coal mines beyond Lake Washington would be provided with more convenient transportation, the relatively short rail haul to Elliott Bay proved only a modest hindrance to present operations.[29]

The board's conclusions were unlikely to please Seattle interests: "The Board considers, ... that the demands of commerce are not at all adequate at the present time to warrant the construction of the proposed canal." They also considered a last minute Chamber of Commerce proposal that the project be limited to linking Lake Union and the Sound. Noting that the commercial advantages would thereby be reduced by half, the board advised against this proposition. The resulting official Corps of Engineers position held that no need existed for a canal at Seattle. The board's position was reconfirmed in 1905 when local interests proposed the construction of a canal with reduced dimensions. Citing a lack of sufficient economic benefit, the Corps of Engineers reaffirmed the inadvisability of the undertaking.[30]

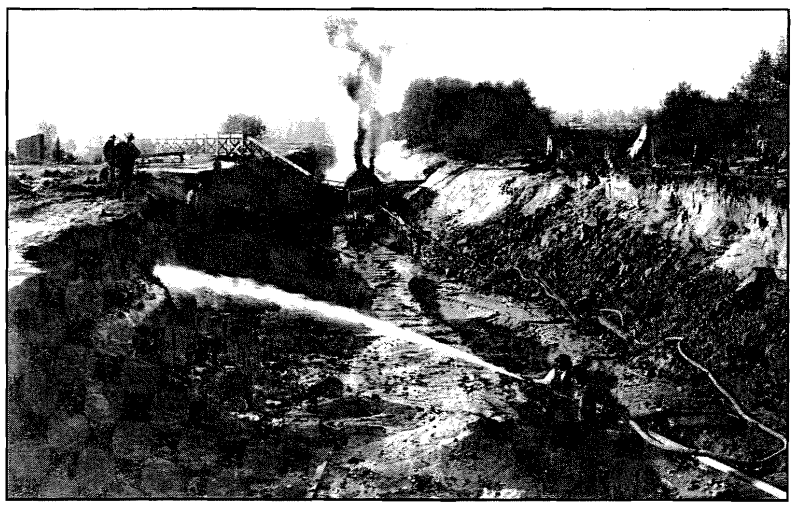


Canal Connecting Puget Sound with Lakes Union and Washington, from Annual Report, June 30, 1901.

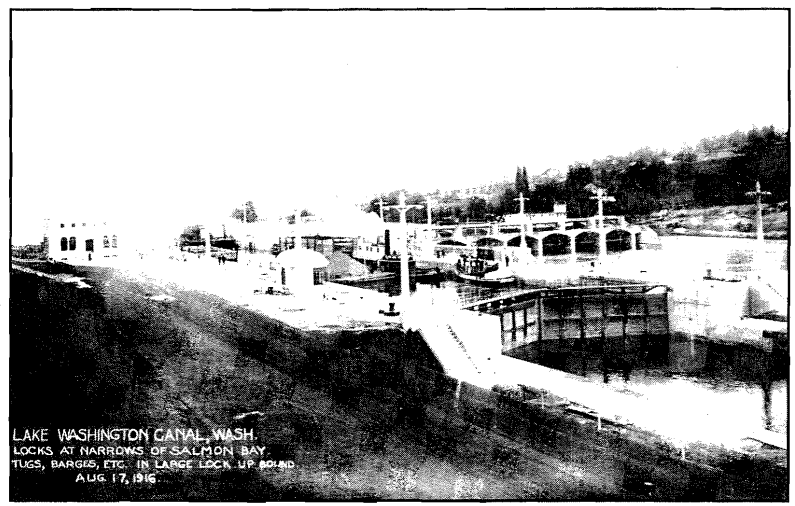
At first, Eugene Semple failed to perceive the situation correctly. Because of its dependence on Federal appropriations, he considered the northern canal all but defunct. His own project, in brightening contrast, relied on private investment and was now free to proceed. The numerous obstacles cited by Colonel Heuer, however, proved chilling to prospective investors. Local opposition mounted amid allegations of corruption and extensive property damage by the hydraulic process. Finally, in May 1904, the city forced a halt to operations. Although work on the waterways continued to successful conclusion, the grand canal soon deteriorated to little more than a weed-infested scar on the side of Beacon Hill.[31]

Demise of Semple's south canal meant that once again only one project for connecting the lakes with the Sound existed. Extensive dredging began in Salmon Bay in 1905, but otherwise the Corps of Engineers did little more than act as caretaker of the north canal. They maintained guard to prevent vandals from removing survey stakes or opening the gates at the portage log raceway, which had been deeded to the government as part of the right-of-way. Brief excitement occurred in October 1903 when muskrats tunneling through the Fremont cofferdam caused the artificial channel extending westward from Lake Union to flood.[32]

Local public officials proved a more persistent source of aggravation than burrowing rodents. The rapid growth of Seattle at the turn of the century, especially in its north end, overwhelmed the prevailing methods of sanitation. Wells and springs became polluted, and officials voiced fears of imminent epidemic. In 1904, municipal engineer R. H. Thomson opened three sewer drains into the Lake Union-Salmon Bay channel without first securing permission from the Corps of Engineers. If the city, complained an outraged Major John Millis of the Seattle District, believed that the canal was "principally useful as a trunk sewer," the government should give up all connection with the work. Although relations between the city and the Army became temporarily strained, the two sides eventually concluded an agreement allowing use of the



Excavation by water blasting, Lake Washington Ship Canal. Asahel Curtis photo, ca. 1914.



Locks, Lake Washington Ship Canal, August 17, 1916.

canal for sewage purposes pending construction of a permanent waste disposal system.[33]

Other possible, if extraneous, uses of the canal also produced controversy. Local interests realized that the opening of an artificial outlet for Lake Washington would lower its level and dry up the natural Black River exit. Together with a diversion of the Cedar River into the lake, this would resolve much of the flooding problem in the Duwamish Valley. The Corps of Engineers had considered the concept in the 1890s, but rejected it because of the impact on lakeshore property. Sponsors of the canal, though, campaigned for public support of the county's right-of-way expenditure by promising that the government's project would result in a lowering of the lake. "Those who made such representations," observed Major Millis, "were not entirely responsible."[34]

Pressure mounted after the State legislature approved a bill in 1901 protecting the government against any damages resulting from an alteration of lake levels. Major Millis, observing the local consensus as of mid-1905, found "no room for doubt that the question of drainage of Lake Washington is by all odds the paramount issue, and that navigation of the streams, or a navigable channel for deep draft vessels from the Sound to Lake Washington are secondary considerations." Under these circumstances, he recommended that the project be turned over to King County. If this proved impracticable, Major Millis urged congressional authorization of the flood control aspects before undertaking further work on the canal.[35]

By 1905, the prospect of a canal being constructed appeared nil. The combined barriers of physical, political, and financial obstructions blocked Semple's southern cut. With excavation partially complete, the Seattle District suggested that it might be best to abandon the north canal to the local populace. If prospects seemed low, however, the need for a water passage appeared to increase. The opening of farms and the first residential developments east of Lake Washington, as well as the bustling activity of a dozen lake-bound steamers, testified to the likelihood of expanding trade. As ever, speculators dreamed of mills, mines, and timber camps lining the shores.[36]

In April 1906, Major Hiram M. Chittenden became the new District Engineer in Seattle. Highly-regarded within his profession, the major possessed wide-ranging intellectual interests. Among other accomplishments, his two-volume history of the western fur trade, published in 1902, was a pioneer work of historical scholarship. Although only in his late forties, Chittenden had a persistent nervous disorder which threatened to force his retirement from active duty. Believing that the canal was the most important matter before the District, the major determined that its completion would be a fitting conclusion to his military career. Unfortunately, Chittenden found upon his arrival that "another whirlwind project had swept the people off their feet ... and caused them to give their backing to a scheme which would probably forever have destroyed the canal."[37]

Discouraged over the lack of Federal progress, Seattle residents united in early 1906 behind the proposal of James A. Moore, a briefly-prominent investor in the community. For a payment of $500,000 from King County, Moore agreed to build a wooden lock 600 feet long at the head of Salmon Bay and to lower the level of Lake Washington. Although the Corps of Engineers worried that a poorly-constructed lock would eventually be turned over to the government for operation, an obligation had been assumed by the acceptance of the right-of-way. Since Federal authorities had refused to complete the canal, noted an aide to the Chief of Engineers, "it would be highly illogical and obstructive ... to refuse to allow anyone else to build it." In the absence of opposition from the Corps, Congress in June 1906 authorized the use of the right-of-way for the new project.[38]

Facing this state of affairs in his first week of duty in Seattle, Major Chittenden was horrified by the prospect. The wooden lock, he later recalled, "could never have been built on a basis of safety and it would surely have collapsed sooner or later and precipitated Lake Washington into Puget Sound." This inevitable disaster would end forever the

Major Hiram M. Chittenden, District Engineer, 1906.

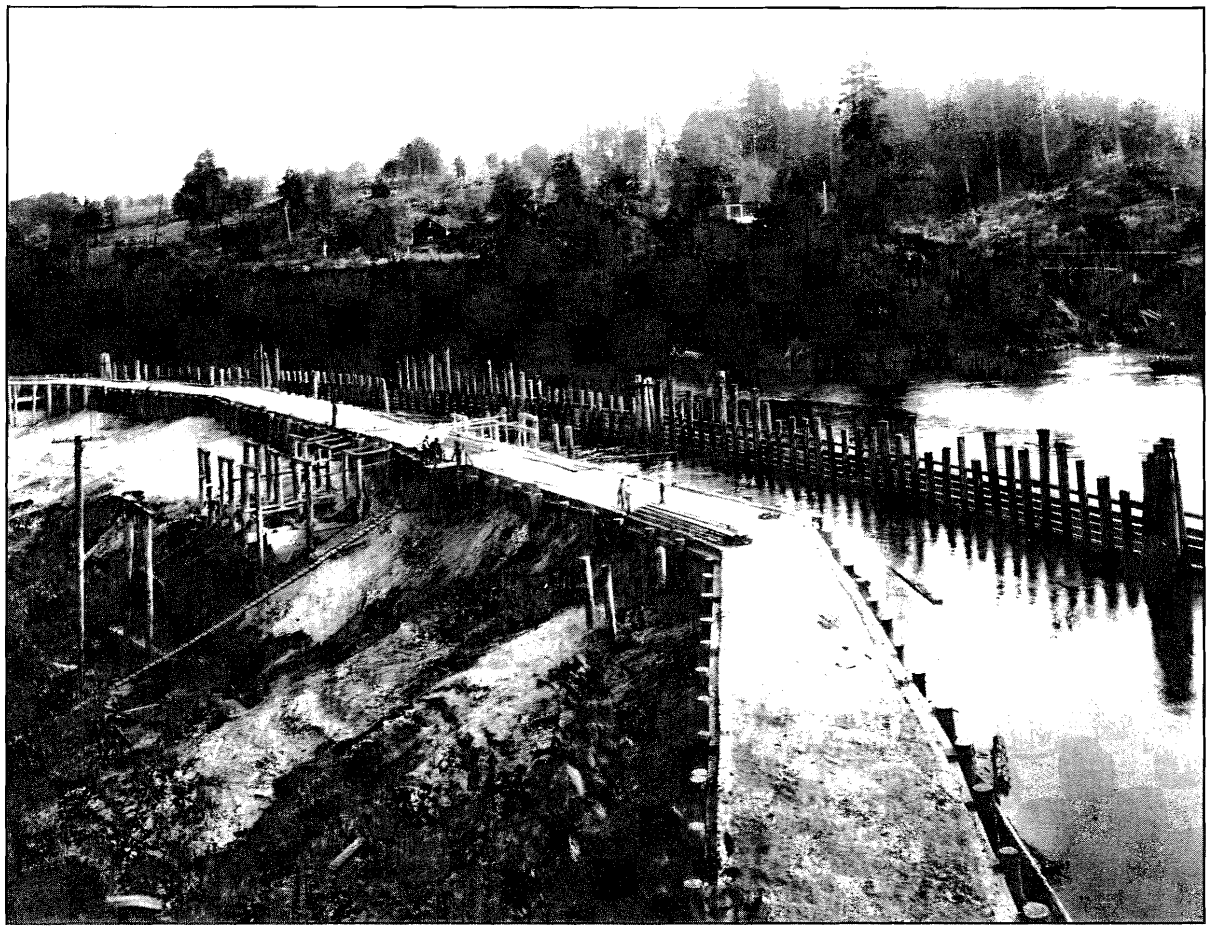
possibility of constructing a proper ship canal. Of additional importance, noted Chittenden, the Moore scheme was "fatal ... to my personal hopes for the winding up of my professional career."[39]

Because of the great initial popularity of Moore's project, Major Chittenden saw little use in making his concerns known to the public. Instead, he sought to cultivate personal relationships with community leaders. He invited these individuals for cruises on his personal boat, where they learned in relaxed surroundings of Moore's technical shortcomings. "I thus spread a leaven of doubt as to the whole scheme," wrote Chittenden, "and this continued to develop until it overthrew the Moore project." In this fashion, the major performed what he considered his greatest service to the canal.[40]

It soon became apparent, even to Moore, that the wooden lock could not be constructed for the sum originally proposed. In the spring of 1907, the promoter and the Lake Washington Canal Association, a new organ- ization of waterway supporters, concluded an agreement. Under terms endorsed and apparently drafted by Chittenden, Moore transferred his rights under the 1906 act of Congress to the local group. With this move, the Federal government returned to the business of building a canal.[41]

Working with Chittenden, the Canal Association secured authority from the State legislature in March 1907 for the organization of a local assessment district to raise $1 million as a contribution to the construction effort. By spring, the association had assembly of the assessment rolls underway and work had begun on clearing the portage between Lakes Washington and Union for excavation. Pressed by Seattle interests, Congress authorized a new survey of the entire project by Chittenden. Beginning with the firm belief that previous adverse recommendation had been based upon "wholly misleading information" as to the likely commercial future of Seattle, the major completed his study by the end of 1907. The only significant issues, he concluded, involved the dimensions, form, and placement of the locks.[42]

Previous plans had called for a single lock at Salmon Bay sufficient to pass the most sizable merchant ships afloat. Chittenden, though, believed that the main traffic through the canal would be modest steamers, tugs, and others of the "mosquito fleet" variety. "The smallest boat that may

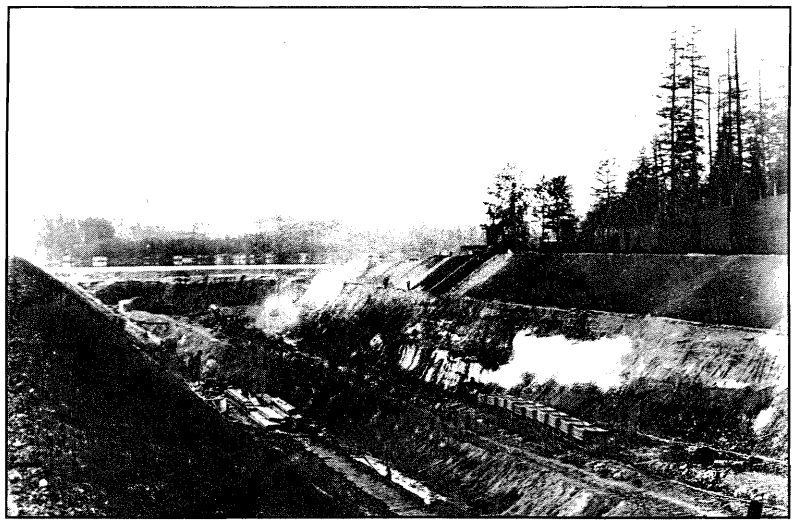


Cofferdam during construction of the Lake Washington Ship Canal, Shilshole end. Asahel Curtis photo.

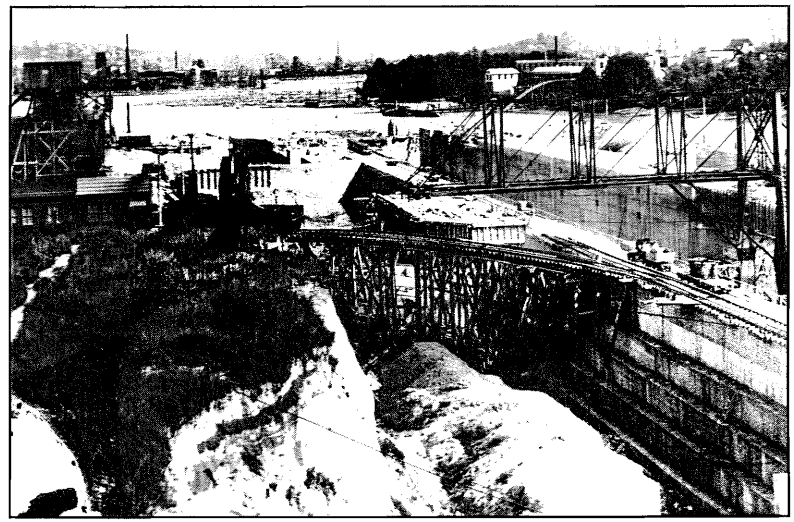
pass a lock," he pointed out, "...requires nearly as much time and just as much power and water as to pass the largest vessel that the lock will take, and to use a great lock for such small craft must necessarily be a large source of waste." To prevent this, the major advised the construction of twin locks, one 825 feet long and 80 feet wide and the other of corresponding 150 by 30 feet dimension. A middle gate would divide the former into two chambers for efficient handling of boats of differing size. These recommendations formed the basis for the revived project.[43]

Chittenden also called for the removal of the planned lock at the eastern end of the canal to lower Lake Washington to the level of Lake Union and reduce the danger of floods in the southern valley. Besides, he reported, "the cost of constructing the canal will be largely reduced by the elimination of one lock." Funding requirements could be lowered to $4.5 million, and a third of this sum would now be coming from local sources. This proposal, like that for the twin locks at the western end of the canal, became a part of the final plan.[44]

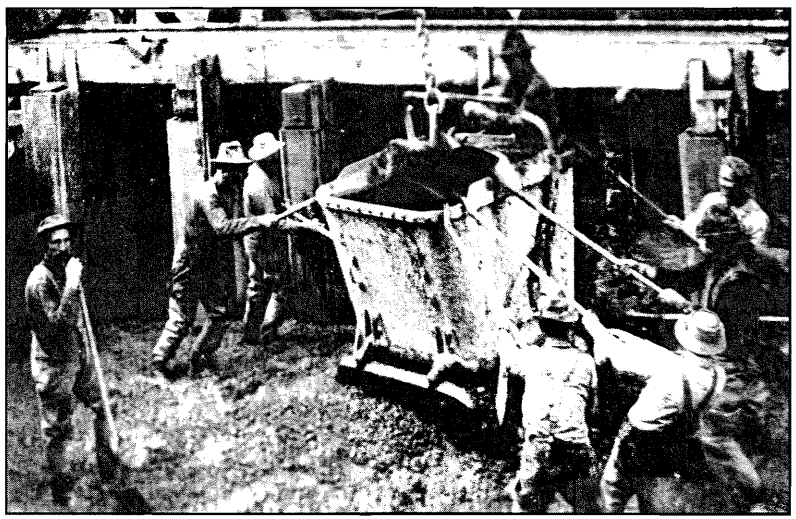
Considerable controversy flared over the last matter at issue. Past surveys had placed the outer locks at the Narrows at the mouth of Salmon Bay, where ideal engineering conditions existed. The mill interests at Ballard, who were supposed to benefit by raising the bay, had been compensated by King County in the late 1890s for the cost of relocating to high ground. Those operators, citing recent increases in the value of their properties, now came out in opposition to the locksite. Although Chittenden, especially irritated when selfish interest superseded the public welfare, believed that the mill owners had "no valid case," he recognized their capacity to force delays upon the project.[45]



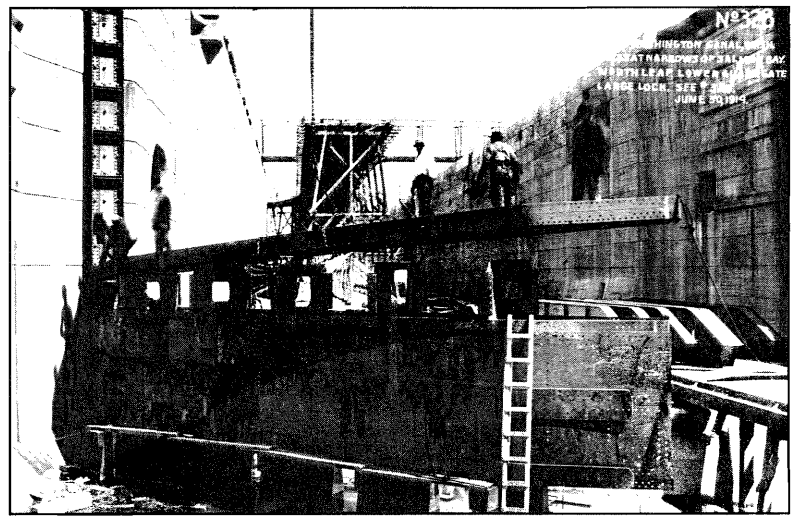
Dam construction tram



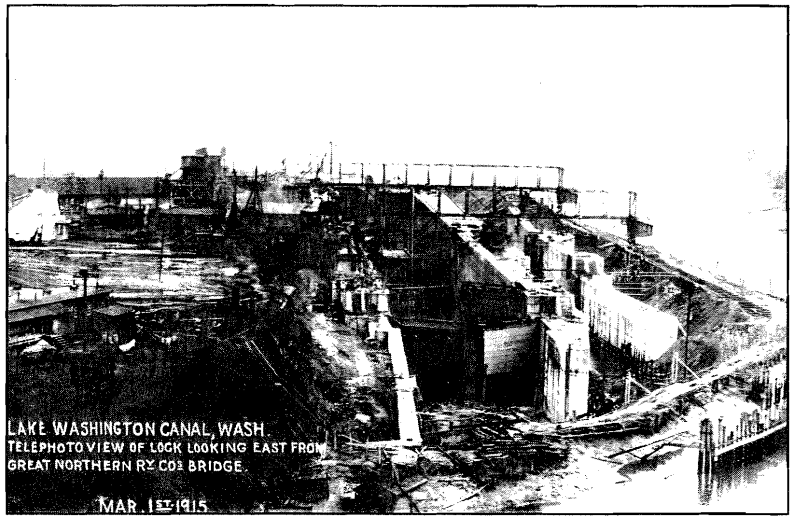
Large lock construction



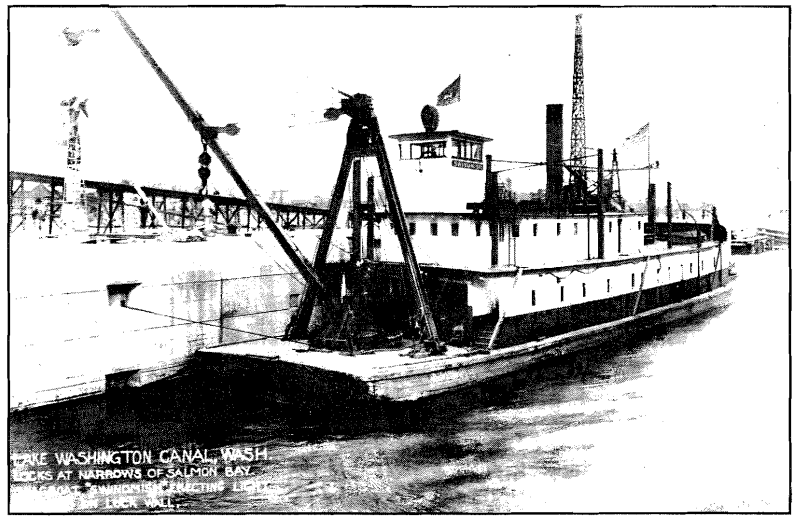
Concreting the miter walls at lower end of lock



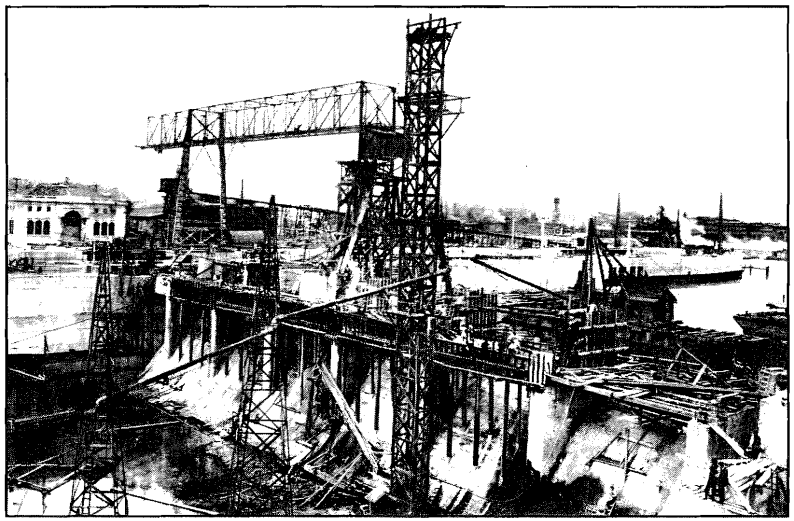
North leaf lower guard gate, large lock



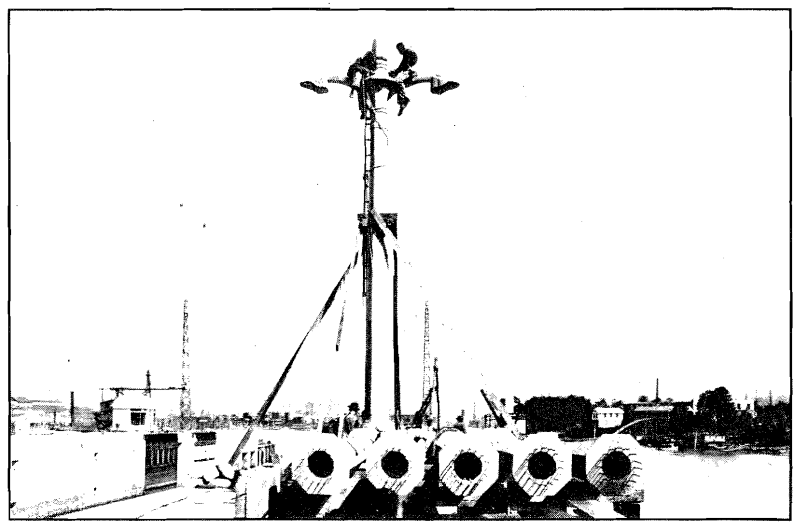
Looking east from Great Northern Railroad bridge



Snag boat Swinomish *erecting light standard on lock wall*

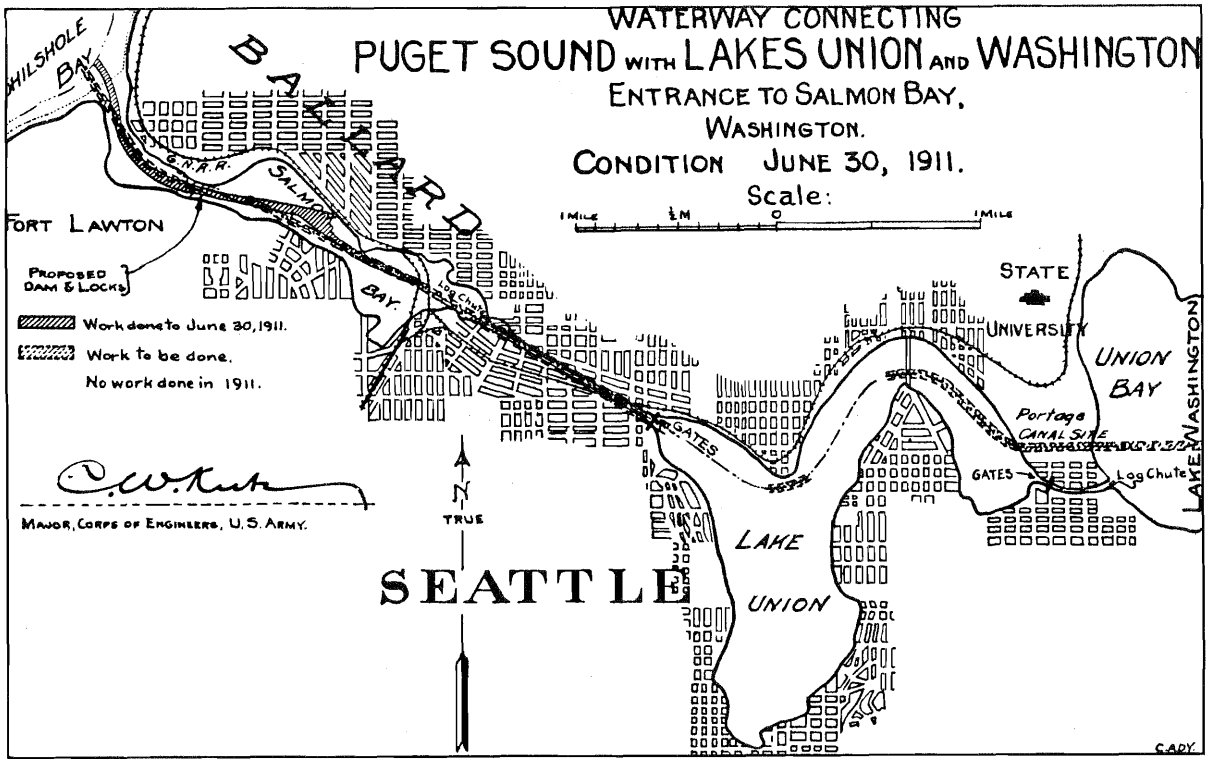


Spillway dam



Concrete light standard in place

In his concern to begin construction early, Major Chittenden at first decided to let the Ballard interests have their way. Because of "the large part which local interests are taking in the construction of the canal," he reported in March 1907, "the decision of the questions should be left to them upon a proper hearing of all the interests involved." The prevailing state of opinion, in his assessment, held that the locks "should be somewhere between Lake Union and the head of Salmon Bay and not at the original site." A visit to Ballard to mark off the area to be flooded, how- ever, convinced the major that the claims of damage were exaggerated.[46]



Waterway connecting Puget Sound with Lakes Union and Washington, Entrance to Salmon Bay, condition June 30, 1911.

Over the early summer of 1907, Chittenden worked to marshal local opinion behind the Narrows site. A public meeting in Ballard revealed that most residents of that community favored the western location. At a Federal hearing in mid-July, the mill owners comprised the only significant group to support placement at the head of the bay. "It is everywhere conceded," wrote Chittenden, "that the mill owners have no legal right to object to carrying out of the original plan for raising the waters of Salmon Bay." In his survey report submitted in December, the major pointed out that there existed "no advantage whatever, but very serious disadvantage, in going to any other location and the old location should therefore be retained."[47]

Noting that the substantial local contribution recently pledged placed the canal "in a much more favorable light," the Board of Engineers in Washington, D.C. approved Chittenden's project in March 1908. The major, however, was unable to direct construction. His health deteriorated rapidly after October 1907, following the ordeal of the annual 50-mile horseback ride required of military officers. Electric shock treatments, many months of sick leave, and an unsuccessful operation marked the bedridden passage of time until his final retirement from service in December 1909. Chittenden could at least take satisfaction in later years in the belief that he was the individual most responsible for construction of the Lake Washington Canal. Through the defeat of the Moore scheme, the organization of local support, and the

development of the canal's final shape, he had been "the agency of rehabilitating a project which had well-nigh gone to pieces.[48]

An act of the Washington legislature in early 1910 appropriating $250,000 from the sale of State lands for the purpose of excavation allowed actual resumption of work. Placed at the disposal of the Corps of Engineers, this money enabled letting a contract for the cut through the portage between Lakes Washington and Union. In June 1910, Congress authorized construction of the locks, provided that State and local interests made funds available for completion of the canal's connecting links. Nevertheless, matters again stalled because of self-interested local obstruction.[49]

In part, the temporizing attitude of Chittenden's successor, Major Charles W. Kutz, allowed resurrection of the dispute over location of the lock. The opponents of the Narrows site, he conceded, were in a distinct minority and had been compensated for their impending losses. Still, their "wishes" were "entitled to greater consideration than the opinions" of those who would not be damaged by the raising of Salmon Bay. "This question of lock location," concluded Kutz, "is a local rather than a National one and the decision should be left primarily with those interests that will be most vitally effected." Although Congress approved the Narrows locksite in 1910, defeating the primary aim of the Ballard mill owners, the requirement that local and State project funds be in hand prior to construction opened new avenues of opposition.[50]

Working through the State court system, opponents in early 1911 challenged the legality of the local assessment district and of the $750,000 bond issue approved by county voters in the previous year's election. Recent purchasers of waterfront land on Lake Washington joined in the action, contending that the Federal government's indemnity against damages did not apply to their holdings. The court upheld these contentions upon initial hearing, placing the necessary local financial participation in jeopardy. The War Department thereupon determined that, pending appeal, the construction authorized by Congress in 1910 could not proceed.[51]

These matters quickly reached a resolution in the spring of 1911. The State Supreme Court overruled the earlier decisions, validating the project's financial structure and protecting the government from suits for damages. After a mid-June hearing in his Washington office, Secretary of War Henry Stimson ruled that the previous county and State expenditures and the 1910 bond issue provided sufficient guarantee of local support to satisfy the requirements of Congress. Issued on 29 June 1911, this determination meant that the construction of locks could finally get underway.[52]

Work thereafter proceeded in a steady and relatively contention-free manner. Major James B. Cavanaugh, appointed District Engineer in mid-1911, was chosen to supervise the local and State excavations, placing him in overall charge of the project. By the summer of 1912, contractors had removed nearly a quarter million cubic yards of material from the locksite and constructed the necessary buildings, shops, and wharves. Workers poured the first concrete in the lock walls in late February 1913.[53]

Major James B. Cavanaugh, appointed District Engineer mid-1911; photo 1921.

Occasional problems and controversies provided pale reminders of the delays and bitterness of former years. In March 1914, the old Lake Union cofferdam suddenly washed out, flooding the channel to Salmon Bay and lowering the lake by an estimated 12 feet. The Corps used emergency funds to repair the damage and build a new structure. A few weeks later, Seattle voters rejected a

bond issue for the relocation of three bridges across the canal, raising the prospect of a dispute between Federal and State governments. Voters resolved the matter in the spring of 1915, by approving a new bond measure.[54]

The Corps of Engineers completed the walls, except for portions left out to allow passage of construction trains on elevated tracks, and floors of the locks in June 1914. Installation of the steel gates commenced at that point and continued until the early summer of 1915. Pending construction of an adjacent dam, the gates were kept open to allow transit of vessels to and from Ballard. In July 1916, workers finished the dam, closed the gates, and raised Salmon Bay to an elevation of 21 feet above low water in Puget Sound.[55]

Early Seattle District floating plant: launch Orcas, *tug* Wilson, *snag boat* Skagit *(to be sold), snag-boat* Swinomish *(new), February 27, 1915.*

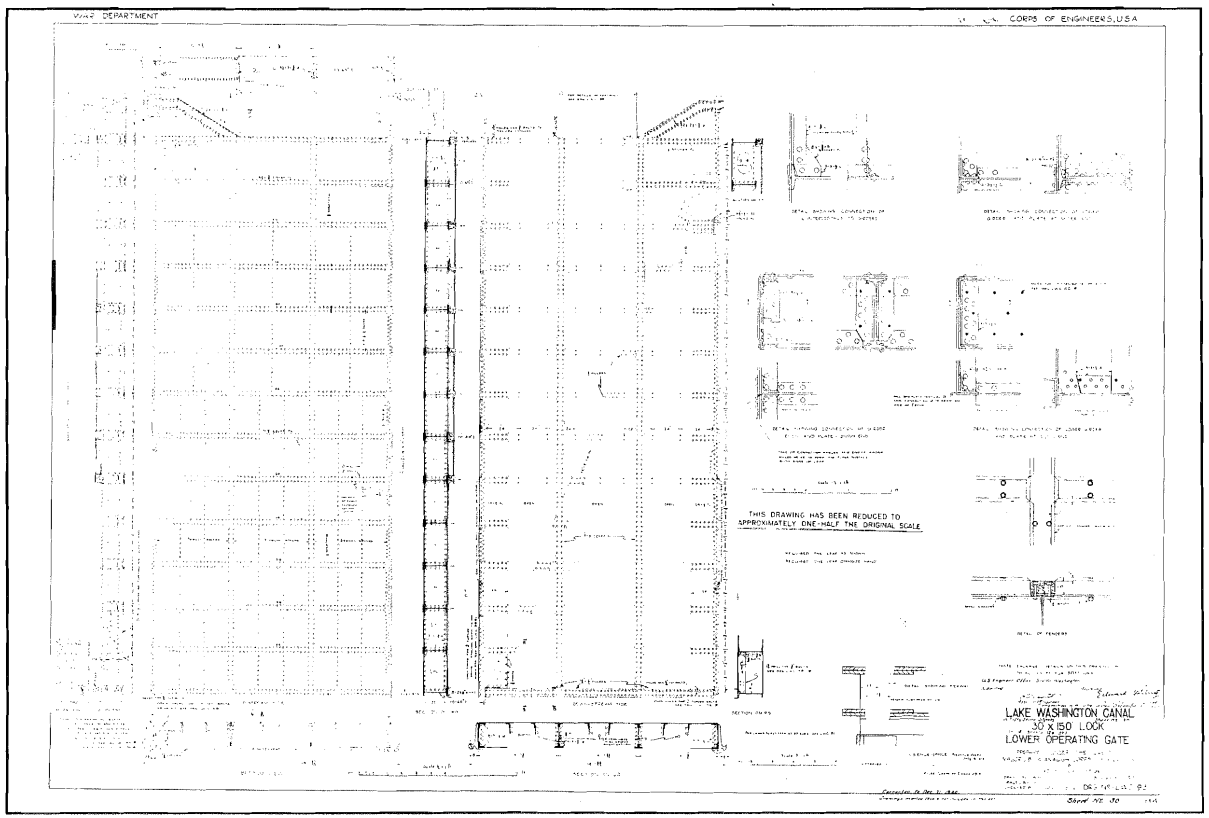
On 3 August 1916, three weeks prior to the opening of the portage cut, the Corps of Engineers launch *Orcas* and the snagboat *Swinomish* became the first boats to pass through the functioning locks. By the end of 1916, 7,500 vessels utilized the locks, carrying 12,000 passengers and 201,000 tons of freight worth an estimated $1.9 million. For 1917, the first full year of operation, the locks accommodated 22,392 tugs, fishing boats, and pleasure craft. The Corps had to replace defective gate sheaves and cables to reduce delays, and it installed an electric light system allowing around-the-clock activity. The locks required a permanent staff of 49 — lockmen, electricians, machinists, and so on — greatly inflating the District payroll.[56]

With channel dredging and bank revetment still unfinished, the Corps considered the entire canal project three-quarters complete as of the official Fourth of July dedication of the locks in 1917. The Corps reported the total expenditure to that point as $3.5 million, of which $2.5 million had come from the Federal government. The canal stretched for 7.8 miles from west of the locks in Shilshole Bay through freshwater channels to Lake Washington. The smaller lock was 150 feet long, 30 feet wide, and 16 feet deep. Adjoining it to the north, the second lock

was 825 feet long, 80 feet wide, and 36 feet deep. In the Western Hemisphere, only the famed isthmian locks at Panama exceeded the dimensions of the larger lock.[57]

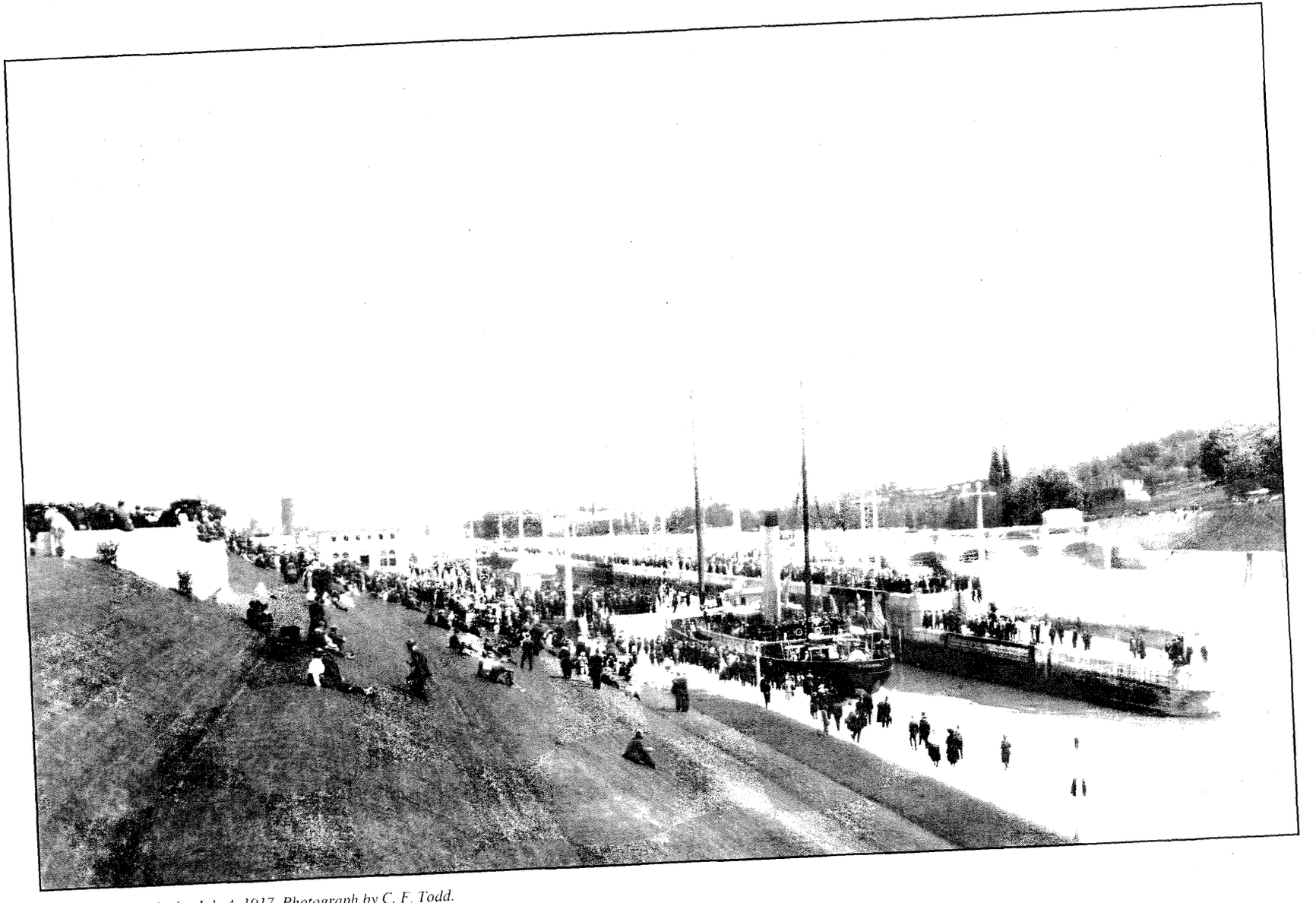
Commercial traffic mounted to $21.6 million in 1923, erasing the doubts of those who questioned the project's economic worth. Over half of this amount consisted of logs, which were floated through the large lock in rafts. Local interests soon called for a widening and deepening of the canal and for the construction of a third lock. Army Engineers responded that the predominance of shallow-draft vessels precluded the need for channel enlargement, while improved regulation of the log rafts would reduce complications at the locks. But Colonel Edward H. Schulz of the Seattle District did report in February 1921 that "the necessity for an additional lock is practically certain."[58]

Beginning in the mid-1920s, major transformations obviated the need for project expansion. Tugboat traffic commenced a long-term decline in 1926. In contrast, the numbers of pleasure and fishing craft using the passage tripled in the quarter century after that date, with the former as the principal beneficiary of the canal. Local pressure continued for the alterations originally requested in the aftermath of construction. After an exhaustive study, however, the Seattle District reported in June 1955 that the existing locks and channels adequately provided for the commercial needs of the region.[59]

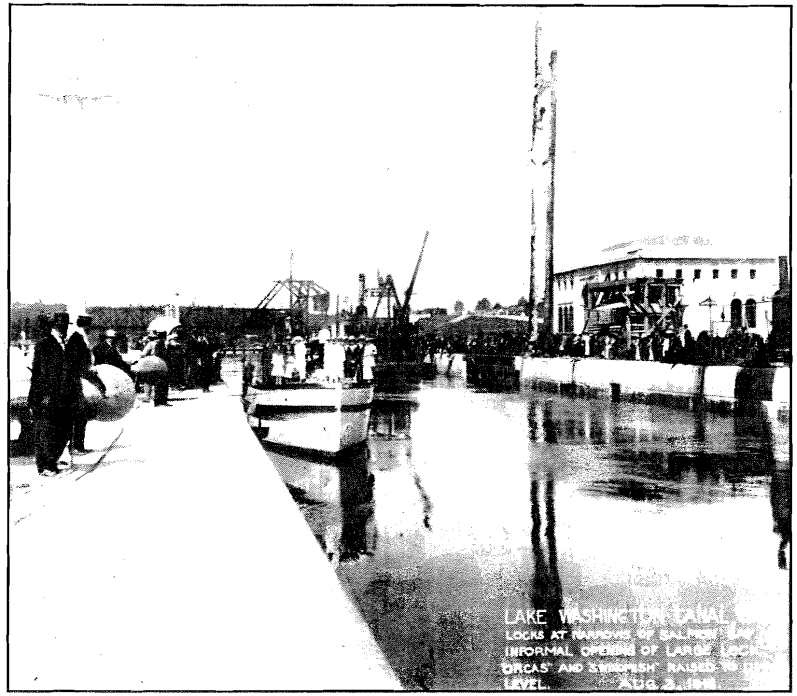


Drawing, Lake Washington Canal, Lower Operating Gate.

The project survived into modern times in its original form as a working piece of history. Many professed hopes of its initial sponsors had long since been thwarted. Lake Washington developed as a rela- tively unspoiled location for homes and parks, rather than as the sooty Pittsburgh-of-the West envisioned by early boosters. The canal failed to become a waterway for fleets of ocean-going steamers trading between the lakes and the ports of the world. The locks and waters became instead the recreational resort of boaters and sightseers and an integral aspect of the relaxed mood of the city of Seattle.



Dedication of the locks, July 4, 1917. Photograph by C. F. Todd.



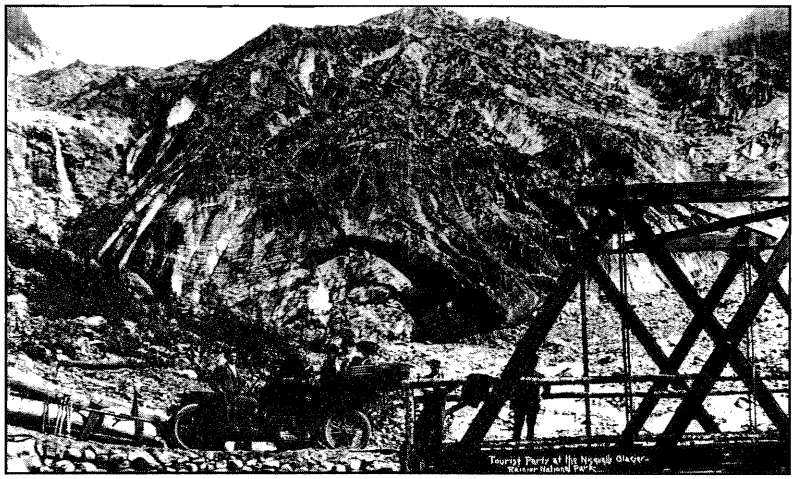
Informal opening of large lock with the boats Orcas *and* Swinomish, *August 3, 1916.*

The Lake Washington Ship Canal served as an apt representative of turn-of-the-century Corps of Engineers works in the Pacific Northwest. The project demonstrated the vital role of local interests in securing Congressional approval of projects and in determining the place and manner of their construction. It also pointed out the duty of the Army Engineer to assess proposals according to a calculation of benefit. And finally the protracted history of the canal construction — Seattle's population increased by eight times between the Mendell Board survey of 1891 and the dedication of the locks in 1917 — reflected the impact of local opposition and controversy on the progress of engineering projects.

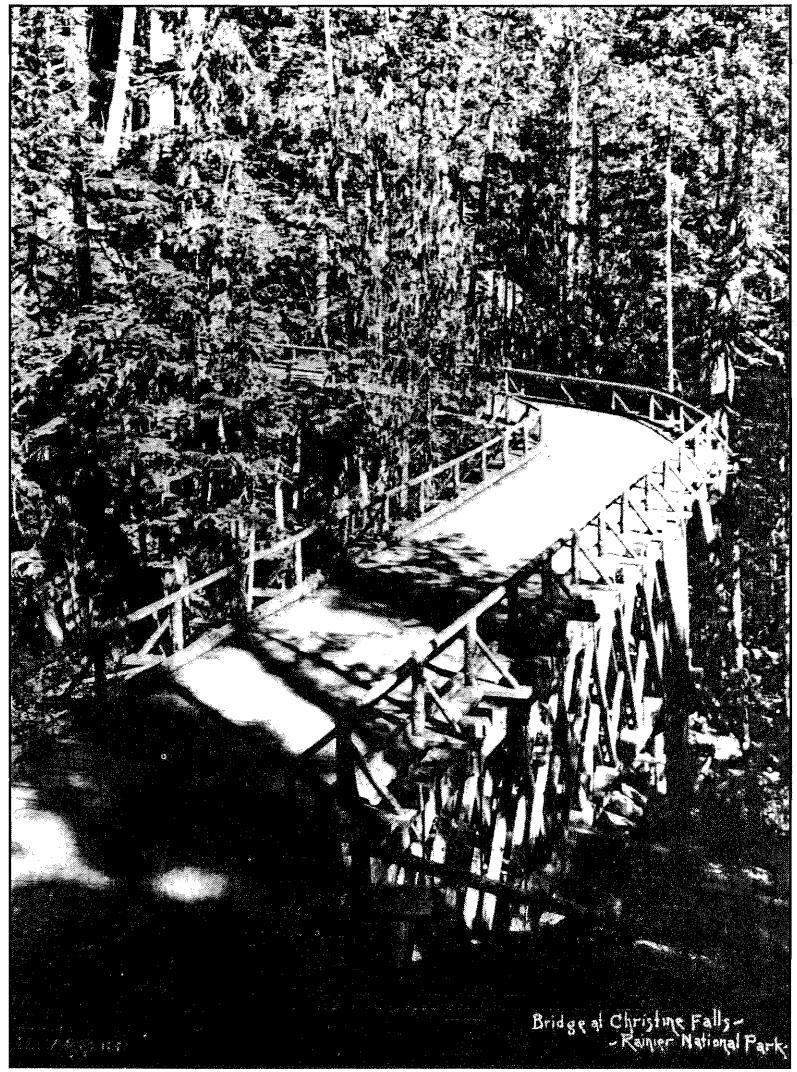
Locks personnel, 1917.

The construction of the Lake Washington Ship Canal occurred, of course, while the Seattle District carried out numerous other engineering works. In addition to those previously discussed, one other undertaking is noteworthy. Between 1904 and 1911, the Seattle District built a wagon road into Mount Rainier National Park. Located 45 miles east of Tacoma and on the edge of the Cascades mountain range, Mount Rainier sat amidst dense forests, towering rock formations, glaciers, innumerable waterfalls and lakes, and vegetation of vast variety and beauty. Although the locale possessed great scenic and scientific interest, accessibility remained difficult until Congress authorized the Corps of Engineers to build a road to the park.[60]

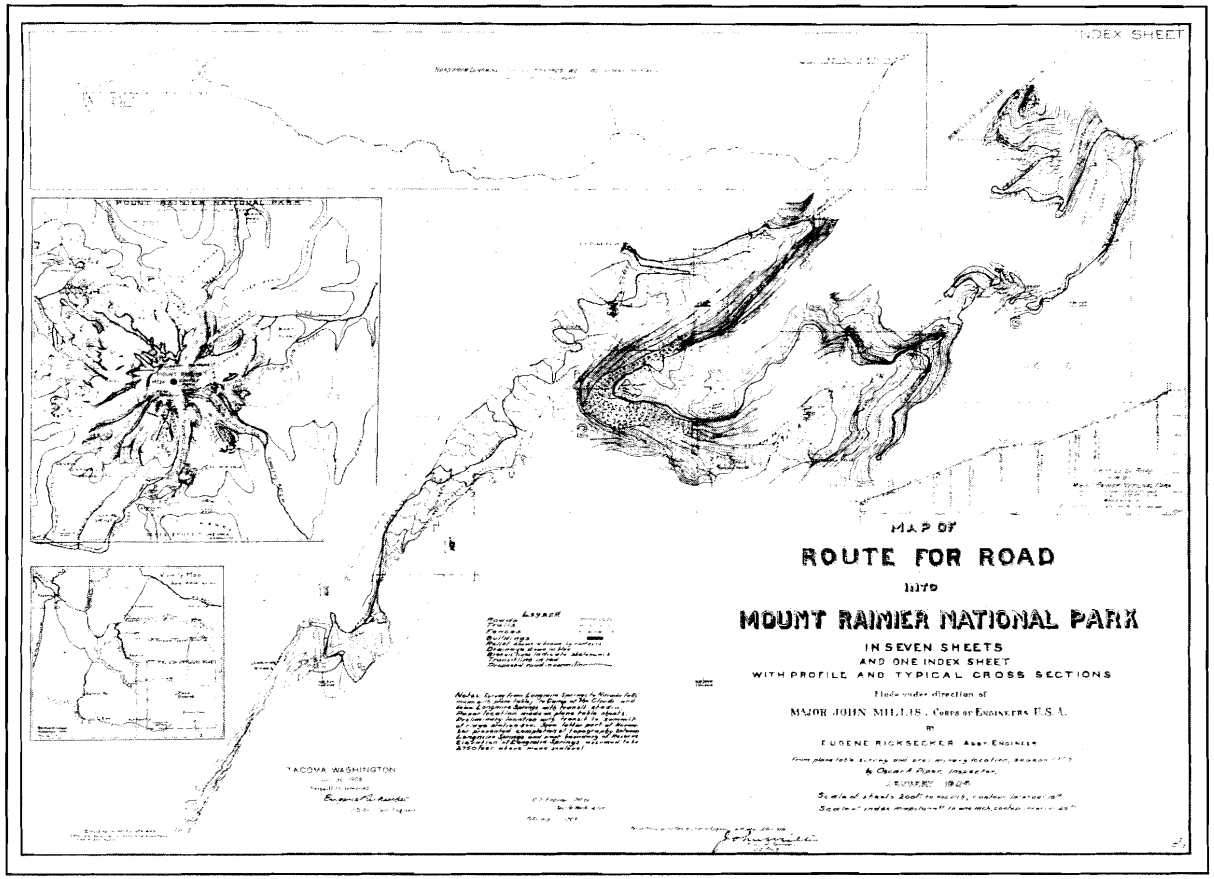
After the District completed surveys and prepared plans for the road in 1903, a congressional appropriation in the spring of 1904 allowed work to begin in August of that year. The proposed road entered the park from the west, opening it to travellers from the Puget Sound area. Construction proceeded slowly, complicated by a short work season and



Government road at foot of Nisqually Glacier, from the 100-foot Howe truss bridge across the Nisqually River, Mount Rainier National Park. Photograph from Annual Report, June 30, 1909.



One hundred-foot span deck Howe truss bridge across Van Trump Creek, in front of Christine Falls, Mount Rainier National Park. One hundred feet to bottom of canyon. Photograph from Annual Report, June 30, 1909.

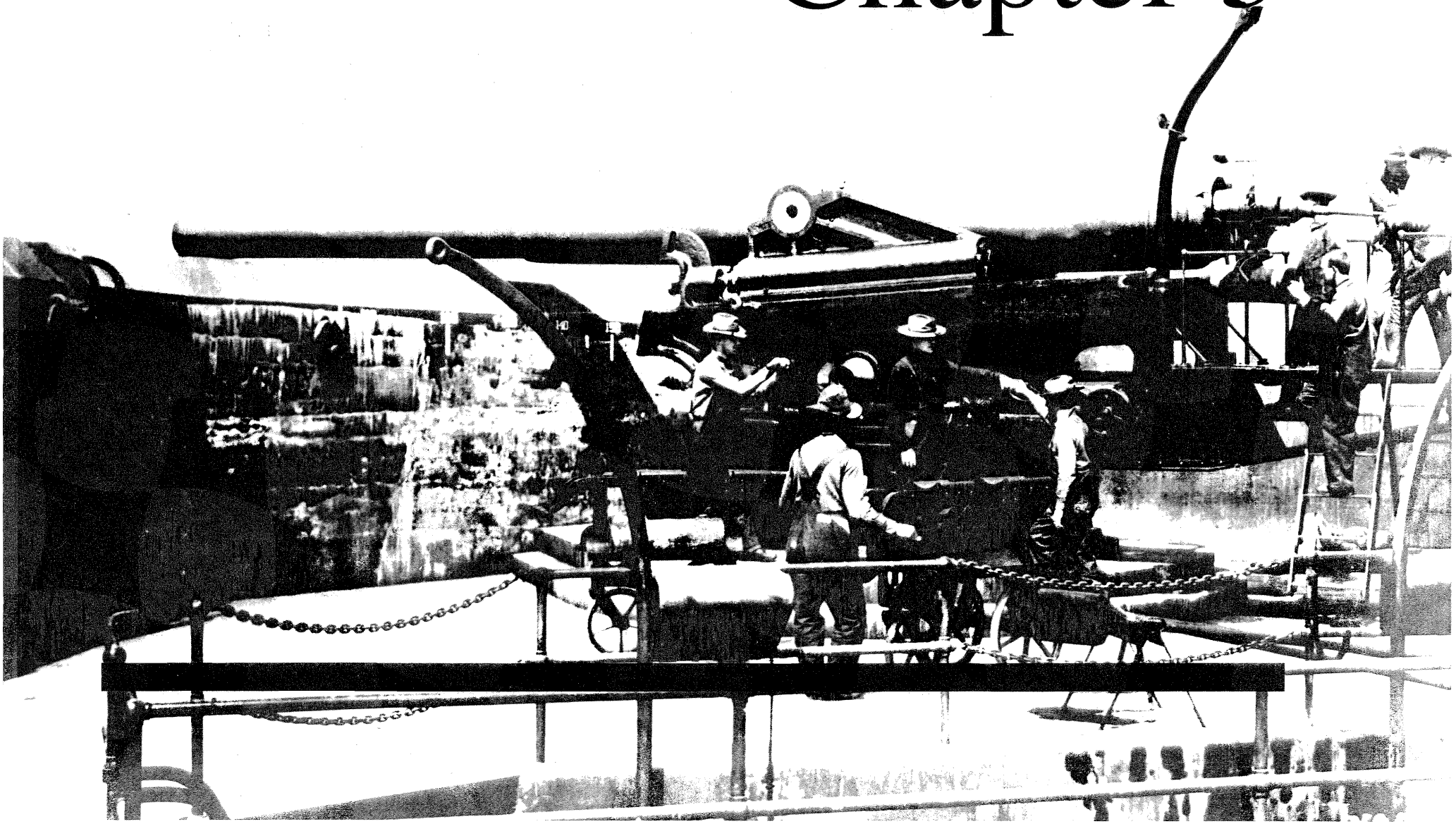


Map of Route for Road into Mount Rainier National Park, Major John Millis, January 1904.

financial difficulties of the contractor. The Corps finally took over the entire project in 1906 and completed it by hired labor in 1911. Total cost of the road came to $240,000.[61]

In all, the Seattle District carried out an impressive and geographically far-flung collection of civil projects in its first 25 years. To this body of work, the District added responsibility for constructing the turn-of-the-century military fortifications on Puget Sound.

Chapter 5



COASTAL DEFENSE

Cruisers from the enemy fleet maneuvered in the wide and deep waters of the Strait of Juan de Fuca on an early fall day in 1903. As fog and the smoke of forest fires thickened, pilots conscripted from the merchant marine guided the vessels toward Puget Sound. There, soldiers trained the guns of three imposing forts — Worden, Flagler, and Casey — to bring triangulated fire to bear against hostile ships attempting to enter the Sound. Warned of the approach by coast-watchers, soldiers of the Artillery Corps stood at the ready in gun emplacements half-flooded by recent rains.

Partially hidden in the haze, the ships loomed within range. Lack of telephone or wireless connections between the forts, however, prevented coordination of fire against targets briefly coming into view. Due to imperfect positioning of batteries, moreover, gunners could maintain simultaneous firing for only a few minutes. Once they negotiated this dangerous interval, the vessels steamed up the Sound in unmolested procession. Inviting targets offered themselves to the enemy commander. He might raid the naval station at Bremerton and deliver a mortal blow to the capacity of the United States for war in the North Pacific. Or he could bombard and reduce to rubble the cities of Seattle and Tacoma.

Whatever the choice, concealment offered by nightfall and foggy weather would enable a return run past the forts to the safety of the Strait and the open sea to the west. Fortunately, the "hostile" ships constituted components of the American fleet. Their attack formed an exercise designed to test the fortifications recently constructed on Puget Sound by the Corps of Engineers. The results of that test, as demonstrated by the "enemy's" unscathed passage, represented an obvious and major disappointment.[1]

opposite: Loading 10-inch Gun at Fort Flagler, Battery Revere.

From the first years of American settlement, the matter of defending Puget Sound preoccupied the thinking of Army officers assigned to the Pacific Northwest. At first, the military perceived the major threat as coming from the Indian population. In response, the Army established Fort Steilacoom in 1849 near the village of that name on the southern Sound. Although the Army maintained the post for years as headquarters for operations north of the Columbia, it had short-term actual significance. An expanding settler presence and implementation of the Indian treaties concluded in 1854 and 1855 limited the danger posed by local native inhabitants.[2]

Indians from British and Russian possessions to the north — "numerous, brave, and warlike" according to a report of 1855 — represented a more imposing threat. Traveling in ocean-going canoes, these Indians made annual trading visits to Puget Sound. Settlers occasionally became embroiled in violent encounters with the unwelcome visitors. Forts built on Bellingham Bay and at Port Townsend specifically to counter the Northern Indians proved ineffective. In 1859, therefore, General William S. Harney, commanding Army forces in the Pacific Northwest, ordered establishment of a post on San Juan Island in the Gulf of Georgia as an advanced point of defense against hostile incursions. Occupation of that disputed island initiated the melodramatic border controversy with England known as the Pig War.[3]

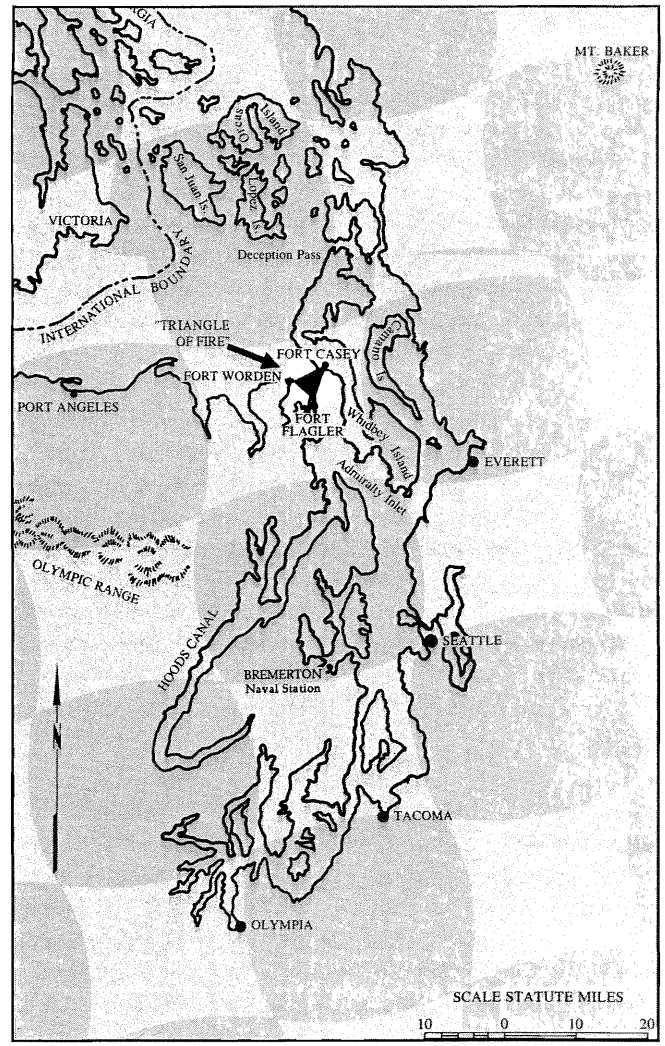
Meanwhile, planning of more substantial defensive works got underway. An Army-Navy commission had advised in November 1850 that eventually it would be necessary to place heavy guns at the entrance to Puget Sound. Because early settlement focused at Olympia and Steilacoom, Army officers also noted the importance of the Narrows north of the latter village, where high bluffs restricted the Sound's width. "A Battery of guns in position here," reported General Harney, "would close the head of the Sound to the largest fleets." Officers of a later time,

though, pointed out that an invading force could easily land to the north at undefended Commencement Bay and outflank the proposed fortifications.[4]

Emergence during the mid-1850s of important lumber manufacturing ports near the entrance to Puget Sound soon caused a shift of emphasis northward. The British on Vancouver Island supposedly stood in constant readiness to take advantage of an outbreak of war with the United States. Construction of a British naval base at Esquimalt west of Victoria heightened the perception of hostile intent. According to a May 1860 report by Brigadier General Joseph Totten, the Chief of Engineers, Great Britain dominated the Strait of Juan de Fuca and its connecting waters. "So long as that mastery is upheld," observed the general, "all commerce of the inner waters through these narrow straits must, in time of war, be interrupted or at least exposed to the greatest hazards."[5]

For the proper positioning of defense against attack, Army Engineers focused on Admiralty Inlet, the narrow channel opening into Puget Sound. At three locations — Point Wilson outside Port Townsend, Marrowstone Point to the southeast of that town, and Admiralty Head to the northeast on Whidbey Island — forts could be built to cover the inlet. Each place represented the tip of a triangle with sides three to four miles in length. The problem was that Civil War-era artillery lacked sufficient range to effectively engage enemy vessels, especially those running through the inlet under cover of darkness or foul weather. Early studies therefore concluded that defense of the Sound was impracticable.[6]

Instead, the Corps of Engineers recommended an offensive strategy in the event of war with Britain. "The vast superiority in the means of making war which we possess on this coast over those which England could command," advised a Pacific coast engineering board in 1867, "would suggest, ... that we should make the war aggressive." The British could easily be expelled from Esquimalt and Victoria and the whole of Vancouver Island enveloped within the American nation. Thus, the problem of defending Puget Sound would be permanently resolved without expensive coastal fortifications. In the event that defensive



Adapted from a map accompanying the June 30, 1902 Annual Report of the War Department, Chief of Engineers, 1902, showing the "Triangle of Fire" formed by gun emplacements at Point Wilson (Fort Worden), Marrowstone Point (Fort Flagler), and Admiralty Head (Fort Casey).

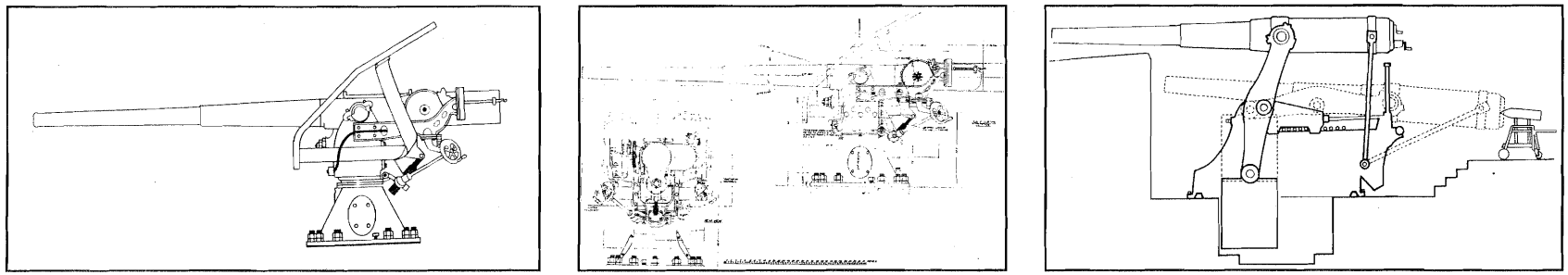
measures eventually became practicable, however, 36 military reservations were created upon the Army's recommendation in 1866.[7]

Subsequently, the rapid economic development of Puget Sound during the 1880s presented a more inviting target to foreign enemies. Expansion of the facilities at Esquimalt and the stationing of additional warships there, moreover, suggested to many observers hostile designs on the part of the British. Recent improvements in artillery, finally, made it possible to mount a more effective defense of Admiralty Inlet. Erection of batteries at the three commanding headlands, observed a board of officers in October 1884, would subject enemy vessels to "a heavy cross-fire." Beginning in that year, Army reports stressed the necessity of defensive works for Puget Sound.[8]

The emerging belief in the linkage between sea power and national prosperity accentuated the pressure for fortifications. A powerful navy, according to the new thinking among strategists, was essential to project America's commercial might throughout the world. Strong coastal defenses became necessary, in this view, to protect naval bases and centers of commerce. In 1886, a special Army-Navy board chaired by Secretary of War William Endicott called for the expenditure of $127 million on construction of works along the nation's coastline. Congress eventually responded by authorizing a scaled-down version of this program. The government's decision at the end of the 1880s to locate a naval station at Bremerton on Puget Sound reinforced the earlier interest in Admiralty Inlet.[9]

Business and political leaders in the new State of Washington added their voices to the call that the Federal government provide coastal defense. In response to both military and civilian pressure for fortifications at the entrance to Puget Sound, the War Department studied the matter again. In 1894, a special board of Army Engineers examined the defense question from a technical perspective. Reporting for his colleagues in June of the following year, Colonel George H. Mendell recommended an appropriation of $2.2 million for the three long-discussed forts. To provide a secondary line of defense, the board also proposed construction of batteries at Seattle and Tacoma. Surveys were already underway to determine the current status of the military reservations and the need for additional land acquisitions. Following consideration of this report, Congress in 1896 authorized the building of fortifications at Point Wilson, Marrowstone Point, and Admiralty Head.[10]

Within days of its formal organization in the spring of 1896, the Seattle District began detailed planning for construction of the forts. As approved by the War Department, the project entailed placement of 29 heavy guns, 96 mortars, and 23 large caliber rapid-firing guns at Admiralty Inlet. Planners projected the cost at $2.8 million. Fortifications planned for the entire seacoast of the nation, Captain Harry



Three illustrations of 3-inch rapid fire gun, model of 1903 Barbette carriage.

Taylor was soon informed, required an expenditure of $82.1 million. Unfortunately, as the captain also learned, "the most liberal provision for this work which Congress has so far been willing to consider is $45,000,000." The Chief of Engineers, as a result, instructed Taylor to achieve a 45 percent reduction in the estimate, primarily through limiting thickness of the parapets. In an emergency, noted the Chief of Engineers, gun emplacements could be strengthened with sand from nearby beaches.[11]

Survey work proceeded rapidly at Admiralty Head and Point Wilson, where settlers had cleared much of the land. Difficult conditions, however, confronted engineer Eugene Ricksecker at Marrowstone Point. The only drinking water available came from rainwater collected in barrels which soon became "full of 'wrigglers'." Because of fallen timber, Ricksecker worked several feet above the ground, clinging with his equipment to the sides of rotting spruce and fir. Captain Taylor sent photographs to the Nation's Capital as examples of what he facetiously termed "the beauties of travel in a Puget Sound forest." The worst spots could not be pictured, he reported, because sufficient light did not penetrate the entangled mass of giant trees. Formulation of construction plans, originally thought to require a matter of weeks, stretched on through the summer and into the fall of 1896.[12]

A major problem became evident while these efforts slowly progressed. Much of the land required at Admiralty Head and Point Wilson had been effectively removed from the military reservations through faulty surveying and homestead claims filed prior to 1866. Absentee ownership and imperfect titles hindered acquisition of private holdings. "It seems to be a very rare thing here," complained Captain Taylor, "for anyone to have a clear title to land, and no matter how willing the owner may be to dispose of his property ... he is unable to transfer it without long delays." Taylor had to admit in his 1897 annual report that "the failure to attain these sites as early as desired has seriously delayed the progress of construction work."[13]

Complicating matters further, at Point Wilson much of the old military reserve lay within the bounds of Port Townsend and had been divided into town lots. Many of these lots had been purchased by speculators who demanded astronomical prices for their holdings. Fortunately, at least from Captain Taylor's perspective, economic conditions at Port Townsend had been depressed since the Panic of 1893. "The prevailing sentiment there now," reported Taylor in February 1897, "is that when work is begun ... the town will increase in prosperity to such an extent that the price of land will also advance." The two largest holders, sharing this belief, soon agreed to sell at an eighth of their original demand. The remaining owners acceded to the same terms and the required tract was in Federal possession by early 1898.[14]

The Seattle District encountered additional problems in getting work on the forts underway. The Alaska goldrush in the summer of 1897 drained away laborers just as the Corps began awarding bids for the work at Admiralty Head and Marrowstone Point. Engineer Ricksecker reported in August 1897 that "Klondike fever is having an ill-effect on my men ... I believe ... that in order to retain good men, it will be necessary to ... increase wages." One week later, the laborers struck for higher pay ($2.00 a day instead of $1.67) and fewer work hours (8 hours a day instead of 10). Since contractors refused to increase pay, labor strife continued to plague the construction effort over the life of the project.[15]

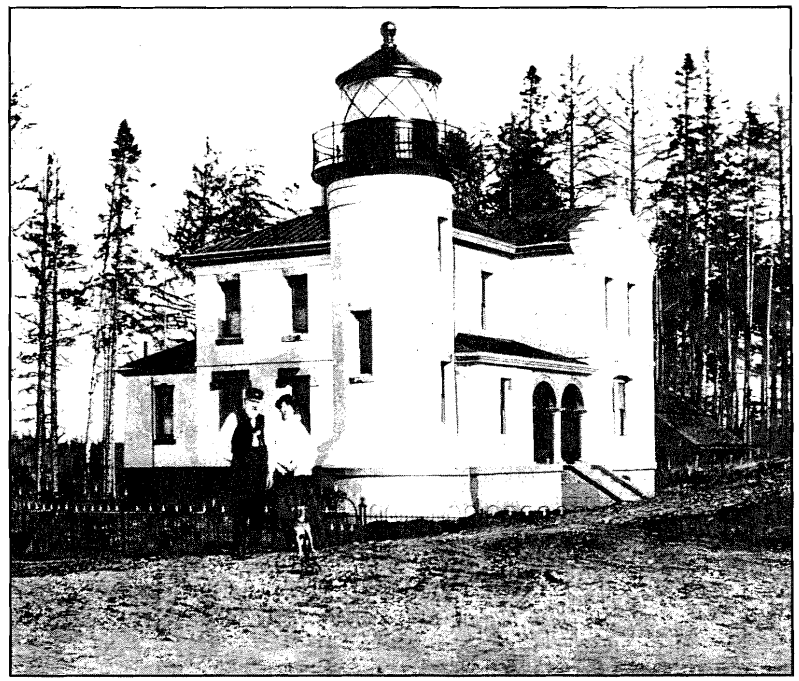
Meanwhile, security concerns caused fortification work to be managed differently than Army Engineer civilian projects. The problem of securing bids, for instance, proved difficult because detailed plans could not be examined by prospective contractors. The Army allowed firms awarded contracts to peruse blueprints only under the supervision of an officer of the Seattle District. Government regulation required all workers, at a time when a large portion of the region's labor force was foreign- born, to be American citizens. Among other difficulties, this forced Captain Taylor to abandon his normal practice of engaging Chinese cooks for men in the field. Finally, overseers had to maintain

constant vigilance to prevent "suspicious persons" from "entering or lurking about the fortifications during working hours."[16]

As the time for construction approached, engineers made modifications in the original plans. Considerable debate ensued over the issue of mounting guns on expensive disappearing carriages, devices that enabled concealment of ordinance during reloading. Otherwise, some feared, the weaponry risked exposure to counterfire from enemy warships. Captain Taylor's initial designs, moreover, placed magazines at the front of many of the batteries. "The safety of the magazines from the fire of our own guns," the Chief of Engineers reminded Taylor, "must not be overlooked." At the last minute, the Corps had to relocate the Admiralty Head lighthouse, since it stood in the line-of-fire of one of the batteries planned for that location.[17]

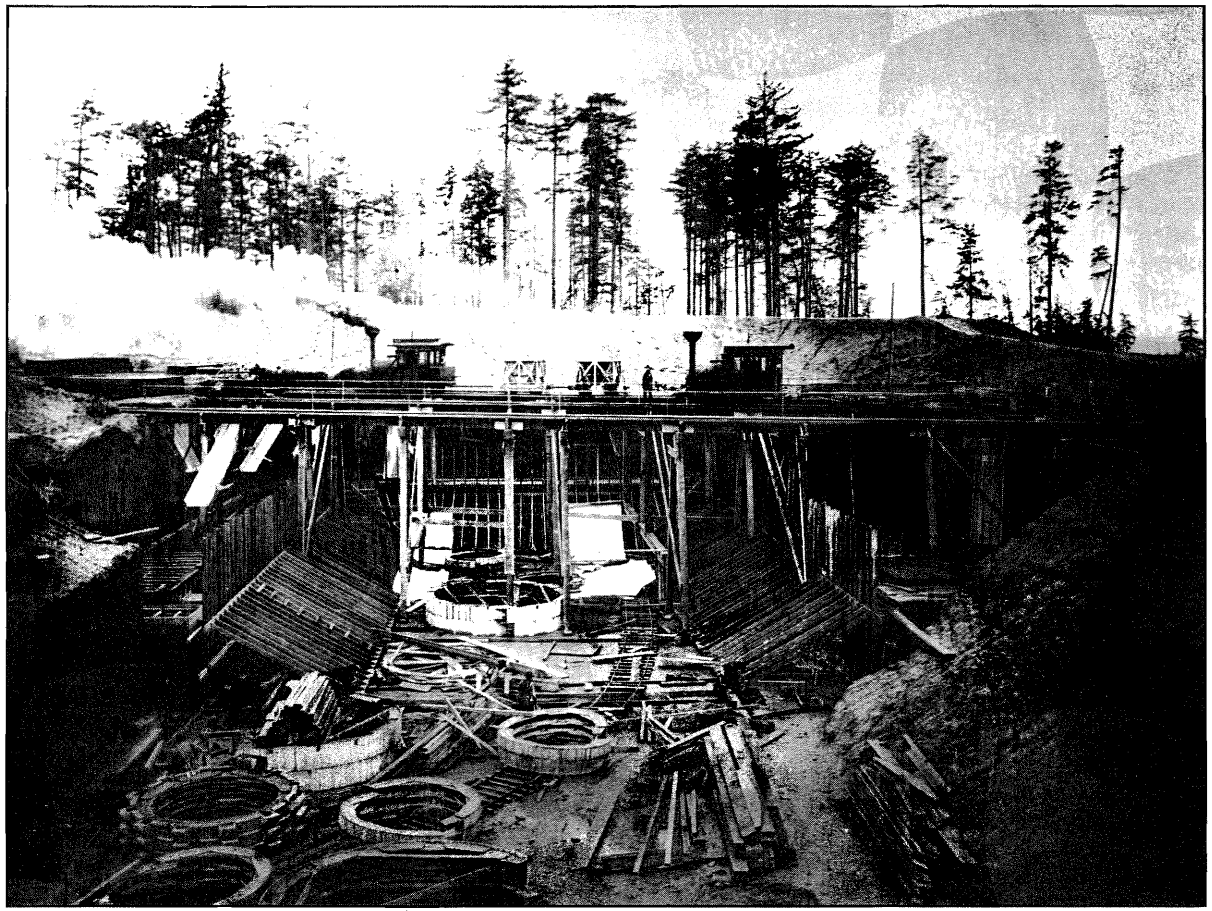
During the mounting political crisis with Spain over the Cuban insurrection, Congress abandoned its earlier cost-cutting approach and approved in March 1897 the expenditure of $2.5 million on defenses for Puget Sound. Additionally, winning bids came in at rates much lower than expected, enabling the planning of more batteries. Although War Department documents continued for security reasons to refer to the works as sites one, two, and three, the fortifications finally received official names: Fort Worden at Point Wilson, Fort Flagler at Marrowstone Point, and Fort Casey at Admiralty Head.[18]

Excavation work began in the spring of 1898. Contractors erected barracks and laid track for movement of gravel and other construction material from tidewater landings. Obtaining a sufficient supply of water for mixing concrete — to say nothing of drinking, washing, and cooking — required drilling numerous wells. At Fort Worden, the Corps built a fence around the project to guard against theft and sabotage from nearby Port Townsend. "The men work better," reported supervising engineer W.T. Preston of the result, "and discharged employees are not able to hang around and breed trouble among the men."[19]



Early photo of Admiralty Head Lighthouse, Fort Casey.

Although delayed by labor strife, bad weather, and inexperienced contractors, the Seattle District completed much of the emplacement work and mounted the first guns by early 1901. Although the Corps of Engineers remained on the scene to finish batteries and build support facilities, the forts were officially turned over to the Puget Sound Artillery District. Four batteries of 10-inch guns neared completion at Casey, while installation of 10- and 12-inch guns was in process at Flagler and Worden. Supporting mortars and rapid-firing guns had been placed at each fort. On the surface, this armament represented an imposing obstacle to any foreign power attempting to attack the Sound.[20]



Construction of 12-inch mortar battery, Fort Worden.

Deficiencies, however, soon became evident. A mixture of concrete "too lean in cement," for one thing, resulted in weak walls at several batteries. "Speaking for Fort Casey," reported a Seattle District inspector, "it is noticed that every successive practice with the guns has resulted in new leaks in the emplacements." Inadequate drainage compounded the problem. Batteries often flooded during heavy rainfall and ammunition was rendered unfit from dampness. Rails and working parts became corroded with rust. At Fort Worden, observed Colonel Tully McCrea of the Artillery Corps in June 1902, "some doors cannot be closed and in the majority of them the latch works very hard and requires the blow of a hammer to open them."[21]

For the 700 soldiers assigned to the fortifications, life was uncomfortable and dreary. The Corps did not complete barracks prior to the arrival of troops, forcing many men to spend the winter in tents. Authorities condemned water supplies at all three forts in late 1902 as unfit for human consumption. Personnel stationed at Flagler and Casey were beset by isolation. "There is no place to go," noted Colonel McCrea, "nothing to see, and no way to spend their time." The relatively high wages paid employees of area contractors represented an allurement to enlisted men. A third of the artillerymen, to the surprise of few experienced observers, either deserted or declined to reenlist during the final eight months of 1902. Although the official strength of the posts was deemed inadequate for operation of the guns, on average only three-fourths of this number were actually present for duty.[22]

Additional problems plagued the limited forces at the Puget Sound forts. Since no ammunition arrived during 1902, the soldiers could not carry out artillery practice that year. In the following year, a number of

the guns required extensive repairs. The forts had ordnance and sufficient projectiles in 1905, but practice was scheduled for the height of the annual salmon run. Fishing boats filled the waters of Admiralty Inlet, making firing impossible. Proper funding and competent management could eliminate such deficiencies. Other limitations, though, resisted easy correction.[23]

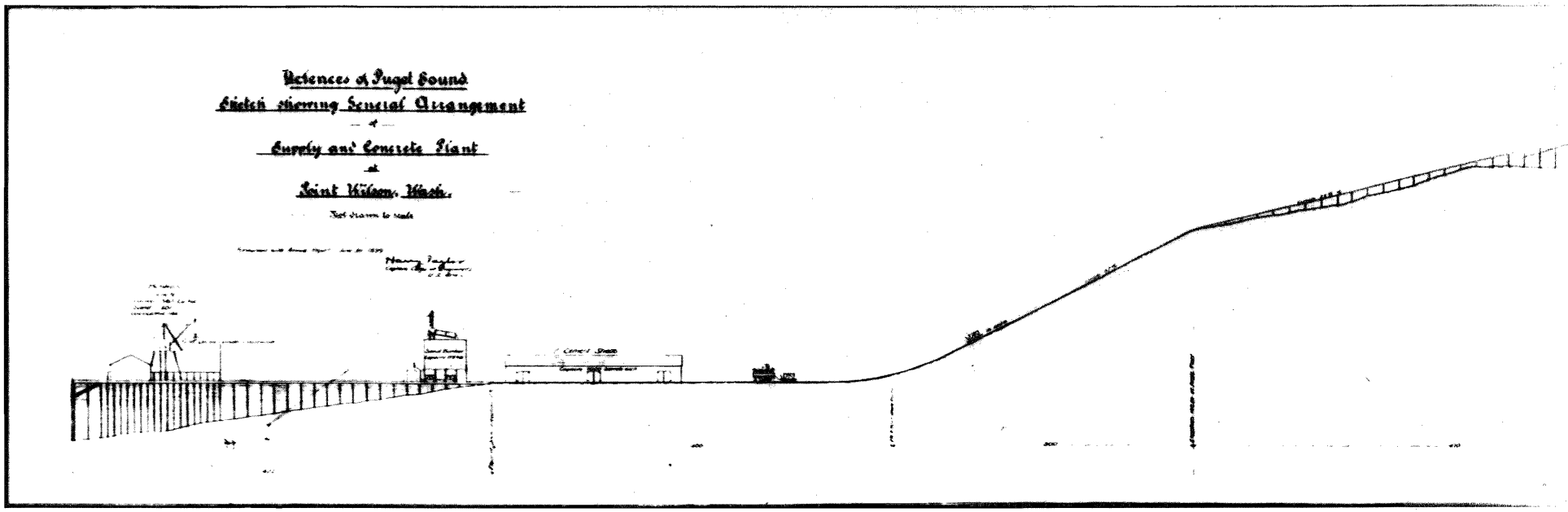
The depth and width of Admiralty Inlet combined with the limited range of artillery to reduce the actual value of the batteries. "In fact," reported Colonel George S. Grimes of the Artillery District, "the only effective fire that can be brought to bear upon an enemy's fleet is limited to the time required by the vessels to run by the forts." Hostile ships, moreover, could slip unnoticed through the inlet under cover of fog or darkness, a shortcoming amply demonstrated by the previously described 1903 exercise. Installation of searchlights and a submarine cable linking the three forts increased detection and coordination capabilities. In 1901, construction commenced on a battery at the entrance to Bremerton and on a system of mortars and mine fields to present a second line of defense if an enemy passed Admiralty Inlet. In the view of artillery officers, however, these developments provided only partial correctives.[24]

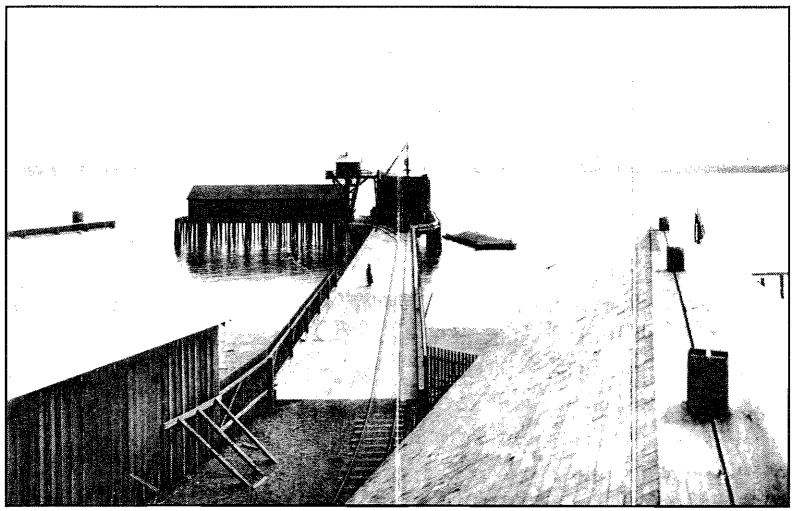
Artillerymen and Army Engineers alike agreed that an astute enemy commander could actually destroy the forts without risking his fleet. No plans had been developed for protection of the fortifications against attack from the rear. Landing parties placed ashore beyond the range of the guns could easily overrun the batteries. Ships could also anchor in Discovery Bay to the west of Port Townsend and reduce Fort Worden by bombardment. "It is doubtful," wrote Hiram Chittenden of this weakness, "if there is another situation in the world where a great fortification, ...has close in rear of it, but just outside of range of the batteries, an extensive harbor, perfectly sheltered and large enough to float all the navies of the world." As for the interior defensive line, many observers pointed out that the enemy could steam up Hood Canal and assault the Bremerton naval station by land. Despite these frequently-voiced concerns, shortages of men and money prevented action to improve the plan of defense.[25]

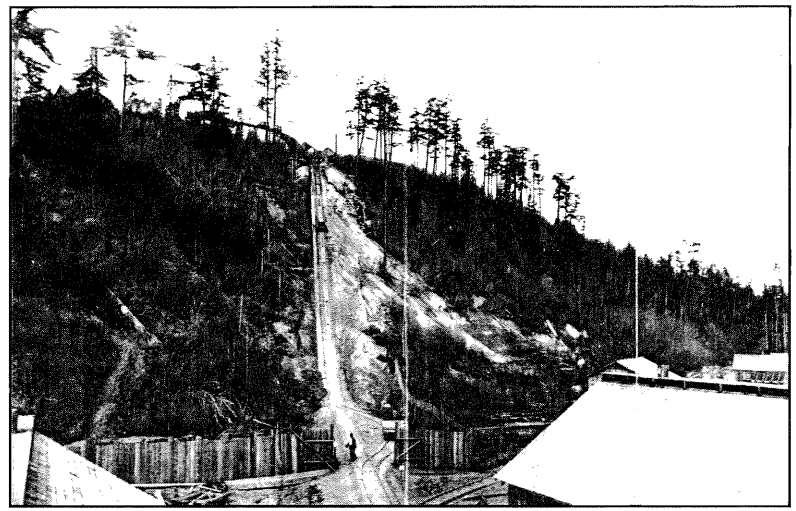
In the gravest defect of all, a hostile force might avoid Admiralty Inlet by sailing to the east of Whidbey Island and emerging on central Puget Sound above the fortifications. Early studies of the defense question rejected the possibility that warships could negotiate the narrow Deception Pass at the north end of Whidbey. "The tide runs through like a mill-race," reported Major R.S. Williamson of the Corps of Engineers in June 1866, "and though the water is deep, the current would dash a vessel from one side to the other in the narrow pass but 200 yards wide." Mendell's engineering board of 1895 advised, after a visit to the scene, that "the rush of water was that of a mountain torrent rather than of a tidal flow."[26]

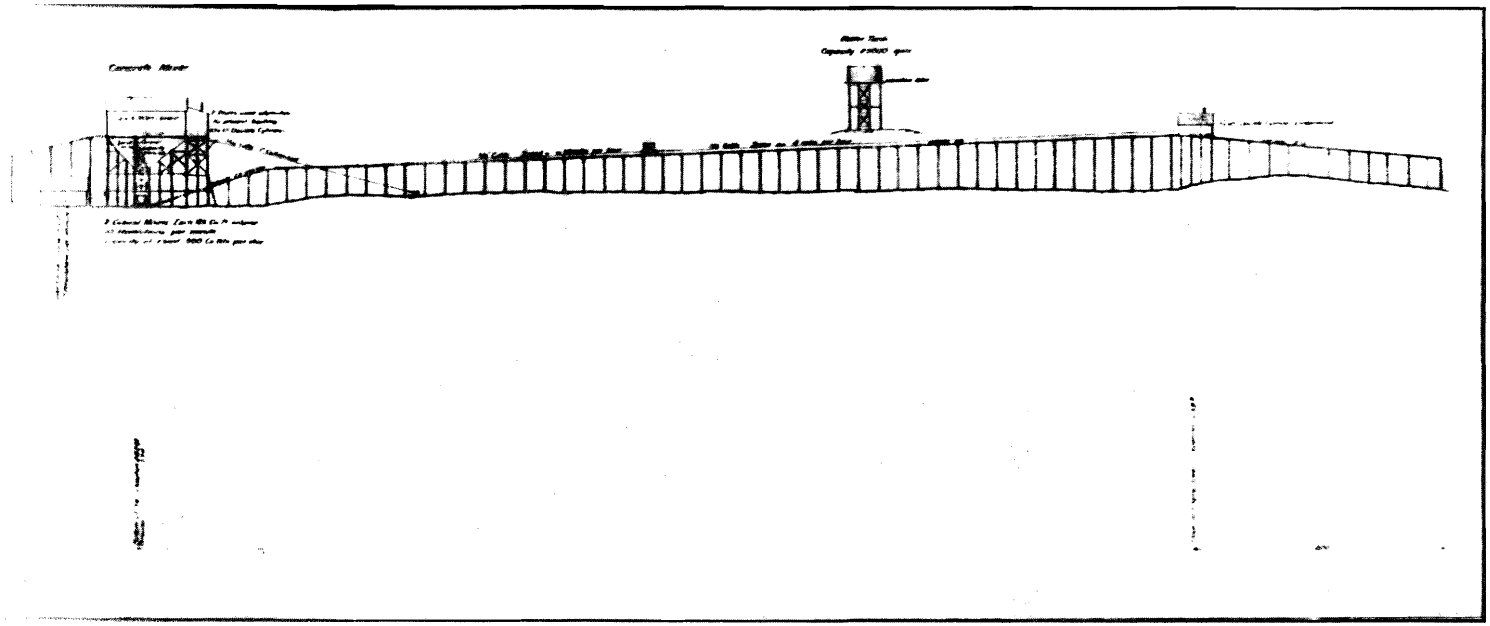
Following construction of the Admiralty Inlet forts, however, Army officers on the scene pointed with concern to what one termed "this hole in our armor." At the proper stage of tide, critics argued, the enemy commander could send all but his largest vessels around Whidbey Island. "There is nothing to prevent his entrance into the Sound via Deception Pass at any slack-water period," noted Colonel W.H. Heuer in June 1902. "This would defeat the object for which the defensive works at Admiralty Inlet were constructed." Of all the weaknesses of the existing system of defense, Deception Pass produced the most concern among informed observers.[27]

In 1904, Major John Millis of the Seattle District recommended placement of batteries at the pass. Pending construction, he also suggested that a cable with attached explosives be used to block the channel. General George Gillespie, the Chief of Engineers, rejected the Millis plan based on his belief that a hostile force would not expose itself to the treacherous tides. According to one of the general's worried aides, this decision placed the reputation of the Corps of Engineers at risk in the event of war. "I am quite strongly convinced," wrote this officer in an unsigned memorandum, "that there is danger of being accused of grave lack of judgement in leaving open this possible line of entrance to the rear of our main ... line of defense."[28]


Defences of Puget Sound
Timber steering General Arrangement
of
Supply and Concrete Plant
at
Point Wilson, Wash.



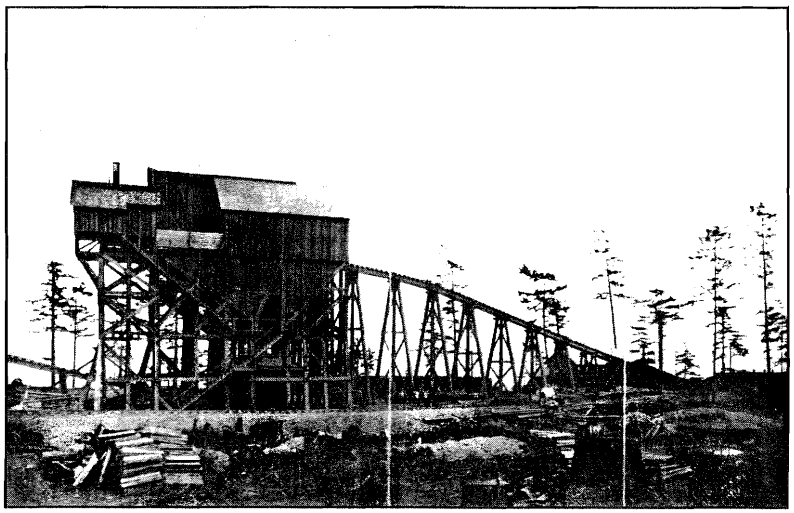


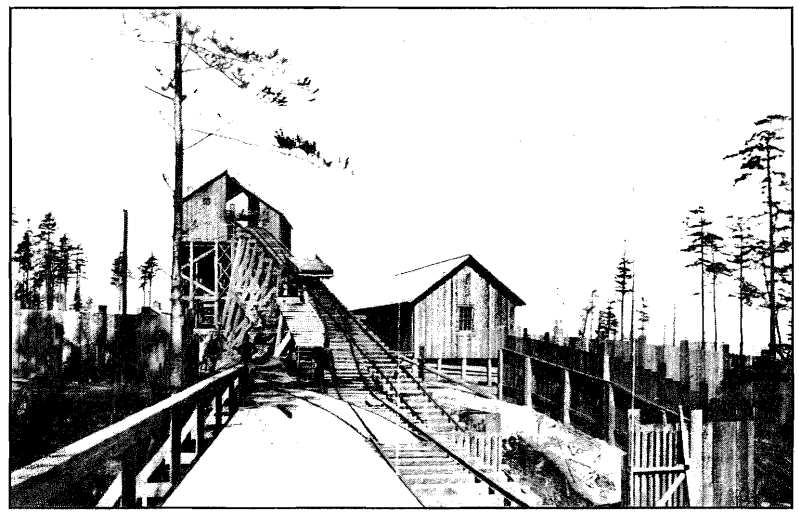


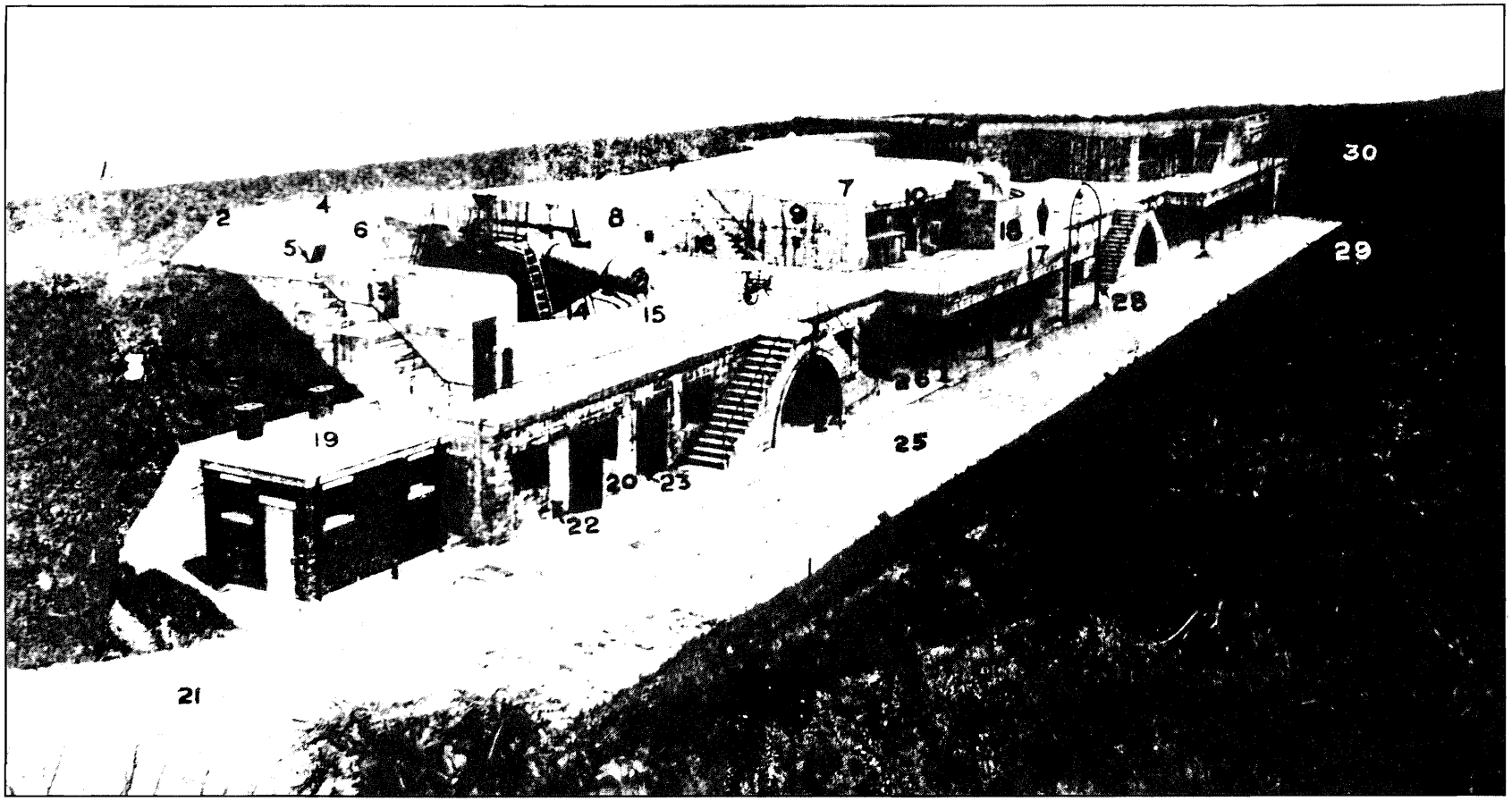
Pages from the Annual Report of the War Department, Chief of Engineers, 1899, for gun emplacements at Point Wilson.

Top: Defenses of Puget Sound, sketch showing general arrangement of supply and concrete plant at Point Wilson, Washington.

Bottom, left to right: Wharf at Point Wilson; tramway; two views of concrete mixer building.







A seacoast gun battery, Fort Worden.

1. Exterior Slope of Parapet.
2. Superior Slope of Parapet.
3. Interior Slope of Parapet.
4. Blast Slope or Apron.
5. Magazine Ventilator.
6. Interior Crest.
7. Traverse.
8. Interior Wall.
9. Traverse Wall.
10. Canopy.
11. Reserve Table.
12. Delivery Table.
13. Observing Station (Crow's Nest).
14. Gun Platform.
15. Loading Platform.
16. Platform Stairs.
17. Corridor.
18. Corridor Wall.
19. Latrine.
20. Parade Wall.
21. Approach.
22. To Oil and Tool Room.
23. To Shell Room.
24. To Magazine.
25. Battery Parade.
26. Office.
27. Gallery.
28. Crane.
29. Interior Slope of Parados.
30. Traverse Slope of Parados.

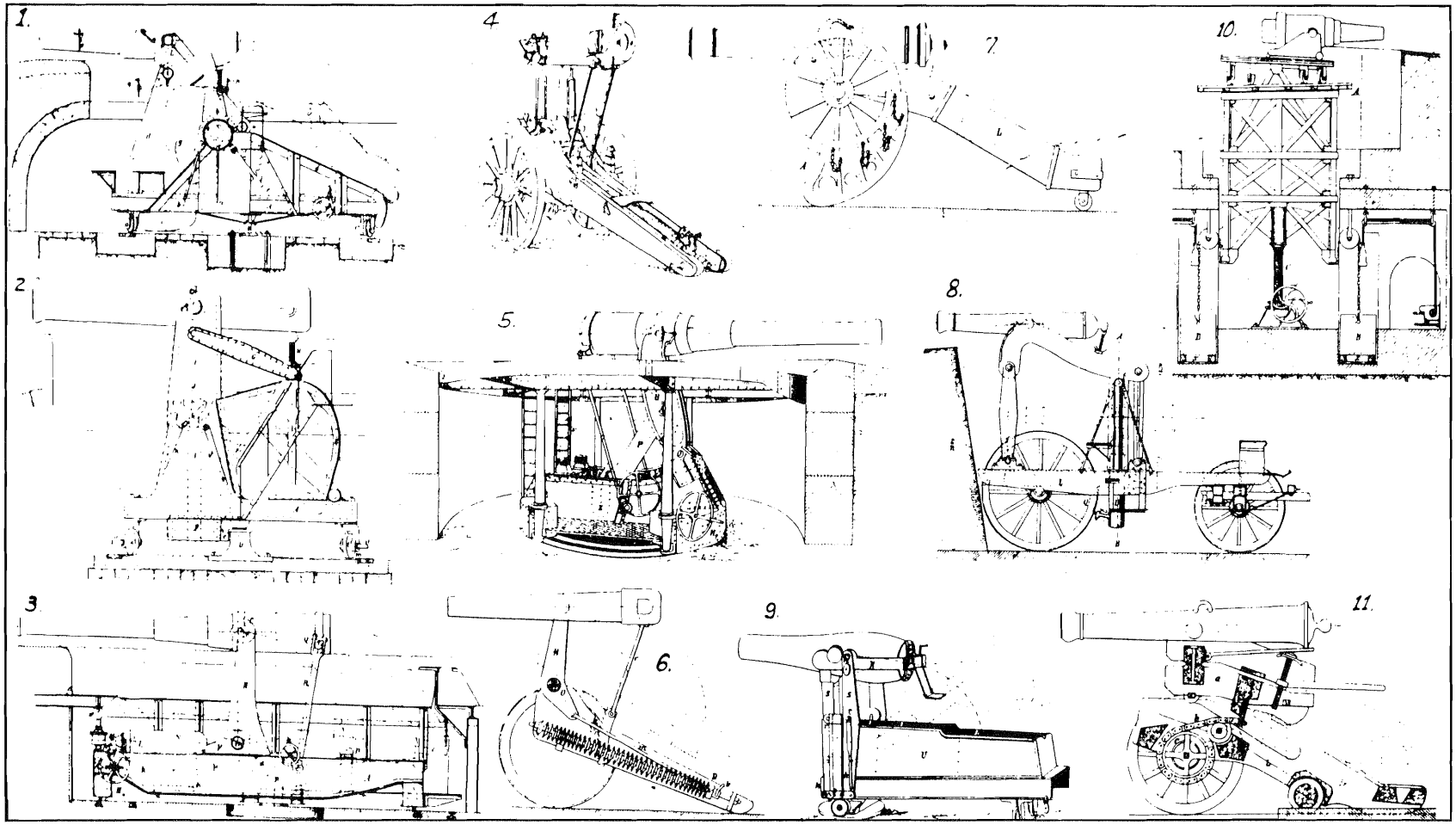


Plate of early seacoast and disappearing carriages, Fort Casey.

Engineer's dock, Fort Flagler.

Constant attention to the weaknesses of the defensive system made the Corps of Engineers a target of criticism within the War Department. General Gillespie grew angry when the department's own annual report for 1902 detailed the shortcomings of the fortifications. "It is really a reflection on Congress," complained the general, for that body had failed to supply sufficient funding for an effective construction program. Gillespie, moreover, expressed pride that his agency had devoted all moneys to essential matters. The Army Engineers, he informed departmental critics, "have not frittered away their funds on *conveniences*, such as electric lights, power attachments to move the guns and hoist the powder, thus lessening the *labor* of the troops at the expense of the number of guns now ready for service." Besides, contended Gillespie, appropriations for coastal defenses should be allocated to areas actually exposed to real danger of foreign attack.[29]

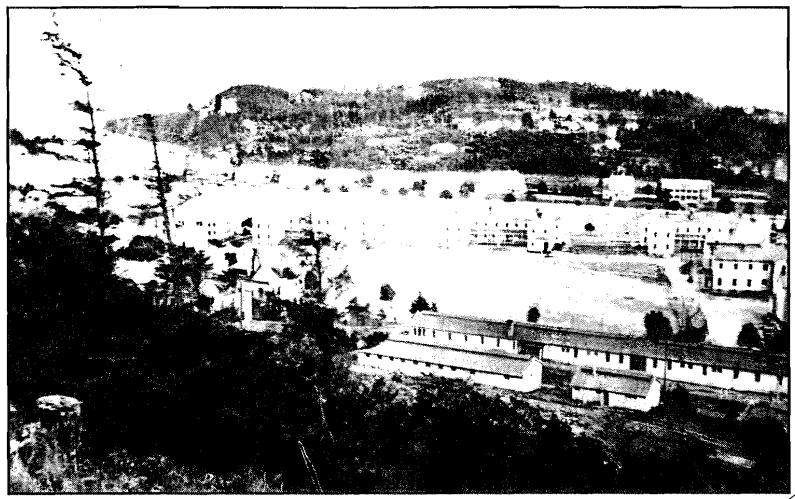
Here the Chief of Engineers came close to addressing an issue seldom raised: whether or not extensive fortifications were required at Puget Sound. In retrospect, scant likelihood of war with Great Britain existed, even though such affairs as the Venezuelan boundary controversy of the mid-1890s occasionally disturbed relations. Although the British had expanded the base at Esquimalt in the previous decade, visitors of the time suggested that the absence of defenses there and at Victoria indicated peaceful intentions. The mere existence of Seattle, Tacoma, and the Bremerton naval station, rather than any rational calculation of exposure to danger, seemed the only justification for building the forts at Admiralty Inlet.[30]

Certainly, a foreign power would not have abandoned hostile designs because of the obstacles at the inlet. The Army's own reports revealed the ease in which those fortifications could be reduced or bypassed. Improvements made during the First World War only partially rectified the defects. The Corps installed sixteen-inch guns in several of the

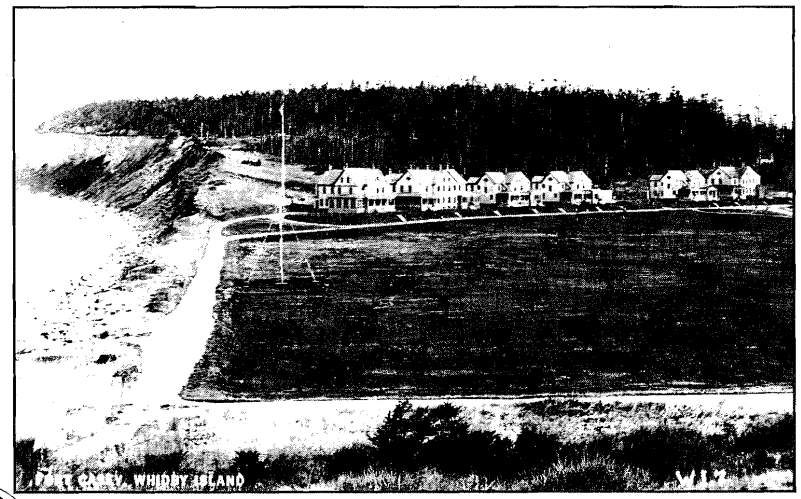
batteries, thereby exposing attacking ships to greater danger. The military also placed a small battery near the entrance to Swinomish Slough to block Deception Pass. At war's end, each of the forts added anti-aircraft guns, despite the lack of conceivable launching places for enemy planes.[31]

The War Department placed the fortifications on inactive status in the early 1920s and thereafter garrisoned them only with skeleton detachments. The Seattle District's evaluation of their military significance on the eve of World War II became clear in its September 1940 recommendation that bomb-proofing was a needless expense. During World War II, they became training sites for the Army and the National Guard. Following the war, the Corps of Engineers served as a caretaker administrator for the forts. Subsequent deactivation of Worden, Flagler, and Casey brought to an end the mission of defending Puget Sound.[32]

Casual observers of the Corps of Engineers in the Pacific Northwest may not recognize that the agency is a part of the Nation's defense establishment. The projects of the Army Engineers in the region — from the early river and harbor improvements to the great dam constructions of the twentieth century — have been focused on civilian economic development. Examination of the Puget Sound fortifications, therefore, serves as a useful reminder that the Corps is not restricted to non-military endeavors. Still, the isolation of Puget Sound, especially in relation to likely foreign enemies, meant that the historical importance of the Seattle District depended upon domestic projects rather than upon defense against the external foe.



Early view of Fort Worden.



Officers' Row, Fort Casey.

Epilogue

The Corps of Engineers has carried out civil works projects in the territory of the Seattle District for 100 years. The Portland Engineer Office initiated engineering efforts on the waters tributary to the Puget Sound in the early 1880s. Work on the great navigation projects — the Lake Washington Canal and the Grays Harbor jetties — started not long after Washington achieved statehood in 1889. Between 1896, when the Chief of Engineers established the Seattle District, and 1920 the new engineer office laid a solid foundation for its future work. While the Seattle District built the impressive turn-of-the-century fortifications at the entrance of Puget Sound, the District undertakings were chiefly civilian in nature.

The Seattle District assumed responsibility for civil works improvements in Washington at the tail end of the Corps single-purpose project era. In the post-1920 period, the Corps increasingly shifted its focus to multiple-purpose undertakings. The new emphasis involved Seattle's contribution, in the late 1920s, the "308 Report" on the Columbia River and the subsequent construction of Chief Joseph, Albeni Falls, and Libby dams.

The history of the Seattle District serves as a good example of the Army's role in the civilian life of the United States. Down to the First World War, that role focused on supplying a navigational infrastructure as incentive to regional economic growth. Nature had blessed Western Washington with the unsurpassed estuary of Puget Sound, numerous rivers, and valuable Pacific anchorages at Grays Harbor and Willapa Bay. To a considerable extent, however, nature had also barred these waterways to efficient commercial usage by massive deposits of sand, gravel, and debris.

opposite: Artist's rendering of Mount Rainier over Puget Sound, from Pacific Railroad Survey, Asahel Curtis collection.

As its major early work, the Seattle District opened the most important watercourses to the shipping of the world. Drawing on engineering experience gained at Corps projects of a similar nature (especially in the Portland District) and employing trial-and-error when all else failed, Seattle Engineer Officers improved the navigability of key rivers and harbors. Vessels previously able to come and go only at the mercy of tide and weather could, by the 1920s, haul with relative ease lumber from Grays Harbor and grain from Tacoma's Commencement Bay. Because justifiable funding often fell below the level necessary for complete removal of obstacles, many of the navigation improvements were imperfect. Nevertheless, they made a signal contribution to the expansion of trade, helping to solidify commercial connections between the Pacific Northwest and the ports, foreign and domestic, of the Pacific Rim.

The early, single-purpose navigation projects involving snagging, rock removal, dredging, and building jetties and canals proved a valuable engineering training ground. The basic engineering and political skills required for authorizing, planning, and constructing such works were adaptable to future multiple-purpose projects combining hydropower, navigation, and flood control components. What did change was the economic justification and technological complexity of Corps' projects. Instead of justifying work based on its potential to reduce freight rates and stimulate commerce, such rationale now had to show that future amortized benefits exceeded costs over a defined period of time. Still, as General Louis H. Foote, North Pacific Division Engineer, stated in 1956 "every flood-control, waterway, harbor, or multi-purpose project is in a sense a prophecy, for it must be built to serve not just in the times and conditions in which it is begun, but in the times and conditions that will prevail when it is finished, and perhaps far into the future."[1]

Over a century has passed since a few workers under Army Engineers' direction struggled aboard a makeshift snagging raft on the

debris-choked Skagit River of Puget Sound. From this colorful but humble beginning, the Corps of Engineers developed the technological capability to overcome an array of natural obstacles to convenient and safe navigation in the waters of Washington. Corps executives of today might be concerned over the future of the Seattle District, dependent as it currently is on uncertain National, political, and bureaucratic policy. In recent years, moreover, the Corps of Engineers has been much-criticized as it struggled to adapt traditional developmental emphases to contemporary environmental concerns. Amidst uncertainty and controversy, however, the Seattle District could look back upon decades of accomplishment in the improvement of rivers and harbors to better serve the needs of the people of the Pacific Northwest.

Appendix A

DISTRICT ENGINEERS ASSIGNED TO THE SEATTLE DISTRICT 1896-1920

NAME	RANK	TOUR OF DUTY	
		FROM	TO
Harry Taylor	Captain	1 May 1896 15 Dec 1898	14 Nov 1898 30 Nov 1900
M. L. Walker	Lieutenant	15 Nov 1898	14 Dec 1898
John Millis	Major/Lieutenant Colonel	1 Dec 1900	31 Aug 1905
F. A. Pope	1st Lieutenant	1 Sep 1905	12 Apr 1906
H.M. Chittenden	Major	13 Apr 1906	15 Sep 1908
C.W. Kutz	Major	6 Sep 1908	31 Jul 1911
J. B. Cavanaugh	Major/Lieutenant Colonel	1 Aug 1911	10 May 1917
E. J. Dent	Major	11 May 1917	7 Sep 1917
A. H. Acher	Major	8 Sep 1917	13 Dec 1917
Geo. A. Zinn	Colonel	14 Dec 1917	14 Jan 1918
W. T. Preston	Civilian	15 Jan 1918	24 Jan 1919
C. L. Sturdevant	Colonel	14 Jan 1919 21 Aug 1931	8 Sep 1919 7 Feb 1935

Appendix B

WASHINGTON GROWTH
1870 - 1920

	1870	1880	1890	1900	1910	1920
NUMBER						
Washington	23,955	75,116	357,232	518,103	1,141,990	1,356,621
Seattle	3,553	42,837	80,871	237,174	315,372	
Spokane	350	19,922	36,848	104,402	140,437	
Tacoma	1,098	36,006	37,714	83,743	96,965	
Walla Walla	3,588	4,709	10,049	19,364	15,503	
PER CENT						
Washington		213.6	375.6	45.0	120.4	18.8
Seattle		1,105.7	88.8	193.3	33.0	
Spokane		5,592.0	85.0	183.3	0.0	
Tacoma		3,179.2	4.7	122.0	15.8	
Walla Walla		31.2	113.4	92.7	-19.9	

Abbreviations

AAG:Assistant Adjutant General

AG:Adjutant General

AGO:Adjutant General's Office Records, 1822-1860, microfilm, National Archives and Records Administration

AM:*Atlantic Monthly*

ARCE:*Annual Report of the Chief of Engineers*

ARDC:*Annual Report, Department of the Columbia*

BL:Bancroft Library, University of California, Berkeley

CA:Chief of Artillery

CAD:U.S. Army Coast Artillery District Records, Letters Sent, RG 392, National Archives and Records Administration

CBIAC:Columbia Basin Inter-Agency Committee Records, University of Washington Library

CCR:Construction Completion Reports, U.S. Army Corps of Engineers, RG 77, Washington National Records Center

CE:Chief of Engineers

DE:District Engineer

D107-36:Department of the Interior Records, Office of the Secretary, 1907-1936, RG 48, National Archives and Records Administration

DivE:Division Engineer

DO:Department of Oregon Records, Letters Sent, RG 393, National Archives and Records Administration

HNMM:*Harper's New Monthly Magazine*

NA:National Archives and Records Administration

NM:*Northwest Magazine*

NPD:North Pacific Division Records, U.S. Army Corps of Engineers, RG 77, Federal Records Center, Seattle

OCE:Office of Chief of Engineers Records, 1894-1923, RG 77, National Archives and Records Administration

OSN:Oregon Steam Navigation Company Records, Oregon Historical Society

PCOMR:Pacific Coast Office of Military Roads Records, RG 77, National Archives and Records Administration

PD:Portland District Records, U.S. Army Corps of Engineers, RG 77, Federal Records Center, Seattle

PHR:*Pacific Historical Review*

P-I:*Seattle Post-Intelligencer*

PNQ:*Pacific Northwest Quarterly*

PNRBC:Pacific Northwest River Basins Commission Records, University of Washington Library

RH:Rivers and Harbors Files, Records of the Office of the Chief of Engineers, 1923-1942, RG 77, Washington National Records Center

SD:Seattle District Records, U.S. Army Corps of Engineers, RG 77, Federal Records Center, Seattle

SDRHA:Seattle District Records Holding Area

SW:Secretary of War

TE:Topographical Engineers Records, Letters Sent, RG 77, National Archives and Records Administration

TS:*The State*

UW:University of Washington Library

WHQ:*Washington Historical Quarterly*

WS:*West Shore*

WSU:Washington State University Library

Note about the Author

William F. Willingham serves as Historian of the North Pacific Division of the Army Corps of Engineers. He graduated from Willamette University (1966) and earned his Ph.D. in history at Northwestern University (1972). He has taught at a number of colleges and universities, the most recent being Lewis and Clark College in Portland, Oregon. His previous writings include *Eliphalet Dyer, Connecticut Revolutionary* (1977), *Army engineers and the Development of Oregon* (1983), *Enlightenment Science in the Pacific Northwest: The Lewis and Clark Expedition* (ed., 1984), *Water Power in the "Wilderness": The History of Bonneville Lock and Dam* (1987), and numerous scholarly articles and reviews.

End Notes

PREFACE

1. Hugo Winkenwerder, "The Forests of Washington," *Journal of Geography*, 14(May 1916):332; *Tenth Census of the United States*, Vol. IX, *Report on the Forests of North America* (Washington, D.C.: Government Printing Office, 1884), p. 573.

2. Charles F. Powell to CE, 27 Jan. 1882, Box 4, PD; Thomas W. Symons to Thomas L. Casey, 3 Oct. 1890 and 20 March 1895, in *ARCE. 1891*, pp. 3297-3298 and *ARCE, 1895*, pp. 3517-3519; Wallace J. Miller, *South-western Washington* (Olympia: Pacific Publishing Company, 1890), pp. 145-146; Harry Taylor to John L. Wilson, 20 Aug. 1897, in *ARCE, 1898*, pp. 3089-3090.

3. *Graphic*, 5(3 Oct. 1891):12. Also see Samuel Bowles, *Across the Continent: A Summer's Journey to ... the Pacific States, with Speaker Colfax* (Springfield, Mass.: Samuel Bowles & Company, 1865), pp. 204-205; H.H. [Helen Hunt Jackson], "Puget Sound," *AM*, 51(Feb. 1883):221.

4. *ARCE, 1891*, pp. 3240-3241; Jno. S. Butler to CE, 8 Feb. 1928, Box 198, SD; Eldridge Morse Notebooks, 20:3-4, BL.

5. See Randall V. Mills, *Stern-Wheelers Up Columbia: A Century of Steamboating in the Oregon Country* (Palo Alto, Cal.: Pacific Books, 1947), pp. 39-40, 80; M.J. Lorraine, *The Columbia Unveiled* (Los Angeles: The Times-Mirror Press, 1924), pp. 440-441.

6. M.J. Lorraine, *The Columbia Unveiled*, pp. 242, 301; Thomas W. Symons, "Report of an Examination of the Upper Columbia River," Senate Ex. Doc. No. 186, 47th Cong., 1st sess., pp. 22-23, 47-48; J.B. Cavanaugh to CE, 14 May 1914, Box 159, SD; Symons to Casey, 15 March 1893, in *ARCE, 1893*, p. 3386. The Indian fishing figure is taken from T.C. Elliott, ed., "The Journal of John Work; July 5-September 15, 1826, "*WHQ*, 6(Jan. 1915):37.

7. A.S. Mercer, *Washington Territory* (Utica, N.Y.: L.C. Childs, 1865), p. 8.

CHAPTER 1

1. Charles Gates and Dorothy Johansen, *Empire of the Columbia: A History of the Pacific Northwest* (New York: Harper and Brothers, 1957), pp. 43-47; Gordon Dodds, *The American Northwest* (Arlington Heights, Ill.: Forum Press, 1986), pp. 25-28.

2. Charles Gates and Dorthy Johansen, *Empire of the Columbia*, pp. 52-57; Frederic W. Howay, ed. *Voyages of the "Columbia" to the Northwest Coast, 1787-1790 and 1790-1793* (Boston: Massachusetts Historical Society, 1941).

3. Two recent studies of the Lewis and Clark expedition are David Lavender, *The Way to the Western Sea: Lewis and Clark Across the Continent* (New York: Harper and Row, 1988), and William Willingham and Leonoor Ingraham, eds., *Enlightenment Science in the Pacific Northwest: The Lewis and Clark Expedition* (Portland, Ore.: Lewis and Clark College, 1984).

4. William H. Goetzmann, *Exploration and Empire: The Explorer and the Scientist in the Winning of the American West* (New York: Vintage, 1966), pp. 3-263; summaries of this activity can be found in Gates and Johansen, *Empire of the Columbia*, pp. 136-148, 199-200 and Dodds, *The American Northwest*, pp. 35-38, 45-46.

5. Dodds, *The American Northwest*, pp. 39-42; Carlos A. Schwantes, *The Pacific Northwest: An Interpretive History* (Lincoln, Neb.: University of Nebraska Press, 1989), pp. 95-97.

6. Dodds, *The American Northwest*, pp. 42-44, 46-47, 90-92, and 94; Schwantes, *The Pacific Northwest*, pp. 95-104.

7. Robert E. Ficken and Charles P. LeWarne, *Washington: A Centennial History* (Seattle, Wash.: University of Washington Press, 1988), pp. 18-25.

8. Ibid., p. 26.

9. Ibid., pp.

10. Robert Ruby and John Brown, *Indians of the Pacific Northwest: A History* (Norman, Ok.: University of Oklahoma Press, 1981), p. 131.

11. Ficken and LeWarne, *Washington*, pp. 26-27; Ruby and Brown, *Indians of the Pacific Northwest*, p. 131.

12. Ruby and Brown, *Indians of the Pacific Northwest*, p. 131.

13. Ibid., pp. 132-134.

14. Ibid., pp. 135-136.

15. Ibid., pp. 136-138.

16. Ibid., pp. 138-144; Robert Utley, *Frontiersmen in Blue: The United States Army and the Indian, 1848-1865* (Lincoln, Neb.: University of Nebraska Press, 1967), pp. 179-181.

17. Ruby and Brown, *Indians of the Pacific Northwest*, pp. 145-152; Thomas J. Cram, "Topographical Memoir of the Department of the Pacific," House Ex. Doc. No. 114, 35th Cong., 2nd sess., pp. 89-110; Utley, *Frontiersmen in Blue*, pp. 187-192.

18. Ruby and Brown, *Indians of the Pacific Northwest*, pp. 152-164; Cram, "Topographical Memoir," pp. 107-118, 124-126; Utley, *Frontiersmen in Blue*, pp. 192-210.

19. W. Turrentine Jackson, *Wagon Roads West: A Study of Federal Road Surveys and Construction in the Trans-Mississippi West, 1846-1869* (Berkely: University of California Press, 1952), p. 89; see also Oscar Osburn Winther, "Inland Transportation and Communication in Washington, 1844-1859," *PNQ*, 30(Oct. 1939):371-374, and "The Place of Transportation in the Early History of the Pacific Northwest," *PNR*, 11 (Dec. 1942):383-384. After adjustments made upon the extension of statehood to Oregon in 1859, the territory encompassed the modern states of Washington and Idaho, plus those portions of Montana and Wyoming west of the Continental Divide.

20. Isaac I. Stevens to George B. McClellan, 26 April 1853, Box 5, Isaac I. Stevens Papers, UW. For details on Stevens's controversial career, see Kent D. Richards, *Isaac I. Stevens: Young Man in a Hurry* (Provo, Ut.: Brigham Young University Press, 1979). Goetzmann, *Exploration and Empire*, pp. 284-285.

21. Stevens to McClellan, 26 April 1853, Box 5, Stevens Papers; Jefferson Davis to McClellan, 9 May 1853, George B. McClellan Corr., UW; Philip H. Overmeyer, "George B. McClellan and the Pacific Northwest," *PNQ*, 32(Jan. 1941):7-14; Jackson, *Wagon Roads West*, pp. 89-90.

22. Between 80 and 100 emigrant wagons crossed to the Sound via Naches Pass in the fall of 1853, accomplishing one of the important purposes set forth by Governor Stevens. Isacc Ebey to W.S. Ebey, 28 Sept. 1853, Box 1, Winfield S. Ebey Papers, UW; Overmeyer, "McClellan and the Pacific Northwest," pp. 20-44; Jackson, *Wagon Roads West*, pp. 91-96.

23. *Reports of Explorations and Surveys ... for a Railroad from the Mississippi River to the Pacific Ocean* (Washington, D.C.: Thomas H. Ford, 1860),12:252-253, 255-257; D.W. Meing, *The Great Columbia Plain: A Historical Geography, 1805-1910* (Seattle: University of Washington, 1968), pp. 193-198.

24. See William H. Goetzmann, *Army Exploration in the American West, 1803-1863* (New Haven, Conn.: Yale University Press, 1959), pp. 281-283; Frank N. Schubert, *Vanguard of Expansion: Army Engineers in the Trans-Mississippi West, 1819-1879* (Washington, D.C.: Government Printing Office, 1980), pp. 97-99, 109-110.

25. See Robert W. Frazer, ed., *Mansfield on the Condition of the Western Forts, 1853-1854* (Norman: University of Oklahoma Press, 1863), p. 179; Jackson, *Wagon Roads*, pp. 71-75.

26. Davis to Harman Bache, 14 May 1855, Box 1, Letters Recd., PCOMR. Derby did not commence Washington Territory roads until 1856 due to his initial concentration on matters south of the Columbia. See Jackson, *Wagon Roads West*, pp. 75-79, for the lieutenant's work in Oregon; Davis to Bache, 14 May 1855; George H. Derby, Report on the proposed Military Road from the Dalles ... to Columbia Barracks, recd. 18 April 1856, Box 1, Letters Recd., PCOMR. Chapter six of Jackson's definitive *Wagon Roads West* provides complete details on Washington Territory roadbuilding.

27. Derby Report, recd. 18 April 1856, Box 1, Letters Recd., PCOMR; Bache to J.J. Abert, 18 and 29 Dec. 1855, Letters Sent, PCOMR.

28. Derby to Bache, 4 April, 19 and 31 May, 12 July, and 1 Aug. 1856, all Box 1, Letters Recd., PCOMR.

29. Derby to Bache, 1 Oct. and 1 and 18 Nov. 1855, ibid.

30. Derby estimated that a complete road, with attendant bridges and ferries, would require nine times the amount of money available in 1855. Derby, Report on proposed Military Road from Columbia Barracks to Fort Steilacoom, n.d.; Derby to Bache, 5 Dec. 1855, ibid.; Bache to Abert, 4 March 1856, Letters Sent, PCOMR.

31. Bache to Derby, 6 May 1856, Letters Sent, PCOMR; Bache to Derby, 1 Aug. 1856, ibid.; Derby to Bache, 31 May, 23 July, and 1 Aug. 1856; George Gibbs to Derby, ? July 1856; G.H. Mendell to Bache, 26 Oct. 1856, all Box 1, Letters Recd., PCOMR.

32. Mendell to Bache, 1 Sept. 1857; to George Thom, 16 Sept. 1858, Box 2, Letters Recd., PCOMR; Mendell to Bache, 8 June and 20 Aug. 1857; Bache to

Mendell, 25 Aug. 1857 and 14 July 1858; Bache to Abert, 25 Aug. 1859, all Letters Sent, PCOMR.

33. Mendell to Bache, 1 Sept. 1857; W.W. deLacy, Report on Steilacoom to Bellingham Bay route, n.d., Boxes 1 and 2, Letters Recd., PCOMR; Mendell to Bache, 24 May 1857, letters Sent, PCOMR.

34. Mendell to Bache, 16 Jan. 1858; deLacy Report, n.d., Box 1, Letters Recd., PCOMR; Bache to Abert, 18 Jan. 1858, Letters Sent, PCOMR.

35. Under standard procedure of the time, the contractors were paid for work done up to the time of abrogation. Bache to Abert, 16 March and 24 April 1858; Bache to Mendell, 6 May 1858, Letters Sent, PCOMR; Mendell to Bache, 20 April 1858, Box 1, Letters Recd., PCOMR; Thom to Abert, 1 April 1859; Thom to George W. Sloan, 13 Aug. 1859, Letters Sent, PCOMR.

36. Recommended projects included a wagon road across Snoqualmie Pass east of Seattle, with branches to Walla Walla and Colville, and a road linking the Sound with Grays Harbor and Shoalwater Bay. Thom to Abert, 6 Oct. 1859; Mendell to Stevens, 15 Jan. 1858; Mendell to Bache, 2 April 1858, all ibid.; Road from Seattle via Snoqualmoo [sic], n.d., Box 5, Stevens Papers; See Jackson, *Wagon Roads West*, pp. 105-106.

37. Jackson, *Wagon Roads West*, pp. 257-261.

38. Ibid., pp. 261-266.

39. Ibid., pp. 268-278.

40. H.D. Wallen to John E. Wool, 10 Feb. 1857, John E. Wool Papers, microfilm, New York State Library; Bowles, *Across the Continent*, p. 199.

CHAPTER 2

1. A number of excellent studies cover the pre-Civil War work of Army Engineers. See Forest G. Hill, *Roads, Rails & Waterways: The Army Engineers and Early Transportation* (Norman: University of Oklahoma Press, 1957); Jackson, *Wagon Roads West*; Schubert, *Vanguard of Expansion*; and Frank N. Schubert, ed., *The Nation Builders: A Sesquicentennial History of the Corps of Topographical Engineers, 1838-1863* (Fort Belvoir, VA: U.S. Army Corps of Engineers, 1988). For a perceptive analysis of the development of engineering policy before the Civil War, see Todd Shallat, "Engineering Policy: The U.S. Army Corps of Engineers and the Historical Foundation of Power," *The Public Historian*, 11(Summer 1989): 7-27.

2. The following discussion of the late 19th century structure and functions of the Army Engineers is based on Janet A. McDonnell, "An Administrative and Organizational History of the U.S. Army Corps of Engineers, 1865-1902," manuscript on file at the Office of History, U.S. Army Corps of Engineers, Fort Belvoir, VA; the *Annual Reports of the Chief of Engineers*; and published histories of various Army Engineer Districts. See also Martin Reuss, "Andrew A. Humphreys and the Development of Hydraulic Engineering: Politics and Technology in the Army Corps of Engineers, 1850-1950," *Technology and Culture*, 26(Jan. 1985): 1-33.

3. Hiram M. Chittenden, "Social Democracy and West Point," *AM*, 108(Dec. 1911): 760-766.

4. Hiram M. Chittenden, "Peace and Heroism," *Forum*, 47(Feb. 1912), pp. 185-193.

5. Willingham, William F., *Army Engineers and the Development of Oregon*, (Portland, OR: U.S. Army Engineer District, 1983), pp. 10-11.

6. Ibid., pp. 11-14.

7. Ibid., pp. 16-17. In the early 1870s, Portland was reputed to be one of the richest towns of its size in the United States.

8. *Ninth Census* (Washington, D.C.: Government Printing Office, 1872), 1:xvii; *Tenth Census of the United States*, Vol. II, *Report on the Manufactures of the United States* (Washington, D.C.: Government Printing Office, 1883), pp. 186-187; Henry B. Steer, comp., *Lumber Production in the United States, 1799-1946*, USDA Misc. Pub. No. 669(Washington, D.C.: Government Printing Office, 1948), p. 11; Ficken and LeWarne, *Washington*, pp. 29-33.

9. *Thirteenth Census of the United States, 1910, Abstract of the Census with Supplement for Washington* (Washington, D.C.: Government Printing Office, 1913), p. 568; Carrie Adell Strahorn, *Fifteen Thousand Miles by Stage* (New York: G.P. Putnam's Sons, 1911), p. 363; Thomas Somerville, "The Mediterranean of the Pacific," *HNMM*, 41(Sept. 1870):492-493; Ernest Ingersoll, "From the Fraser to the Columbia," *HNMM*, 68(April 1884):882; Ficken and LeWarne, *Washington*, pp. 33-34.

10. Meriwether Lewis to Thomas Jefferson, 23 Sept. 1806, in Donald Jackson, ed., *Letters of the Lewis and Clark Expedition*. 2 vols (Urbana: University of Illinois Press, 1978), 1:320-321; Stevens to President of Railroad Convention, 3 April 1860, Box 5, Stevens Papers; *Reports of Explorations and Surveys*, 12:251-252; Cram, "Topographical Memoir," pp. 76-77; T.J. Cram to Wool, 30 Nov. 1855, Wool Papers; John Mullan to S.H. Long, 12 Nov. 1862, Box 60, TE; Ficken and LeWarne, *Washington*, pp. 51-52.

11. One passenger drowned in the panic as small boats sped to the rescue. John C. Ainsworth Reminiscences, pp. 54-55, Oregon Historical Society; Mullan to Long, 12 Nov. 1862, Box to, TE; Thom to Abert, 6 Oct. 1859 Letters Sent, PCOMR; Mullan to Long, 12 Nov. 1862, Box 60, TE; Mills, *Stern-Wheelers*, pp. 80-81; Ficken and LeWarne, *Washington*, p. 52; Willingham, *Army Engineers and the Development of Oregon*, p. 12.

12. Dorothy O. Johansen, "The Oregon Steam Navigation Company: An Example of Capitalism on the Frontier," *PHR*, 10(June 1941):179-188; Ainsworth Reminiscences, pp. 80-81, 89; Mills, *Stern-Wheelers*, pp. 42-45; W.H. Gorrill Diary, 19, 21, and 25 Oct. 1869, Yale University Western Americana Coll.; Frances Fuller Victor, *All Over Oregon and Washington* (San Francisco: John H. Carmany, 1872), pp. 103-104; Freight and Passenger Tariff, 1 Feb. 1879, OSN; Ficken and LeWarne, *Washington*, p. 52.

13. Mills, *Stern-Wheelers*, pp. 41-43, 80-81; Ainsworth Reminiscences, p. 85; Frances Fuller Victor, *The River of the West* (Hartford, Conn.: R.W. Bliss & Co., 1870), pp. 578-579; Bowles, *Across the Continent*, pp. 194-196; Articles of Incorporation, 7 Nov. 1868, OSN; Ficken and LeWarne, *Washington*, p. 52.

14. J.C. Ainsworth to H.M. Robert, 23 Nov. 1871; Robert to CE, 2 Jan. 1872, in *ARCE, 1872*, pp. 996-998; Ainsworth to Robert, 7 Sept. 1872, Box 48, PD; Willingham, *Army Engineers and the Development of Oregon*, pp. 12-13, Ficken and LeWarne, *Washington*, p. 53.

15. G.H. Atkinson, "A Winter Trip to the Upper Columbia Basin," *WS*, 7(Dec. 1881):286; Samuel Rodman, Jr., "Explorations in the Upper Columbia Country," *Overland Monthly*, 7(March 1886):255. For complete details on these developments, see Meinig, *Great Columbia Plain*, chapters 9-11.

16. *ARCE, 1879*, pp. 1840-1842; *ARCE, 1880*, pp. 2290-2292; *ARCE, 1881*, p. 2561; *ARCE, 1883*, p. 2042; Powell to CE, 20 May 1882, Box 4, PD; Ficken and LeWarne, *Washington*, p. 53.

17. *ARCE, 1880*, p. 2292. See Symons, "Report," especially chapter 10, for views on the future of Eastern Washington.

18. *ARCE, 1881*, P. 2561; *ARCE, 1891*, P. 3212.

19. Report of Board of Engineers for the Pacific Coast, 24 Sept. 1877, in *ARCE, 1878*, pp. 1340-1344; Willingham, *Army Engineers and the Development of Oregon*, pp. 20-21, 24-25, 28-36.

20. John M. Wilson to A.A. Humphreys, 22 June and 23 Sept. 1876; to Ainsworth, 18 April 1876, Boxes 1, 48, PD; *ARCE, 1877*, pp. 1041, 1044; Victor, *All Over*, p. 126. Improvement of the Snake had been called for since at least the early 1860s. See Fitz-Hugh Ludlow, "On the Columbia River," *AM*, 14(Dec. 1864):711.

21. *ARCE, 1874*, p. 359; *ARCE, 1881*, pp. 2558-2560; *ARCE, 1887*, pp. 2520-2521.

22. *ARCE, 1874*, p. 359; *ARCE, 1876*, p. 665; *ARCE, 1886*, p. 1949; S.R. Smith to W.A. Jones, 24 Oct. 1888, Box 26, PD.

23. Philip G. Eastwick to Powell, 26 Feb. 1884, in *ARCE, 1884*, pp. 2232-2234; W. Young to Powell, 24 March 1886, in *ARCE, 1886*, pp. 1951-1952; *ARCE, 1889*, p. 2584. On the Clearwater project, see Eastwick to J.M. Wilson, 12 Oct. 1878; J.M. Wilson to Humphreys, 16 Oct. 1878, in *ARCE, 1879*, pp. 1813-1823.

24. Symons, "Report," pp. 55-66.

25. *Report of Captain Alfred T. Pingstone ... on the Columbia River from Ainsworth to Kettle Falls* (Portland: A.G. Walling, 1881), pp. 7-8; Victor H. Smalley, "The Inland Empire and What it Offers to Settlers," *NM*, 20(March 1902):12; *ARCE, 1884*, pp. 2229-2230, 2244. See Meinig, *Great Columbia Plain*, pp. 334-340, for details on the Big Bend.

26. *ARCE, 1886*, pp. 1953-1954, 1965; Jones to Casey, 15 Oct. 1888, in *ARCE, 1890*, p. 3065. The Oregon Railway and Navigation Co. preferred the construction of a government wagon road around Priest Rapids to the more expensive improvement of the river itself. See W.P. Gray to Frank T. Dodge, 5 June 1884, in *ARCE, 1886*, pp. 1967-1968.

27. J.C. Ensign to Thomas Handbury, 24 Dec. 1889, in *ARCE, 1890*, pp. 3068-3069; *ARCE, 1891*, p. 3224; Mills, *Stern-Wheelers*, p. 91.

28. Jones to Casey, 15 Oct. 1888 and 15 Feb. 1890; Ensign to Handbury, 24 Dec. 1889; Handbury to Casey, 31 Dec. 1889, all in *ARCE, 1891*, pp. 3065-3069, 3071; *ARCE, 1891*, pp. 3224-3225.

29. Symons to Casey, 4 May 1892, Box 27, PD. For the use of logbooks on the Snake River, see Dubuar Scrapbook, 56:13, UW.

30. *ARCE, 1891*, pp. 3212-3213, 3217.

31. Idaho became a state in 1890. *Thirteenth Census, Washington Abstract*, p. 568; Steer, comp., *Lumber Production*, p. 11; S.B. Pettengill, "Puget Sound of To-Day," *WS*, 13(Jan. 1887), p. 41.

32. *Thirteenth Census, Washington Abstract*, p. 568; H.H., "Puget Sound," p. 225; Septima M. Collins, *A Woman's Trip to Alaska* (New York: Cassell Publishing Company, 1890), pp. 34-38; Rudyard Kipling, *From Sea to Sea and Other Sketches* (Garden City, N.Y.: Doubleday, Page & Company, 2 vols., 1925), 2:90.

33. See chapters 3 and 4 for complete details on these projects.

34. G.L. Gillespie to H.G. Wright, 18 Nov. 1880, in *ARCE, 1881*, p. 2612; *ARCE, 1875*, pp. 791-792; *ARCE, 1890*, p. 2986; Ezra Meeker, *Pioneer Reminiscences of Puget Sound* (Seattle: Lowman & Hanford, 1905), p. 60; Morse Notebooks, 20:8-9; Herbert Hunt and Floyd C. Kaylor, *Washington West of the Cascades* (Chicago: S.J. Clarke Publishing Company, 2 vols., 1917), 1:396, 423-426.

35. Robert A. Habersham to Gillespie, 30 June 1881, in *ARCE, 1881*, p. 2606; Hunt and Kaylor, *Washington West of the Cascades*, 1:423-426; Morse Notebooks, 20:8.

36. Habersham to Gillespie, 30 June 1881, in *ARCE, 1881*, p. 2607.

37. Gillespie to Wright, 18 Nov. 1880, in *ARCE, 1881*, p. 2612; *ARCE, 1882*, pp. 2685-2686; *ARCE, 1883*, pp. 2074-2075; *ARCE, 1884*, p. 2274.

38. *ARCE, 1886*, pp. 2007-2009; *ARCE, 1887*, p. 2490; *ARCE, 1889*, pp. 2561-2562; Habersham to Gillespie, 30 June 1881, in *ARCE, 1881*, p. 2605; Morse Notebooks, 20:12; Pettengill, "Puget Sound of To-Day," p. 41; E.H. Jefferson to Handbury, 15 May 1889, in *ARCE, 1889*, p. 2563; *ARCE, 1885*, p. 2403.

39. Jefferson to Handbury, 15 May 1889, in *ARCE, 1889*, pp. 2562-2563.

40. *ARCE, 1890*, p. 2987; *ARCE, 1891*, pp. 3240-3241; Symons to Casey, 8 Nov. 1890, in *ARCE, 1891*, p. 3272.

41. Handbury to CE, 24 April 1890, Box 14, PD; Willingham, *Army Engineers and the Development of Oregon*, p. 44. From time to time, similar second offices were created in Portland to supervise major projects at locations remote from District headquarters. See pp. 44-45 of Willingham's history.

42. See chapters 3 and 4 for the early development of these projects.

43. Handbury to CE, 24 April 1890, Box 14, PD; [Sherman Green], "History of the Seattle District, 1896-1968," unpub. manuscript, p. 2-2. Taylor occupied a spartan office suite in Seattle's Burke building.

44. These observations are based on information in volumes 4 and 5 of General Cullum's *Biographical Register of the Officers and Graduates of the United States Military Academy* (Saginaw, Mich.: Seemann & Peters, 1910).

45. Taylor to W.P. Craighill, 11 Sept. 1896, in *ARCE, 1897*, p. 3472; L.E. Atkins to DivE, 3 Feb. 1940, Box 209, SD; interview with Colonel Norman K. Hintz, Seattle, 6 April 1984.

46. John Biddle to CE, 25 Jan. 1909, Box 1009, OCE.

47. Taylor to W.M. Black, 14 Oct. and 10 Dec. 1896, Box 325, OCE.

48. Taylor to J.M. Clapp, 4 and 11 April 1898, Box 89, SD.

49. John Millis to Gillespie, 28 July and 9 Sept. 1903; to CE, 26 Sept. 1903; Taylor to Black, 10 Dec. 1896, Boxes 134, 325, OCE.

50. Until 1901, the Seattle and Portland Districts were supervised by the Pacific Division in San Francisco. In that year, a North Pacific Division was established in Portland. See Willingham, *Army Engineers and the Development of Oregon*, p. 46. The Board of Engineers was composed of senior officers and acted in an advisory capacity to the Chief of Engineers. Although a permanent board existed in Washington, D.C., special boards were sometimes created to exercise its functions in the Pacific Northwest.

51. Local interest groups complained that it was impossible to secure reversal of negative reports submitted by the District Engineer. Wesley L. Jones to Ralph H. Philbrick, 13 April 1911, Box 177, Wesley L. Jones Papers, UW. The Chief of Engineers, however, did not approve all District and Division reports; see *ARCE, 1893*, pp. 3458-3459.

52. Cavanaugh to W.H. Bixby, 23 Feb. 1912, SD. (Recent additions to this collection are currently held in unnumbered boxes.) On the "anomalous status" of the Army Engineer, see Goetzmann, *Army Exploration*, p. 5.

53. Robert Wiebe, *The Search for Order* (New York: Hill and Wang, 1967).

54. The engineering dictum is taken from David McCullough, *The Path Between the Seas: The Creation of the Panama Canal, 1870-1914* (New York: Simon and Schuster, 1977), p. 314.

CHAPTER 3

1. Clapp to Taylor, 30 June 1900, Box 46, SD.

2. Ficken and LeWarne, *Washington*, pp. 30-33.

3. Clapp to Taylor, 1 June 1896, Box 44, SD; Habersham to Powell, 2 and 14 Nov. 1881, in *ARCE, 1882*, pp. 2689, 2723; Powell to CE, 27 Jan. 1882, Box 4, PD; Chittenden, "Ports of the Pacific," p. 177.

4. Powell to CE, 25 Jan. 1882, Box 4, PD; Habersham to Powell, 2 Nov. 1881, in *ARCE, 1882*, p. 2723; Clapp to Taylor, 16 April 1898, Box 44, SD.

5. Habersham to Powell, 14 Nov. 1881; Powell to CE, 26 Jan. 1882, in *ARCE, 1882*, pp. 2687, 2689; Caroline Gale Budlong, *Memories of Pioneer Days in Oregon and Washington Territory* (Eugene: Picture Press Printers, 1949), p. 40; "Grays Harbor Country," p. 574.

6. The nearest lighthouse was at Shoalwater Bay, 14 miles to the south. Powell to CE, 27 Jan. 1882, Box 4, PD; *ARCE, 1883*, p. 2075; *ARCE, 1884*, pp. 2276-2278; *ARCE, 1888*, pp. 2174-2175; *ARCE, 1890*, pp. 2984-2986.

7. Habersham to Powell, 2 and 14 Nov. 1881, in *ARCE, 1882*, pp. 2689, 2724; *ARCE, 1883*, p. 2076; Habersham to Symons, 1 Oct. 1890, in *ARCE, 1891*, pp. 3298-3299; [Edward G. Jones], *The Oregonian's Handbook of the Pacific Northwest* (Portland: The Oregonian Publishing Co., 1894), pp. 326-334; Ficken and LeWarne, *Washington*, p. 37.

8. Miller, *South-western Washington*, p. 167; E.V. Smalley, "The Gray's Harbor Basin," *NM*, 8(March 1890):21-22; [Jones], *Oregonian's Handbook*, pp. 325-326; George H. Emerson to Heuer, n.d., Box 150, OCE; Habersham to Symons, 1 Oct. 1890; Symons to Casey, 3 Oct. 1890, in *ARCE, 1891*, pp. 3297-3299.

9. A.J. McMillan to Symons, 21 Feb. 1891; Symons to Casey, 29 April 1891, in *ARCE, 1891*, pp. 3300-3303; Mendell to Symons, 24 May 1892; J.M. Adams to Symons, 8 Aug. 1892, Boxes 41, 48, SD.

10. *ARCE, 1893*, pp. 3408-3410; Clapp to Symons, 4 Sept. 1893 and 26 Jan. 1894, Box 48, SD.

11. Symons to Casey, 27 Aug. 1894, Box 134, OCE; Clapp to F.R. Shunk, 2 Nov. 1893; to Symons, 4 June 1895, Boxes 48, 49, SD; *ARCE, 1895*, p. 3406; *ARCE, 1896*, p. 3335.

12. *ARCE, 1893*, p. 3410; *ARCE, 1895*, pp. 3407-3408; Clapp to Symons, 4 June 1895, Box 49, SD; *ARCE, 1896*, pp. 3335-3336; Clapp to Taylor, 1 June 1896, Box 44, SD.

13. Clapp to Symons, 19 May 1895; to W.L. Fisk, 20 Dec. 1895; to Taylor, 1 June 1896, Boxes 49, 44, SD.

14. T.G. Deckebach to W.H. Calkins, 3 March 1892; Calkins to Stephen B. Elkins, 9 March 1892, Box 48, SD; [Jones], *Oregonian's Handbook*, pp. 334-335.

15. Symons to Casey, 6 Sept. 1894, Box 19, PD; Symons to Craighill, 22 May 1895, in *ARCE, 1895*, pp. 3521-3533. At the time Symons developed the jetty plan for Grays Harbor, he was in charge of the first Portland Engineer Office. On the Oregon jetties, see Willingham, *Army Engineers and the Development of Oregon*, pp. 60-63, 83-85.

16. Mendell to CE, 4 April 1895, in *ARCE, 1895*, p. 3528.

17. Symons to Craighill, 22 May 1895, in *ARCE, 1895*, pp. 3528-3533; Taylor to Craighill, 14 July 1896, Box 150, OCE.

18. Taylor to Craighill, 14 July 1896, Box 150, OCE; *ARCE, 1897*, p. 3436; Taylor to Emerson, 31 Dec. 1896; Mackenzie to Taylor, 10 June 1897, Boxes 89, 44, SD. The standard practice of making continuing annual appropriations was unpopular on Grays Harbor, due to fear that Congress might someday decline to make additional money available for project completion. See "The Grays Harbor Jetty," *TS*, 2(20 Oct. 1898):86.

19. Taylor to Craighill, 23 Dec. 1896; to J.M. Wilson, 17 April, 16 Sept. and 23 Dec. 1897; to Chas R. Suter, 17 April and 19 Aug. 1897, all Box 89, SD; Clapp to Taylor, 30 June 1899, Box 45, SD; *ARCE, 1899*, pp. 3261-3262; Heuer to Gillespie, 2 June 1902, Box 1009, OCE.

20. Clapp to Taylor, 31 Dec. 1898 and 30 June 1899, Box 45, SD; *ARCE, 1899*, pp. 3261-3262; Heuer to Gillespie, 2 June 1902, Box 1009, OCE.

21. *ARCE, 1901*, p. 3579; *ARCE, 1902*, p. 2411; Taylor to J.M. Wilson, 19 Aug. 1898, Box 89, SD; Heuer to Gillespie, 2 June 1902; Millis to Mackenzie, 31 Dec. 1904; Kutz to CE, 2 Feb. 1910, Boxes 1009, 150, 151, OCE.

22. E.L. Carpenter to F.A. Pope, 25 Nov. 1905, Box 50, SD; Levi Ankeny to Elihu Root, 22 June 1903, Box 134, OCE.

23. Kutz to CE, 2 Feb. 1910; Millis to Mackenzie, 24 June 1905, Boxes 151, 150, OCE; Memorial to Congress, n.d., Box 47, SD.

24. Heuer, Millis and Langfitt to CE, 7 Nov. 1903, Box 150, OCE.

25. A.M. Miller to CE, 4 Dec. 1903 and 15 Feb. 1904, ibid. The Pacific Northwest board of officers had considered this option, but concluded that "the success of dredging work on exposed sand bars on the Pacific coast ... is still extremely doubtful." Heuer, Millis and Langfitt to Gillespie, 28 Jan. 1904, in *ARCE, 1904*, pp. 3598-3599.

26. *ARCE, 1903*, p. 2327; *ARCE, 1904*, p. 3602; *ARCE, 1905*, p. 2511; *ARCE, 1906*, pp. 2024-2025; Carpenter to Cavanaugh, 1 April 1914, Box 170, SD.

27. *ARCE, 1906*, p. 2024; *ARCE, 1908*, pp. 2287-2288; Chittenden to Jones, 3 Feb. 1908; Clapp to Chittenden, 8 April and 13 Aug. 1908, all Box 170, SD.

28. Frank H. Lamb to Jones, 29 Dec. 1911, Box 179, Jones Papers. *ARCE, 1910*, p. 2421; *ARCE, 1911*, p. 2629; *ARCE, 1912*, p. 2846; *ARCE, 1916*, p. 3250; *ARCE, 1917*, p. 3355; Cavanaugh to CE, 8 July 1912 and 21 Sept. 1916, Box 170, SD. After 1916, the seagoing *Colonel P. S. Michie* occasionally was used in place of the *Oregon*. On the dredges, see Willingham, *Army Engineers and the Development of Oregon*, pp. 72, 85.

29. Chittenden to Mackenzie, 12 Dec. 1906 and 18 March 1907; Board of Engineers to Mackenzie, 28 Dec. 1906; Kutz to CE, 2 Feb. 1910, Boxes 150, 151, OCE.

30. *ARCE, 1908*, pp. 2283-2285; *ARCE, 1909*, pp. 2246-2247; *ARCE, 1910*, pp. 2418-2419; Chittenden to Mackenzie, 18 March 1907; Biddle to CE, 25 Jan. 1909, Boxes 150, 1009, OCE.

31. Clapp to Kutz, 18 Jan. 1910; Biddle to Kutz, 7 Feb. 1910; Kutz to Biddle, 11 Feb. 1911, all Box 97, SD. *ARCE, 1910*, p. 2419.

32. *ARCE, 1911*, p. 2627; *ARCE, 1912*, p. 2844; *ARCE, 1913*, pp. 3122-3123; *ARCE, 1914*, p. 3249; *ARCE, 1915*, pp. 3422-3423, *ARCE, 1916*, p. 3248.

33. *ARCE, 1913*, p. 3123.

34. Habersham to Symons, 10 Oct. 1890; in *ARCE, 1891*, p. 3267; E.V. Smalley, "South Bend," *NM*, 9(May 1891):21-22; Powell to CE, 30 Jan. 1882, Box 4, PD.

35. See "Willapa Valley," *WS*, 11 (May 1885):157; Powell to CE, 21 Oct. 1884, in *ARCE, 1885*, pp. 2420-2422; Symons to Casey, 11 Oct. 1890 and 2 May 1891; Habersham to Symons, 10 Oct. 1890; McMillan to Symons, 19 Feb. 1891, all in *ARCE, 1891*, pp. 3266-3271.

36. Symons to Casey, 11 Oct. 1884, in *ARCE, 1891*, pp. 3267-3268; R.B. Dyer to James C. Post, 9 Nov. 1895, Box 73, SD.

37. Symons to Casey, 2 May 1891, in *ARCE, 1891*, pp. 3268-3270; Symons to Casey, 29 Aug. 1894, Box 151A, OCE; H.M. Adams to Symons, 6 Aug. 1892, Box 73, SD.

38. *ARCE, 1893*, p. 3403; Clapp to Symons, 3 June 1895, Box 73, SD; Clapp to Symons, 3 June 1895; to Taylor, 25 June 1896, Boxes 73, 74, SD; *ARCE, 1896*, pp. 3326-3327; Taylor to Wilson, 20 Aug. 1897, in *ARCE, 1897*, pp. 3089-3090.

39. Carpenter to Pope, 29 Dec. 1905, Box 74, SD; *ARCE, 1908*, pp. 2281-2282.

40. Jos. H. Earle to Kutz, 10 April 1909; Kutz to CE, 19 April 1909, Box 97, SD; Kutz to CE, 12 July 1910, Box 151A, OCE; *ARCE, 1911*, p. 2625; *ARCE, 1912*, p. 2842; *ARCE, 1913*, pp. 3119-3120.

41. W.W. Hays to Jones, 14 Feb. 1912, Box 177, Jones Papers; Black to Poindexter, 22 Aug. 1917; A.H. Acher to CE, 21 Nov. 1917; J.A. Woodruff to CE, 15 April 1920, Boxes 151A, 152, OCE.

42. Jefferson to Taylor, 16 July 1898, Box 64, SD.

43. Chittenden to Mackenzie, 31 March 1908; Kutz to CE, 11 July 1910, Box 209, SD; *ARCE, 1911*, p. 2637; Philip G. Eastwick to Powell, 27 Oct. 1884, in

ARCE, 1885, pp. 2414-2415; Edw. Burr to Mendell, 31 Jan. and 25 Feb. 1885, Box 9, PD; Ricksecker to Millis, 26 June 1905, in *ARCE, 1905*, p. 2526.

44. The District also constructed a bulkhead to limit deposition of sediment in the inlet by the Deschutes River. Taylor to Craighill, 26 June 1896, Box 134, OCE; *ARCE, 1896*, pp. 3349-3350; *ARCE, 1897*, pp. 3443-3444; John Zug to Taylor, 12 March 1900, in *ARCE, 1900*, pp. 4482-4483.

45. Lockwood to Mackenzie, 9 March 1908; Kutz to CE, 11 July 1910; Cavanaugh to CE, 14 Feb. 1917, all Box 134, OCE; Cavanaugh to CE, 12 Feb. 1916; Frederic V. Abbot to CE, 13 March 1917, Box 196, SD.

46. *ARCE, 1897*, p. 3451; Thomas Huddleston to Millis, 22 Dec. 1902, Box 69, SD.

47. Adams to Symons, 8 Aug. 1892; J.R. Savage to Symons, 24 June 1893; Carpenter to Taylor, 26 June 1897, Boxes 68, 69, SD; Symons to Mendell, 7 June 1894, Box 19, PD; *ARCE, 1898*, pp. 3976-3077; *ARCE, 1900*, pp. 4487-4488; *ARCE, 1903*, p. 2336; *ARCE, 1906*, pp. 2040-2042; *ARCE, 1908*, p. 2301; Kutz to CE, 26 May 1909, Box 97, SD.

48. Symons to Casey, 1 Jan. 1895, in *ARCE, 1895*, pp. 3472-3472; Taylor to Wilson, 14 June 1897, in *ARCE, 1897*, pp. 3479-3480; Chittenden to CE, Box 147, SD.

49. Taylor to J.M. Wilson, 14 June 1897, in *ARCE, 1897*, p. 3480; F.S. Greeley to Millis, 4 April 1905, in *ARCE, 1905*, p. 2553; S.W. Roessler to Chittenden, 6 April 1908, NPD; Chittenden to Mackenzie, 27 April 1907; to Roessler, 9 April 1908; Clapp to Chittenden, 14 March 1908; Kutz to CE, 8 July 1910 and 3 March 1911, all Box 147, SD.

50. Symons to Casey, 12 and 14 Oct. 1892, in *ARCE, 1893*, pp. 3463, 3466.

51. Symons to Casey, 12 Oct. 1892, in ibid., pp. 3465-3466; Norman H. Clark, *Mill Town*, (Seattle: University of Washington Press, 1970), pp. 19-28.

52. Symons to Casey, 12 Oct. 1892, in *ARCE, 1893*, pp. 3465-3466; Clark, *Mill Town*, pp. 28-42; Chittenden to Mackenzie, 31 March 1908, Box 211a, SD.

53. Symons to Casey, 12 Oct. 1892, in *ARCE, 1893*, p. 3467

54. According to the captain's estimate, 1.9 million cubic yards of excavation would be required. Symons to Casey, 9 July 1894, Box 19, PD; *ARCE, 1896*, p. 3374.

55. Adams to Symons, 28 Feb. 1895; Schuyler Duryee to Symons, 5 Sept. 1894; Taylor to J.S. Wilson, 13 Feb. 1900, Boxes 41, 42, SD.

56. James J. Hill to SW, 22 Jan. 1900; Taylor to Wilson, 13 Feb. 1900, Box 42, SD.

57. Symons to Casey, 15 Sept. 1894, Box 19, PD; Adams to Symons, 24 Sept. 1894, Box 41, SD; *ARCE, 1895*, p. 3432; *ARCE, 1896*, pp. 3374-3375; *ARCE, 1897*, pp. 3447-3448; *ARCE, 1900*, p. 4485; Zug to Millis, 1 July 1901, Box 42, SD.

58. *ARCE, 1901*, p. 3588; *ARCE, 1902*, p. 2426; Millis to Everett Improvement Co., 21 Jan. 1902, Box 89, SD; Heuer to Gillespie, 2 June 1902, Box 1009, OCE.

59. Millis to Gillespie, 27 Oct. 1902; to Everett Chamber of Commerce, 15 Oct. 1902, Box 89, SD; *ARCE, 1903*, pp. 2334-2335; *ARCE, 1904*, p. 3615.

60. Millis to Mackenzie, 24 June 1905; Chittenden to Mackenzie, 19 April 1907 and 31 March 1908, Boxes 89, 211a, SD.

61. Chittenden to Mackenzie, 19 April 1907 and 31 March 1908, Box 211a, SD.

62. Contrary to Chittenden's plan, the sloughs were not closed. Kutz to CE, 12 July 1900. Box 211, SD; *ARCE, 1912*, pp. 2857, 2859; *ARCE, 1913*, p. 3136; *ARCE, 1914*, p. 3262.

63. Charles Lord Russell of Killowen, *Diary of a Visit to the United States of America in the Year 1883* (New York: The United States Catholic Historical Society, 1910), p. 101; Taylor to Wilson, 16 Feb. 1898 and 13 Nov. 1900, in *ARCE, 1898*, p. 3101; *ARCE, 1901*, pp. 3596-3597.

64. Alfred Cavanagh, "A City of Industry," *Harper's Weekly*, 57(May 1913):13; Habersham to N. Michler, 5 Oct. 1875, in *ARCE, 1876*, pp. 642-644; McMillan to Symons, 28 Oct. 1890, in *ARCE, 1891*, p. 3257; Taylor to Wilson, 16 Feb. 1898, in *ARCE, 1898*, p. 3099; Ricksecker to Millis, 12 Oct. 1913., Box 70, SD.

65. Habersham to Michler, 5 Oct. 1875; Wilson to Humphreys, 19 Feb. 1876, in *ARCE, 1876*, pp. 642-644, 670-671; Powell to CE, 3 Nov. 1884, in *ARCE, 1885*, p. 2419.

66. Murray Morgan, *Puget's Sound: A Narrative of Early Tacoma and the Southern Sound* (Seattle: University of Washington Press, 1979), p. 274; Powell to CE, 3 Nov. 1884, in *ARCE, 1885*, pp. 2418-2419; McMillan to Symons, 28

Oct. 1890, in *ARCE, 1891*, p. 3257; Taylor to Wilson, 27 Dec. 1897, Box 138, OCE.

67. Powell to CE, 3 Nov. 1884, in *ARCE, 1885*, p. 2419; Taylor to Wilson, 16 Feb. 1898 and 13 Nov. 1900, in *ARCE, 1898*, p. 3099; *ARCE, 1901*, pp. 3597-3598; P.C. Kaufman, "Tacoma as a Seaport," *TS*, 7(Aug. 1901):49; Ricksecker to Millis, 7 Feb. 1903, Box 70, SD.

68. Taylor to Wilson, 13 Nov. 1900, in *ARCE, 1901*, p. 3597.

69. Morgan, *Puget's Sound*, pp. 274-278, 296-299; Wilson to SW, 27 June 1900, Box 139, OCE.

70. Committee to Tacoma Chamber of Commerce, 2 Feb. and 31 Oct. 1903; Ricksecker to Millis, 7 Feb. 1903, all Box 70, SD; Millis to Gillespie, 31 Dec. 1903, in *ARCE, 1904*, pp. 3635-3636; Ricksecker to Millis, 17 June 1905, in *ARCE, 1905*, pp. 2538-2539.

71. Millis to Gillespie, 31 Dec. 1903, in *ARCE, 1904*, p. 3635; Woodruff to CE, 28 Nov. 1919, Box 216, SD; *ARCE, 1903*, p. 2331; *ARCE, 1904*, p. 3609; *ARCE, 1905*, p. 2527.

72. Committee to Chamber of Commerce, 2 Feb. and 31 Oct. 1903; Ricksecker to Millis, 7 Feb. 1903, all Box 70, SD; Henry Hewitt, Jr., "The Tacoma Harbor," *TS*, 7(Oct. 1901):57-60. Because the Middle Waterway was within pre-existing harbor lines, it remained a private undertaking. R.L. Hoxie to CE, 26 Jan. 1904, in *ARCE, 1904*, pp. 3633-3634.

73. Ricksecker to Millis, 12 Oct. 1903, Box 70, SD; Hoxie to CE, 26 Jan. 1904, in *ARCE, 1904*, p. 3634.

74. Lockwood to Mackenzie, 20 Jan. 1905; Kutz to CE, 20 May 1909, Boxes 70, 97, SD; *ARCE, 1906*, pp. 2034-2035; *ARCE, 1908*, p. 2295.

75. Chittenden to Lockwood, 4 Feb. 1908; to Mackenzie, 4 April 1908; to CE, 31 Aug. 1908; Hoxie to CE, 1 June 1908, Boxes 217, 202, SD. King and Pierce counties carried out in 1915 engineering works to make the diversion permanent. W.J. Roberts to Cavanaugh, 9 July 1915, Box 202, SD.

76. Kutz to CE, 9 Nov. 1909, Box 218, SD; Kutz to CE, 17 Dec. 1909 and 19 March 1910, Box 217, SD.

77. Kutz to CE, 17 Dec. 1909, 15 Feb., 19 March and 3 May 1910; Langfitt to CE, 11 Jan, 1910; Rossell to CE, 7 March 1910; W.B. Sadue to Kutz, 16 April 1910, all Box 217, SD; *ARCE, 1910*, p. 2427.

78. Symons to Casey, 12 July and 12 Oct. 1892, in *ARCE, 1892*, p. 2722; *ARCE, 1893*, pp. 3453-3455.

79. Symons, *Upper Columbia River*, pp. 56, 110-112.

80. Ibid., p. 73.

81. Ibid., pp. 58-67.

82. Jones to T.L. Savage, 16 and 30 March 1912; to A.E. Baldwin, 1 April 1912, all Box 178, Jones Papers.

83. J.G. Holcombe to Symons, 30 June 1891, in *ARCE, 1891*, p. 3231; *ARCE, 1891*, pp. 3224-3225, 3227-3229; *ARCE, 1894*, pp. 2593-2594.

84. *ARCE, 1891*, pp. 3228-3229; Holcombe to Symons, 30 June 1891, in *ARCE, 1891*, p. 3231, and 30 June 1892, Box 71, SD.

85. Holcombe to Symons, 1 and 3 April and 30 June 1892; Shunk to Symons, 16 April 1892, all Box 71, SD; *ARCE, 1894*, pp. 2593-2594; *ARCE, 1895*, p. 3395.

86. "Steamboating on the Columbia and Lake Chelan," *NM*, 30(March 1902):14; Mills, *Stern-Wheelers*, p. 91; Shunk to Symons, 15 Nov. 1894; C.F.B. Haskell to Symons, n.d., in *ARCE, 1895*, pp. 3477-3478, 3538; Mendell to Symons, 11 Jan. 1895, Box 71, SD.

87. Symons to Craighill, 22 May 1895, in *ARCE, 1895*, pp. 3534-3535; Symons to Casey, 17 Jan. 1895, Box 19, PD.

88. Symons to Craighill, 22 May 1895, in *ARCE, 1895*, pp. 3534-3537; Symons to Casey, 17 Jan. and 3 May 1895, Box 19, PD; Taylor to Post, 28 Oct. 1895; Prowell to Fisk, 2 June 1896, Box 71, SD; *ARCE, 1897*, p. 3455.

89. Lockwood to Mackenzie, 26 Aug. 1907; Biddle to CE, 25 Jan. 1909, Boxes 1312, 1009, OCE; *ARCE, 1908*, pp. 2305-2306; Williams to CE, 9 Sept. 1910, Box 159, SD; Mills, *Stern-Wheelers*, pp. 92-94.

90. Ankeny to River and Harbor Board, 6 March 1907; to Chittenden, 19 April 1907; to Mackenzie, 17 July 1907; Ricksecker to Chittenden, 15 May 1907, Boxes 158, 159, SD; Jones to W.H. Taft, 7 Dec. 1907, Box 1312, OCE;

Bridgeport *Republic*, 17 Jan. 1908, clipping in Nelson C. Blaylock Scrapbook, WSU.

91. Smith S. Leach to Chittenden, 26 Dec. 1907; C.E. Hansen to Ricksecker, 6 Jan. 1908; Ricksecker to Chittenden, 18 March 1908, all Box 159, SD.

92. Ricksecker to Chittenden, 18 March 1908; Chittenden to Mackenzie, 31 March 1908; Williams to CE, 4 Oct. 1910; Kutz to CE, 24 Jan. 1911, all ibid.

93. Cavanaugh to Bert E. Hilborn, 5 Dec. 1911; to CE, 30 Jan. and 15 Oct. 1913, all ibid.; *ARCE, 1911*, p. 2640; Cavanaugh to CE, 30 Jan. and 15 Oct. 1913 and 6 March 1915; to Taylor, 30 Jan. 1913, all Box 159, SD; Poindexter to Dan C. Kingman, 25 Feb. 1915, Box 1313, OCE; Savage to Jones, 30 May 1914, Box 178, Jones Papers.

94. *ARCE, 1912*, p. 2863; *ARCE, 1913*, p. 3141; *ARCE, 1914*, p. 3267; *ARCE, 1915*, p. 3442; *ARCE, 1916*, p. 3272; *ARCE, 1917*, p. 3376; Columbia River, Brewster to Kettle Falls, Operations during 1912-13, File 1505-22, Upper Columbia Basin, SDRHA.

95. Cavanaugh to CE, 15 Oct. 1913, 6 and 13 March 1915 and 5 Jan. 1917; to Savage, 23 March 1915; Preston to CE, 22 May 1918, Boxes 159, 157, SD.

96. Schulz to Cavanaugh, 1 Nov. 1921; Schulz Report, Navigation on the Columbia and Its Tributaries Above the Mouth of the Snake, 20 March 1922, Box 158, SD.

97. Approximately $360,000 was spent on projects upstream from the mouth of the Snake. Lytle Brown to Burton L. French, 22 Dec. 1930, Box 298, RH; Schulz to Cavanaugh, 1 Nov. 1921, Box 158, SD.

98. Chittenden Diary, 11 Oct. 1906; Chittenden to C.H. Hanford, 9 June 1908, in Chittenden Misc.; Kutz to CE, 11 July 1911, Box 157, SD; William M. Clapp to Jones, 7 March 1910, Box 178, Jones Papers; Walla Walla *Statesman*, 8 Jan. 1908, clipping in Blaylock Scrapbook.

99. Kutz to A.S. Fleet, 5 June 1911; to Robert E. Strahorn, 3 May 1910, Boxes 157, 158, SD.

100. Kutz to CE, 11 July 1911; to J.M. Teal, 14 July 1911; Lockwood to CE, 28 June 1909, all Box 157, SD.

101. *ARCE, 1898*, pp. 3124-3130; *ARCE, 1900*, pp. 4494-4500; *ARCE, 1904*, pp. 3622-3624; *ARCE, 1906*, pp. 2045-2046; *ARCE, 1909*, pp. 890-891; *ARCE, 1910*, pp. 993-995, 2434-2435; *ARCE, 1912*, p. 2864; *ARCE, 1893*, pp. 3456-61; *ARCE, 1895*, pp. 3515, 3489-3491; *ARCE, 1897*, pp. 3467, 3480; *ARCE, 1898*, pp. 3078-80; *ARCE, 1899*, pp. 3276-3280; *ARCE, 1901*, pp. 654, 3603-3605.

102. *ARCE, 1895*, pp. 3480-3484; *ARCE, 1896*, p. 3390; *ARCE, 1898*, pp. 3081-3082, 3124-3130; *ARCE, 1899*, p. 3280; *ARCE, 1901*, pp. 655, 3592; *ARCE, 1902*, p. 2432; *ARCE, 1910*, pp. 995-996, 2436; *ARCE, 1911*, p. 2644.

103. *ARCE, 1906*, p. 787; *ARCE, 1907*, pp. 802, 2332; *ARCE, 1908*, p. 2309; *ARCE, 1909*, p. 2264; *ARCE, 1910*, pp. 996-997, 2436-2437; *ARCE, 1911*, p. 2645; *ARCE, 1912*, pp. 2865-2867; *ARCE, 1912*, p. 2867; *ARCE, 1913*, p. 3143; *ARCE, 1914*, p. 1454; *ARCE, 1915*, p. 1585; *ARCE, 1920*, pp. 1928-1929.

104. *ARCE, 1917*, pp. 1788-1790; *ARCE, 1918*, pp. 1835-1837; *ARCE, 1919*, pp. 1935-1937; *ARCE, 1920*, pp. 1929-1932.

CHAPTER 4

1. *P-I*, 26 Aug. 1916.

2. *P-I*, 5 July 1917.

3. N.A. Matthias to DivE, 27 June 1955, File 1517-08, Survey Report Files, SDRHA; R.H. Thomson to E.R. Edsen, 10 Nov. 1905, Box 2, R.H. Thomson Papers, UW; Taylor to J.L. Wilson, 5 March 1898, in *ARCE, 1898*, p. 3104; Eugene Ricksecker to Millis, 1 July 1901, Box 52, SD; Millis to Gillespie, 7 Jan. 1904, Box 139, OCE.

4. Erastus Brainerd, "Lake Union & Lake Washington Water-Way," p. 3, pamphlet in UW; Neil H. Purvis, "History of the Lake Washington Canal," *PNQ*, 25(April 1934):117; Hiram M. Chittenden to J.M. Hitt, 11 Oct. 1907, Box 176, SD; *P-I*, 5 and 15 July 1917; Clapp to Millis, 23 Nov. 1903, Box 55, SD.

5. B.S. Alexander to Humphreys, 11 Oct. 1870 and 15 Dec. 1871; Handbury to Alexander, 13 Oct. 1871, all in Senate Ex. Doc. No. 165, 50th Cong., 1st sess., pp. 7-15, 26-27. Also see Powell to CE, 20 March 1884, Box 7, PD.

6. The Portage Canal was just to the south of the present route of the Lake Washington Canal. Clapp to Millis, 23 Nov. 1903; Ricksecker to Millis, 30 Dec. 1903, Box 55, SD; Powell to CE, 20 March 1884, Box 7, PD.

7. D.H. Gilman to Thomas Burke, 2 March 1892, Box 6, Thomas Burke Papers, UW; Ricksecker to Symons, 10 June 1895, Box 51, SD; *Thirteenth Census, Washington Abstract*, p. 568.

8. The Stimson mill alone loaded 136 vessels between 1891 and mid-1895. Ricksecker to Symons, 10 June 1895, Box 51, SD; *West Coast Lumberman*, 4(June 1893):9.

9. Roger S. Greene to Watson C. Squire, 27 April 1896; Ricksecker to Symons, 10 June 1895; Chittenden, Report upon the Waterway Connecting Puget Sound with Lakes Union and Washington, 2 Dec. 1907, Boxes 51, 176, SD.

10. Mendell, Handbury, and Symons to Casey, 15 Dec. 1891, in House Ex. Doc. No. 40, 52d Cong., 1st sess., pp. 5-9; Purvis, "History of the Lake Washington Canal," pp. 120-122; A.C. Wyckoff to Maurice McMicken, 12 Aug. 1916, A.C. Wyckoff Letters, UW.

11. Eugene Semple to Mendell, 19 May 1894, Box 2, Eugene Semple Papers, UW; Alan A. Hynding, "Eugene Semple's Seattle Canal Scheme," *PNQ*, 59(April 1968):77-80. Also see chapter 10 of Hynding's *The Public Life of Eugene Semple: Promoter and Politician of the Pacific Northwest* (Seattle: University of Washington Press, 1973).

12. Symons to Semple, 13 March 1893, Box 9, Semple Papers; Symons to Gilman, 14 Sept. 1892, Box 3, D.H. Gilman Papers, UW.

13. Symons Report, 15 June 1894, in "Lake Washington Ship Canal Prospectus," pp. 6-9, pamphlet in UW; Semple to W.T. Forrest, 13 June 1894; Symons to Hale, 18 Sept. 1894, Boxes 2, 17, Semple Papers; *P-I*, 3 Feb. 1895; *History and Advantages of the Canal and Harbor Improvement Project Now Being Executed by the Seattle and Lake Washington Waterway Company* (Seattle: Lowman & Hanford, 1902), p. 19. Some of the eastern investors believed that Symons underestimated the difficulties of the project. Henry Semple Ames to Semple, 28 Feb. 1895, Box 6, Semple Papers.

14. Hynding, "Semple's Seattle Canal Scheme," pp. 80-81; Semple to Symons, 7 Oct. 1895, Box 5, Semple Papers; Mendell to CE, 19 Sept. 1895, Box 139, OCE.

15. For information on landholdings, see Robert C. Nesbit, *"He Built Seattle": A Biography of Judge Thomas Burke* (Seattle: University of Washington Press, 1961), pp. 256-257, 404; Gilman to Burke, 24 Feb. and 2 March 1892, 22 Feb. 1894, 3 May 1895, 6 Nov. 1901 and 19 Aug. 1902, all Box 6, Burke Papers; Gilman to Symons, 11 Sept. 1892, Box 51, SD.

16. Greene, et al. to Daniel S. Lamont, 18 July 1895, Box 10, Burke Papers. Symons continued, from his station on the Great Lakes, to advise the south canal project.

17. Symons also expressed doubt as to whether Elliott Bay could properly be regarded as part of Puget Sound. Symons to Casey, 1 Nov. 1894; to A.A. Mackenzie, 24 Aug. 1896, Box 139, OCE; Mackenzie to Lamont, 28 Aug. 1896, Box 53, SD.

18. Symons to Craighill, 29 Aug. 1895, in *ARCE, 1896*, pp. 3356-3363; Ricksecker to Symons, 10 June 1895, Box 51, SD; Symons to Casey, 12 April 1895; Mendell to CE, 15 April 1895; W.L. Fisk to Craighill, 2 April 1896, all Box 139, OCE.

19. Greene to Taylor, 13 June 1896; to Lamont, 23 July 1896, Box 53, SD; Semple to Symons, 23 Oct. 1896, Box 5, Semple Papers; Taylor to CE, 21 June 1900; Edw. A. Bowers to SW, 24 Aug. 1896, Box 139, OCE; Mackenzie to Taylor, 17 July 1900, Box 53, SD; *ARCE, 1896*, pp. 3353-3355; *ARCE, 1897*, pp. 3446-3447.

20. Greene, Burke, and Edward O. Graves to Lamont, 2 Oct. 1896, Box 53, SD; Graves to Lamont, 5 Oct. 1896, Box 10, Burke Papers.

21 *ARCE, 1896*, p. 3354; Taylor to Craighill, 13 Aug. 1896; to J.L. Wilson, 25 June 1897, Box 139, OCE; Mackenzie to Lamont, 28 Aug. 1896; to Taylor, 10 Oct. 1896, Box 53, SD.

22. Great Northern Railway Co. Petition, 22 Feb. 1898; James Hamilton Lewis to SW, 5 March 1898, Box 524, OCE; Report of Board of Engineers, 23 March 1898; Mackenzie to Taylor, 19 April 1898, Box 53, SD; J.L. Wilson to SW, 28 Feb. 1898; Mackenzie to SW, 11 March 1898, Box 524, OCE.

23. Taylor to CE, 21 June 1900, Box 139, OCE; Mackenzie to Taylor, 17 July 1900; Taylor to J.L. Wilson, 28 July 1900, Box 53, SD.

24. Millis to Gillespie, 11 May 1901; Mackenzie to Millis, 29 May 1901, Box 54, SD; *ARCE, 1902*, p. 2417; *ARCE, 1903*, pp. 2332-2333.

25. Semple to R.E. Moody, 17 Sept. 1901; to Symons, 16 Oct. 1901, Box 3, Semple Papers; Hynding, "Semple's Seattle Canal Scheme," pp. 84-85; W.H.

Heuer to Gillespie, 2 June 1902, Box 1009, OCE; John McGraw to Erastus Brainerd, 9 March 1902, Box 3, Erastus Brainerd Papers, UW.

26. Millis to CE, 2 Jan. 1902; to Gillespie, 10 Jan. 1902; Jones to Gillespie, 20 Dec. 1901, all Box 139, OCE.

27. Burke to Brainerd, 13 Dec. 1901, Box 21, Burke Papers; Semple to Symons, 28 Dec. 1901 and 23 Jan. 1902; Symons to Semple, 4 March 1902, Boxes 3, 9, Semple Papers; Millis to Mackenzie, 28 July 1902, Box 139, OCE. On the debate before Congress, see Hynding, "Semple's Seattle Canal Scheme," pp. 83-84, and the correspondence in the Semple and Brainerd papers.

28. "The wonder we had," wrote Thomas Burke after the Board's findings were made public, "was that one could get so sober a report out of so jolly a commission." Burke to Brainerd, 21 Feb. 1903, Box 21, Burke Papers; Heuer, W.C. Langfitt, and Robert P. Johnston to Gillespie, 6 Jan. 1903, in *ARCE, 1903*, pp. 2342, 2345, 2354-2357.

29. *ARCE, 1903*, pp. 2347-2350.

30. *ARCE, 1903*, p. 2350; Chittenden Report, 2 Dec. 1907, Box 176. SD. Millis to Gillespie, 26 Aug. 1903; D.W. Lockwood, et al. to Mackenzie, 8 Nov. 1905, Boxes 54, 56, SD.

31. Semple to Jos. K. McCammon, 20 Feb. 1903, Box 4, Semple Papers; Thomson to N.H. Latimer, 21 April 1906, Box 2, Thomson Papers; Hynding, "Semple's Seattle Canal Scheme," pp. 85-86.

32. For the dredging work, see Millis to Mackenzie, 15 May 1905, Box 57, SD; Ricksecker to Millis, 25 July and 9 Oct. 1901; Millis to Gillespie, 21 Sept. 1903; Clapp to Millis, 6 Nov. 1903, Boxes 52, 55, SD.

33. Millis to Mackenzie, 28 July, 10 Aug., 14 Sept., and 9, 17, and 25 Nov. 1904; 18 Feb. 1905, Boxes 139, 1148, OCE; Thomson to Millis, 10 Aug. 1904, Box 1, Thomson Papers; *ARCE, 1905*, p. 2541.

34. Millis to Gillespie, 7 Jan. 1904, Box 139, OCE; Wilson R. Gay to Taylor, 18 Oct. 1900, Box 53, SD; *P-I*, 7 Jan. 1903; Purvis, "History of the Lake Washington Canal," p. 124.

35. Millis to Mackenzie, 27 July 1905; F.A. Pope to Mackenzie, 4 Feb. 1906, Boxes 1020, 140, OCE; Mackenzie to S.H. Piles, 4 Aug. 1905, Box 56, SD.

36. Thomas Irving to Millis, 19 April 1905, in *ARCE, 1905*, pp. 2544-2545.

37. For an assessment of Chittenden-the-historian, see chapter 4 of Gordon Dodds, *Hiram Martin Chittenden: His Public Career* (Lexington: The University Press of Kentucky, 1973). Lieutenant F.A. Pope served as District Engineer in the brief interval between Millis and Chittenden; Chittenden Diary, 6 May 1906; H.M. Chittenden, "Lake Washington Canal," pp. 1-2, unpub. man. in Chittenden Misc. On matters of health, see Dodds, *Chittenden*, pp. 126-127.

38. Working with Moore was Eugene Semple, who had in the best opportunity-grabbing manner gone over to the side of the north canal. Chittenden, "Lake Washington Canal," pp. 1-2; Chittenden Report, 2 Dec. 1907; H.F. Hodges to Chittenden, 25 June 1906, Boxes 176, 57, SD; James A. Moore to Semple, 4 April and 26 May 1906, Box 8, Semple Papers.

39. Chittenden, "Lake Washington Canal," pp. 1-2. Moore's own professional engineer concluded that the estimate of the lock's cost was a gross understatement. Moore to Semple, 16 Nov. 1906, Box 8, Semple Papers.

40. Chittenden, "Lake Washington Canal," pp. 2-4; Chittenden Diary, 14 April 1907.

41. Eugene Semple tried to secure a payment from the association for his alleged services on behalf of the north canal. Chittenden Report, 2 Dec. 1907; Lake Washington Canal Assn. to Moore, 17 April 1907, Boxes 176, 204, SD; Moore to Semple, 17 Dec. 1906 and 13 May and 25 July 1907, Box 8, Semple Papers.

42. Chittenden to Mackenzie, 11 March and 1 Aug. 1907; to J.S. Brace, 11 June 1907; Chittenden Statement, n.d.; Chamber of Commerce to Piles, 15 Feb. 1907, all Box 176, SD; *ARCE, 1907*, p. 793; Chittenden, "Lake Washington Canal," p. 3; Chittenden Diary, 22 July 1906.

43. Chittenden Memorandum Upon the Lake Washington Canal Project, n.d.; Chittenden Statement, n.d.; Chittenden Report, 2 Dec. 1907, all Box 176, SD.

44. Chittenden Report, 2 Dec. 1907, ibid.; Chittenden to Mackenzie, 19 July 1907, Box 140, OCE.

45. Moore had placed his wooden lock at the eastern end, or head, of the bay. Chittenden to Mackenzie, 11 March 1907; Chittenden Report, 2 Dec. 1907, Box 176, SD; Chittenden to Mackenzie, 19 July 1907, Box 140, OCE; Chittenden to George F. Cotterill, 30 June 1906, Box 8, George F. Cotterill Papers, UW. For a complete discussion of the Major's handling of the lock issue, see Dodds, *Chittenden*, pp. 136-138.

46. Chittenden to Mackenzie, 11 March 1907; Chittenden Memorandum, n.d., Box 176, SD; Chittenden to Thomson, 6 July 1907, two letters of this date, unnumbered box, SD.

47. Minutes of meeting, 8 July 1907; John W. Witham, et al. to Chittenden, n.d.; Cotterill, et al. to Chamber of Commerce, 9 July 1907, all Box 204, SD; Chittenden to John H. McGraw, 6 July 1907, unnumbered box SD; Thomson to William H. Moore, 20 July 1907, Box 2, Thomson Papers; Chittenden to Mackenzie, 19 July 1907, Box 140, OCE; Chittenden Report, 2 Dec. 1907, Box 176, SD.

48. Lockwood to Mackenzie, 30 March 1908, Box 140, OCE; an unwitting investment in a fraudulent land speculation added to Chittenden's woes during 1908. Dodds, *Chittenden*, pp. 138-139, 142-146, 148-149, 152-154; Thomson to Piles, 30 April 1908, Box 2, Thomson Papers; Chittenden, "Lake Washington Canal," pp. 1, 4.

49. C.W. Kutz to CE, 27 July 1909; E.L. Pangburn to Wyckoff, 31 Aug. 1909, Box 176, SD.

50. Kutz to CE, 12 Jan. 1910, Box 140, OCE; Kutz to Thomson, 30 Dec. 1909, unnumbered box, SD.

51. John H. Powell to Kutz, 7 March 1911; Kutz to CE, 18 May 1911, Box 177, SD; Kutz to CE, 6 April 1910; E.H. Crowder to SW, 17 May 1911; Thomas A. Meade to Henry L. Stimson, 20 June 1911, Boxes 140, 141, OCE.

52. J.A. Fowler to SW, 15 June 1911; Burke to Stimson, 8 June 1911; Hearing on Lake Washington Canal, 7 and 22 June 1911; Stimson Findings ... and Instructions, 29 June 1911, all Box 140, OCE; Burr to Kutz, 1 July 1911, Box 177, SD.

53. Cavanaugh to CE, 22 Aug. 1911, Box 177, SD; and 3 Jan. 1912, Box 141, OCE; *ARCE, 1912*, pp. 2853-2854; *ARCE, 1913*, p. 3132.

54. Cavanaugh to CE, 16 and 17 March 1914; to DivE, 9 March 1915, Boxes 173, 177, SD; Cavanaugh to CE, 10 April 1914, Box 141, OCE; *ARCE, 1914*, p. 3258.

55. *ARCE, 1914*, pp. 3257-3258; *ARCE, 1915*, pp. 3430-3432; *ARCE, 1917*, p. 3365; Matthias to DivE, 27 June 1955, File 1517-08.

56. A.W. Sargent to Cavanaugh, 1 Sept. 1916, Box 191, SD; *ARCE, 1917*, pp. 3365, 3377-3379; *ARCE, 1918*, p. 3430.

57. The project, in all its features, was not rated as complete until 1934. *ARCE, 1918*, p. 1817; Matthias to DivE, 27 June 1955, File 1517-08; Chittenden, "Ports of the Pacific," pp. 192-194.

58. *ARCE, 1921*, p. 1931; *ARCE, 1924*, pp. 1824-1825; Edward H. Schulz to CE, 10 Feb. 1921, Box 141, OCE; Robert S. Wilson, et al. to Jones, 27 Sept. 1920, Box 178, Jones Papers; R.G. Powell to DE, 4 Nov. 1920; Schulz to CE, 10 Feb. 1921, two letters of this date; Taylor to CE, 31 March 1922, all Box 141, OCE.

59. Matthias to DivE, 27 June 1955, file 1517-08. In 1941, the District studied but rejected the possibility of a new canal through the original Black River drainage of Lake Washington to the mouth of the Duwamish. B.C. Dunn to DivE, 13 Sept. 1941, Box 421, RH.

60. *ARCE, 1904*, pp. 4203-4217.

61. *ARCE, 1907*, pp. 2471-2472; *ARCE, 1908*, pp. 897-898, 2553-2554; *ARCE, 1909*, pp. 2513-2514; *ARCE, 1910*, pp. 1055-1056, 2739; *ARCE, 1911*, pp. 1117, 3033-3034.

CHAPTER 5

1. George S. Grimes to AG, 7 Oct. 1903, Box 241, SD; Millis to Gillespie, 17 June 1903, Box 1130, OCE.

2. J.S. Hatheway to Joseph Hooker, 5 Sept. 1849, Box 1, PacD; George Stoneman and W.H.C. Whiting to E.D. Townsend, 5 July 1855, AGO; W.S. Harney to AAG, 19 July 1859, DO.

3. Stoneman and Whiting to Townsend, 5 July 1855; G. Clarke to L. Thomas, 14 Sept. 1857, AGO; A. Pleasonton to George Pickett, 18 July 1859; Harney to AAG, 19 July 1859; to S. Cooper, 29 Aug. 1859, all DO.

4. Extract from Army-Navy Commission Report, 1 Nov. 1850, in Fort Worden History, CAD; Stoneman and Whiting to Townsend, 5 July 1855, AGO; Harney to AAG, 19 July 1859, DO; John A. Hussey, "Fort Casey — Garrison for Puget Sound," *PNQ*, 47(April 1956):33-34; Gibbon, "Puget Sound," pp. 417-418.

5. J.G. Totten to SW, 28 May 1860, in Ex. Doc. No. 165, p. 53. In his survey report on the northern railroad route, Isaac Stevens had recommended construction of fortifications at Port Townsend. *Reports of Explorations and Surveys*, 12:346.

6. Totten to SW, 28 May 1860; R.S. Williamson to R. Delafield, 2 June 1866, in Ex. Doc. No. 165, pp. 43, 54-57; Grimes to AG, 11 March 1904, CAD; Gibbon, "Puget Sound," p. 410; Hussey, "Fort Casey," pp. 34-36.

7. George H. Elliott, et al. to Humphreys, 9 Dec. 1867, in Ex. Doc. No. 165, pp. 35-36; H.W. Halleck letter of 22 Nov. 1867, in Fort Worden History, CAD; *ARCE, 1894*, pp. 4-5; Black to Taylor, 5 May 1896, Box 249, SD.

8. Nelson A. Miles to AG, 1 Nov. 1844; to AAG, 7 July 1885; Jno. I. Rodgers, et al. to AAG, 14 Oct. 1884, all in Ex. Doc. No. 165, pp. 16, 19, 21; Hussey, "Fort Casey," pp. 36-38.

9. See Edward Ranson, "The Endicott Board of 1885-1886 and the Coast Defenses," *Military Affairs*, 31(Summer 1967) pp. 74-84.

10. James Lever, "Early Labor Problems During the Construction of Fort Casey," unpublished paper delivered at the 1984 conference on Washington State military history, pp. 1-3. Mendell, et al. to Craighill, 27 June 1895, in Fort Worden History, CAD; J.C. Post to CE, 10 July 1894; Hoke Smith to SW, 20 July 1894, Box 19, OCE; *ARCE, 1895*, p. 17; Hussey, "Fort Casey," p. 38.

11. Wilson to SW, 9 April 1901; Black to Taylor, 1 May 1896, Boxes 902, 325, OCE; Mackenzie to Taylor, 11 Aug. 1896; Black to Taylor, 5 May 1896, Box 249, SD.

12. Ricksecker to Taylor, 19 June and 2 July 1896; Taylor to Craighill, 20 and 30 Nov. 1896, all Box 249, SD; Taylor to Black, 25 July and 8 Aug. 1896; to Craighill, 4 June and 28 July 1856, all Box 325, OCE.

13. The same held true for Marrowstone Point when land outside the reserve was needed for roads and other support facilities. E.S. Otis to Taylor, 3 June 1896, Box 249, SD; Taylor to Craighill, 10 and 19 Oct. 1896 and 10 Feb. 1897, Boxes 325, 45, OCE; *ARCE, 1897*, p. 21, 763; *ARCE, 1898*, p. 810.

14. Taylor to Craighill, 16 Nov. 1896; to CE, 16 Feb. 1897; to Wilson, 27 May 1898; Wilson to SW, 29 April and 6 July 1897, all Box 325, OCE.

15. Lever, "Early Labor Problems," pp. 5-16.

16. Mackenzie to Taylor, 11 Aug. 1896; Black to Taylor, 11 Sept. 1896; Taylor to Wilson, 14 Aug. 1897; Grimes to Millis, 28 July 1904, Boxes 249, 243, SD.

17. Taylor to Craighill, 30 Nov. 1896; to Wilson, 26 March 1897; Mackenzie to Taylor, 16 Jan. 1897, all Box 249, SD; *ARCE, 1899*, p. 1014; *ARCE, 1900*, p. 1035; *ARCE, 1902*, p. 790.

. Joseph E. Kuhn to Taylor, 14 Aug. 1897; Wilson to Taylor, 3 April 1897; ibid.

19. Preston to M.L. Walker, 1 July 1889; R.H. Ober to Millis, 1 July 1901, Boxes 253, 262, SD; Hussey, "Fort Casey," pp. 38-39.

20. Millis to Gillespie, 3 July 1902, Box 241, SD; Heuer to Gillespie, 27 Nov. 1903, Box 1009, OCE; Hussey, "Fort Casey," pp. 40-41; *ARCE, 1900*, pp. 1026-1044; *ARCE, 1901*, pp. 902-903, 908; *ARCE, 1902*, pp. 784-786, 790.

21. S.D. Mason to Millis, 14 Feb. 1905; Millis to Gillespie, 13 July and 11 June 1903, Boxes 242, 241, SD; Tully McCrea to AG, 30 June 1902, CAD. *ARCE, 1900*, pp. 1026-1034, 1037, 1041. Similar difficulties occurred in the construction of Fort Stevens at the mouth of the Columbia River; see Willingham, *Army Engineers and the Development of Oregon*, pp. 66-70.

22. Report of Water Supply Committee, 15 Dec. 1902; Grimes to AG, 7 Oct. 1903, Boxes 246, 241, SD; McCrea to AG, 21 Jan. 1903, CAD.

23. McCrea to AG, 31 Aug. 1902; Grimes to CA, 16 Oct. 1903; to Pope, 28 Oct. 1905, all CAD.

24. Grimes to CA, 2 April 1904, CAD; Grimes to AG, 7 Oct. 1903; Millis to Mackenzie, 20 Feb. 1904, Boxes 241, 244, SD; Millis to Grimes, 19 Nov. 1904; John P. Miner to Military Secy., 16 Dec. 1905; Preston to Millis, 19 June 1901; Chittenden Memorandum on the Defenses of Puget Sound, 23 Nov. 1907, Boxes 242, 244, 262, 313, SD; Clarence Deems to AG, 7 April 1903, CAD; Millis to Gillespie, 29 July 1902, Box 902, OCE.

25. Grimes to AG, 7 Oct. 1903; Miner to Military Secy., 16 Dec. 1905; Chittenden Memorandum, 23 Nov. 1907; John P. Wisser, Report of Inspection, 2-15 June 1904, Boxes 241, 244, 313, SD.

26. Williamson to Delafield, 2 June 1866; Mendell, et al. to Craighill, 27 June 1895, in Ex. Doc. No. 165, pp. 44, 85; Gibbon, "Puget Sound," pp. 411-412.

27. Memorandum, 24 Feb. 1904; Heuer to Gillespie, 2 June 1902, Boxes 902, 1009, OCE; Miner to Military Secy., 16 Dec. 1905; Chittenden Memorandum,

23 Nov. 1907, Boxes 244, 313, SD; E.R. Hills to Military Secy., 26 Dec. 1905, CAD.

28. Millis to Gillespie, 22 Jan. 1904; Heuer to Mackenzie, 15 June 1904; Memorandum, 24 Feb. 1904, Boxes 902, 1009, OCE.

29. Gillespie to Elihu Root, 13 Oct. 1902; to Board of Engineers, 28 Oct. 1902, Boxes 1058, 902, OCE.

30. See Gibbon, "Puget Sound," p. 414.

31. Cavanaugh to CE, 29 April 1916; E.J. Dent to AG, 4 Sept. 1917; Dent Memorandum, 9 Aug. 1917, all Box 313, SD; Acher to CE, 26 Nov. 1917, all Box 1637, OCE; Schulz to Commanding Officer, 20 Sept. 1920, in Fort Worden Record Book, CAD.

32. Hussey, "Fort Casey," pp. 42-43; Donald J. Leehey to J.C.H. Lee, 14 Sept. 1940, Box 313, SD.

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1. Speech to Inland Empire Waterways Association, 27 Nov. 1956, Box 1, Northwest Public Power Association Records, University of Washington Library.

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