NAVIGATION on the COLUMBIA RIVER

LIGHTHOUSE AT NORTH HEAD (Cape Disappointment)

Corps of Engineers

U.S. Army

Portland, Oregon, District

1941

NAVIGATION ON THE COLUMBIA RIVER

TABLE OF CONTENTS

NAVIGATION ON THE COLUMBIA RIVER

Description. - The Columbia River Basin extends from the Continental Divide to the Pacific Ocean and lies between the rugged mountains of British Columbia and the arid regions of Utah and Nevada. The river is 1,210 miles in length and with its tributaries drains an area of 259,000 square miles. From its source in British Columbia, 75 miles north of the International Boundary, the Columbia River flows northwesterly for 200 miles, then turns and flows almost due south a distance of 260 miles, entering the United States near the northeastern corner of the State of Washington. From the International Boundary, the river flows in a general southerly direction a distance of 441 miles through the eastern part of the State of Washington and then turns and flows westward 309 miles between the States of Oregon and Washington to the Pacific. Snake River, the largest tributary, enters the Columbia in Washington just north of the Oregon boundary (See Plate IV).

The Columbia River breaks through the Cascade Range of mountains in a spectacular gorge having a width, from rim to rim, of one to two miles. Basaltic cliffs rise precipitously to heights of more than 3,000 feet above the river channel. In early day voyages, portages at the numerous rapids were necessary, but improvements which have been made have eliminated most of the natural obstructions to navigation on the Columbia River, from its mouth deep into the Inland

Empire.

The river empties into the Pacific Ocean 583 miles north of San Francisco Bay and 153 miles south of the Strait of Juan de Fuca. Cape Disappointment, a high, rocky headland lies to the north, and Clatsop Spit, a low sand point, to the south of the entrance. Clatsop Spit extends a distance of 2-1/2 miles northwesterly from Point Adams, the original mainland, at the southerly side of the entrance. The distance between Point Adams and Cape Disappointment is about 6 miles.

Snake River has a drainage area of 109,000 square miles. It rises in Yellowstone National Park in Western Wyoming, flows westerly across Idaho and northerly along the boundary between the States of Oregon and Idaho to Lewiston, Idaho, thence westerly across the southeast corner of the State of Washington to its mouth. Other important tributaries above the mouth of the Snake include the Clark Fork, which drains a large area in Western Montana and enters the main stream near the International Boundary; the Kootenai, which lies largely in Canada and enters the Columbia from the northeast some 30 miles above the International Boundary; and the Spokane, Okanogan, Chelan, and Yakima Rivers. The important tributaries of the Columbia River below the Snake are the Walla Walla River in Oregon and Washington, the Umatilla, John Day, Deschutes, and Willamette Rivers in Oregon, and the Klickitat, White Salmon, Lewis, and Cowlitz, in Washington.

The extreme low-water flow of the Columbia above the mouth of the Willamette River is about 50,000, and the maximum discharge of record about 1,160,000 cubic feet per second. The effect of the tides

is observed on the Columbia to a point about 36 miles above Vancouver and on the Willamette River from its mouth to the foot of the falls at Oregon City.

History. - As early as the 16th Century, Spanish explorers had sailed past the broad mouth of the Columbia River without noting its existence. The white man's knowledge of the "River of the West" was purely legendary prior to its entrance by Captain Robert Gray in the American ship Columbia on May 11, 1792. Earlier navigators had suspected, but were not certain of, the existence of a large fresh water stream at this locality. This may have been due to the sand bars which almost completely screened the entrance or to the usually heavy seas breaking on the sands which presented formidable difficulties to the near approach or passage of the small sailing vessels in use at that time. It is fitting that the river was named for Captain Gray's ship, which played a noteworthy part in exploration of the waters of the Pacific Northwest.

Captain Gray's ship was followed into the Columbia River by the American brig Jenny in command of Captain Baker, whose name is given to the bay situated just inside the entrance, in the lee of Cape Disappointment.

Captain George Vancouver, of the British Royal Navy, made a voyage of exploration to the North Pacific Ocean in command of the sloop of war Discovery and an armed tender, the Chatham in the years 1790 to 1795. Having learned of the discovery of the Columbia River from Captain Gray, Captain Vancouver assigned the task of further

exploration to Lieutenant W. R. Broughton, who proceeded in a small boat to Vancouver Point, site of the present city of Vancouver, Washington in the fall of 1792. On this voyage of exploration, names were assigned to a number of streams and land marks, a few of which have survived. Among these are: Youngs River, Tongue Point, Grays Bay, Puget Island, Walker Island, Mt. Coffin, Warrior Rock, Vancouver, and Mt. Hood.

By 1796, a number of ships engaged in the fur trade were making the estuary of Columbia River a regular port of call. Lewis and Clark, entering upon the last lap of their westward journey of exploration in 1805 reached the Clearwater River, which they followed to its junction with the Snake, thence down the Snake River to the Columbia. The descent of the Columbia River to its mouth was made in canoes, portages being made at the numerous rapids. The journal of Lewis and Clark is the first authentic record of navigation on the Columbia River above Vancouver by white men, though French trappers and fur traders had previously operated their bateaux in the upper reaches of the stream

The settlement of Astoria had its beginning upon the arrival of John Jacob Astor's ship, the Tonquin on March 24, 1811. The first steam-propelled craft to enter the river was the Hudson Bay Company's Beaver, in 1836. The Oregon legislature passed a law in 1846 authorizing the governor to appoint a pilot commission. In April, 1847, the first pilot's license on the Columbia River was granted and shortly thereafter coastwise shipments of lumber began, stimulated by the discovery of gold in California in 1849. Four years later, the first cargo of export lumber was shipped, from Portland, Oregon, to Australia.

During this period, vessels of about 20-foot draft could enter the river in its unimproved condition, though the crossing was hazardous on account of the shifting nature of the channels in the wide bar at the mouth.

The first river-type steamer to ply the Columbia was a 90-foot side-wheel vessel named the Columbia. She was built at Astoria and made her initial trip on July 3, 1850. Shortly afterward, the 160-foot Lot Whitcomb was placed in service. These two pioneer river steamers plied between Astoria and Vancouver on the Columbia and to Oregon City on the Willamette. The freight rate between Astoria and the upper settlements on these first vessels was $25 per ton and the fare $25 per passenger.

A Coast Survey chart of the entrance was prepared in 1851, and in October 1856 the lighthouse on Cape Disappointment was completed. The year 1868 marks the first direct shipments of wheat in the export trade from Portland, and by 1874 there were 85 ships in the grain fleet out of Portland, the largest having a tonnage of 1,346 and the smallest 291.

Two of the largest warships in the American Navy, the cruisers Baltimore and Charleston (4,600 and 4,044 tons, respectively), ascended the river to Portland in 1892, 100 years from the date of discovery. These were the largest vessels to enter the river up to that time, and it was stated by their commanders that the Columbia was the only stream in America which their vessels could ascend for 100 miles.

Photo No. 1. ENTRANCE TO COLUMBIA RIVER.
Showing North and South jetties.
Cape Disappointment in foreground.

Surveys and charts. - The first published chart of the waters of the Pacific Northwest is that prepared from the records of Captain George Vancouver's voyage of exploration and discovery, 1790 to 1795. On this early chart an insert shows, in some detail, the estuary of the Columbia River. Soundings and other data were obtained, no doubt from the records of Lieutenant Broughton, who made a voyage up the Columbia River as far as Vancouver. (See Plate I). It has been stated that William A. Slacum of the U. S. Navy made a survey of the estuary in 1836 under the direction of President Jackson, though no charts of this survey have been found. Sir Edward Belcher, of the British Admiralty, surveyed the entrance in considerable detail in 1839, and copies of the chart prepared from this survey are available. The next survey was made in 1841 by Captain Charles Wilkes, who was in command of the U. S. Ex Ex. The Wilkes expedition also mapped the Columbia River as far as the mouth of the Snake River and many interesting notations are to be found on this map. (See Plate II).

The first chart of the U. S. Coast Survey bears the date of 1851. Beginning in 1875, and excepting the years 1877, 1884, 1887, and 1888, surveys of the entrance have been made annually by the Corps of Engineers, United States Army. The 1941 survey is shown on Plate III. The execution of the Federal river and harbor and power projects referred to in the following paragraphs, except Grand Coulee, has been carried out by the Corps of Engineers.

Improvements at the mouth. - Originally there were from one to three channels across the bar at the mouth of the Columbia, shifting rapidly in location and with depths of only 19 to 21 feet. Navigation improvements at the mouth of the river were inaugurated by the River and Harbor Act of July 5, 1884. This act provided for the construction of a south jetty extending seaward from Point Adams, a distance of 4-1/2 miles. Construction operations for this first improvement extended from April 1885 to October 1895. Extensions of the south jetty, which have since been made have provided a structure with a total length of about 7 miles and as rehabilitated in 1932-35 is now about 26 feet in height above low water and contains about 8,000,000 tons of rubble stone. Construction of a concrete terminal extending 1200 feet shoreward from the outer end, to prevent ravelling of the enrockment, is now under way. Construction of the north jetty was authorized by the River and Harbor Act of March 3, 1905. However, work was not begun until 1913 and the jetty was completed in 1917.

The existing Federal project provides for a channel 40 feet deep and not less than one-half mile wide over the ocean bar. The improvements have resulted in a stabilized channel with a present depth of 46 feet at mean lower low water on the entrance range, and depths of 40 feet and over prevailing over a width of about one mile (See Plate III). No dredging has been necessary since 1918.

Expenditures for new work and maintenance at the mouth of the Columbia River to June 30, 1941, have amounted to $22,531,320.83. In addition, local interests have contributed $500,000 for new work.

River improvements, Portland to the Sea. - In 1853, Portland was a small village struggling for existence. Shipping was continually being held up on account of the troublesome bars in Willamette River below Portland and in Columbia River above St. Helens. Steamers would occasionally ground on the bars below St. Helens but were usually able to free themselves at high tide. On account of these conditions some of the vessels engaged in regular service made St. Helens their up stream terminus on the Columbia, and a considerable part of the commerce in these early days was moved from the vicinity of Portland on lighters to points on the lower river.

Increased use of the river by ships in foreign and coastwise trade and the growing importance of Portland as a commercial center resulted in the adoption in 1877 of a project which provided for a channel depth of 20 feet between Portland and the sea. Prior to the adoption of the original project, however, expenditures of some $222,000 for dredging to provide temporary relief had been made. In 1891, the project was revised to obtain a low-water channel depth of 25 feet at an estimated cost of $772,464, and the Port of Portland Commission was granted permission to assist in carrying out the execution of the project. The Act of July 25, 1912, provided for increasing the main channel depth to 30 feet.

The existing Federal project authorized by the Act of July 3, 1930, provides for a 35-foot depth in a channel 500 feet wide from Portland to the sea, and a channel 300 feet wide and 30 feet deep from Vancouver to the mouth of the Willamette River (5 miles), together with turning

basins at Vancouver and auxiliary channels at Cathlamet, St. Helens and Rainier.

Annual freshets in the Columbia caused shoaling of dredged channels, and a shifting of alignment, so that maintenance of deeper projects formerly required the use of three large dredges almost continuously. In order to reduce the amount of maintenance dredging and stabilize the channel a system of permeable pile and stone spur dikes were devised and constructed. One hundred thirty-seven of these dikes have been placed in the river above the estuary and have resulted in marked improvements in the channel and a material reduction in the amount of maintenance dredging. Less dredging is now necessary for maintenance of the 35 foot channel than was formerly done on the 30 foot project. The largest commercial vessels now operating on the Pacific can ascend the river to Portland without difficulty. Project costs to June 30, 1941 amounted to $17,158,922.91. In addition, local interests have contributed $126,890.81 for new work.

Photo No. 2. COLUMBIA RIVER AT VANCOUVER, WASHINGTON. Facilities for deep water navigation have aided in making Vancouver an industrial center.

Photo No. 3. WILLAMETTE RIVER AT PORTLAND, OREGON. (May 23, 1938.) Situated 105 miles from the sea, Portland, with a population of 305,000, is the principal shipping center of the Columbia River Basin. A 35-foot channel in the Columbia and lower Willamette Rivers provides for navigation by the largest vessels.

Navigation above Vancouver. - The principal obstacle to early navigation on Columbia River between Vancouver and The Dalles was at Cascade Rapids, 45 miles above Vancouver. In early-day voyages, portages around Cascade Rapids were made with wagons. A tramway was constructed in 1859, and in 1862 a steam railway was built along the Washington shore from the foot to the head of the Cascades. Later, a steam portage railway was built on the Oregon side.

The first steamer to navigate the river between the head of Cascade Rapids and The Dalles was the James P. Flint, a small propeller-driven vessel which was hauled on lines over the rapids in 1851. Four vessels plied this reach of the river until completion of the railroad from Portland, Oregon, to Wallula, Washington, in 1882, when this boat service was discontinued. The Cascades Canal, by-passing the rapids, was begun in 1878 and opened for navigation in 1896, but navigation below the locks for a distance of several miles was still difficult on account of the strong currents. Cascade Rapids are now drowned out in the pool above Bonneville Dam.

The Oregon Steam Navigation Company was incorporated at Vancouver, Washington, December 29, 1860. This company carried on a very successful operation on Columbia River until 1879, when it was taken over by the Oregon Railway and Navigation Company. Beginning with two or three small sternwheelers built for short trips out of Portland, the pioneer company developed an extensive system covering nearly every important route in the northwest and finally tapped the Inland Empire with nearly 2,000 miles of railroad.

Freight and passengers were transferred between The Dalles and Celilo (11 miles) over a wagon road until 1862 when a portage railroad was constructed. In the same year, gold was discovered on the Salmon River in Idaho, and during the next four years 10 or 12 boats were in operation on the river above Celilo. These boats ran regularly as far as Lewiston, Idaho, and made occasional trips on the Clearwater and on the Snake above Lewiston. Activity declined from 1866 to 1870 and most of the boats were taken to lower river points. In 1882, upon completion of the railroad between Portland and Wallula (the present Union Pacific Railroad), regular boat service above Celilo Falls was discontinued. A few boats continued to operate on the Snake River above the railroad crossing at Riparia. Navigation in the reach between The Dalles and Celilo was made possible by the present canal, completed in 1915, although until recent years not much use was made of the waterway provided. Navigation of the reach between the Cascades Canal and The Dalles continued until June 1923, when regular boat service was discontinued on account of lack of business. Since the completion of Bonneville Dam and ship lock, there has been a revival of river commerce between Vancouver and The Dalles and to the mouth of the Snake River.

One of the high-lights in the memory of many residents of the Pacific Northwest is the boat trip up Columbia River to The Dalles. For some 25 years prior to 1920, a number of steamers made this round trip daily, carrying passengers and freight. Some of the best known boats of this era were the Regulator, Dalles City, Charles R. Spencer, and Bailey Gatzert. These steamers were excellently appointed,

sturdily constructed and designed for speed. Leaving Portland at the same time, boats of rival companies often raced to Cascade Locks, as the first to obtain passage through the locks was the first to reach The Dalles. During one June freshet, when the locks could not be operated, the Bailey Gatzert was brought down safely over Cascade Rapids with upwards of 100 passengers on board. In earlier times, a few boats had run these rapids and a lesser number had successfully negotiated Celilo Falls and the intervening swift water and tortuous channel from there to The Dalles. The daring exploits of early-day steamboat captains form an interesting chapter in the river's history.

Improvement of the reach between Vancouver, Washington, and Bonneville, Oregon, authorized by the River and Harbor Act of August 26, 1937, will provide upon completion (probably early in 1942) a navigable channel 27 feet deep and 300 feet wide. A ship lock at Bonneville provides for navigation past the Bonneville Dam, and the pool created by the dam has a navigable depth of 30 feet extending for 47 miles through the gorge to the foot of Five Mile Rapids at the entrance to the Dalles-Celilo canal, 3½ miles above The Dalles. These improvements will enable ocean-going vessels of moderate draft to ascend the river for 190 miles. Navigation by river craft around the falls and rapids extending 12 miles above The Dalles is afforded by The Dalles-Celilo canal, a lateral waterway 8.6 miles long, 8 feet deep, and 65 feet wide, with locks 265 feet long, 45 feet wide and 7 feet deep over the sills. The total lift is 56 feet at low water and 62 feet at high water. From Celilo to the mouth of the Snake

(123 miles), the Columbia River lies in a narrow valley, which is in places 1,000 feet below the surrounding plateau. The low-water fall totals 185 feet, about half of which occurs through 21 rapids having a combined length of 20 miles and low-water gradients of 2 to 10 feet per mile. The authorized project for improvement provides for the excavation of a channel 7 feet deep and 150 feet wide through these rapids to Wallula, and a channel of no prescribed dimensions in the 10-mile reach thence to the mouth of the Snake. Navigation is hindered at present in the reach between Wallula and the mouth of the Snake by the Homly Rapids. Work now in progress at that point will provide a controlling depth of 5 feet for a width of 100 feet. However, the channel is tortuous and velocities range up to 8 miles per hour.

The Snake River is a swift-flowing stream in a generally deep and narrow valley. The fall at low water in the 139-mile reach below Lewiston, Idaho, totals 393 feet, three-fourths of which occurs through 56 rapids having a combined length of 45 miles and slopes ranging from 3 to 12 feet per mile. The authorized project for improvement of this stream provides for removal of rock reefs, dredging gravel bars and the construction of contraction works with a view to securing a channel depth of 5 feet at low water from the mouth to Lewiston and for the removal of obstructive rocks and reefs between Lewiston and Johnson's Bar, a total distance of 232 miles.

A comprehensive plan for ultimate development of Columbia and Snake Rivers in the interest of navigation, irrigation and the development of hydroelectric power is contained in House Document No. 704, 75th Congress, 3rd Session. Construction of a series of locks and dams, under the plan presented, would provide for slack-water navigation from the head of the Bonneville pool to Grand Coulee Dam on the Columbia and a combination of open river and slack-water navigation on the Snake River to Asotin, Washington. Designs and estimates are based on provision of adequate fishways, and of navigation locks 56 feet wide, 360 feet long, and 9 feet deep. Backwater from the Grand Coulee Dam will extend nearly to the International Boundary, but no navigation facilities are provided at the dam.

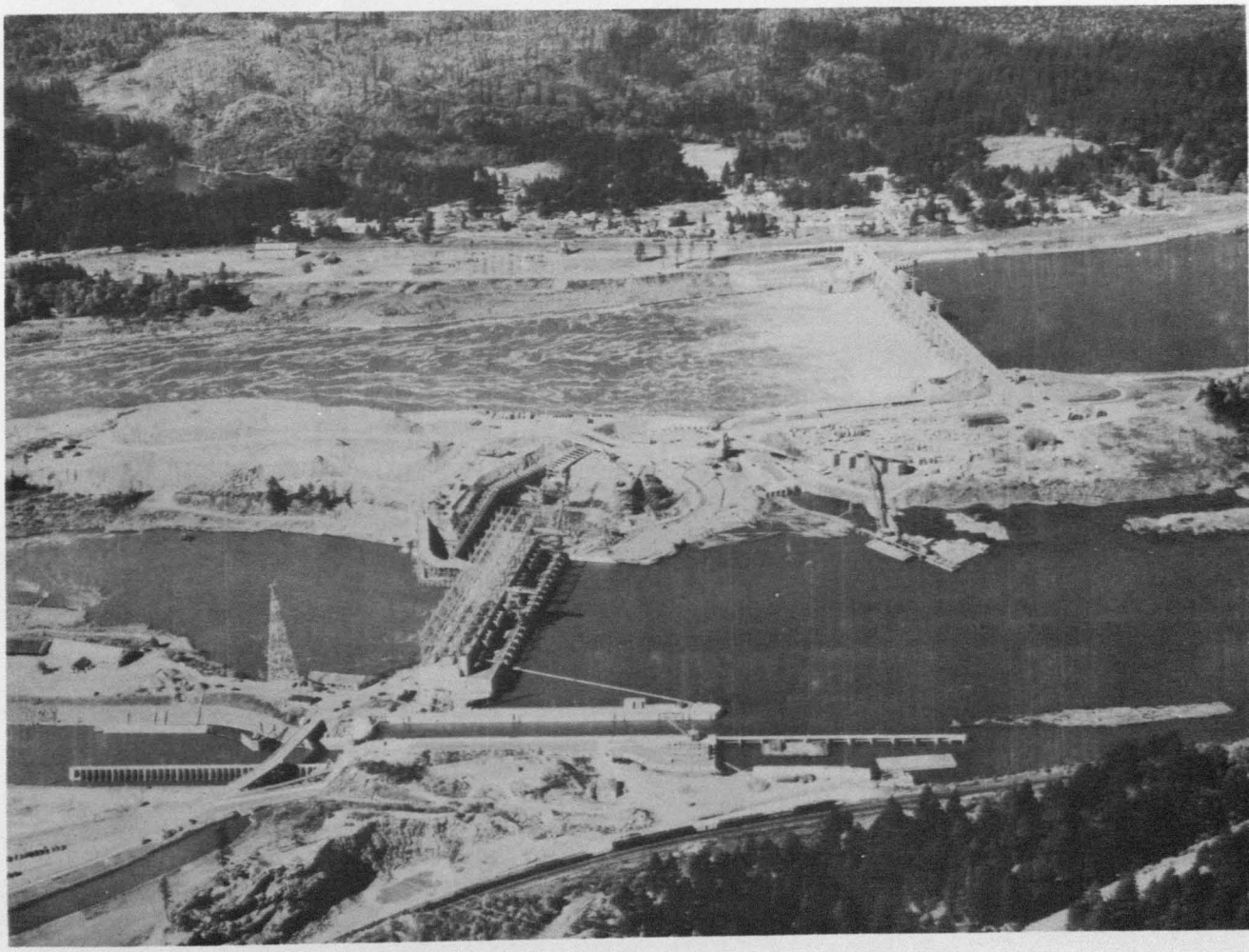


Photo No. 4. BONNEVILLE DAM.
Navigation on the Columbia River by ocean-going vessels as far as The Dalles, 83 miles above Vancouver, has been made possible by the construction of this dam and a ship lock, 76 feet wide and 500 feet long. When complete, a 10-unit power plant will furnish 518,400 kilowatts of power.

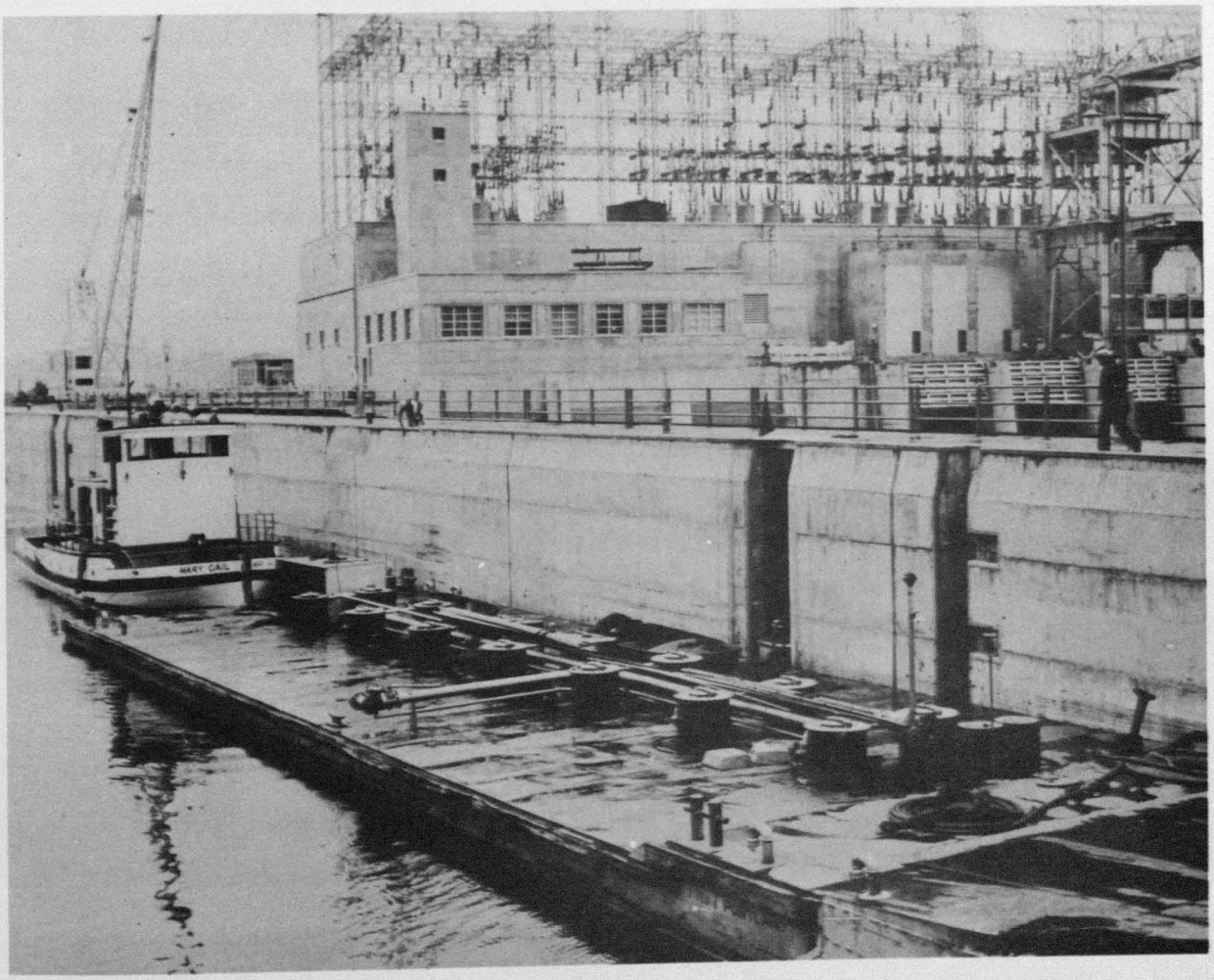


Photo No. 5. OIL BARGE IN BONNEVILLE LOCK.

Present river traffic. - Ocean-going traffic on the Columbia and Lower Willamette Rivers below Vancouver, Washington, and Portland, Oregon, consists of tankers, general cargo vessels and lumber carriers, with average loaded drafts ranging from 18 to 31 feet. Internal traffic consists of river cargo boats, tug boats, barges and rafted logs. Water-borne commerce on the Columbia and Lower Willamette Rivers during the calendar year 1940 was valued at nearly $335,000,000. The total tonnage handled amounted to a little more than 15,000,000, of which 62-1/2 percent consisted of vessel cargoes and the remainder rafted logs.

The traffic between Vancouver, Washington, and The Dalles, Oregon, consists principally of fuel oil and gasoline upstream, and wheat downstream, with drafts of loaded vessels ranging from 6 to 11 feet. Some logs and piling are towed to Portland and other cities from points above and below Bonneville. Commerce during 1940 was valued at $26,500,000 and amounted to about 1,500,000 tons, one-half of which was rafted logs and piling.

Traffic passing through The Dalles-Celilo Canal (controlling depth 7 feet at low water) and moving on the river between Celilo and the mouth of Snake River is carried by vessels having loaded drafts of 5 to 7 feet, towed barges being largely used. The value of the commodities handled in 1940 amounted to more than $9,000,000 with tonnage of 323,000. The greater part of the petroleum products transported upstream was delivered at Attalia, Washington, and a large percentage of the wheat shipped downstream originated in the same vicinity. In

recent years, there has been considerable activity in interior trade, the traffic increasing 150 percent in 1940 over that of 1939, and recently showing further marked increases.

River Terminals. - At Astoria, Oregon, there is a large municipal terminal with grain elevator and flour mill. There are also a number of private wharves for the shipment of canned salmon, lumber and flour, and for the receipt of coal, oil, and general merchandise.

Two of the largest sawmills in the Pacific Northwest are located at Longview, Washington, 65 miles above the mouth. A public terminal is maintained by the Port of Longview and both of the mill companies have wharves for the shipment of lumber.

At Kalama, Washington, 73 miles above the mouth, there is a municipal wharf for the shipment of lumber.

The Port of Vancouver, Washington, has two municipal terminal wharves and there is a privately-owned grain elevator. In addition to the public terminal facilities listed, there are numerous privately-owned wharves on the Columbia River between Astoria and Vancouver, for the accommodation of river boats and for the shipment of lumber in ocean-going carriers.

In Portland, there are three river terminals for general cargo which are under public ownership. In addition, there are two public drydocks with capacities of 10,000 and 15,000 tons each. Under private ownership, but open to the public on equal terms, are 11 general cargo, 5 grain and flour, 6 lumber, 1 cement, and 9 crude oil and gasoline terminals besides numerous outfitting and storage wharves.

There are, at present, no terminals suitable for ocean vessels on the Columbia River between Vancouver, Washington, and Bonneville, Oregon, though there are a number of wharves for the accommodation of barges and river boats.

The Port of The Dalles (44 miles above Bonneville) has a municipal wharf for use of both ocean-going and river boats. In addition, there is a municipal oil terminal situated about a mile below the main wharf. Near the oil terminal are a number of privately-owned storage tanks. Bulk grain is handled in a privately-owned elevator.

In the reach of the river from The Dalles to the mouth of the Snake, there are no public wharves, but a number of facilities have been provided for transferring bulk grain from trucks to river craft and for transferring oil from river barges to storage tanks on shore. There are privately-owned grain elevators at Umatilla and Blalock on the Oregon side of the Columbia River and at Port Kelley and Attalia, in Washington. At Umatilla, Oregon, and also at Attalia, Washington, there are private storage tanks with capacities of about 5,000,000 gallons for handling petroleum products from river boats and barges. Terminals are also under construction or proposed for early construction at Arlington, Oregon, and at Kennewick and Pasco, Washington.

The effect of navigation improvements upon industrial development.- The growth of cities in the Columbia River Basin is associated closely with the improvement of the rivers for navigation. The largest ships have, for some time, been able to ply between the mouth of the Columbia River and Portland, and the 27-foot project between Vancouver and The Dalles is nearing completion. These river improvements and the power

supply available in the Pacific Northwest provide for almost unlimited possibilities in industrial expansion. Water transportation is vital to logging and lumbering, long the sustaining industries of the region. Recently, the manufacture of aluminum has become an important industry in the Columbia River Basin, made possible by the power available from Bonneville Dam and facilities for navigation by ocean-going vessels. The building of new ships and the conversion of vessels for use in the program of National Defense have also become activities of considerable importance.

Resume. - The discovery of Columbia River by Captain Robert Gray, the eventful journey of Lewis and Clark, and the voice of early settlers, were deciding factors in fixing the territorial claim of the United States to the Oregor Country and led to the eventual establishment of the 49th parallel of latitude as the north boundary.

Since the time when pioneers began to arrive in the Northwest over the "Oregon Trail", agricultural and commercial development has been intimately associated with the navigation of the waterways of the region. In this, the Columbia River and its tributaries have had an important role. The discovery of gold in California, in Idaho, and in Alaska; the inception of the great lumber industry; the first shipment of grain and many other momentous events have all had their influence on the progress of navigation on the Columbia River.

Today, navigation on the improved waterways of the Columbia River Basin continues to be one of the principal factors in the economic welfare of the Pacific Northwest. Comprehensive plans for future river improvements are designed to keep pace with as well as to stimulate the commercial and industrial development of the region.

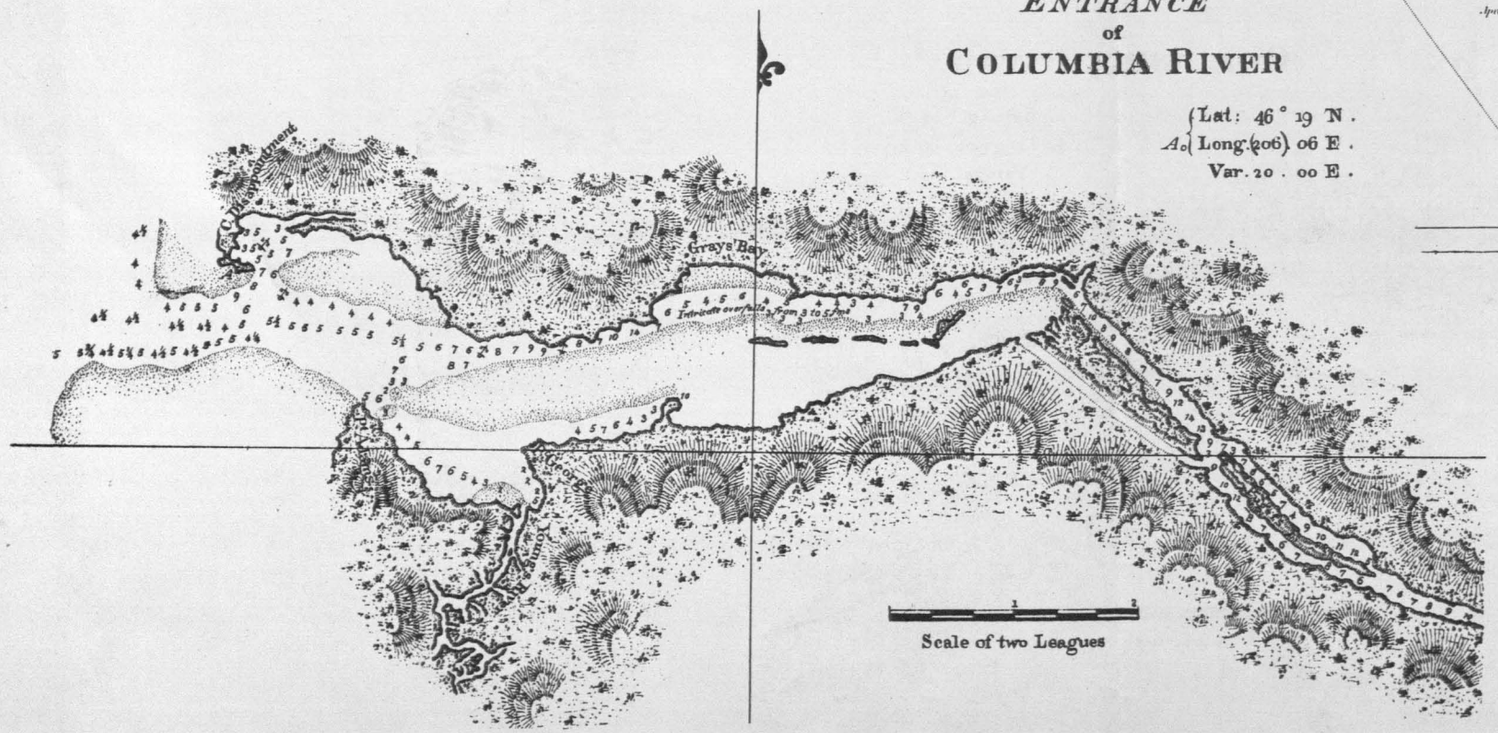
MILEAGE TABLES

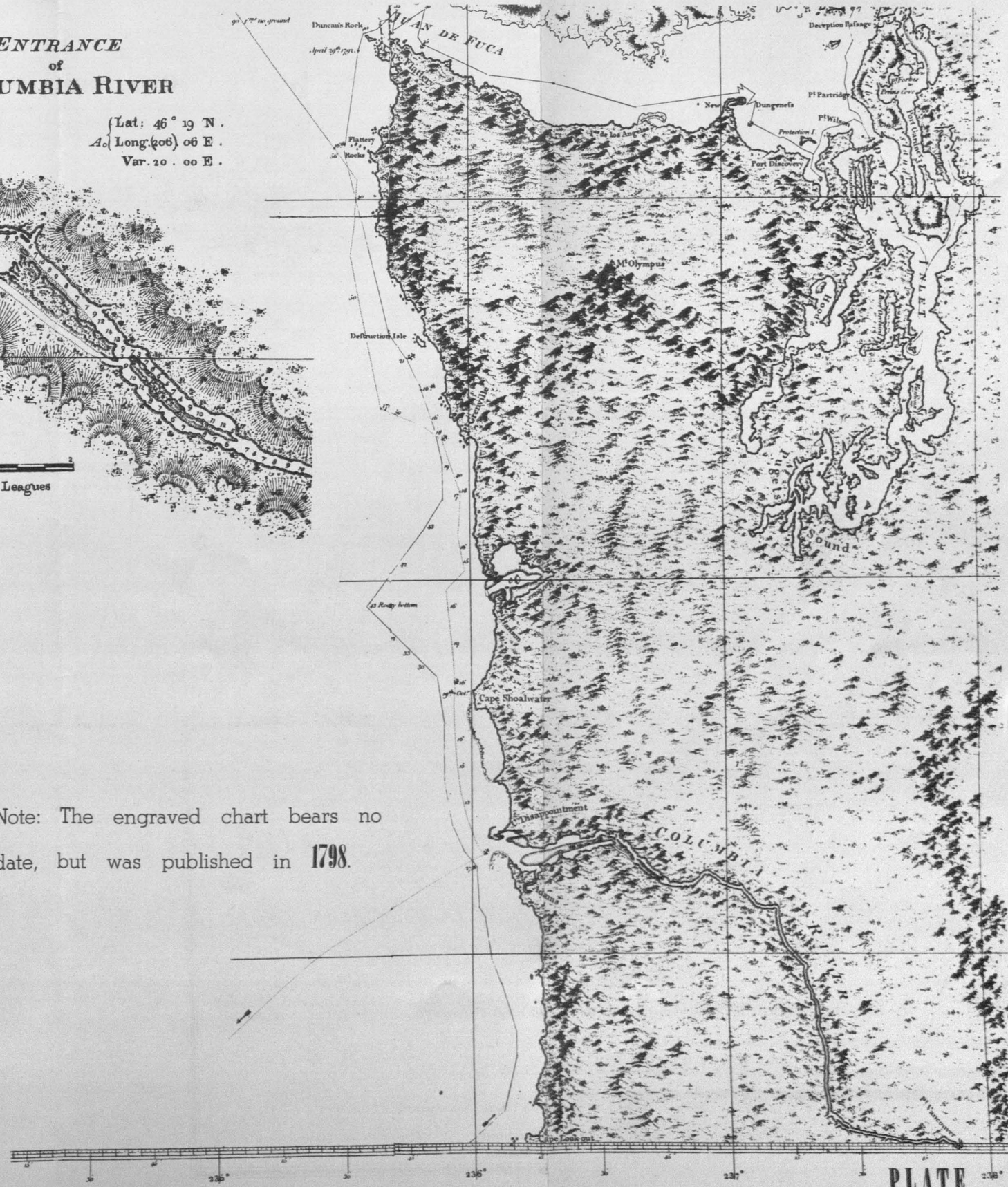
(a) Columbia River

Miles From Mouth	Point
14	Astoria, Ore.
66	Longview, Wash.
75	Kalama, Wash.
101.5	Mouth of Willamette River
106	Vancouver, Wash.
145	Bonneville Dam
149	Cascade Locks, Ore.
189.5	The Dalles, Ore.
201	Celilo, Ore.
233	Blalock, Ore.
242	Arlington, Ore.
289	Umatilla, Ore.
312	Port Kelley, Wash.
314	Wallula, Wash.
318	Attalia, Wash.
324	Mouth of Snake River
328	Pasco and Kennewick, Wash.
400	Priest Rapids
599	Grand Coulee Dam, Wash.
749	International Boundary

(b) Snake River

68	Riparia, Wash.
84	Central Ferry Bridge, Wash.
139.5	Lewiston, Idaho
148	Asotin, Wash.
176	Oregon-Washington boundary line
232	Johnson Bar Landing





A CHART

shewing part of the

COAST OF N.W AMERICA,

with the tracks of His *MAJESTY's* Sloop

DISCOVERY and Armed Tender CHATHAM;

Commanded by GEORGE VANCOUVER Esq.r and prepared

under his immediate inspection by Lieut. Joseph Baker, *in which*

the Continental Shore has been traced and determined from

Lat: 45°. 30 N. *and* Long. 236°. 12 E. *to* Lat: 52°. 15 N. *and* Long. 232°. 40 E.

at the different periods shewn by the Tracks

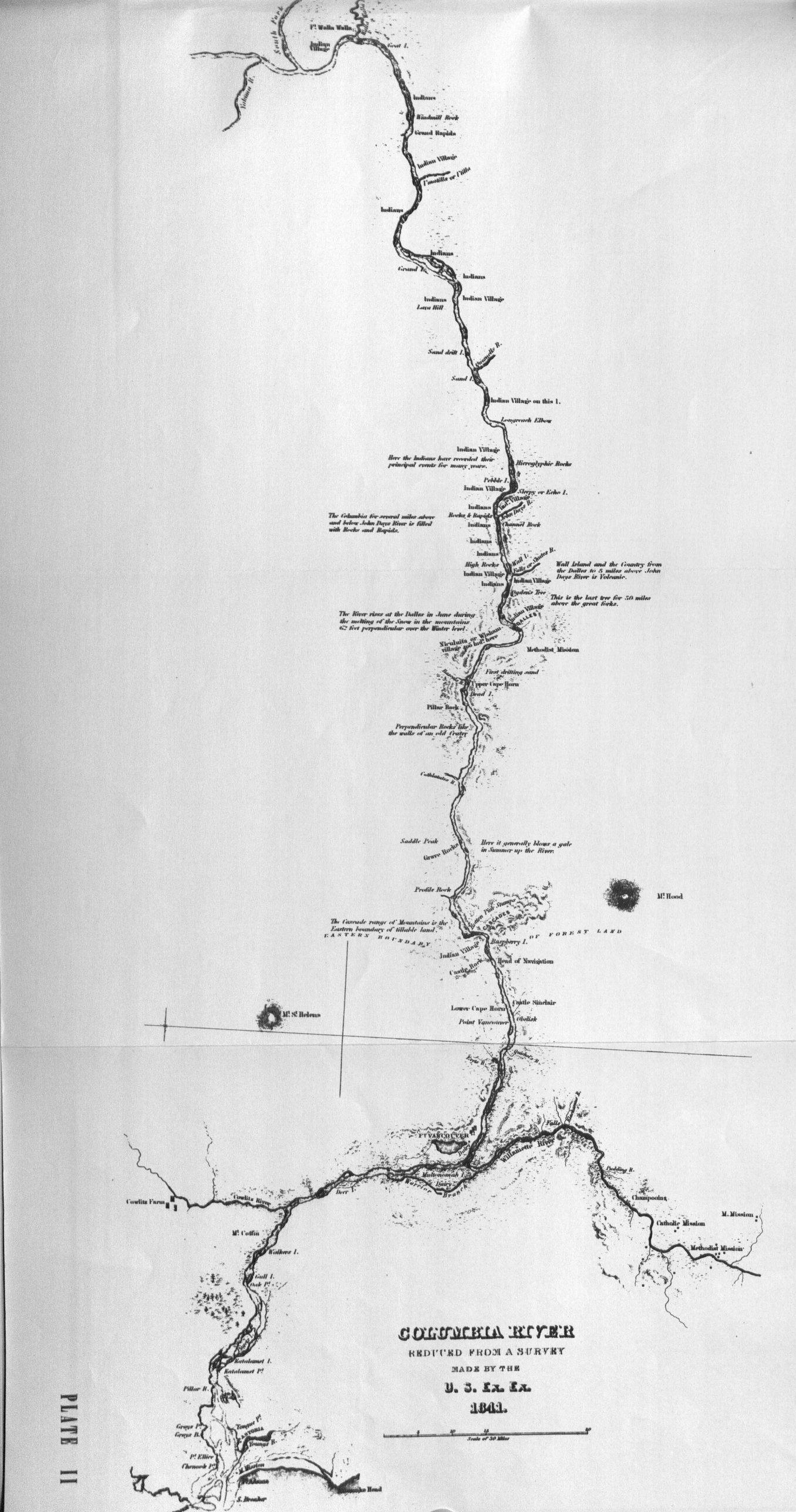
The parts not shaded are taken from Spanish Authorities.

denotes the Vessels track Northward *their return Southward.*

Warner Sculp:

Note: The engraved chart bears no date, but was published in **1798**.

PLATE



COLUMBIA RIVER

REDUCED FROM A SURVEY

MADE BY THE

U. S. Ex. Ex.

1841.

PLATE II

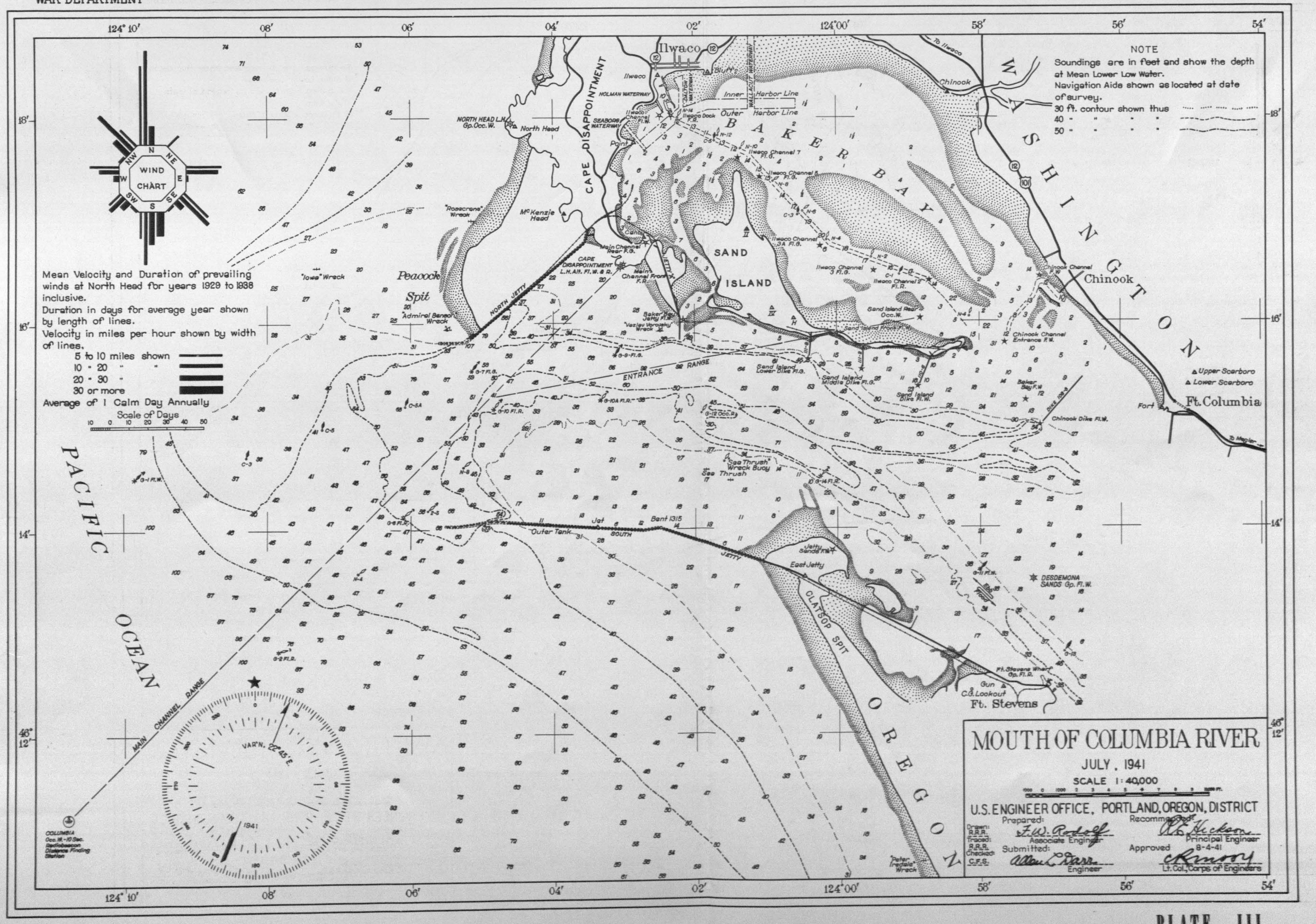
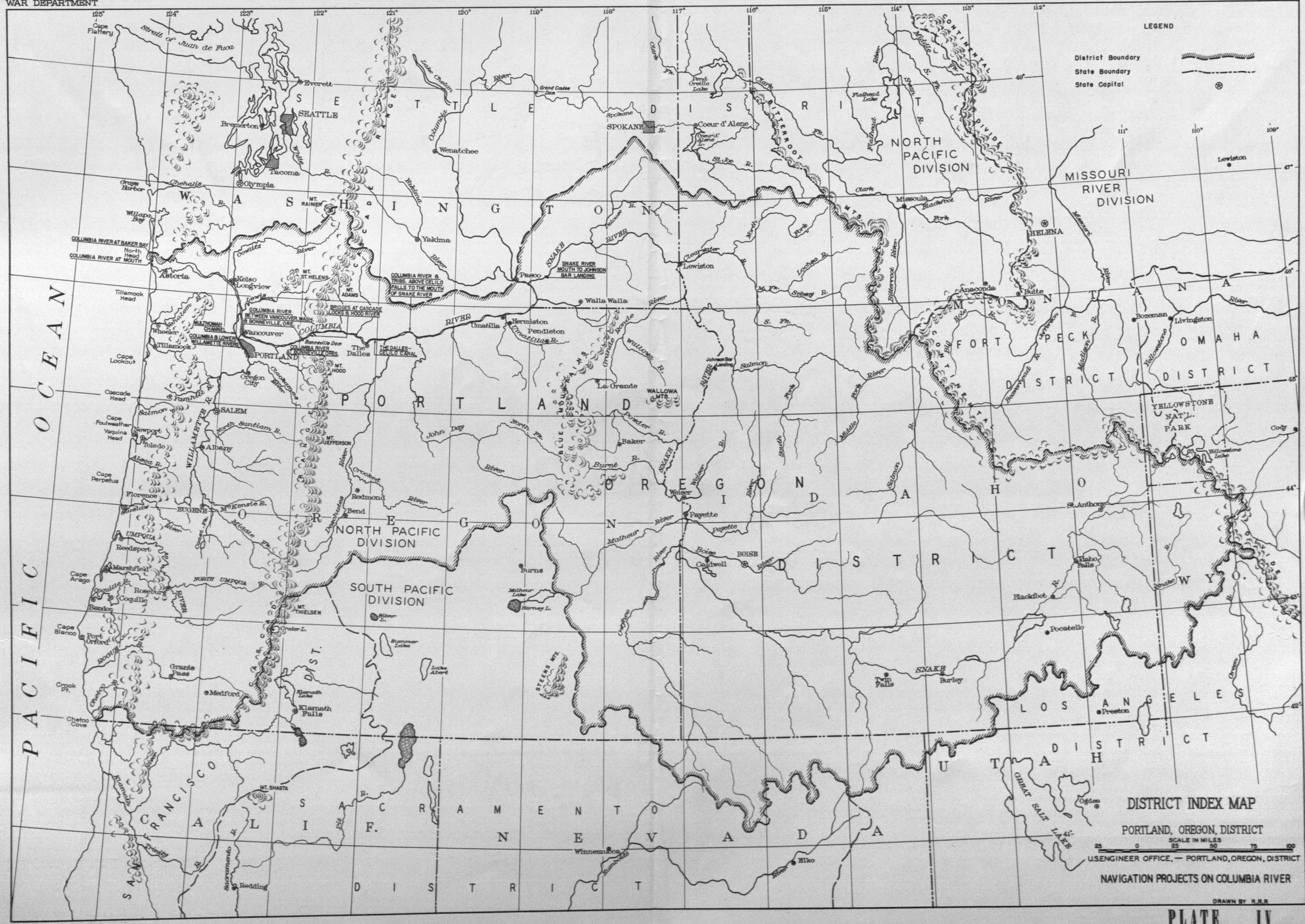

MOUTH OF COLUMBIA RIVER
JULY, 1941
SCALE 1:40,000
U.S. ENGINEER OFFICE, PORTLAND, OREGON, DISTRICT
Prepared:
Recommended:
Principal Engineer
Associate Engineer
Submitted:
Engineer
Approved
8-4-41
Lt. Col., Corps of Engineers
NOTE
Soundings are in feet and show the depth at Mean Lower Low Water.
Navigation Aids shown as located at date of survey.
30 ft. contour shown thus
40 " " " "
50 " " " "
WIND CHART
Mean Velocity and Duration of prevailing winds at North Head for years 1929 to 1938 inclusive.
Duration in days for average year shown by length of lines.
Velocity in miles per hour shown by width of lines.
5 to 10 miles shown
10 " 20 " "
20 " 30 " "
30 or more
Average of 1 Calm Day Annually
Scale of Days
Ilwaco
Bluff
Inner Harbor Line
Outer Harbor Line
BAKER BAY
WASHINGTON
Chinook
SAND ISLAND
CAPE DISAPPOINTMENT
North Head
Point
McKenzie Head
Peacock Spit
NORTH JETTY
ENTRANCE RANGE
Jat
Bent 1315
Outer Tank
SOUTH JETTY
East Jetty
CLATSOP SPIT
OREGON
PACIFIC OCEAN
MAIN CHANNEL RANGE
VAR'N. 22° 45' E.
1941
Ft. Columbia
Ft. Stevens
Upper Scarboro
Lower Scarboro
DESDEMONA SANDS Gp. Fl. W.
"Sea Thrush" Wreck Buoy
Sand Island Rear Occ. W.
Chinook Channel Entrance F.W.
Chinook Dike Fl. W.
Sand Island Middle Dike Fl. G.
Sand Island Lower Dike Fl. G.
Sand Island Dike Fl. W.
Baker Bay F.W.
Ft. Stevens Wharf Gp. Fl. R.
Gun
C.G. Lookout
Jetty Sands Fl. W.
"Peter Iredale" Wreck
"Rosecrans" Wreck
"Iowa" Wreck
Admiral Benson Wreck
"Vazjau Voroshilov" Wreck
NORTH HEAD L.H. Gp. Occ. W.
COLUMBIA Occ. W. -10 Sec. Radiobeacon Distance Finding Station
124° 10'
08'
06'
04'
02'
124° 00'
58'
56'
54'
18'
16'
14'
46° 12'

PLATE III

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



DISTRICT INDEX MAP

PORTLAND, OREGON, DISTRICT

U.S. ENGINEER OFFICE, — PORTLAND, OREGON, DISTRICT

NAVIGATION PROJECTS ON COLUMBIA RIVER

DRAWN BY R.R.R

PLATE IV