DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 378

PROFILE SURVEYS IN 1914
ON
MIDDLE FORK OF WILLAMETTE RIVER AND WHITE RIVER, OREGON

PREPARED UNDER THE DIRECTION OF
R. B. MARSHALL, CHIEF GEOGRAPHER

Prepared in cooperation with
THE STATE OF OREGON
John H. Lewis, State Engineer

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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PROFILE SURVEYS IN 1914 ON MIDDLE FORK OF WILLAMETTE RIVER AND WHITE RIVER, OREGON.

Prepared under the direction of R. B. Marshall, Chief Geographer.

INTRODUCTION.

In order to determine the location of undeveloped water powers on the rivers of the United States the United States Geological Survey has from time to time made surveys and profiles of some of the streams adapted to the development of power by low or medium heads of 20 to 100 feet.

The surveys are made by means of plane table and stadia. Elevations are based on heights derived from primary or precise levels of the United States Geological Survey. The maps are made in the field and show not only the outlines of the river banks, the islands, the positions of rapids, falls, shoals, and existing dams, and the crossings of all ferries and roads, but the contours of banks to an elevation high enough to indicate the possibility of using the stream. The elevations of the bench marks left are noted on the field sheets in their proper positions. All gaging stations are shown on the maps and the elevation of the zero of the gage is given.

WILLAMETTE RIVER BASIN.

GENERAL FEATURES.

Willamette River drains a trough-shaped area extending north and south between the Coast and Cascade ranges in Oregon. The area is roughly rectangular, and is about 140 miles in length and about 85 miles in width. Willamette River proper is formed by the junction of three main tributaries, which unite in the vicinity of Eugene; these are the Middle Fork (considered the continuation of the main stream), the Coast Fork, and McKenzie River. The river is navigable for ocean-going vessels from its mouth to Portland, and for ordinary river steamboats from Portland to Corvallis, except during a few months of each year. From Corvallis to Eugene the river is navigable for light-draft boats at medium stages of the water. The falls of Willamette River at Oregon City are passed by a series of five locks, which are at present in private ownership.

The other principal tributaries of Willamette River are Santiam, Molalla, and Clackamas rivers. From the Coast Range flow Long

Tom, Marys, Luckiamute, Yamhill, and Tualatin rivers. The drainage areas of this river and its principal tributaries are given below.

Drainage areas in Willamette River basin.

	Square miles.		Square miles.
Willamette at mouth	11,150	McKenzie River	1,040
Willamette at Oregon City	10,200	Santiam River	1,890
Willamette at Salem	7,520	Yamhill River	763
Willamette at Albany	4,860	Clackamas River	927
Coast Fork of Willamette	705	Tualatin River	690
Middle Fork of Willamette	1,450		

From the summit of the mountain ranges the slopes are steep, but they merge gradually into a wide alluvial valley or gently rolling agricultural lands.

The entire drainage area may still be considered densely forested. The portions of the basin that contribute most of the flow of the streams lie almost entirely within national forests, and privately owned timber lands extend from the boundaries of the national forests to the main stream in the valley, except where lands have been cleared.

Although records of precipitation at the summit of the Coast Range are meager, it is likely that the total annual rainfall is as much as 150 inches. On the eastern slope of the Coast Range the annual precipitation decreases very rapidly to about 40 inches, but it gradually increases again until at the summit of the Cascade Range it is approximately 100 inches. From north to south the same general variation is observed, although the differences are not so striking. At the mouth of the river the precipitation is about 50 inches, in the vicinity of Corvallis about 40 inches, and at the summit of the Callapooya Mountains, which form the southern boundary of the drainage area, 55 or 60 inches. Except on the summits of the mountain ranges this precipitation is almost entirely rain, 95 per cent falling during nine months, from September to May. On the mountain ranges part of the precipitation is snow, and the country is subject during the spring and fall to warm chinook winds, accompanied by rather sudden melting of these snows, which frequently cause considerable damage from floods. During the growing season, when the precipitation rarely exceeds 2 inches, the valley is practically arid. Although irrigation has not long been practiced in the valley, it is likely that before many years a large part of the agricultural bottom lands will be placed under irrigation. Small ditches and pumping plants have been constructed, and the returns from irrigated agricultural lands show an increase of 50 to 500 per cent in production over the nonirrigated lands.

Lying almost wholly within a narrow strip adjacent to the main divide of the Cascades, where the soil and underlying rock is porous,

similar to that in the basin of Deschutes River, on the east side of the range, are a number of lakes and marshes which afford favorable sites for storage reservoirs. As a result the streams flowing through the lakes and marshes are not subject to great floods and are characterized by a large low-water flow. The effect of reservoirs on the Willamette would not be so marked as on more flashy streams, but their operation would greatly enhance the value of the river for irrigation, power, and navigation.

The highest known flood in the Willamette Valley occurred December, 1861, when the discharge at Albany was 220,000 cubic feet per second. The highest gage reading at Portland since that date was in 1894 but was due to backwater from Columbia River. The years 1899 and 1907 were "wet years." The year 1905 was a comparatively dry year. The longest record of stream flow in this basin has been obtained by applying recent measurements made at Albany to records obtained by the United States Weather Bureau since 1895.

The results of earlier profile surveys in the Willamette River basin were published in Water-Supply Paper 349 (Plates I to III); those of the parts of the river surveyed in 1914 appear in Plates I–IV, at the end of this volume.

GAGING STATIONS.

The Survey has maintained two gaging stations on the Middle Fork of the Willamette, as follows: Dash following the date indicates that the station was being maintained June 30, 1915.

Willamette River, Middle Fork (head of Willamette River), near Hazeldell, Oreg., 1911–

Willamette River, Middle Fork, at Jasper, Oreg., 1905–

WHITE RIVER.

White River, one of the larger tributaries of the Deschutes, rises on the southern slopes of Mount Hood, flows southeastward about 15 miles, then takes an easterly and northeasterly course to its junction with the main stream, 6 miles east of Tygh Valley. Its principal tributaries are Rock, Threemile, and Tygh creeks.

A short distance west of Deschutes River the White falls from the Deschutes Plateau into a canyon, forming a number of picturesque cascades. Advantage has been taken of this natural water power, and a hydroelectric plant has been installed. A concrete dam, 8 feet high, has been built across the river above the falls and diverts the water into a settling basin, the use of which is necessitated by the large amount of sediment carried by White River. The water is thence conveyed to a second settling basin, which acts also as a forebay reservoir. A 60-inch wood-stave and steel pressure pipe 430 feet long, leading to the power house, gives a head of 149 feet. Power is developed at 2,300 volts, but is stepped up to 66,000 volts for transmission 27 miles to The Dalles. Here connection is made with a transmission line

leading to Hood River, where a small hydroelectric plant of 325 kilowatts is tied into the same circuit. A branch line extends to Dufur.

The results of a profile survey on White River in 1914 are presented in Plates V and VI at end of volume.

The Geological Survey has maintained a gaging station on White River near Tygh Valley since June 18, 1911. A station was also maintained on Tygh Creek at Tygh Valley from June 9 to September 30, 1911, and from March 8 to October 15, 1912.

PUBLICATIONS.

Information concerning stream flow at the stations on the Middle Fork of the Willamette and White rivers has been published by the Survey as follows:

Middle Fork of Willamette:
Water-Supply Papers 178, 214, 252, 272, 292, 312, 332C, 362C, and 394.[1]
White River:
Water-Supply Papers 312, 332C, 362C, 394.[1]

Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C., but the edition printed for free distribution is small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
St. Paul, Minn., Old Capitol Building.
Madison, Wis., Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, Federal Building.
Boise, Idaho, 615 Idaho Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., Federal Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., Federal Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Geological Survey's publications may be obtained by applying to the Director of the United States Geological Survey, Washington, D. C.

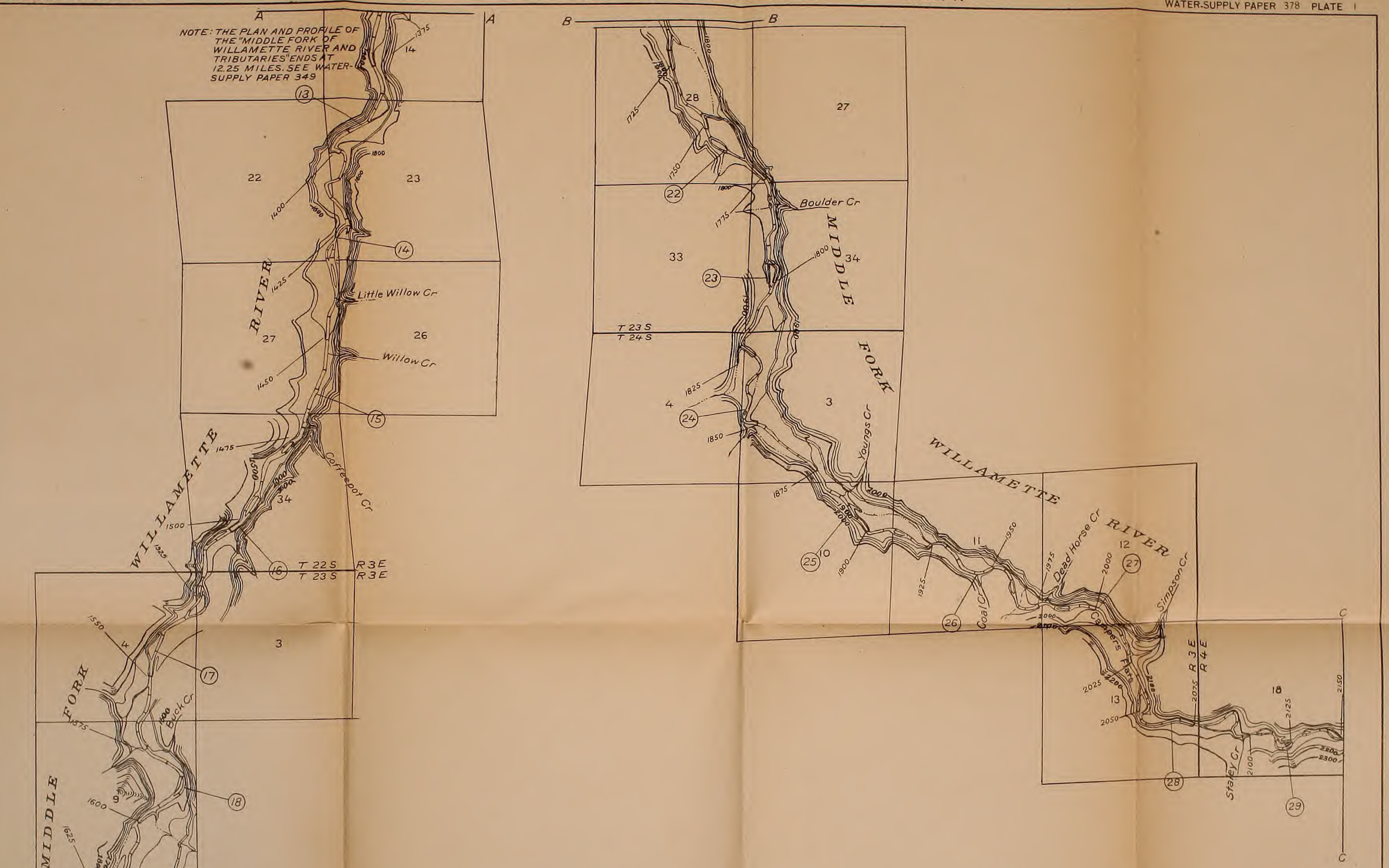
[1] In preparation.

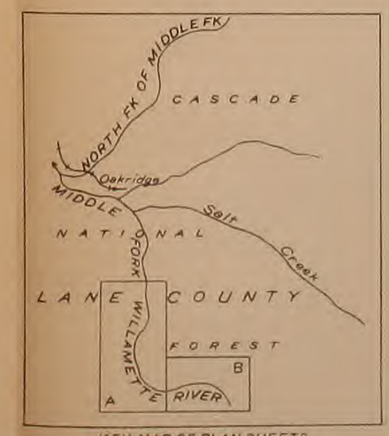
U. S. GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR
STATE OF OREGON
JOHN H. LEWIS, STATE ENGINEER

PLAN AND PROFILE OF MIDDLE FORK OF WILLAMETTE RIVER ABOVE OAKRIDGE, OREGON

SHEET A

NOTE: THE PLAN AND PROFILE OF THE "MIDDLE FORK OF WILLAMETTE RIVER AND TRIBUTARIES" ENDS AT 12.25 MILES. SEE WATER-SUPPLY PAPER 349





KEY MAP OF PLAN SHEETS

R. B. Marshall, Chief Geographer
T. G. Gerdine, Geographer in charge
Topography by C. P. McKinley
Surveyed in 1914
SURVEYED IN COOPERATION WITH THE STATE OF OREGON

DIAGRAM OF TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Scale 1/31,680

1 0 1 2 Miles

4,000 2,000 0 4,000 8,000 Feet

1 0 1 2 Kilometers

Contour interval on land 25 feet
Contour interval on river surface 5 feet
Datum is mean sea level
1915

20½° TRUE NORTH MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION 1914

Subject to adjustment

4 SHEETS
(2 plans, 2 profiles)

U. S. GEOLOGICAL SURVEY
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STATE OF OREGON
JOHN H. LEWIS, STATE ENGINEER

PLAN AND PROFILE OF MIDDLE FORK OF WILLAMETTE RIVER ABOVE OAKRIDGE, OREGON

SHEET B

KEY MAP OF PLAN SHEETS

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T. G. Gerdine, Geographer in charge
Topography by C. P. McKinley
Surveyed in 1914
SURVEYED IN COOPERATION WITH THE STATE OF OREGON

DIAGRAM OF TOWNSHIP

6	5	4	3	2	1	
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18	17	16	15	14	13	
19	20	21	22	23	24	
30	29	28	27	26	25	
31	32	33	34	35	36	

Scale 1/31,680

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4,000 2,000 0 4,000 8,000 Feet
1 0 1 2 Kilometers

Contour interval on land 25 feet
Contour interval on river surface 5 feet
Datum is mean sea level
1915

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Subject to adjustment

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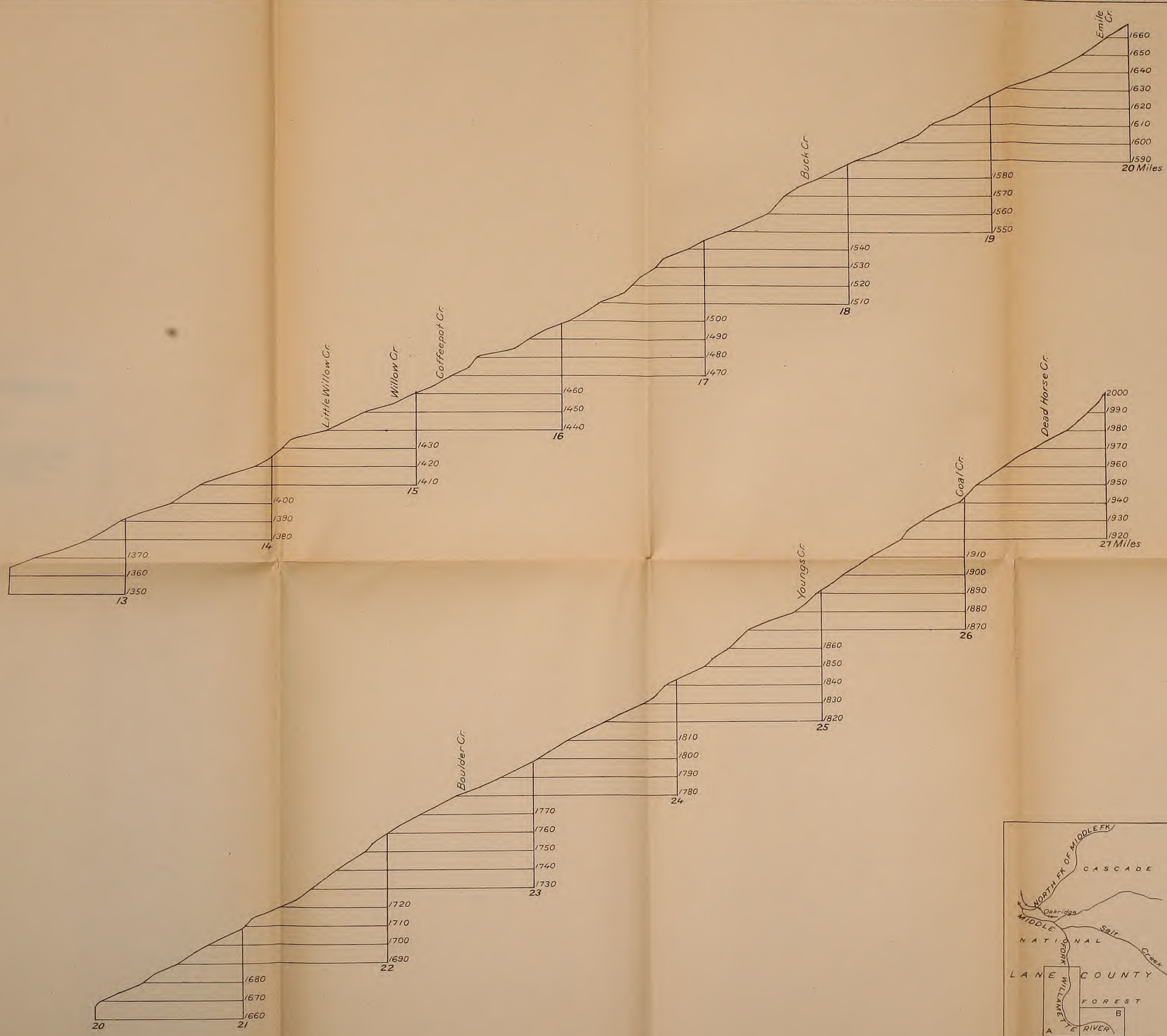
STATE OF OREGON
JOHN H. LEWIS, STATE ENGINEER

PLAN AND PROFILE OF MIDDLE FORK OF WILLAMETTE RIVER ABOVE OAKRIDGE, OREGON

SHEET C



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T. G. Gerdine, Geographer in charge
Topography by C. P. McKinley
Surveyed in 1914
SURVEYED IN COOPERATION WITH THE STATE OF OREGON

Scale 1/31,680

1 0 1 2 Miles
4,000 2,000 0 4,000 8,000 Feet
1 0 1 2 Kilometers

Vertical scale 1 inch = 40 feet
Datum is mean sea level
1915

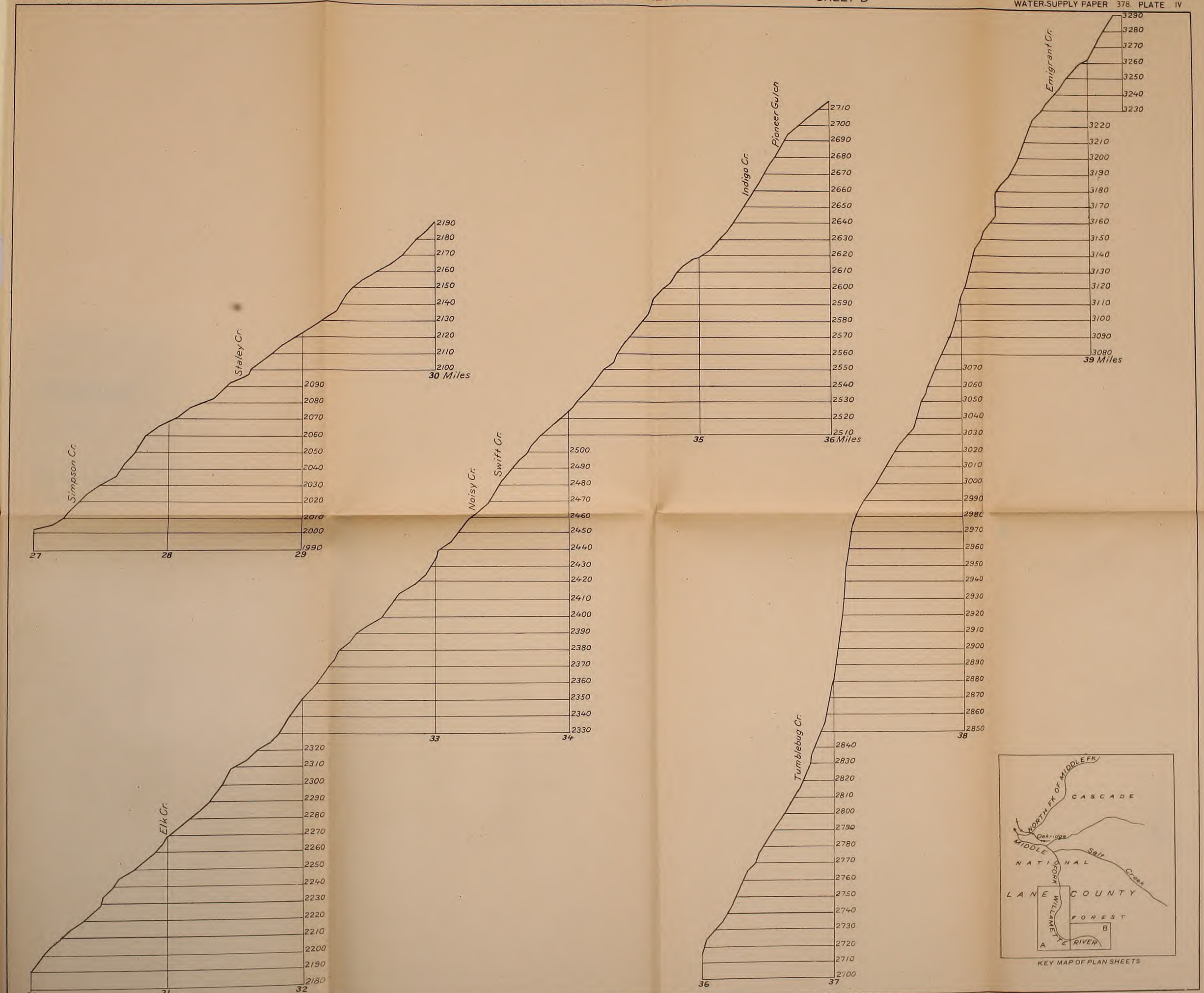
Subject to adjustment

4 SHEETS
(2 plans, 2 profiles)

U. S. GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR
STATE OF OREGON
JOHN H. LEWIS, STATE ENGINEER

PLAN AND PROFILE OF MIDDLE FORK OF WILLAMETTE RIVER ABOVE OAKRIDGE, OREGON

SHEET D



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T. G. Gerdine, Geographer in charge
Topography by C. P. McKinley
Surveyed in 1914
SURVEYED IN COOPERATION WITH THE STATE OF OREGON

Scale 31,680

1 0 1 2 Miles
4,000 2,000 0 4,000 8,000 Feet
1 0 1 2 Kilometers

Vertical scale 1 inch = 40 feet
Datum is mean sea level
1915

Subject to adjustment

4 SHEETS
(2 plans, 2 profiles)

U. S. GEOLOGICAL SURVEY
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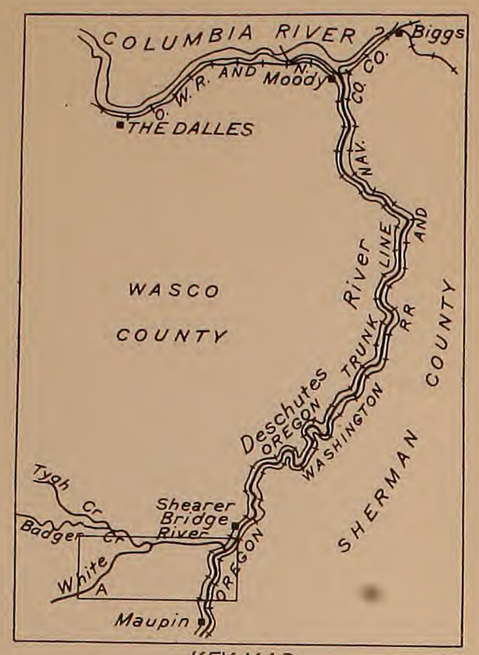
JOHN H. LEWIS, STATE ENGINEER

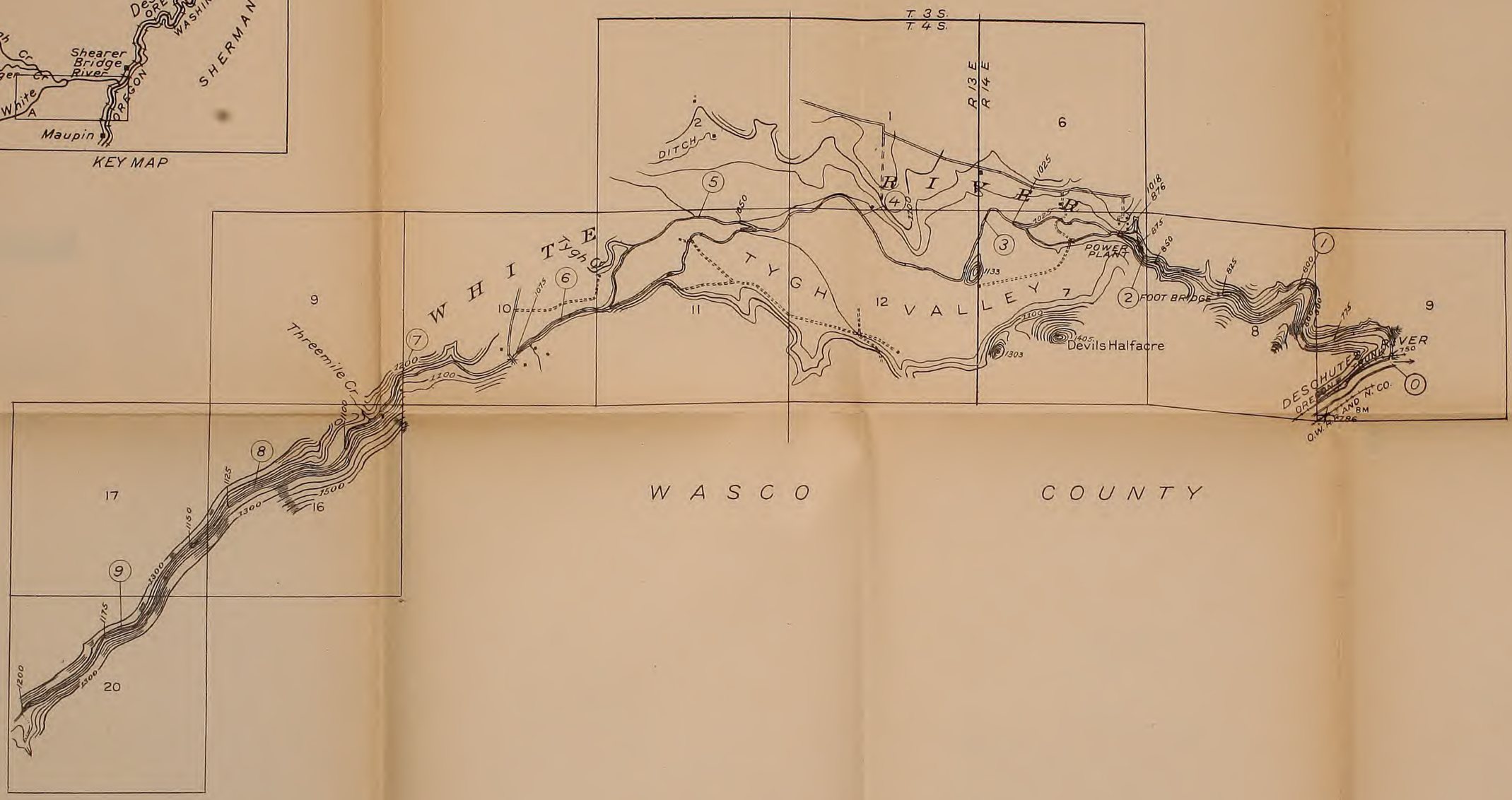
PLAN AND PROFILE OF WHITE RIVER, VICINITY OF TYGH VALLEY, OREGON

SHEET A

WATER-SUPPLY PAPER 378 PLATE V



KEY MAP



R. B. Marshall, Chief Geographer
T. G. Gerdine, Geographer in charge
Topography by Albert Pike
Surveyed in 1914
SURVEYED IN COOPERATION WITH THE STATE OF OREGON

Scale 1/31,680

1 0 1 2 Miles
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1 0 1 2 Kilometers

Contour interval on land 25 feet
Contour interval on river surface 5 feet
Datum is mean sea level
1915

TRUE NORTH
MAGNETIC NORTH
21½°
APPROXIMATE MEAN DECLINATION 1914

Subject to adjustment

2 SHEETS
(1 plan, 1 profile)

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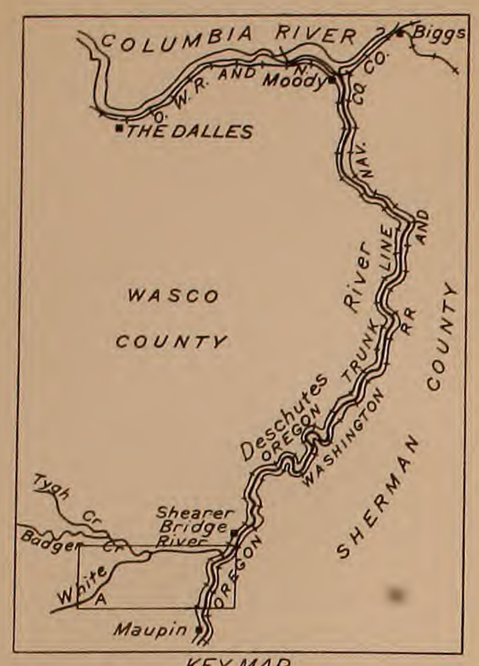
PLAN AND PROFILE OF WHITE RIVER, VICINITY OF TYGH VALLEY, OREGON

SHEET B

WATER-SUPPLY PAPER 378 PLATE VI



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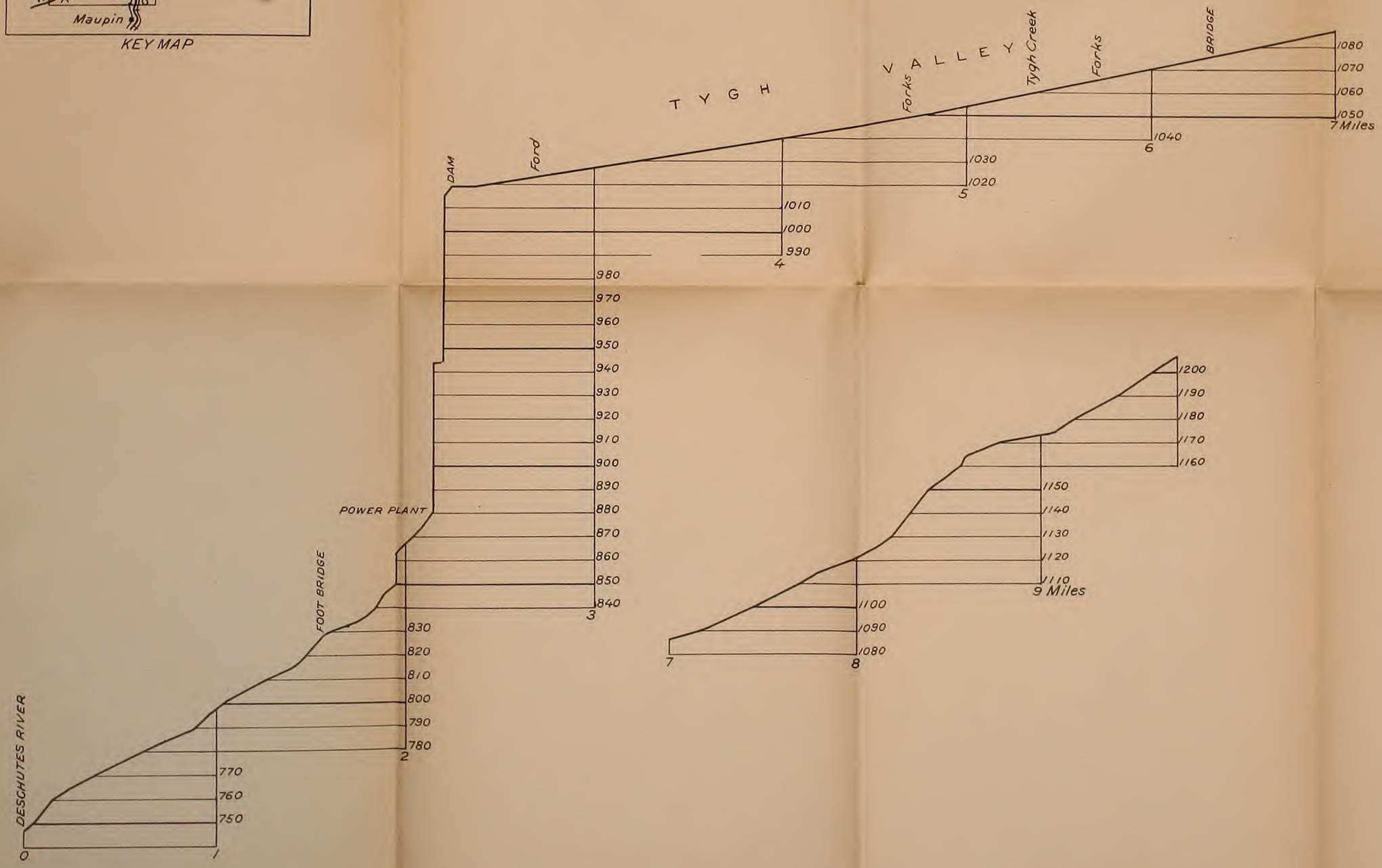

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