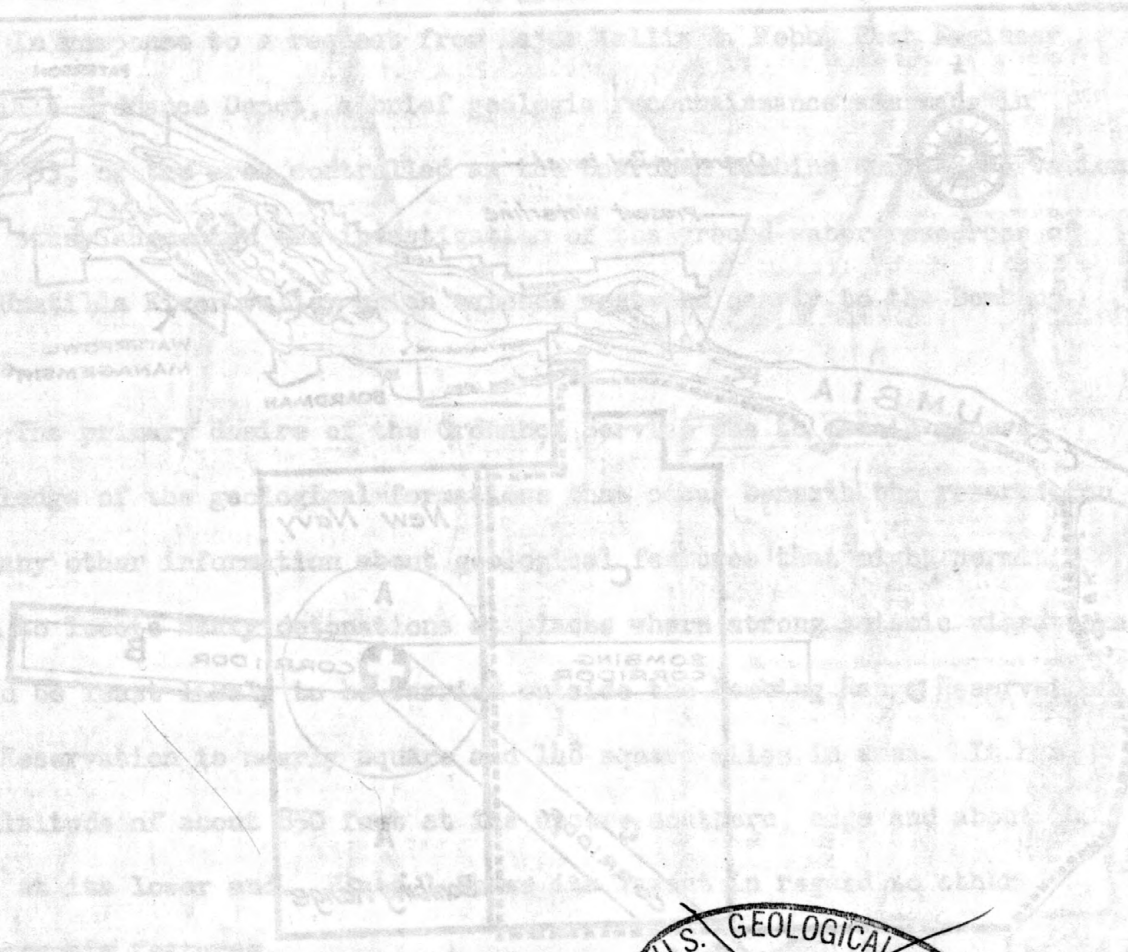
HOGENSON, GLENMORE MELVIN, 1923-

GEOLOGY OF THE BOARDMAN BOMBING RANGE RESERVATION, BOARDMAN, OREGON

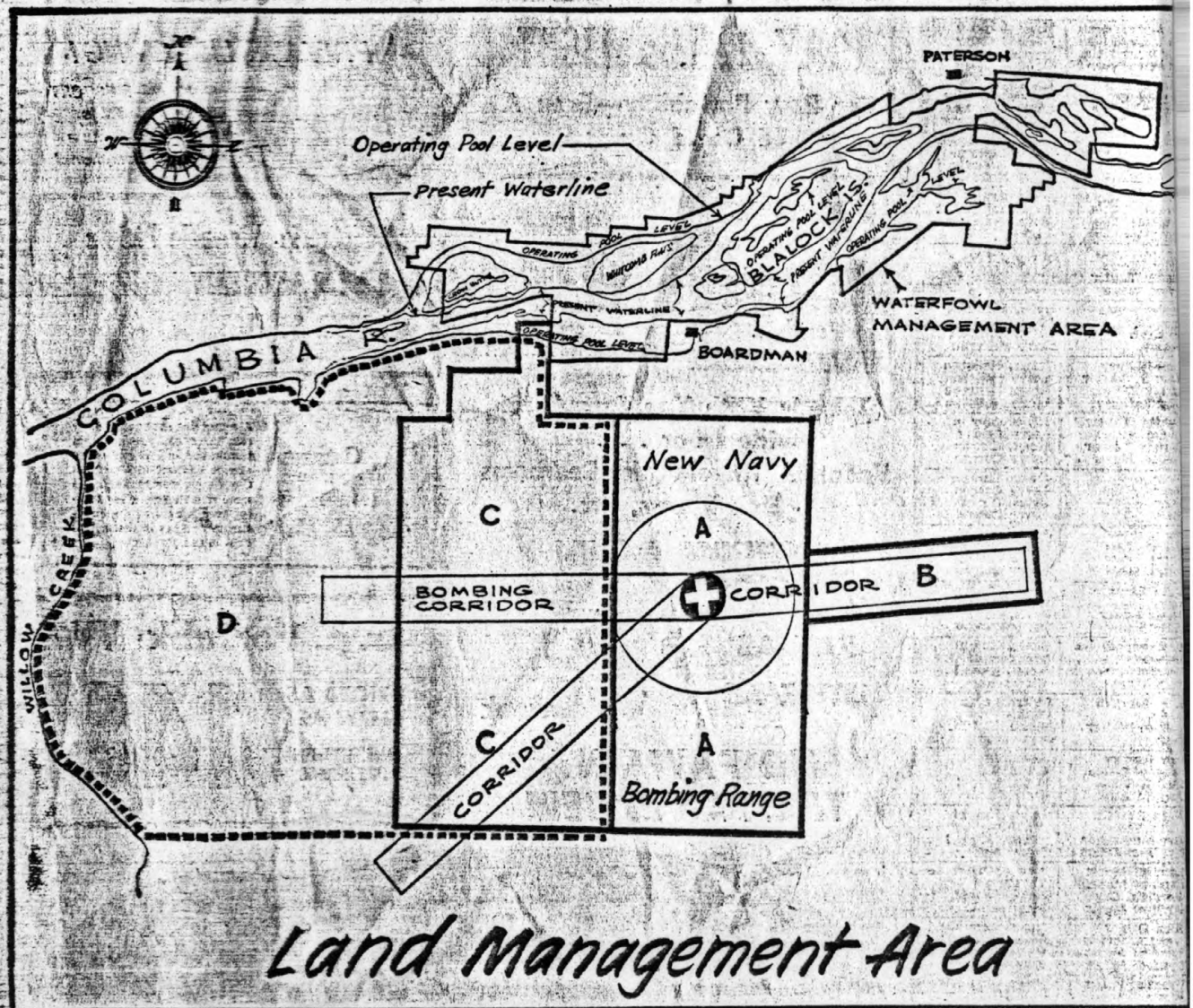
Hogenson Glenmore Melvin, 1923 —



BRIGHT SILVER salmon, of about 10 pounds, is admired by children of lucky angler, Ronald Clark, Oregon City. Kids, from left, are Debbie, 4½; Ricky, 2½, and Ronnie, 5½. He used a spinner.

Oregon Journal Sept ?, 1962

John Day Waterfowl Area Under Study



SUBJECT OF HEARING Tuesday at Boardman by Army Engineers is proposed 18-mile-long John Day Waterfowl Management Area (at top), on Columbia River beginning about 44 miles east of John Day Dam. Area contains 29,370 acres of land and water. Adjacent to site are Navy's 50,000-acre Boardman Bombing Range (A) and new 5,000-acre place approach corridor (B). State's Space Age Industrial Park includes 50,000 acres (C) acquired from Navy, and 50,000-acre tract extending to Willow Creek (D), with 11 miles river frontage.

GEOLOGY OF THE BOARDMAN BOMBING RANGE RESERVATION

BOARDMAN, OREGON

STATEMENT OF THE PROBLEM

In response to a request from Major Wallis W. Webb, Post Engineer, Umatilla Ordnance Depot, a brief geologic reconnaissance was made in May 1953, of the area controlled as the Boardman Bombing Range Reservation. This study augmented the investigation of the ground-water resources of the Umatilla River valley which extends westward nearly to the Bombing Range.

The primary desire of the Ordnance Service was to obtain general knowledge of the geological formations that occur beneath the reservation and any other information about geological features that might permit them to locate heavy detonations at places where strong seismic vibrations would be least likely to be carried outside the Bombing Range Reservation. The Reservation is nearly square and 148 square miles in area. It has an altitude of about 850 feet at its upper, southern, edge and about 400 feet at its lower end. Plate 1 shows its layout in regard to other topographic features.

GEOLOGY

General Setting

Physiography

The Bombing Range is situated at the northern foot of a uniformly inclined plateau surface known locally as the Columbia Slope, which ranges down smoothly from the central Oregon mountains to the Columbia River. The Range area lies across the junction of that rolling ramplike plateau slope with the flatter terfaces that border the Columbia River.

Bedrock

The Columbia River basalt, which beneath a cover of soil forms the Columbia Slope, is a black lava rock of basaltic composition. It is a layered hard rock that has few, if any, sedimentary interbeds. It was formed in Miocene and Pliocene time by the accumulation of lava flow on lava flow until in its thicker parts there had been assembled a formation that is thousands of feet thick. Later the layered basalt was tilted and warped by earth movements. The basalt underlies the region about the bombing range and crops out in the exposures on the Columbia Slope, the Columbia River Gorge, and the Horseheaven upland farther north.

The total thickness of the basalt and the character of the rock underlying the basalt beneath the Bombing Range can be inferred only from the information known at distant localities. Thirty miles south of the Bombing Range granitic rock crops out from beneath the basalt. Farther eastward the underlying older crystalline rocks crop out in canyons near Pomeroy and Clarkston, Washington. Fifty miles to the southwest, near Condon, the basalt lies on sedimentary rocks.

Northward from the Bombing Range the basalt forms the bedrock continuously for over a hundred miles, as far as the localities of Wenatchee and Bridgeport, Washington. At Union Gap south of Yakima the basalt has been drilled for a depth of 4,500 feet beneath 1,500 feet of exposed strata, and near Vantage, has been drilled for 4,500 feet without encountering the bottom.

Thus, the thickness of the basalt bedrock beneath the Bombing Range can be estimated only from the known tapering edge 30 miles to the south. The type and velocity of seismic travel, of the rock beneath the basalt at the Bombing Range is entirely unknown.

Unconsolidated Deposits

There are two general types of surficial deposits in the region of the Bombing Range. One consists of a loess which mantles the Columbia Slope and conceals the basalt in all but the most abrupt "breaks" in the topography. It is a powdery, siltlike deposit of windblown and rock-weathered origin. It is buff or tan in color when dry and dark brown when wet.

The other unconsolidated deposit is a glacial outwash deposit composed of poorly bedded sands, silts, gravels, and heterogeneously mixed materials with much rock debris of types foreign to this area. They are deposited to depths which in places may exceed 100 feet. The conditions that caused the deposition of this material also caused the removal of much of the loess so that the glacial-fluviatile material veneers the basalt and underlies the terraces along the Columbia River. In places the materials are badly reworked by the wind, especially in the northern half of the reservation. The thickest of the glacial fluviatile deposits occur below a general elevation of 600 or 700 feet, although some may be present in thin veneer fashion above the main deposit and even, as scattered debris reaching upward to an elevation of 1,100 feet.

General Geology of the Bombing Range

The accompanying map shows the outline of the bombing range, the area of basalt outcrop and a general boundary between the areas covered by the loess soil of the Columbia Slope and the glacial-fluviatile deposits of the terraces nearer the river. Where the tilt of the basalt layers could be determined they are shown by the strike-and-dip T-shaped symbol whose arrow points in the direction of dip as shown in degrees below the horizon.

Seismic Conditions in the Area

In personal interview of April 7, Mr. Higgins indicated that the prime need of the Ordnance Service was to locate a place within the reservation where the sedimentary veneer was sufficiently thick to cushion the shock waves and to spread the impact that was being transmitted to the basalt by the detonations. The seismic velocities of travel in the basalt, as observed elsewhere in the Northwest, are on the order of 10,000 to 16,000 feet per second; those in the sedimentary deposits are estimated to run from about 1,000 at the soil zone to 5,000 feet per second in the water-saturated parts of the more indurated layers. Velocities of travel for the rock materials that underlie the basalt are not known specifically in this district.

The individual lava flows of the basalt range from 10 to 100 feet in thickness. In this area they dip generally in a northerly direction at less than two degrees. Since the basalt is a dense rock with a relatively high seismic velocity of travel and since it lies in essentially horizontal and continuous sheets, it probably would act as an excellent medium to carry the shock waves to the surrounding areas.

Probable more favorable sites for demolitions

The sedimentary mantle seems to be thickest in the southern half of Township 3 North, Range 25 East and that part of Township 2 North which lies within the reservation, especially in the 3-mile bank lying immediately north of the southern boundary of the reservation. In this latter area some basalt bedrock is exposed in Juniper Canyon, but it is under fairly deep cover in the canyon — an indication that demolition sites should be kept on the hills and out of the low places.

Possible sources of Additional Information

Test drilling and geophysical exploration are the principal processes by which additional and more detailed data could be obtained on the Reservation area. Either or both of those methods can be used to determine the thickness and character of the unconsolidated deposits available for a "cushion" in each locality.

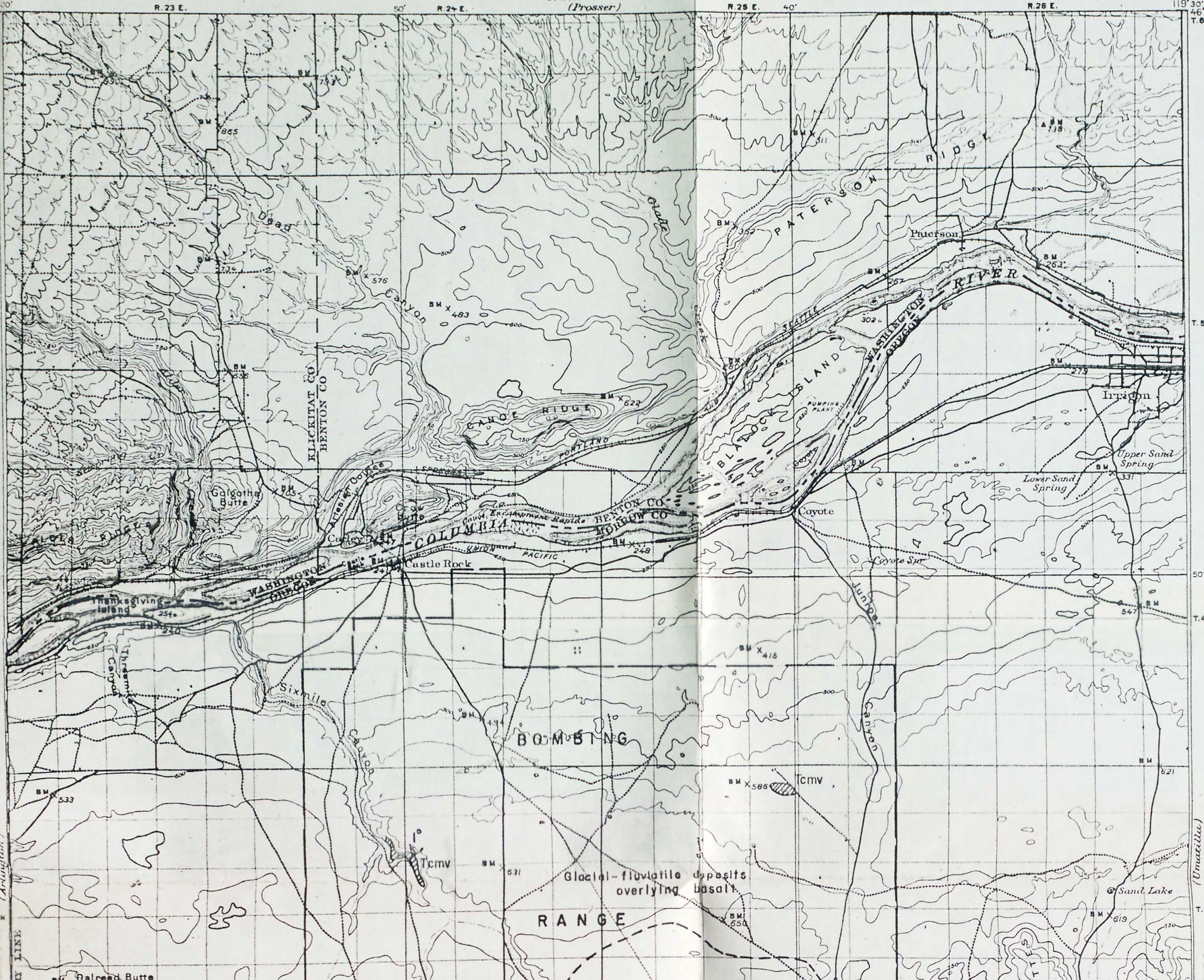
Local seismic testing can be done in conjunction with your current demolitions if a few simple-type seismographs can be set up in adjacent communities and the size of each shock effect recorded for comparison with the effect from similar-sized detonations that are fired in other and different demolition sites on the reservation. Perhaps such records would point out some sites from which lesser effects were transmitted to nearby areas.

G. M. Hogenson

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF OREGON
REPRESENTED BY THE
STATE ENGINEER

OREGON-WASHINGTON
BLALOCK ISLAND QUADRANGLE



E. M. Douglas, Geographer.
E. C. Barnard, in charge of section.
Topography by A. H. Sylvester, S. N. Stoner,
E. R. Bartlett, S. T. Penick, and R. M. LaFollette.
Triangulation by A. I. Oliver.
Surveyed in 1906.

SURVEYED IN COOPERATION WITH THE STATE OF OREGON.

(Condon)

APPROXIMATE MEAN DECLINATION 1906.

Scale $\frac{1}{125000}$

1 0 1 2 3 4 5 6 7 8 9 Miles

3000 1500 0 3000 6000 9000 12000 Yards

5000 0 5000 10000 15000 20000 25000 Feet

1 0 1 2 3 4 5 6 Kilometers

Contour interval 50 feet

Datum is mean sea level

Elevations shown on this sheet are one foot too low

Edition of Feb. 1908, reprinted 1944

Geology added by Ground Water Branch·
Portland, Oregon 7/7/53

ORE.-WASH.
BLALOCK ISLAND
N4530-W11930/30

EXPLANATION

Basalt outcropping –

Basalt, strike and dip of flows 2°

, horizontal ⊕