

State Department of Geology and Mineral Industries

1069 State Office Building
Portland 1, Oregon

HOT LAKE GEOTHERMAL AREA

Union County, Oregon

Location and History: Hot Lake is about seven miles southeast of La Grande in the southern part of the Grande Ronde Valley near the center of Union County. Several hot springs occur in a narrow northwest trending zone that extends from Hot Lake at the north to Union Junction which is about three and one-half miles southeast. The width of the thermal anomaly is not known but it appears to be less than one-half mile wide paralleling the east base of Craig Mountain.

The Hot Lake springs have been known since 1812 and have been developed as a sanatorium and resort since the early 1900's. The present owner is Dr. A. J. Roth who lives on the property. (For additional history see appended clipping, item 1.)

Geologic Setting: The Grande Ronde Valley is a structural valley: a composite graben bounded by horst block mountains on the east and west. The upland area near Hot Lake is underlain by Tertiary volcanic rocks (Columbia River basalt and associated volcanic rock) and the valley is floored with fluvial and lacustrine silt, sand, and gravel. The youngest volcanic rocks in the area that may be of importance are two small cinder cones of Pleistocene (?) age about five miles southeast of Union Junction. The geologic map of Hampton (1957-58) shows a high angle normal fault paralleling the base of Craig Mountain and curving around the north end to an east-west direction at Hot Lake. This fault extends southeastward up Pyle Canyon and the two cinder cones mentioned previously straddle the fault. This geologic environment, in a volcanic terrain with high angle normal faults at the edge of a graben or fault valley is similar to other Oregon geothermal areas at Lakeview; in the Steens Mountains; and in the Klamath Falls area.

Hot Lake Springs: There are two or more spring orifices at Hot Lake where 180° to 200° F. temperature water flows into a holding pond at about 100 gal./min. Another flowing well or spring of about the same temperature and volume is located about one-half mile southeast, just south of State Highway 203. Chemical analysis (Item 2- appended) of the water (Hot Lake Spr) shows only 461 ppm dissolved solids indicating that considerable surface dilution with surface waters has taken place. The temperature and volume of water in the Hot Lake springs area indicates a substantially large heat source and either the water has come from very deep where the geothermal gradient is high or there is a cooling rock mass relatively near the surface.

Comments: The only present use of the thermal energy from the Hot Lake springs is for domestic heating of the privately owned facilities at Hot Lake. There is most certainly a greater potential. The flowing well or spring south of State Highway 203 discharges northward into the swampy area north of Hot Lake. If ownership and

engineering problems could be worked out, the hot water available here could possibly provide all of the City of Union or a part of La Grande with domestic heating. The water is chemically basic, does not appear to be excessively corrosive and would be amenable to a variety of industrial uses.

Appended Item 1

Discovered 1812

Historically, Hot Lake's discovery by a white man dates back to a day in 1812 when a member of the Hunt-Price expedition, St. Louis-bound after the expedition had set up a trading post at Astoria, came across the body of steaming water. A hundred years was to elapse before starts were made on its gaining world-wide attention and the respected title of "Mayo Clinic of the West" under the direction of Dr. W. T. Phy, about whom the word "great" was thought by many to be less than he deserved. Heyday of Hot Lake Sanatorium and Dr. Phy was in the 1920's and 1930's, when Hot Lake was a veritable city within itself.

Going back in history beyond discovery by the first white man, legend has it that Hot Lake was set aside as a peace ground by the medicine men of Indian tribes of the region. They used the curative powers of the boiling mineral waters and their tribal leaders ruled that this and the valley surrounding it belonged to all the Indians as a place of peace, rest and cure for their sick.

Appended Item 2

Chemical Analysis of Water from 5K1
-Hot Lake Spring, USGS, WSP 1597-

Temperature (F)	180°	
Silica (SiO ₂)	81	ppm
Iron (Fe)	.00	"
Calcium (Ca)	3.6	"
Magnesium (Mg)	.3	"
Sodium (Na)	128	"
Potassium (K)	2.7	"
Bicarbonate (HCO ₃)	.0	"
Carbonate (CO ₃)	31	"
Hydroxide	4	"
Sulfate (SO ₄)	56	"
Chloride (Cl)	129	"
Fluoride (F)	1.6	"
Nitrate (NO ₃)	.0	"
Dissolved Solids	461	"
pH	9.5	

ppm : parts per million

Report: N. V. Peterson, November 1968.
Visited: June 26, 1968 with N. S. Wagner, H. M. Dole
Informant: Dr. A. J. Roth, Hot Lake Sanatorium
Route 2, Box 137, La Grande, Oregon

References: USGS Water Supply Paper 1597
Geology and Ground-Water Resources of the Upper Grande Ronde
River Basin, Oregon by E. R. Hampton

Memo Report

Hot Lake Geothermal Area Union County, Oregon

Location: Hot Lake is in sec. 5, T. 4S., R. 39E. in the southeastern part of the Grand Ronde valley very nearly the center of Union County.

The geothermal area as determined from surface springs and seeps is a narrow northwest trending zone about 3 mile long and a few hundred yards wide. The hot spring zone extends southeastward from Hot Lake to Union Junction.

There are at least 2 hot spring orifices at Hot Lake where the flow is reported to be 170 gallons a minute. South and east of Hot Lake about $\frac{1}{2}$ mile in the southeast corner of sec. 4, T. 4S., R. 39E. there is another hot spring (about 200°) with a substantial flow.

Like many other hot springs in Oregon these are near the edge of a large structural valley and ~~probably~~ lie astride a strong normal fault. ~~The springs~~

The Grand Ronde Valley is much like ~~several~~ other fault basins in Oregon that are bounded on either side by fault block mountains.

Hampton has described the geology of the Grand Ronde Valley in U.S. Geological Survey Water Supply Paper 1597 and he estimates that the displacement on the northwest striking normal fault on the east side of the valley is about 4000 feet.

The Hot Lake springs ^{have a geological environment that is} similar to other Oregon thermal springs at Lakeview, ^{in the} Steens Mountains, and in the Klamath Falls area. All occur within structural basins or valleys and they mark the presence of normal faults at the edge of the valley.

The temperature and volume of water ^{in the Hot Lake area} indicates a substantial heat source and either the water has come from very deep where the geothermal gradient is high or there is a cooling rock mass nearby the surface quite close to the surface. Since the ground water level is very near ~~to~~ the surface in this part of the Grand Ronde Valley there is probably appreciable dilution or cooling of the rising hot water.

~~There is most certainly is a much greater potential for the thermal energy present at Hot Lake.~~

^{privately owned} ~~Presently~~ ^{present} The only use of the thermal energy from Hot Lake is for heating the Hot Lake Sanitarium - there most certainly is a greater potential. ~~for the amount of~~ The hot water available ^{Spiculations:} could possibly provide all of Union or even La Grande with domestic heating. The water does not appear to be excessively corrosive and would be amenable to a variety of industrial uses. ~~transportation~~

2 to 4 weeks
300

250

Econ. Geology

HAZEN

Mid to Late Pleistocene ~~science~~ - horst & graben structure

Lind

LASS

- Memo Report -

Hot Lake Geothermal Area Union County, Oregon

1.8°F per 100' depth

Geographic setting - Grande Ronde Valley (graben)

Valley floor ^{is thick} of 2000' in some places

Indian used -

La Brame - Hot Lake is near the center of Union County - 7 miles southeast of La Brame and 4 miles northwest of Union -

Temp. 180°

Extension of Pyle Canyon fault.

A. J. Roth has owned since 1942.

Info from Dr. A. J. Roth Box 137
Hot Lake San Route 2
Holy to Indian Cash Cash - Indian

Early owners were Nodine -

Cochran & Eberhart - 1870s in 1880's
Built by Walter Pierce in -
J. F. Phiz in

Now owned by Dr. A. J. Roth

$2\frac{1}{2} \times 10^6$ gallons per day

5 K 1 ✓

22 H 1

23 E 1

22 D 1

Craig Mt.

2 Cinder Cones
South of Union

Hot Spring at the
Union Station
2 mile west

$2\frac{1}{2}$ miles from
U. Station to Hot
of Union.