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Preparation of Standard Umtanum Sample by Battelle-Northwest

C. E. Hodge
M. W. Grutzeck

April 25, 1978

Prepared for the United States
Department of Energy
Under Contract EY-77-C-06-1030

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Informal Report

PREPARATION OF STANDARD UMTANUM SAMPLE
BY BATTELLE NORTHWEST LABORATORIES

by

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April 25, 1978

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INTRODUCTION

Battelle Northwest Laboratories was asked by Rockwell Hanford Operations to perform sorption experiments. As part of this work, they were required to obtain a standard sample of Grande Ronde Basalt (Umtanum Flow) from Umtanum Ridge northwest of the Hanford reservation. In addition, this same material was also needed by The Pennsylvania State University, a subcontractor to Rockwell Hanford Operations. Therefore, Rockwell Hanford Operations' personnel assisted Battelle Northwest Laboratories in gathering this sample. The following discussion describes these efforts.

DISCUSSION

On November 21, 1977, Rockwell Hanford Operations' personnel (Mr. R. W. Cross and Drs. M. W. Grutzeck and C. W. Myers) accompanied Battelle Northwest Laboratories' personnel (Messrs. L. L. Ames and J. F. Relyea) to Umtanum Ridge near Priest Rapids Dam (see Figures 1 and 2) to locate and sample the Umtanum Flow basalt for geochemical testing. Approximately 350 pounds of basalt were collected. The site was appropriately sampled, labeled, and photographed by Rockwell Hanford Operations' personnel for documentation (see Figures 3 and 4). The samples were then taken to Battelle Northwest Laboratories for preparation. The basalt samples all averaged 20 to 30 centimeters (too large to go through the crusher). A 4-pound hammer was used to break the samples into a size compatible with the crusher (see Figure 5). The samples were then put into a Mine and Smelter Supply, Inc. jaw crusher, where they were reduced in size to less than 1/4 inch (see Figure 6).

The crushed material was hand-picked for removal of those chips exhibiting a weathered surface. The weathered chips were discarded because the original surface mineralogy had been altered in an oxygen-rich environment (see Figure 7). At depth, this type of oxidation would not be expected to occur. After the sample was sorted and the weathered material discarded, the sorted sample was passed through a grinder for further size reduction.

Two samples were split from this large 20- to 50-mesh material for major constituent whole rock analysis by X-ray fluorescence at Washington State University (Table I shows analytical results for the two samples of

basalt and two weathering products: heulandite and nontronite). Parts of the above samples were also mounted by Battelle Northwest Laboratories for optical examination and photography. Several typical areas were photographed at 8- to 400-power magnification. These mounts will then be examined by scanning electron microscope and electron microprobe, including chemical analysis of the glassy groundmass down to 0.1 weight percent. Maps will be obtained of the X-ray emissions of iron, silicon, aluminum, potassium, magnesium, calcium, phosphorus, and titanium of selected sample areas. These data will be submitted to Rockwell Hanford Operations at a later date.

Of the 350 pounds of crushed material, approximately 50 pounds were discarded prior to final crushing; 150 pounds were retained by Battelle Northwest Laboratories for use in their sorption experiments; 50 pounds were retained by the Waste Isolation Program; and, 100 pounds were shipped to The Pennsylvania State University for use in modeling the behavior of basalt, waste, and ground water in a flow-through pressure temperature apparatus.

FIGURE 1

LOCATION OF UMTANUM RIDGE

FIGURE 2

UMTANUM RIDGE NEAR PRIEST RAPIDS DAM

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FIGURE 3

SAMPLING DESIGNATION

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FIGURE 4

SAMPLING DESIGNATION

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FIGURE 5

PREPARING SAMPLES FOR CRUSHER

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FIGURE 6

MINE AND SMELTER SUPPLY, INC. JAW CRUSHER

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FIGURE 7

DISCARDING WEATHERED CHIPS

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TABLE I

STANDARD ROCK AND MINERAL CHEMICAL ANALYSES*

CONSTITUENT	Weight Percent				
	UMTANUM BASALT		HEULANDITE**		NONTRONITE**
SiO ₂	55.64	55.23	61.60	66.40	39.92
Al ₂ O ₃	13.62	13.70	16.70	13.80	5.37
TiO ₂	2.05	2.07	-	-	0.08
Fe ₂ O ₃	2.00	2.00	-	-	29.46
FeO	10.68	10.86	-	-	0.28
MnO	0.20	0.20	-	-	-
CaO	7.17	7.23	9.40	8.20	2.46
MgO	3.33	3.30	-	-	0.93
K ₂ O	1.62	1.64	0.20	0.10	-
Na ₂ O	3.30	3.36	-	-	-
P ₂ O ₅	0.39	0.40	-	-	-
H ₂ O	-	-	12.10	11.50	21.38
TOTAL	<u>100.0</u>	<u>99.99</u>	<u>100.0</u>	<u>100.00</u>	<u>99.88</u>

*Washington State University, X-Ray Fluorescence.

**Weathering products of basalt.

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