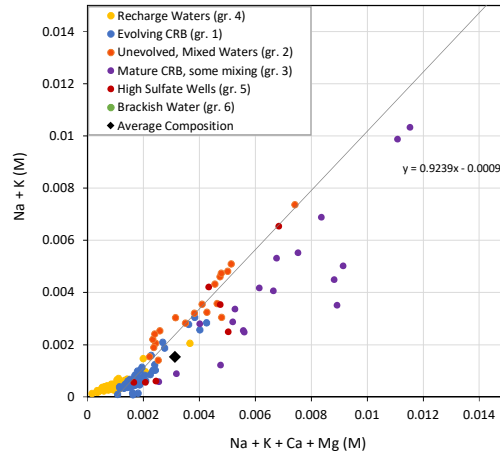
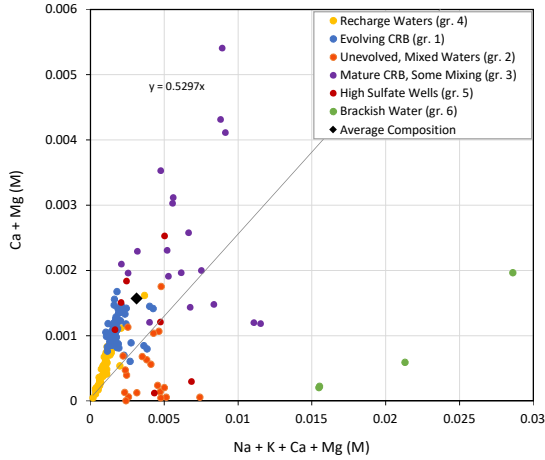


Initial Water Chemistry

Initial water chemistry for the lower portion of the CRBG was calculated to account for

1. Increasing TDS, Ca, and Mg with increasing time spent in the aquifer (blue), and
2. Mixing between recharge water (yellow) and saline water from underlying sedimentary units (green) that correlates with the scatter seen in orange and purple groups

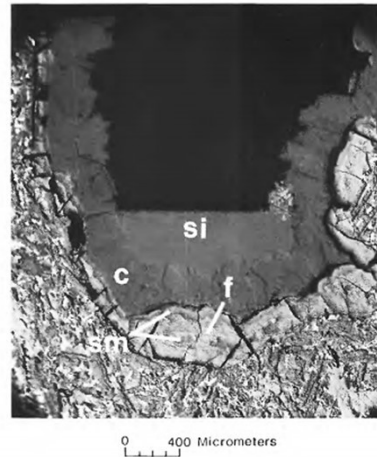
Resulting composition is shown in black



Initial Mineralogy

XRD and SEM analysis of samples of the Sentinel Bluffs, Ortlely, and Wapshilla Ridge flows from the Portland and Tualatin Basins supports previously published igneous and secondary mineralogies for Grande Ronde basalt flows from the Columbia Plateau

PREVIOUS STUDIES		
IGNEOUS MINERALOGY	Alteration Products	
Labradorite ^{1,3}	Nontronite-beidellite clay ^{1,2,3}	Apatite ^{2,3}
Andesine ³	Quartz ^{1,2,3}	Pyrite ^{2,3}
Augite ^{1,3}	Calcite ^{1,3}	Phillipsite ^{2,3}
Illmenite ^{1,3}	Opal ^{1,2,3}	Gypsum ^{2,3}
Magnetite ^{1,3}	Clinoptilolite ^{1,2,3}	Erionite ^{2,3}
Apatite ³	Cristobalite ²	Chabazite ^{2,3}
Olivine ³	Tridymite ²	Illite ³
Metallic sulfides ³	Mordenite ²	Analcime ³
Basaltic glass ^{1,3}	Celadonite ²	Vermiculite ³
THIS STUDY		
Andesine	Montmorillonite	
Augite	Vermiculite	
Clinopyroxene	Silica	
Magnesian ferrite		



1. Ames, L.L., and McGarrah, J.E., 1980, Hanford basalt flow mineralogy: Battelle Pacific Northwest Labs, Richland, Washington, Report PNL-2847, 469 p.
 2. Benson, L.V., and Teague, L.S., 1982, Diagenesis of basalts from the Pasco Basin, Washington - I - Distribution and composition of secondary mineral phases: Journal of Sedimentary Petrology, 52:595-613.
 3. Hearn, P.P., Jr., Steinkampf, W.C., Bortleson, G.C., and Drost, B.W., 1985, Geochemical controls on dissolved sodium in basalt aquifers of the Columbia Plateau, Washington: U.S. Geological Survey Water-Resources Investigations Report 84-4304, 38 p.

Figure: Scanning electron micrograph of a vesicle lining showing sequence of secondary alteration: smectite (sm) plus amorphous iron oxide (f) > clinoptilolite (c) > silica (si). Backscattered electron image. Scale bar is 100 micrometers