Lawrence Livermore National Laboratory

NUCLEAR SYSTEMS SAFETY PROGRAM
L-196

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Mr. M. E. Blackford, MS-623ss
Project Officer, WMGT
Technical Review Branch
Division of High-Level Management
Office of NMSS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Transmittal of Letter Report on Review of "Structural Geology of the Cold Creek Syncline: The Comarability to the Vantage Area," SD-BWI-ER-005 by N. Chamness and T. L. Tolan (1983).

NRC FIN A0297

Dear Mr. Blackford:

Attached, please find the subject letter report prepared by Robert D. Bentley. The draft copy of this report was submitted for your information on 23 November 1987. Bentley has revised some parts of the draft report and submitted to this office for transmittal to NRC.

If you have any questions, please let us know.

Sincerely yours,

Dae H. (Danny) Chung
Program Manager

DHC/ic

cc: H. E. Lefevre, NRC/WMGT

LLNL Document Review Sheet

Review Document Number:SD-BWI-ER-005 (REVIEWED WITHOUT PLATE 1)

Topic: Structural Geology of the Cold Creek Syncline: The comparability to the Vantage area.

Site Applicability: B W I P

Document: Chamness, N., Tolan, T. L. (1983 Status Report on the Tectonic Fracture and Breccia Study in the Vantage Area, SD-BWI-ER-005

Reviewer: R. D. Bentley

Date Review Completed: 11/27/87

Brief Review of Document:

The authors have initiated a fracture analysis and areal study in the northern part of the Yakima Fold Belt near Vantage. This study area was selected because it may have been deformed similar to the Cold Creek syncline and because it is not possible to study tectonic features directly in the Cold Creek syncline.

This document is only a preliminary paper that does little more than outline the problem, and begin a study of the physical characteristics of breccia zones and fractures that may influence the hydrogeologic properties of basalt within a broad synclinal area.

The Vantage area syncline may not be comparable the Cold Creek syncline. Although both areas are located in broad synclines occuring between two narrow anticlinal ridges, the Vantage area is dominated by a major northwest trending transpressional cross structure (Ryegrass Mountain Structure). In contrast, the Cold Creek syncline contains no analogous structure except that it lies inline with the southeast plunging Yakima Ridge. Many of the fractures described here (Figures 11 - 17) are associated with this Ryegrass Mountain Structure; and, therefore, the density of tectonic features may not be directly analogous to the Cold Creek syncline.

Significance to NRC Waste Management Program:

As it now stands this document is of little value to the NRC because of its very tentative nature. However, if the study is completed as outlined (page 39), many of the results could assist the NRC in estimating the hydrologic significance of tectonic fractures. In this regard, it should be noted that an updated geologic map (Plate 1?) of the area was presented by Terry Tolan at an informal evening session of the Cordilleran sectional

meeting of the Geological Society of America at Hilo, May 1987.

Problems, Deficiencies or Limitations of Report: Much of the report is preliminary and inadequate. The following items illustrate this:

1. No details are presented on any of the faults or breccia zones in the study areas (Figures 11 - 17). Therefore, evaluation of the suggested terminology (page 38) is very tentative and of little value.

2. It is uncertain if many of the fractures described in this report (Figures 11 - 17) are characteristic of a mildly deformed syncline such as the Cold Creek syncline. It is more likely that many of the described fractures are associated with the Ryegrass Mountain structure and therefore, the density of tectonic features may not be directly analogous to the Cold Creek syncline. Nevertheless, many of the fractures sited in this report are, in my experience (Bentley unpublished data), typical of mildly deformed basalt that occur in many of the synclines in the Yakima Fold Belt. Therefore, the proposed study as outlined on page 39 paragraph 4 would be useful in evaluation of the fracture data (density, distribution , preferred orientation) in an area analogous to the Cold Creek syncline. This is especially true if fractures directly associated with the Ryegrass Mountain anticline are clearly defined as suggested (page 39 paragraph 2).

3. The Grande Ronde units are poorly described in the stratigraphic section (page 14 paragraphs 2 and 3) of the report, yet many of the tectonic features mentioned in the report (Areas A, B, C? and D page 27) occur in upper Grande Ronde units.

4. No location data of thicknesses of the Vantage Member are presented (page 14 paragraph 5). Where is it absent? Are any of the contacts invasive? How is the average 9 meters arrived at?

5. Ginkgo thickness data presented on page 16 paragraph 5 suggests that the flow thins on the Frenchman Hills but no details are described across the structure. Is it regional thinning or is it related to growth structures? Three Ginkgo flows may be present in the area but no details are presented. Bentley and Powell (1984) find that the Gingko thins regionally to the north from more than 100 meters in the Saddle Mountains. This type of "documentation" (page 16 paragraph 5) is typical of the type of data presented in several recent papers (Reidel, 1983) to support the growth structures in the Yakima Fold Belt. A flow must thicken on both sides of a structure to document a growth history.

6. The stratigraphy of the Sand Hollow flow is much more complex than described on page 16 paragraph 6 and page 17 paragraph 3. It thins irregularly across the Ryegrass Mountain and Hog Ranch structures but much more thickness data is needed

to evaluated properly whether the thinning is regional or related to growth of structures.

The main Sand Hollow flow of Mackin (1961) does thin across Frenchman Hills anticline as outlined on page 17 paragraph 3, but it must be shown that it thickens on both sides of the structure if it is to be used as evidence of growth structure in Frenchman Springs time. The present data (unpublished data, Bentley and Powell), shows that the Sand Hollow flow thins across the structures to the north and west, but that it does not thicken on the distant sides of the structures as is necessary to prove the growth of the anticlines.

7. The Sentinel Gap flow, as described in this report (page 17 paragraph 7) must include a Rye (Sand Hollow) flow of Bentley and Powell (1984*) in the western part of the map area and the Babcock Bench flow in the northern part. The Sentinel Gap flow ends abruptly as described by Mackin (1961) in a flow front that is nearly 30 meters thick. It does not thin across the Frenchman Hills as suggested (page 17 paragraph 7). Bentley and Powell (1987) show that this flow front is tracable southwestward across the Yakima Firing Range and not westward as suggested in this report. An upper flow lobe is present in the southern part of the study area which was not recognized by the authors of this study.

* This report presents maps and cross sections of the Vantage area at a scale of 1:12,000.

8. The channel fill of the Roza flow as described on page 17 paragraph 6 and page 18 paragraph 2, probably does not exist. The channel is a locally thickened area just northwest of the end of the Sentinel Gap flow as described by Mackin (1961). The flow that is mapped as the Sentinel Gap flow north of the channel is probably the Babcock Bench flow that was mentioned above. It is a separate flow that overlies the Sentinel Gap Flow.

9. Where is the locality ("towards Wanapum Dam") where the Elephant Mountain flow overlies the Beverly interbed (conglomerate/tuff) and the Priest Rapids flow as mention on page 19 paragraph 2? Bentley and Powell (1984) did not find any outcrops of the Beverly interbed in the study area east of the River. The Beverly member is exposed to the south of the study area adjacent to the Saddle Mountains fault on the west side of the Columbia River, but without any overlying Elephant Mountain basalt above it.

10. The Elephant Mountain flow is unknown west of the Columbia River. The outcrop referred to in this report (page 20 paragraph 2) is probably the Priest Rapids basalt.

This illustrates the very tentative nature of this report.

Action Taken: Submit to NRC. I suggest that the NRC acquire a copy of the updated geologic map of the Vantage area such as was displayed at discussion session at the Columbia River Basalt Symposium, Hilo, May 1987.

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WM Project 10, 11, 16
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