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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards info re max average rate of strike-slip displacement on RAW & "Re-Evaluation of Seismic Velocity Measurements," per NRC request.

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[illegible]

[illegible] of Streamline [illegible]
[illegible] Velocity [illegible]

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July 7, 1982
G02-82-581
SS-L-02-CDT-82-082

Docket No. 50-397

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
RESPONSE TO INFORMAL REQUESTS FOR INFORMATION

Enclosed are sixty (60) copies of the information on Maximum Average Rate of Strike-Slip Displacement on RAW and Reevaluation of Seismic Velocity Measurements which were requested informally by the NRC.

Very truly yours,

G. D. Bouchey
Deputy Director, Safety and Security

CDT/jca
Enclosure

cc: R Auluck - NRC
WS Chin - BPA
R Feil - NRC Site

B001

MAXIMUM AVERAGE RATE OF STRIKE-SLIP DISPLACEMENT ON RAW

The data regarding the amount and timing of strike-slip displacement on RAW do not allow estimates of the present slip rate to be made with a high degree of confidence. However, it is possible to place constraints on the average (long-term) lateral slip rate on the basis of assumptions regarding the known geologic relationships.

No individual stratigraphic or geomorphic markers have been shown to be laterally offset across RAW. The observations that suggest a lateral component of strain along RAW are: (1) horizontal straie that are present on fault surfaces within the Wallula fault zone, and (2) the northwest orientation of RAW relative to the inferred north-south orientation of the maximum compressive stress in the central Columbia Plateau. The tectonic models that propose strike-slip displacement along RAW postulate a zone of dextral shear that is at the surface along the Wallula fault zone to the southeast and that becomes either deeper (Laubscher, Appendix 2.5-O) and/or broader and more diffuse (Davis, Appendix 2.5-N) to the northwest beneath the structures of CLEW. Therefore, any assessment of the lateral slip along RAW northwest of the Wallula fault zone must be based on an assumed relationship between the surface deformation and inferred dextral strain at depth.

A major problem in assessing fault slip rates is using rates averaged over a long period of time to estimate present-day slip. The assumption that slip rates are constant over long periods of time may not be correct; detailed studies of fault slip rates show temporal variations over intervals of thousands of years (e.g., Sharp, 1980). For the Columbia Plateau, some studies suggest that the rate of deformation has been declining during the Quaternary period (Davis, Appendix 2.5-L) and geodetic data suggest deformation has either stopped or is continuing at a low

rate (Savage et al., 1981). Therefore, the present-day slip rate may be considerably less than that based on the deformation that has occurred during the past 14 m.y., which is the interval during which the Columbia River Basalts have been deformed.

In light of the uncertainties presented in the previous discussion, several estimates of the maximum average rate of strike-slip displacement along RAW are presented below. A prominent north-south gravity anomaly has been identified (Weston Geophysical, 1981) that crosses CLEW without any apparent lateral deflection at about longitude 120°W. Weston Geophysical (1981) estimates that, based on the resolution of the gravity data, the cumulative offset of the anomaly can be no more than 3 km. The anomaly is believed to be associated with a basement feature that predates the initial deposition of the Columbia River basalts (about 14 m.y. ago). The slip rate that results from a 3 km displacement during a 14 m.y. period is 0.2 mm/yr.

Constraints on the maximum cumulative offset may also be estimated by relating the pattern and amount of surface deformation to inferred dextral strain at depth. For example, Laubscher (Appendix 2.5-O) develops structural and kinematic arguments for the Columbia Plateau that limit the lateral component of strain across CLEW/RAW to less than 2 to 3 km. Assuming displacement along CLEW/RAW coincided with the initiation of Columbia River basalts about 14 m.y. ago (Davis, 2.5-N), the maximum average slip rate is 0.1-0.2 mm/yr.

Bentley (1980) and Laubscher (Appendix 2.5-O) present data on amounts of crustal shortening across the east-west trending folds of the Yakima fold belt. If it is assumed that all of the north-south shortening across the Yakima folds within CLEW occurs along the north-west striking CLEW/RAW as strike-slip faulting, then the cumulative strike-slip displacement can be estimated. At longitude 120°W, the displacement is calculated to be 3.2 km (shortening 4.5 km) based on Bentley's data, and 1.5 km

(shortening 2.1 km) based on Laubscher's data. Again, assuming a 14 m.y. time period, the resulting maximum average slip rates are 0.2 mm/yr and 0.1 mm/yr, respectively.

The following table summarizes the slip rate estimates:

Slip Rates

Technique	Data	Slip Rate	Reference
N-S Gravity Anomaly	<3 km	0.2 mm/yr	Weston Geophysical (1981)
Kinematic Analysis	2-3 km	0.1-0.2 mm/yr	Laubscher (1981)
Horizontal Shortening	3.2 km	0.2 mm/yr	Bentley (1981)
Horizontal Shortening	1.5 km	0.1 mm/yr	Laubscher (1981)

References

Davis, G. A., 1981, Late Cenozoic tectonics of the Pacific Northwest with special reference to the Columbia Plateau: WNP-2, FSAR, Appendix 2.5N, 47 p.

Laubscher, H. P., 1981, Models of the development of Yakima deformation: WNP-2 FSAR, Appendix 2.5-O, 69 p.

Sharp, R. V., 1980, Variable rates of late Quaternary strike slip on the San Jacinto fault zone, southern California: U.S. Geological Survey Open-File Report 80-95, 37 p.

Savage, J. C., Lisowski, M., and Prescott, W. H., 1981, Geodetic strain measurements in Washington: Journal of Geophysical Research, v. 86, no. B6, p. 4929-4940.

Weston Geophysical Corporation, 1981, Compilation and interpretation of gravity in Washington, Oregon, and adjacent parts of British Columbia and Idaho: WNP-2 FSAR, Appendix 2.5-L, 28 p.