

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

(Skagit Nuclear Power Project,  
Units 1 and 2)

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PREFILED TESTIMONY OF STEPHEN H. JOHNSON  
October 17, 1979

Q. What is your name and occupation?

A. Stephen H. Johnson, Associate Professor of Geophysics,  
School of Oceanography, Oregon State University, Cor-  
vallis, Oregon 97331.

Q. What documents have you reviewed in preparation of your testimony?

A. 1. Single Channel records obtained with a 4 kJ sparker and Acoustipulse obtained by Bolt, Beranek and Newman in 1976 for Puget Sound Power and Light Company.

2. High resolution seismic profiles (Uniboom) obtained in 1976 by the USGS (Open file report 76-187).

3. High resolution seismic profiles (Uniboom) obtained in 1978 by the USGS (Open file report (7801061)).

Q. What is the substance of your testimony?

A. A number of fault trends are proposed to underlie marine areas between the mainland near Bellingham, Washington and the San Juan Islands in the

vicinity of Lummi Island.

The locations of these lines are plotted on the accompanying map of the area. The Mobil Oil Company lines W70-(1 through 11) are shown with fault locations as interpreted by Dobrin (X's) and by Cheney (x's). I did not examine the Mobil lines.

High frequency seismic sources (Acoustipulse and Uniboom) are useful for examination of shallow structures. However, records from these sources are generally of limited value for the study of deep horizons since the high frequencies recorded (850 - 2900 Hz for the 1978 U.S.G.S lines) are rapidly attenuated and arrivals from greater depths are masked by seismic reverberations in the water layer (water multiples). Thus, attempts with such high frequency methods to map deep faults observed on the Mobil multichannel lines in the southern Strait of Georgia have not met with much success. For example, the single fault which Dobrin proposes to cross Mobil lines W70-4, W70-5 and W70-7 must cross the 1978 U.S.G.S Line A at time 1943, Line B at time 2210 and Line C at time 1742. My examination of the U.S.G.S. records reveals no evidence of faulting at these times. This observation neither proves nor disproves the interpretation of Dobrin. The records add no new information except that at these locations, no vertical displacement of surficial sediments appears to be indicated to depths of approximately 75 meters. If these records cannot detect deep faults in the vicinity of where they are seen on multichannel records, then they cannot be used to prove or disprove the existence of other proposed faults.

I should like to point out a number of lateral unconformities which show up on the 1978 U.S.G.S. lines, only one of which has been discussed earlier. Abrupt termination of nearly horizontal reflectors occur on Line A at times 1852 and 2005 and on Line C at time 1652. Taking into account the 6:1 vertical exaggeration of the records, the surfaces have dips of 20°, 34° and 16° respectively. These dips are rather shallow to be interpreted as normal faults in the classical sense, but I suggest that they may represent faulted and eroded or steeply eroded basement against which sediments have accumulated. These steeply dipping surfaces usually face toward the channels where accumulations of nearly horizontal sediments are observed. The nature of these dipping surfaces needs to be addressed more completely since the unconformities at times 1852 and 2005 on Line A are in line with faults proposed by Cheney to lie respectively between Lummi and Clark Islands and between Lummi Island and Frances Point.

A second type of lateral change in the sub-bottom characteristics results in the abrupt disappearance of reflectors between time 2030 and 2045 on Line A and 2112 and 2140 on Line B. This effect is not seen on adjacent sparker lines and may be an effect in the sub-bottom which affects high frequencies, but its cause is unknown and should be explained.

Line 12, which lies between W70-7 and W70-9 was searched for shallow faults but there is little evidence for them on the records even though several faults have been proposed to cross this line. Major offsets known to exist in the section are not visible on the shallow records and therefore lie below the depth of penetration of the sparker or boomer methods.

Numerous small faults are seen on BBN lines in the vicinity of Sucia and Patas Islands. These are probably related to a small platform which accounts for the islands.

Seismic lines in the vicinity of Vendovi Island also show little evidence of faulting in either the basement or the overlying sedimentary layers. Therefore, if faults exist through this area, they would have to cut strata which lie deeper than these records show.

My conclusion is that faults with major vertical offsets are not seen on the shallow penetration records. It is my opinion that the high frequency seismic methods are inadequate to locate the trace or traces of a major fault or faults proposed to exist in the area. Therefore, extrapolation of these faults into adjoining areas or interpolation between widely spaced seismic lines is a matter of considerable speculation.

