UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUN 6 1979

Docket Nos: 50-522
and 50-523

APPLICANT: Puget Sound Power & Light Company

FACILITY: Skagit Nuclear Power Plant

SUBJECT: PUGET PRESENTATION OF DATA ON SKAGIT REGIONAL GEOLOGY - APRIL 18, 1979

Background:

At the staff's request, Puget Sound Power & Light Company is performing more field exploration in the vicinity of the Skagit site. The purpose is to attempt to answer questions raised about the geology of the region during the course of the review and the public hearing. This meeting was the second of its kind dealing with this subject. The first meeting was held on February 23, 1979 at which Puget presented the results and interpretation of an aeromagnetic survey of the Skagit plant site area. The purpose of the meeting on April 18, 1979 was for Puget to present geology data related to the postulated B&B fault.

The meeting attendance list and presentation material are enclosed.

Summary:

Puget made a detailed presentation of the geological exploration and interpretation that have been performed in the region of the postulated B&B fault. There was considerable discussion of Puget's interpretation of the staff's and USGS's concern as presented in a Puget letter, PLN-214, dated March 29, 1979, and the staff advised Puget that the letter did not accurately characterize the concerns. The staff also informed Puget that it would not be useful to respond to the letter until after all of the geological data have been submitted and reviewed by the staff and USGS.

Puget said that it plans to submit the remaining geological data by the middle of May 1979 and agreed that no response to the March 29, 1979 letter is necessary if the data proves to be adequate.

Puget presented the staff with 20 copies of the EDCON aeromagnetic survey report less proprietary figures, 10 copies of the proprietary figures, 20 copies of the Bechtel regional geologic map and 20 copies of the regional geologic map with 100 gamma aeromag overlay. These submittals were covered by cover letters PLN-215 and PLN-216, both dated April 16, 1979.

555116

Technical discussion of the meeting is included as an enclosure to this summary.

Irving A. Peltier, Project Manager
Light Water Reactors Branch No. 1
Division of Project Management

Enclosures:
1. Attendance List
2. Presentation Material
3. Technical discussion

cc:
See next page

555117

cc: V. B. Deale, Esq., Chairman
Atomic Safety & Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555
Bellevue, Washington 98009

Mr. F. Theodore Thomsen
Perkins, Coie, Stone,
Olsen & Williams
1900 Washington Building
Seattle, Washington 98101

Mr. Robert Lowenstein
Lowenstein, Newman, Reis
& Axelrad
Suite 1214
1025 Connecticut Avenue, N. W.
Washington, D.C. 20036

Roger M. Leed, Esq.
Law Offices
1411 4th Avenue
Seattle, Washington 98101

Mr. Lloyd K. Marbet
c/o Forelaws on Board
19142 South Bakers Ferry Road
Boring, Oregon 97009

Mr. Nicholas D. Lewis, Chairman
Energy Facility Site Evaluation Council
820 East 5th Avenue
Olympia, Washington 98504

Honorable Richard Sandvik
Department of Justice
500 Pacific Building
520 Southwest Yamhill
Portland, Oregon 97204

Thomas F. Carr, Esq.
Assistant Attorney General
Temple of Justice
Olympia, Washington 98504

Dr. Frank F. Hooper, Member
Atomic Safety & Licensig Board
School of Natural Resources
University of Michigan
Ann Arbor, Michigan 48109

Mr. Gustave A. Linenberger, Member
Atomic Safety & Licensing Board
U. S. Nuclear Regulatory Commissio
Washington, D. C. 20555

555118

ENCLOSURE NO. 1

MEETING - APRIL 18, 1979

PUGET, USGS, STAFF

ATTENDANCE LIST

| NAME | ORGANIZATION |
|---|---|
| I. A. Peltier | NRC |
| J. F. Stolz | NRC |
| S. L. Wastler | NRC |
| H. E. Lefevre | NRC |
| R. E. Jackson | NRC |
| S. R. Brockman | USGS |
| R. H. Morris | USGS |
| J. F. Devine | USGS |
| W. H. Hays | USGS |
| H. A. Coombs | Puget (consultant) |
| R. H. Talmage | Bechtel |
| T. W. Crosby | Bechtel |
| J. E. Mecca | Puget |
| G. Simmons | Puget (consultant) |
| D. S. Little | Attorney for Puget |
| E. E. Goitein | Bechtel |
| D. J. Stoker | Bechtel |
| F. T. Thomsen | Attorney for Puget |
| J. R. Fishbaugher | Puget |
| G. W. Jacobsen | Director - SNP |
| W. J. Ferguson | Puget |
| J. A. Vance | Puget |

555119

(Enclosure No. 1)

| NAME | ORGANIZATION |
|---|---|
| E. Ridder | FDCON (consultant to Bechtel) |
| M. B. Dobrin | Bechtel (consultant) |
| R. W. Fosse | Bechtel |
| R. L. Black | NRC |
| M. J. Adair | Bechtel |

555120

"... THE UNIFIED RESULT OF THESE SEVERAL CORRELATIONS BASED ON PLANT MEGAFOSSILS, PALYNOLOGY, OR THE TWO TOGETHER, IS THAT MOST OF THE SUBAERIAL SEDIMENT DEPOSITED ON BOTH ISLAND AND MAINLAND SIDES OF THE EASTING LIMITS OF GEOLOGIC AGE ONE SERIES OF LATE UPPER CRETACEOUS AGE. THE SERIES IS NOW SHOWN TO INCLUDE NOT ONLY THE LONG-KNOWN, PARTLY MARINE, COAL-BEARING ROCKS OF VANCOUVER ISLAND, BUT MANY LESS CONSPICUOUS VESTIGES ON THE MAINLAND COAST, AND OTHERS FAR INLAND IN PARTS OF THE OLD BASIN THAT WERE MAINLY NON-MARINE.... THIS BROAD AREA MAY BE TREATED AS ONE BASIN OF LATE CRETACEOUS TO PALEOCENE TIME."

CRICKMAY & POCOCK 1963

IN CONCLUSION, THE CONCEPT OF A LATE CRETACEOUS - EARLY TERTIARY DEPOSITIONAL BASIN, WHICH IS PRESENTLY REPRESENTED ON BOTH SIDES OF THE STRAIT OF GEORGIA BY REMNANTS OF ONCE MORE WIDESPREAD UNITS CONTAINING CORRALATIVE FLORAL ASSEMBLAGES, HAS BEEN PART OF THE LITERATURE FOR SOME YEARS.

# GEOLOGY SUMMARY SAMISH BAY-STRAIT OF GEORGIA

1) SEDIMENTARY ROCK OF NORTHERN LUMMI ISLAND AND BARNES AND CLARK ISLANDS ARE NOT COEVAL.

2) SEDIMENTARY ROCK OF NORTHERN LUMMI ISLAND, MATIA, NORTHERN SUCIA, PATOS AND TUMBO ISLANDS HAVE DISTINCT CHARACTERISTICS COORELATIVE WITH THE CHUCKANUT FORMATION.

3) THESE ROCKS ARE DISTINCTIVE IN:
   - LITHOLOGY
   - STRUCTURAL TRENDS
   - DEPOSITIONED ENVIRONMENT

4) EVERSON GLACIOMARINE DRIFT AND DARRINGTON PHYLLITE OCCURE ON BOTH SIDES OF THE POSTULATED STRUCTURE.

From: PABST, PhD dissertation, 1962

# THE FLORA OF THE CHUCKANUT FORMATION OF NORTHWESTERN WASHINGTON

## The Equisetales, Filicales, and Coniferales

BY

MARIE B. PABST

(Contribution from the University of California Museum of Paleontology)

ABSTRACT

THE CHUCKANUT formation is a sequence of coal-bearing sandstones, shales and conglomerates of early Tertiary age, and possibly in part of latest Cretaceous age, occurring in the three northwesternmost counties of Washington. The abundant leaf impressions and fructification which make up the Chuckanut flora have been preserved in the finer sediments of this formation. The portion of the flora here described consists of 1 genus of scouring rush, 14 genera in 7 families and 2 orders of ferns, and 5 genera in 2 families of conifers. Of the 22 species described in this paper, 12 species of ferns and 1 conifer are new; 2 of the fern genera have not previously been reported as fossils. One conifer is reassigned to another genus within the same family. Abundant associated angiosperms are not considered in this report.

Comparison of the ferns and conifers with those of other Tertiary floras indicates that their closest affinity is with the Fort Union flora of Paleocene age; any final age reference must include the evidence of the angiosperms. The Chuckanut flora is considered to have lived under ecotonal conditions existing between subtropical and warm temperate forests. There was abundant rainfall and absence of frost during the time these plants lived in northwestern Washington.

p. 28



### SUMMARY AND CONCLUSIONS

This paper contains a discussion and description of the nonflowering plants and conifers present in the flora of the Chuckanut formation, northwestern Washington.

The earliest collections were made by James D. Dana in 1841. Lesquereux, Newberry, and Knowlton have described species from the flora.

The ferns and conifers are related to plants living today in the West Indies, tropical Mexico and Central America, northwestern South America, the southern coast of Chile, and southeastern and central Asia. They are largely lowland rain forest types.

The flora developed under ecotonal conditions existing between a warm temperate and subtropical climate. There was abundant rainfall and no freezing temperature at the time the flora lived in northwestern Washington. This forest could not have developed at the 49th parallel unless the tropical climatic zone extended farther north than it does today.

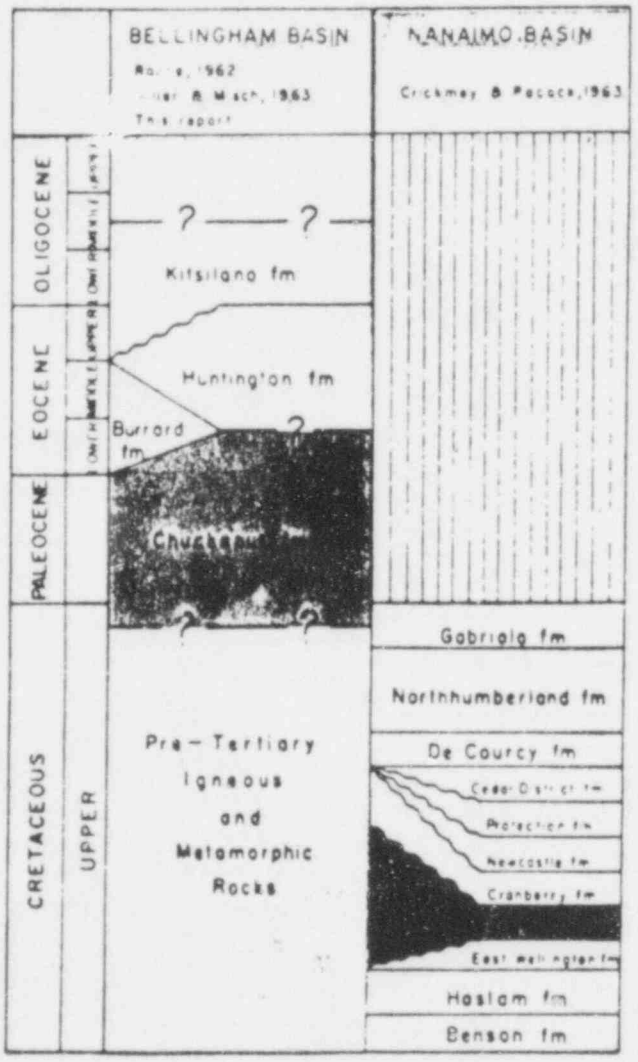
Twelve species of ferns and one of conifer are new; two of the fern genera are reported for the first time in the fossil record. One of the conifers has been reassigned to another genus in the same family. The distribution of species indicates that the formation was deposited during an interval extending from uppermost Cretaceous through Eocene time. More precise determinations will not be possible until the study of the angiosperms is completed. The species studied have their greatest similarity with those of the Fort Union formation of Paleocene age.

from: Griggs, P.H,
Palynological Interpretation of the Type Section,
Chuckanut Formation, Northwestern Washington
GSA Special Paper 127

p. 209, Caulosicus

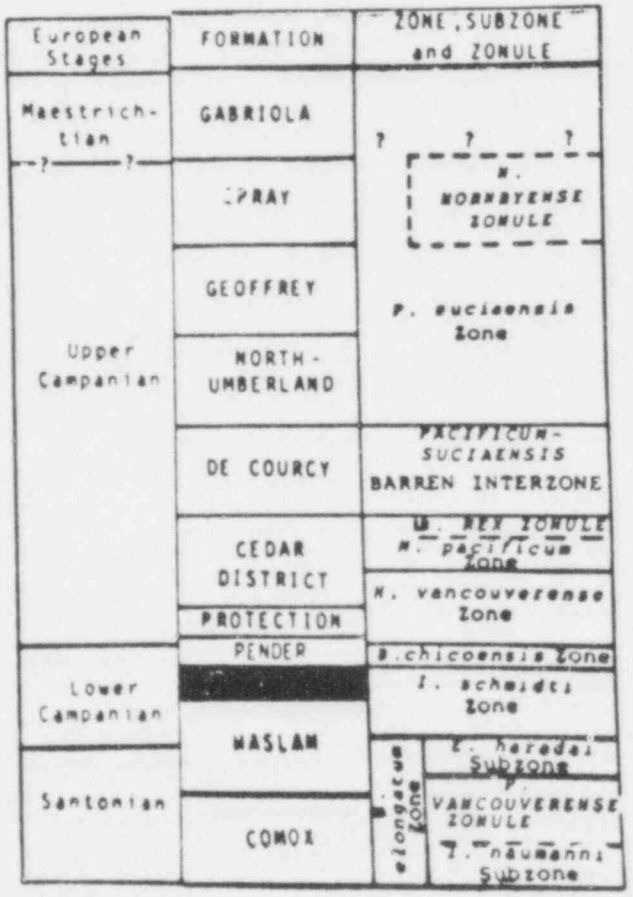
A comparison of the Chuckanut palynomorphs from the Samish Bay section with those described from the Burrard and Comox Formations of British Columbia indicates that the age of this section is younger than the Comox, perhaps very late Late Cretaceous to Paleocene or early Eocene and nearly the same as the Burrard. Pabst gives an age of Late Cretaceous to Paleocene for this section, based on the megafossil flora. The similarity of the microfossil flora to the Burrard and its almost complete dissimilarity with the Comox is offered as evidence for assignment of a late Late Cretaceous to early Eocene age for this section.

from: Griggs, 1970
Palynological Interpretation of the Type Section, Chuckanut Formation, Northwestern Washington, GSA special Paper 127




555126

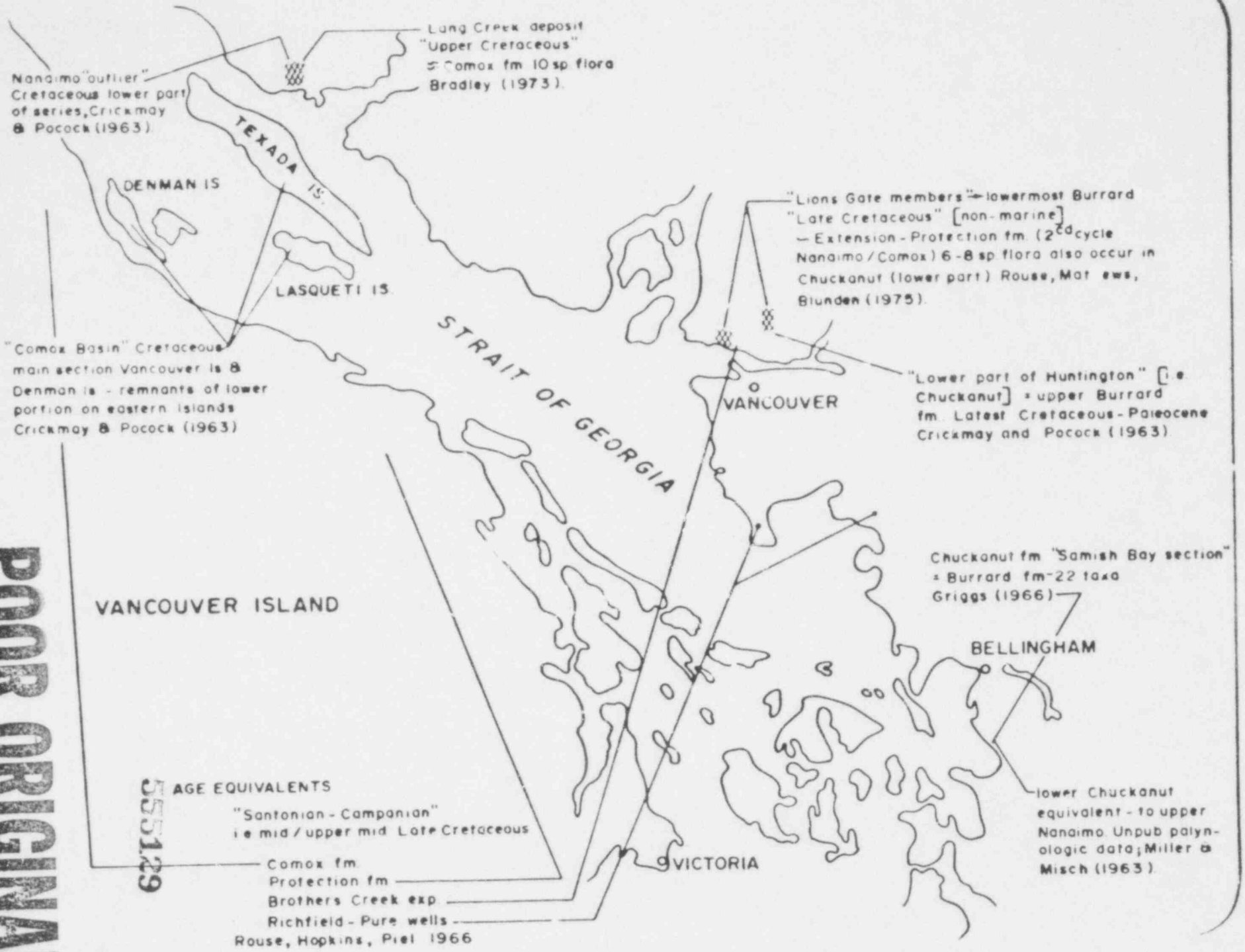
from: Ward, 1978
"Revisions to the stratigraphy and biochronology
of the Upper Cretaceous Nanaimo Group,
British Columbia and Washington State"
Can. Jour. Earth Science, Vol. 15, 1978




555127

| STAGE | ZONE AND SUBZONE | | FORMATION | CYCLE |
|---|---|---|---|---|
| | | | GABRIOLA 600' – 3000' | nonmarine |
| Maestrichtian | Sucia Island zone | Hornbyense subzone | SPRAY 950' – 1770' | fourth cycle |
| Campanian | | cf. Pacificum subzone | GEOFFREY 300' – 1500' | |
| | | | NORTHUMBERLAND 500' | third cycle |
| | Vancouverense zone | | DESCOURCY 900' – 1400' | |
| | | | CEDAR DISTRICT 1000' | second cycle |
| | | | EXTENSION PROTECTION 200' – 1900' | |
| | Schmidti zone | | HASLAM 200' – 500' | first cycle |
| | Elongatum zone | Haradai subzone | | |
| Santonian | | Naumanni subzone | COMOX 150' – 2000' | |

555128



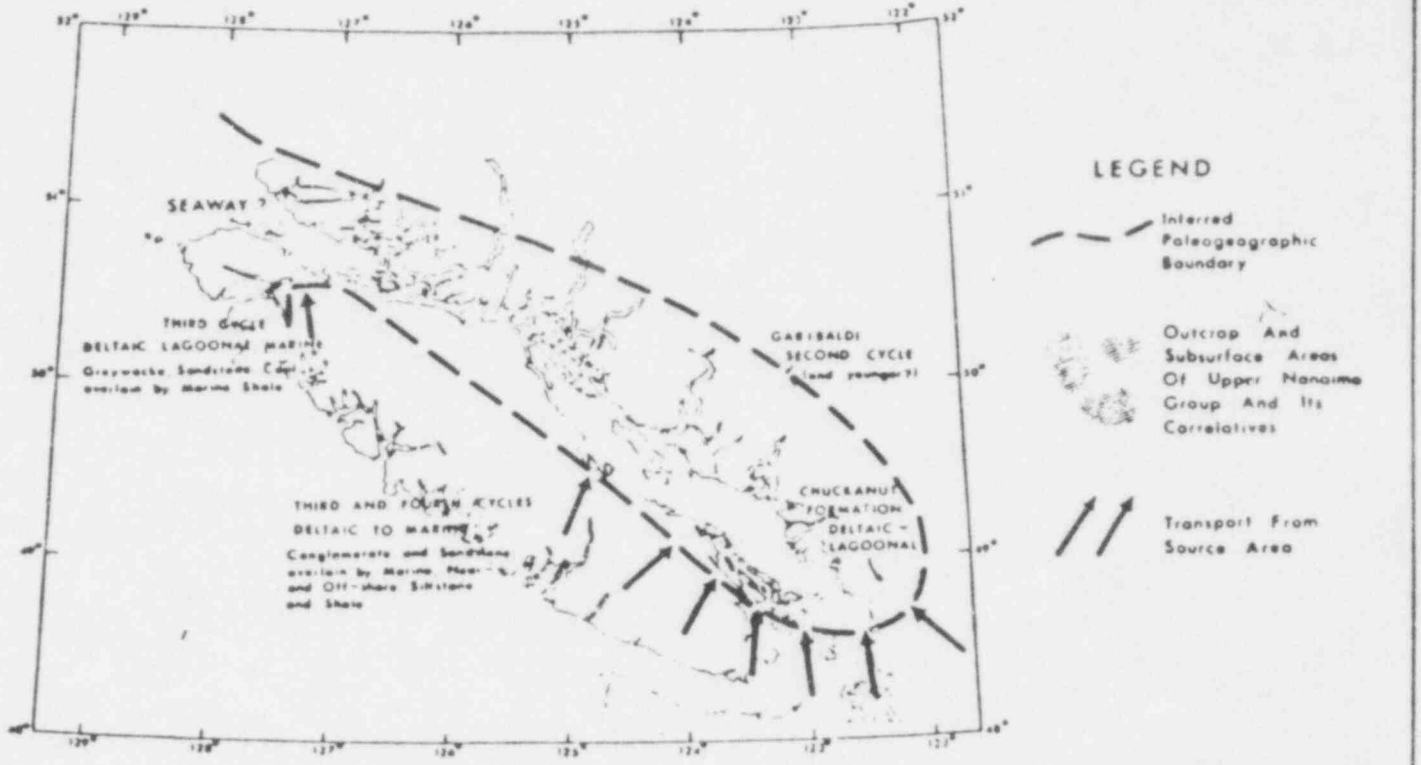



Figure 9. PALEOGEOGRAPHIC DATA FOR UPPER PART OF NANAIMO GROUP

FROM: Muller and Jeletzky, 1970.

ENCLOSURE 3

Technical Summary

A meeting was held between Puget Sound Power and Light (PP&L), the NRC and USGS on April 18, 1979 to discuss the postulated B and B fault. The discussion centered primarily on two areas: 1) the NRC and USGS comments on the March 29, 1979 letter (PLN-214) from J. E. Mecca, PP&L to John Stolz, NRC (see attached letter) and 2) the geology data related to the postulated B and B fault.

March 29, 1979 letter:

PP&L's March 29, 1979 letter summarized the applicants understanding relative to concerns associated with the postulated B and B fault. In this letter, the NRC was requested to comment on any error regarding PP&L's interpretation of the NRC/USGS concerns relative to the postulated B and B fault. At the April 18, 1979 meeting, the NRC and the USGS informally responded to this request by noting several shortcomings of the letter.

The first comment centered on the applicants' statement that "...Dr. Hays and other reviewers indicated that the hypothetical fault if it existed would exhibit Quaternary displacement." Neither the USGS nor the NRC, has proposed Quaternary displacement along this postulated fault. Dr. Hays stated in this meeting that the postulated fault is most likely post-Nanaimo to pre-Vashon but there is presently no apparent evidence to more closely bracket the last age of displacement on the postulated fault.

The NRC and the USGS noted that sufficient data was not presently available to reach a final decision with regard to the postulated B and B fault. In March 1978, during the Skagit ASLB hearing, Dr. Hays first brought forth his ideas regarding the postulated B & B fault based on the data available at that time. Since the hearings the NRC has not received additional information from the applicant relative to this fault. The applicant has performed geophysical and geologic investigations in the Skagit area since the hearing in order to respond to the NRC/USGS June, 1978 geology questions. The applicants aeromagnetic report was made available at the April 18, 1979 meeting and the geology report will be submitted May 15, 1979. The NRC informed the applicant that until the USGS and NRC review the geology report a formal response to the March 29, 1979 letter concerning the B and B fault and conclusions regarding the aeromagnetic report would be delayed.

Thirdly, the NRC and USGS noted the letter's omission of significant data relevant to the basis for postulating the B & B fault, as put forth by Dr. Hays during the March, 1978 hearing and the March 18, 1979 telephone conference call with the applicant. Therefore, Dr. Hays briefly discussed the basis for postulating the B & B fault.

555132

Lastly, the USGS noted that the March 29, 1979 letter doesn't reflect an understanding of the requirement for the postulated B & B fault. In order to maintain both Bechtel's interpretation of the Chilliwack stratigraphy in the Skagit site vicinity and Dr. Whetten's interpretation of the Jura-Cretaceous stratigraphy of the San Juan Islands, a contact between these two rocks types must occur. The regional geology and tectonic interpretations suggests at the present time to the USGS that this contact is a suture or a fault. If the applicant maintains his current hypothesis then the nature and location of this

contact must be defined.

Geologic data related to the postulated B & B fault: The applicants consultants, Bechtel, summarized the geologic data used to support their conclusion that the postulated B & B fault is not required in order to explain the regional geology between the San Juan Islands and mainland Washington. Data supporting the applicants conclusion were derived from remote sensing data, the geology of Table Mountain, Walker Valley and the San Juan Islands, the EDCON, Inc. aeromagnetic report, available seismic profiles in the Puget Sound and stratigraphic arguments to explain comments made by Dr. P. Ward in a December 5, 1977 letter to the USGS.

Following this presentation, the NRC and the USGS expressed the concern that the applicants presentation did not deal with the main issue. As stated previously with regard to the March 29, 1979 letter, their was no discussion directed at the nature of the contact between Dr. Whetten's interpretation of the Jura-Cretaceous deep marine stratigraphy of the San Juan Islands and Bechtel's interpretation of the Chilliwack stratigraphy in the Site site vicinity. In order for both of these interpretations to exist this contact is required and therefore must be defined. In addition, the USGS requested the location, geologic setting and stratigraphy of samples used to obtain radiometric dates in the study area. The USGS and NRC requested that the discussion of the applicants theory regarding the Chuckanut-Nanaimo gradation versus Dr. Ward's theory should be discussed in the geology report. A possible field trip in the San Juan Islands was suggested to including Drs. Ward and Vance to further investigate the relationship between the Nanaimo and Chuckanut rocks in the field.

In summary, the NRC is waiting for the submittal of the extensive geology report before proceeding with the Skagit review. Upon receipt of this report the review would resume and, if necessary, a formal round of questions be issued. It was indicated that the window of time for review which was based on an estimated submittal date for the geology and aeromagnetic report of January 1979 has now been changed and that summer field season could provide for a possible delay in the review.

Attachment