GEOLOGIC MAP GM-13

WASHINGTON DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND EARTH RESOURCES

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GEOLOGIC MAP OF THE DESTRUCTION ISLAND AND TAHOLAH QUADRANGLES, WASHINGTON

By

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INTRODUCTION

Early contributions to geology of the mapped area are by Arnold (1906), Reagan (1909), Arnold and Hannibal (1913), Lupton (1914), and Weaver (1916). These investigations are largely of a reconnaissance nature and confined to the coast and major river valleys. Glover (1940, 1945) collected much detailed information along the coast. Baldwin's 1939 study is one of the first concerning coastal Pleistocene deposits. In 1937 Weaver revised some of his original work. Recent contributions include a summary of the geology and mineral resources along the coast by Weissenborn and Snavely (1968), petrology of some of the Hoh rocks by Koch (1968), and a detailed study of the sedimentary history of the Quinault Formation by Horn (1969). Investigations by Stewart (1970) on petrology, metamorphism, and structural relations include a regional map of the west-central part of the Olympic Peninsula. Reports on detailed biostratigraphic studies of the Quinault Formation and a summary of the coastal geology have been presented by Rau (1970, 1974) as a part of the present mapping project.

The cooperation and courtesies extended to the author during the course of field investigations by members of the Quinault Tribal Council and the Olympic National Park Service are gratefully acknowledged. Thanks are also due to many individuals of the various communities in the area for their generous assistance. Technical discussions with W. M. Cady, N. S. MacLeod, P. D. Snavely, Jr., R. W. Tabor, and H. C. Wagner of the U.S. Geological Survey, and R. J. Stewart of the University of Washington have been most helpful. The assistance of many staff members of the Division of Geology and Earth Resources in the preparation of the map is acknowledged. Field assistants who have contributed much are John P. Braislin, Greg D. Cloud, and Gerald R. Grocock.

GENERAL STATEMENT

The primary purpose of the map is to show the distribution of Tertiary rock units in as much detail as possible, as well as to locate the major structures and faults within these rocks. Mapping of the Quarternary deposits is generalized to show either alluvium or alpine glacial drift. Although in places further subdivisions are apparent, particularly in the alpine glacial drift, in view of the scope of this map these subdivisions are not shown.

In most places Quaternary deposits rest unconformably on Tertiary rocks. However, contact relations are not fully known between what is believed to be the oldest gently dipping Pleistocene deposits and the moderately dipping and faulted Pliocene Quinault Formation. Thus, in places both within the mapped area and in surrounding areas, the two units may well be conformable.

The two major Tertiary units, the moderately folded and faulted Pliocene Quinault Formation and the older intensely folded and faulted Hoh rock assemblage, are separated by a profound and widespread unconformity. Structural relations clearly indicate that major tectonism took place prior to deposition of the Pliocene Quinault Formation and some time following middle Miocene time.

Because much of the bedrock in areas south of the Queets River, east of the Clearwater River, and in the Hoh River valley is masked by thick deposits of drift, Tertiary rocks are shown only where they actually crop out or are known to be only thinly covered. Structural interpretations are necessarily limited and the extent of each Tertiary unit has not been fully determined in these areas. In the major Tertiary outcrop area between the Hoh Valley and the Clearwater-Queets drainage, data on rock type distribution and structure are more available and therefore interpretations are presented in somewhat greater detail in this area.

Almost all faults shown are conceptual. For the most part, they separate abruptly differing structural trends or major blocks of distinctly different rock types. They rarely have been observed as actual fractures. However, in a few places, intense shearing has provided criteria for the precise placement of some faults.

DESCRIPTION OF THE MAP UNITS

SURFICIAL DEPOSITS

ALLUVIUM

Qal: silt, sand, and gravel–major deposits of unconsolidated sediments, largely confined to river bottoms and spits at the mouth of major streams.

ALPINE GLACIAL DRIFT

Baldwin (1939) recognized a two-fold division of drift deposits in the area; and Glover (1940b) informally referred to the oldest of these as the "Taholah Formation," and the youngest as the Queets beds. Although these deposits are undifferentiated on the present map, generally the younger deposits are found in coastal areas and at lower elevations in major stream valleys. The top of these deposits, at some 200 feet elevation or less, forms a piedmont surface a mile or so wide along most of the coastal area and farther inland in major stream valleys, as well as on Destruction Island. This surface, although appearing nearly flat, varies broadly in elevation suggesting gentle warping of the underlying rocks. For example, the surface stands noticeably lower in the Kalaloch area than it does both to the north and south. Essentially all of these deposits appear to be outwash and lacustrine materials. They rest unconformably on the older Pleistocene deposits and Tertiary rocks.

Heusser (1972) records radiocarbon dates from peat beds in the younger unit that span time from 16,700 B.P. to greater than 47,000 B.P. He further estimates the lowest deposits in the younger unit may date from 70,000 B.P. In 1974 he referred to at least some of these deposits as Salmon Springs equivalent.

Older deposits crop out at elevations above 200 feet and are particularly extensive in the upland areas between the Quinault and Queets Rivers, at higher elevations east of the Clearwater River, and along the south side of the Hoh River valley. They also crop out in the basal part of sea cliffs mainly between the Raft River and the Queets River, and from Trail 5 northward to the Hoh River. In these latter areas the contact between the two drift units is very pronounced and nearly horizontal, representing the trace of an elevated wave-cut terrace that was carved on older rocks prior to the deposition of the younger drift unit. Some of the older drift, particularly that in outcrops between Trail 6 and the Hoh River, may well be till; thus suggesting that at one time ice extended at least as far westward as the present-day coast. The older drift unit is estimated to date beyond 70,000 B.P. Heusser (1974) states that some of these pre-Salmon Springs materials might be pre-Puyallup, perhaps dating from Stuck glaciation. These older deposits display even greater warping than the younger Pleistocene deposits. In places, particularly a mile or so east of Taholah, dips up to 40° have been recorded in the older deposits. In this particular area, steeper dips may be reflecting post-Pleistocene faulting and(or) may be related to young diapirism of older rock beneath.

Qg: clay, silt, sand, and gravel–largely glaciofluvial, some lacustrine and till(?). Some 85 percent of the pebbles in the gravel are graywacke sandstone; many contain numerous dark-colored siltstone clasts. Other pebbles consist of volcanic rock, red argillite, phyllite, and light-colored chert. Carbonized wood, varying from mascerated plant material to logs and stumps is associated with lacustrine deposits and, in places, is dispersed throughout sand and gravel deposits.

THE QUINAULT FORMATION (Tq)

Arnold (1906) first applied the name Quinault (Quinaielt) Formation to strata exposed between Cape Elizabeth and Point Grenville. Since then, much information has been made available about the formation, and its known outcrop area has been extended considerably but largely within the area of this map. Rau (1970) presented a summary of the contributions of numerous workers together with detailed descriptions of measured sections, a checklist of Foraminifera from numerous localities, and a comprehensive discussion of the biostratigraphy of the formation.

The lithology of the Quinault Formation varies widely. Massive to well-bedded siltstones are common in places and can be seen particularly well in sections exposed along the coast south of Taholah, and in cliffs extending from about 1 mile south of the mouth of Duck Creek to and including outcrops at Pratt Cliff. Massive to well-bedded sandstones with well-developed channeled surfaces and numerous large penecontemporaneous sedimentary features are well exposed in sea cliffs north of Point Grenville. Thick beds of coarse sandstone and conglomerate interbedded with thinner beds of sandy siltstone are well exposed in the cliffs of the Cape Elizabeth area and northward from the Cape for about 1 mile. Numerous channeled surfaces are also common between the various conglomerate beds in these outcrops.

Although the formation or its equivalent is believed to be widespread on the Continental Shelf, its known extent onshore is limited to coastal outcrops, largely between the mouth of the Queets River and Point Grenville. Nearly continuous outcrops are mapped inland for some 2 miles in the area immediately south of Raft River and a few isolated outcrops are also known about 2 miles inland in the Taholah area.

The Quinault Formation is moderately folded within the mapped area with dips most commonly between 10° and 25°. Dips up to 65° are known in a few places in the Pratt Cliff area. The Quinault Formation rests with major angular unconformity on the Hoh rock assemblage.

Faulting within each continuous outcrop of the Quinault Formation usually displays only minor displacements. However, major pre-Pleistocene(?) faults may have resulted in extensive displacement between some of the major outcrops of the Quinault Formation. Some of these faults are mapped in the following areas: At the south end of the outcrop area of the Quinault Formation immediately north of Point Grenville; just northwest of the mouth of the Quinault River; and about three-quarters of a mile south of Duck Creek. Other major northeast-trending faults may form contacts between the Quinault Formation and the melange rocks of the Hoh rock assemblage, both near the mouth of the Raft River and also in an area approximately 3 miles to the south. Melange rocks are frequently found between major outcrops of the Quinault Formation where, in most places, they are associated with faults on which major displacement is thought to have taken place. At least some of these relations are interpreted as piercement structures where the older melange rocks are believed to have moved into the Quinault Formation, possibly in some places along major faults (Rau, 1974).

Both megafossils and Foraminifera are common in the Quinault Formation and, for the most part, indicate a Pliocene age; however, based largely on Foraminifera, the lowermost part of the formation exposed within the mapped area has been tentatively referred to an uppermost part of the Miocene (Rau, 1970). Furthermore, foraminiferal data from offshore wells indicate that, at least in places, late Miocene strata are present between the older, structurally complex rocks of early and middle Miocene age and strata of Pliocene age.

THE HOH ROCK ASSEMBLAGE

Weaver (1916, 1937) first applied the term Hoh Formation to many of the rocks exposed in the northwestern part of the Olympic Peninsula. Studies in connection with the present map, together with those of a number of other workers (for example, Glover, 1940; Weissenborn and Snavely, 1968; Stewart, 1970; and Snavely and MacLeod, written communication, 1974) have shown that these rocks not only are varied lithologically but also vary greatly in age. Furthermore, they have undergone differing amounts of tectonism from moderate folding and faulting to intense shearing and disarrangement of individual strata.

Glover (1940) suggested that some of these rocks, largely the sandstone beds exposed in the vicinity of Browns Point and Destruction Island, be separated from Weaver's Hoh Formation and referred to as the Browns Point Formation. However, the extent of these rocks inland, as shown on the current map, reveals that satisfactory boundaries are not easily mapped and therefore even these rocks do not constitute a well-defined formation. Because neither the rocks of Weaver's Hoh Formation nor Glover's Browns Point Formation have proven to be mappable units with a definable top and base, they are all informally referred to as the Hoh rock assemblage (Rau, 1973).

Within the area of the Destruction Island and Taholah quadrangles, two major groups of rocks make up the Hoh rock assemblage: (1) those strata believed to be largely turbidite in origin, consisting of tightly folded, steeply dipping, but coherent sequences of siltstone, graywacke sandstone, and conglomerate; and (2) melange rocks of intensely sheared, completely disarranged, chaotically mixed siltstone, and claystone, with blocks of graywacke sandstone, conglomerate, and volcanic material.

Fossils are rare in the Hoh rocks but Foraminifera have been collected from them at 50 localities throughout the mapped area (see checklist). A large majority of these assemblages suggest either an early or middle Miocene age (Saucesian or Relizian Stages of Kleinpell, 1938). The oldest assemblages suggest a middle Eocene age and came from interbedded siltstone of the volcanic rocks of Point Grenville (F-50). Late Eocene assemblages were collected from broken siltstones and sandstones exposed immediately north of the volcanic rocks of Point Grenville (F-48 and 49).

Some of the youngest assemblages of the Hoh rocks are from the Kalaloch Ridge syncline area (F-7, 8, 9, 12, and 13) and suggest a Relizian age. The tentatively identified *Rotalia garveyensis* from very poorly preserved assemblages of the upper Raft River area (F-31 and 32) suggest an age as young as late Miocene and therefore, the associated strata are questionably referred to the Hoh rock assemblage. *Rotalia becki* together with associated fauna from melange rocks near the mouth of the Raft River and in the Hogsback area (F-33, 35, and 36) suggest upper Saucesian to possibly Relizian (middle-Miocene) age. An upper Saucesian age is also suggested by *Siphogenerina branneri* and associated fauna from the melange rocks exposed a mile or so north of Cape Elizabeth (F-43-46). Particularly diagnostic Saucesian assemblages were collected near the mouth of Hurst Creek (F-21) and along the Queets River (F-24 and 25).

A large majority of the assemblages suggest fairly deep-water depositional conditions, perhaps at no less than upper bathyal depths. Shallow-water species were found in a few assemblages, mainly from the Hoh River and Beach Trail 5 areas (F-1, 2, and 10). However, deep-water forms are also present in these same assemblages and suggest that an original shallow-water deposit may have been reworked downslope, perhaps by turbidite action, and incorporated in relatively deep-water deposits.

Megafossils are extremely rare in the Hoh rock assemblage. Within the mapped area the only significant collections were made on the north side of the Hoh River, about 1½ miles upstream from its mouth. According to W. O. Addicott (*In* Rau, 1973, and written communications, 1974), the assemblage indicates an early or middle Miocene age. The fossils further suggest a relatively shallow-water environment, possibly at water depth between 10 m and 30 m.

The following six lithologic types have been recognized and their distribution shown on the map:

Thsl: siltstone–massive to rhythmically bedded with thin laminae of fine-grained sandstone.

Thss: siltstone and sandstone–about equal amounts of light-gray to blue-gray rhythmically bedded siltstone and fine-grained sandstone; beds range in thickness from 3 to 40 cm.

Ths: sandstone–light-gray, blue-gray when freshly broken, olive-gray when weathered; fine- to medium-grained, massive to thick-bedded with thin to thick laminae of siltstone; contains abundant lithic fragments. In places, includes undifferentiated conglomerate, grit, and coarse sandstone.

Thcs: conglomerate, grit, and coarse to very coarse sandstone–light-gray, blue-gray when freshly broken, olive-gray when weathered; massive; contains abundant lithic fragments commonly including dark-gray shale chips.

Thm: melange rocks–chaotically mixed blocks of massive sandstone, varying greatly in size, laminated siltstone and sandstone, massive siltstone, and altered volcanic rocks set in a dark-gray colored, intensely sheared matrix of clays and siltstone fragments.

Thv: volcanic rocks–undifferentiated, including altered volcanic breccia, tuffs, and massive basalt.

STRUCTURE

The extensively folded Hoh rocks seldom dip less than 35° and are commonly vertical or overturned. Among the prominent folds mapped in the major outcrop area, between the Hoh River valley and the Clearwater-Queets drainage, are the steeply northeast-plunging and overturned Kalaloch Ridge syncline and Kalaloch Creek anticline; the steeply northwest-plunging and overturned Destruction Island syncline; the isoclinal and recumbent West Fork anticline, whose overturned western limb forms the coastal outcrops in the Browns Point area; and a steeply plunging and overturned anticline and syncline block immediately south of the Kalaloch Creek anticline. Several less prominent folds are also suggested in the Clearwater River area.

Faulting within the Hoh rock assemblage is extensive and no attempt has been made to show all fractures with only minor displacement. However, a few of these are shown to represent the numerous northwest-trending minor fractures that can be seen in low-tide outcrops of the Browns Point area. Nearly all of these display a left lateral movement. Most other faults shown on the map are primarily those necessary to explain the structural pattern in the outcrop area of the Hoh rocks. Major faults are believed to bound large blocks of strongly folded sedimentary sequences. In some places melange zones are also believed to be bound by significant faults.

Among the most prominent faults in the area of major outcrop is the north-northeast-trending Kalaloch Creek Fault that separates the West Fork anticline sequence from the Kalaloch Ridge syncline sequence and the East Fork Fault to the south. The latter fault is believed to be offset to the north in its northerly extent by the Miller Creek Fault. Major displacement appears to have taken place on the Miller Creek Fault, some of which had a strike slip component in a left lateral direction. Although glacial drift masks the known extent of a northwest-trending fault that cuts the west limb of the West Fork anticline, it may extend northward for a considerable distance. The north-northeast-trending fault that bounds the west side of the Miller Creek melange zone is especially pronounced on aerial photographs because beds are truncated along its trace. An east-west-trending fault shown in the extreme northeast part of the map may also be of major significance but its trace is concealed to the west by Quaternary deposits. Other faults along which major displacement may have taken place, not only in the Hoh rocks but also in the Quinault Formation, are mapped in the area south of the Queets River and are discussed under the section on the Quinault Formation.

Because very little, if any, field evidence was found to indicate the direction and amount of dip of the major northwest- and northeast-trending faults, most are shown on the cross sections as either dipping vertically or as high-angle reverse faults. However, it would not be contrary to the available data if most of these faults were in fact thrusts, with underthrusting to the east. Such a model would be in keeping with the tectonic framework of other parts of the Olympic Peninsula to the east (Stewart, 1970, 1971).

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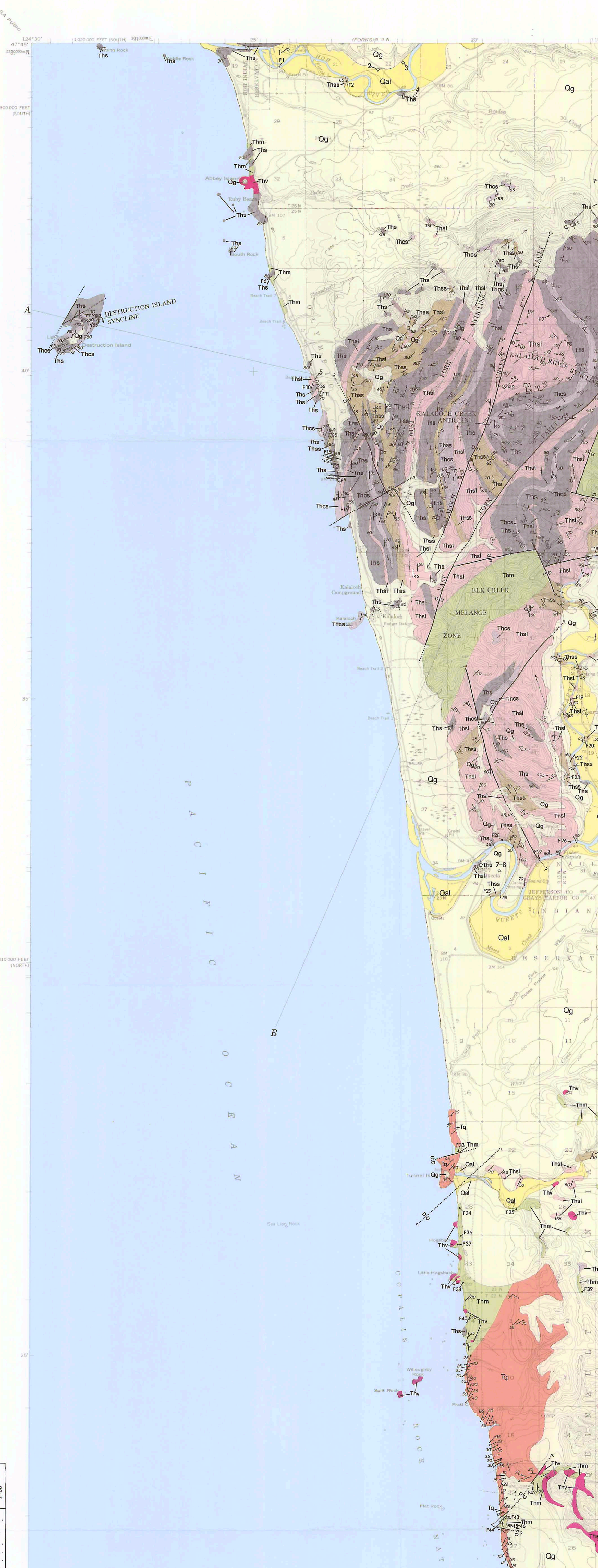
CHECKLIST

Foraminifera from the Hoh rock assemblage

(C — common; F — few; R — rare; ? — questionably identified)

LOCALITIES

SPECIES	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	F-9	F-10	F-11	F-12	F-13	F-14	F-15	F-16	F-17	F-18	F-19	F-20	F-21	F-22	F-23	F-24	F-25	F-26	F-27	F-28	F-29	F-30	F-31	F-32	F-33	F-34	F-35	F-36	F-37	F-38	F-39	F-40	F-41	F-42	F-43	F-44	F-45	F-46	F-47	F-48	F-49	F-50
Alabamina kernensis Smith																																		?																
Alabamina cf. *A. wilcoxensis californica* Mallory																																																	R	?
Allomorphina macrostoma Karrer																																									R									
Amphimorphina jenkinsi (Church)																																																R		
Angulogerina hannai Beck																																																	R	
Anomalina californiensis Cushman and Hobson	?			C	F									F				?				F	?			?																	?	C		R				
Anomalina cf. *A. garzaensis* Cushman and Siegfus																																																		R
Anomalina cf. *A. glabrata* Cushman																							R	R									R	R					?		?		F		F	F				
Asterigerina crassaformis Cushman and Siegfus																																																C		F
Baggina cf. *B. washingtonensis* Rau																									R																									
Bolivina cf. *B. tumida* Cushman									F				F																																					
Bolivina advena Cushman		F										R	?	R							F			F	F		R			R		R	?					R					C							
Bolivina cf. *B. incrassata* Reuss																																																R	?	
Bolivina marginata adelaidana Cushman and Kleinpell						F																		?									F										C	R		F				
Buccella mansfieldi oregonensis (Cushman, R. E. and K. C. Stewart)		F								F																																								
Bulimina alligata Cushman and Laiming					?								?						F													R		R							?									
Bulimina corrugata Cushman and Siegfus																																		R									F		?			R	F	
Bulimina microcostata Cushman and Parker																							?																										R	R
Bulimina ovata d'Orbigny		R	R		F		F			C		F		R		C		R							R		R	?					F					R	R	F	F								?	?
Bulimina pupoides d'Orbigny			F				R		?							R							F		C									F				C	R	C	F									
Bulimina schencki Beck																																																R		
Buliminella cf. *B. subfusiformis* Cushman								?				?													F					R								R								F				
Cassidulina crassipunctata Cushman and Hobson	C	R		?	C	?				C						?			C		C			?			R			?										F				F		?	?			
Cassidulinoides sp.	R																																																
Chilostomella cf. *C. hadleyi* Keijzer			R																															R							F									
Cibicides spp.						R		R		R													R					R	?															?						
Cibicides elmaensis var. A Rau [highly convex ventrally]														R																				R									F		F	R				
Cibicides hodgei Cushman and Schenck																																																	?	
Cibicides martinezensis Cushman and Barksdale																																																		R
Cibicides mcmastersi Beck																																																R	F	
Cibicides cf. *C. pseudoungerianus evolutus* Cushman and Hobson														F				F		R		C	C					C	F				R	R				C		C			C		C	F				
Cibicides spiropunctatus Galloway and Morrey																																										?		?						R
Cibicides venezuelanus Nuttall																																																		R
Dentalina spp.				R			F	R				R						F			F		R		R								R	R			R	R	F		F	F	F				R	R	R	R
Dentalina quadrulata Cushman and Laiming						C	?					R	F	R												F							R	R				F	F				R			R				
Eggerella bradyi (Cushman)																																		F								R								
Elphidium cf. *E. californicum* Cook MS.										F																														F										
Elphidium cf. *E. minutum* Cushman	F	F								C																																								
Entosolenia sp.																																						R												
Epistominella parva (Cushman and Laiming)	F																						?		?										?												?			
Epistominella tenuicarinata (Cushman and Siegfus)																																																	?	
Eponides duprei Cushman and Schenck																		F			R		?							?									?		F	F	?							
Eponides cf. *E. keenani* Cushman and Kleinpell												R	F																									R				R	?							
Eponides umbonatus (Reuss)											R		R																													R	?	R					
Globigerina spp.				R	F	R	F			F			C	C	R	C	R	C	C	R	F	R	C	C	F		R			F			R	C						F		C	C	C		F	F	F	C	F
Globobulimina pacifica Cushman			R						F	F		?											R		R								?																
Globocassidulina globosa (Hantkin)																									?																							R	F	
Globocassidulina cf. *G. subglobosa* (H. B. Brady)																																										F								
Guttulina irregularis d'Orbigny																																																	?	
Gyroidina condoni (Cushman and Schenck)																																																	F	
Gyroidina cf. *G. planulata* Cushman and Renz																																														F				
Gyroidina soldanii d'Orbigny	C	F		C		?	R			C		R	R	F		?	F	R	F	R		C	R		?				R	R	?	?	F	R	R	R	C	R	?	R	R	R	R	R	C	R		R	R	
Karreriella chilostoma (Reuss)																							R																F					R					?	?
Karreriella washingtonensis Rau			?							?	?	?	?																																F					
Lagena spp.	R												R					R	R											R								R						R	F					
Lenticulina spp.		R								R									R		F		R				R	R										R		R	R	R			R	R			R	
Nodogenerina sp.																																																F	R	
Nodogenerina advena Cushman and Laiming										F	F						R				C	R														?						?	R			F				
Nodosaria cf. *N. anomala* Reuss						F	?			?			F					?																R						F	?		R							
Nodosaria cf. *N. longiscata* (d'Orbigny)										R	R	R	C		F			R												R			R	R						F	R							F	R	
Nodosaria cf. *N. raphanistrum caribbeana* Hedberg													?						?			C																R	R				R		R	?				
Nonion costiferum Cushman										F															R								R																
Nonion incisum kernensis Kleinpell										C		?															?																						
Nonion pompilioides (Fichtel and Moll)	F																				R	R				F																								
Nonionella miocenica Cushman			F						R															R																									
Planulina cushmani (Barbat and vonEstroff)																								R	R			?					F	C									F			C				
Plectofrondicularia californica (Cushman and Stewart)														?				F						R									R																
Plectofrondicularia cf. *P. miocenica* Cushman															R																							R								R				
Plectofrondicularia cf. *P. packardi* Cushman and Schenck																																																	R	
Pleurostomella sp.																									R																	?								
Pseudoglandulina sp.																																																		R
Pseudoglandulina inflata (Bornemann)	F									F				?																				?	R		R												
Pseudoglandulina aff. *P. inflata* (Bornemann)															R																																		
Pullenia quinqueloba Reuss							?						R												?		?							?								R	R		F					
Pyrgo sp.																							R																										
Quinqueloculina imperialis Hanna and Hanna																							R																										
Quinqueloculina spp.										R			R																																				
Rotalia becki Bandy and Arnal																																	C		?	F													
Rotalia cf. *R. garveyensis* Natland																														F	?																		
Siphogenerina branneri (Bagg)																																							?				?			R				
Siphogenerina kleinpelli Cushman																				F			F																R					R	C	F			
Sphaeroidina variabilis Reuss												R	R						R		F		R																					R						
Spiroloculina (?) cf. *S. lamposa* Hussey			R										?					C					R				R	F		F		R	C	F				R	F					F	R	R				
Spiroplectammina cf. *S. directa* (Cushman and Siegfus)										?																								R																
Uvigerina auberiana d'Orbigny				C	F	R	R	R											C			R	R			F							C	?	?	R		C					C	C	C	C				
Uvigerina gallowayi Cushman													?										R																						R					
Uvigerina garzaensis Cushman and Siegfus																																																F	C	F
Uvigerinella californica Cushman					F						?												?	C	F		F			F	?	?	?			R	F	R		R			R	R		R				
Uvigerinella obesa impolita Cushman and Laiming				C	C	C				R				R				F			C		?	R	R	F	R	C	?	R		F	F				R	R	R	C			C	C		F				
Valvulineria sp. [elongate]																														R																			
Valvulineria araucana (d'Orbigny)					F	R												?			F			R		F	R		?			?	F	F			?	F					?			F				
Valvulineria californica Cushman							R						C																										F			?								
Valvulineria cf. *V. indiscriminata* Mallory																																																R	?	
Valvulineria tumeyensis Cushman and Simonson																																																F		
Virgulina californiensis Cushman						C			?			F	R	?				R			C			C	C		F			F			F	R			C		R		R		C	F	R	C	?			



Base map by U.S. Geological Survey, 1955 and 1956

Geology by Weldon W. Rau, 1970–1973

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 6 FEET

APPROXIMATE MEAN DECLINATION, 1955

QUADRANGLE LOCATION

EXPLANATION

QUATERNARY

Qal — Alluvium (Holocene)
Unconsolidated silt, sand, and gravel

Qg — Alpine glacial drift (Pleistocene)
Outwash, silt, sand, gravel, and till(?)

UNCONFORMITY

TERTIARY

Tq — Quinault Formation (Late Miocene(?) and Pliocene)
Massive to well-bedded siltstone and sandstone, and conglomerate

UNCONFORMITY

Thsl | Thss | Ths | Thcs | Thm | Thv — Hoh rock assemblage (Eocene, Oligocene(?), and Miocene)

Thsl, massive to thin-bedded siltstone
Thss, thin- to medium-bedded siltstone and sandstone of about equal amounts
Ths, massive to thick-bedded graywacke sandstone
Thcs, coarse- to very coarse-grained graywacke sandstone, grit and conglomerate
Thm, melange rocks of intensely sheared claystone and siltstone containing blocks of indurated siltstone, graywacke sandstone, and altered volcanic rocks
Thv, volcanic rocks undifferentiated, including very large blocks within melange rocks

Contact, approximately located
Dashed where gradational; dotted where concealed

Fault
Dashed where inferred; dotted where concealed; queried where questionable; D, downthrown side; U, upthrown side; arrows indicate apparent direction of motion

Anticline
Showing trace of axial plane and direction of plunge; dashed where approximately located; dotted where concealed

Overturned anticline
Showing trace axial plane, direction of dip of limbs, and approximate bearing and plunge of axis

Syncline
Showing trace of axial plane and direction of plunge; dashed where approximately located; dotted where concealed

Overturned syncline
Showing trace of axial plane, direction of dip of limbs, and approximate bearing and plunge of axis

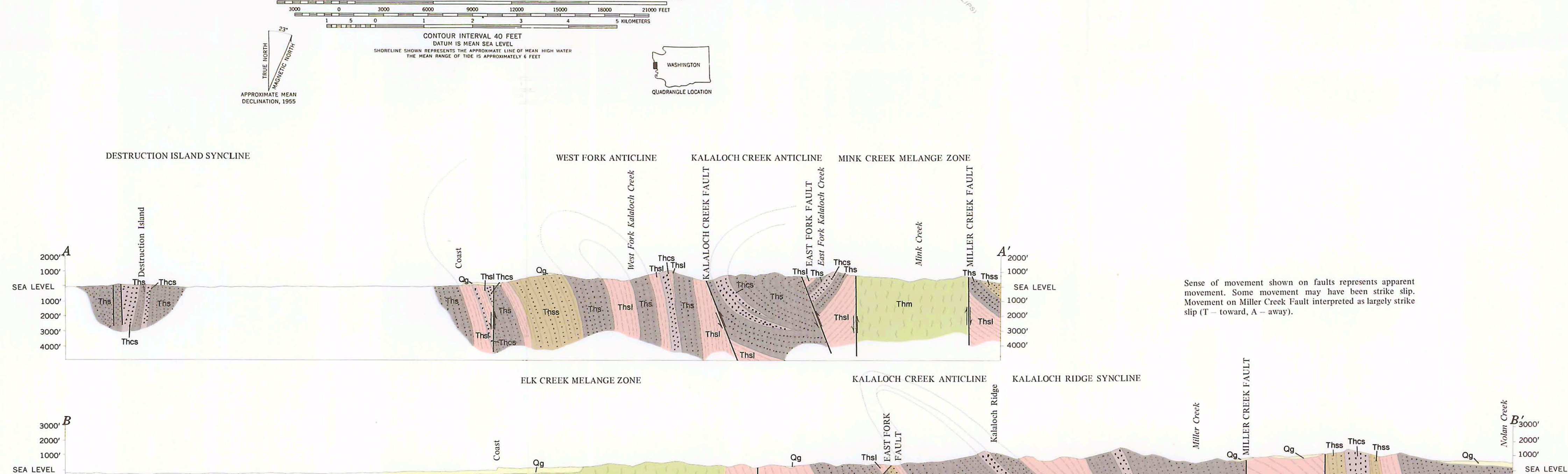
Inclined — Vertical — Overturned — Horizontal
Strike and dip of beds
Ball on inclined symbol indicates top direction known; 90 on vertical symbol indicates top direction

Strike and dip of shearing plane

F1
Microfossil collecting locality
See Rau, 1970, for localities in the Quinault Formation

Petroleum test wells

1. Kincaid-Seattle Hoh Associates Barlow No. 1. 849.3 ft S. of N¼ cor. and thence N. 85° E. for 834.5 ft, sec. 20, T. 26 N., R. 13 W.; 1964; T.D. 5,013 ft.
2. Seattle-Hoh Oil Associates Woodis No. 1. 2,293 ft S., 670 ft E. of NW. cor. sec. 22, T. 26 N., R. 13 W.; 1963; T.D. 460 ft.
3. El Paso Products Company Lacey No. 22-1. 1,650 ft S., 1,670 ft W. of NE. cor. sec. 22, T. 26 N., R. 13 W.; 1975; T.D. 5,722 ft.
4. Union Oil Company of California Milwaukee Land Co. No. 1. 350 ft S., 800 ft W. of NE cor. sec. 27, T. 26 N., R. 13 W.; 1948; T.D. 5,600 ft.
5. Oklatex Oil and Gas Co. Oklatex SW¼SW¼ sec. 16, T. 25 N., R. 13 W.; 1937; shallow.
6. General Gas and Electric Co. State No. 1. W½ sec. 29, T. 24 N., R. 12 W.; 1936; shallow.
7. Olympic Petroleum Co. C. C. Cook-Quinault No. 1. 867 ft S., 572 ft E. N¼ cor. of SE¼ sec. 35, T. 24 N., R. 13W.; 1947; T.D. 1,412 ft.
8. Olympic Petroleum Co. C. C. Cook-Quinault No. 2. (Wm. B. Sam No. 2) 867 ft S., 672 ft E. N¼ cor. of SE¼ sec. 35, T. 24 N., R. 13 W.; 1947; T.D. 3,010 ft.
9. Indian Oil Co. (Quinault Oil Co.) Quinault No. 1. NW¼ sec. 35, T. 22 N., R. 13 W.; 1913; T.D. 560 ft.
10. Indian Oil Co. (Quinault Oil Co.) Quinault No. 2. Same locality as 9 (above); 1913; T.D. 820 ft.



Sense of movement shown on faults represents apparent movement. Some movement may have been strike slip. Movement on Miller Creek Fault interpreted as largely strike slip (T – toward, A – away).

GEOLOGIC MAP OF THE DESTRUCTION ISLAND AND TAHOLAH QUADRANGLES, WASHINGTON

By

WELDON W. RAU

1975