WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES
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GEOLOGIC MAP OF THE SOUTH HALF OF THE SHELTON AND SOUTH HALF OF THE COPALIS BEACH QUADRANGLES, WASHINGTON

Compiled by
ROBERT L. LOGAN

WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES

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WASHINGTON STATE DEPARTMENT OF
Natural Resources
Brian Boyle · Commissioner of Public Lands
Art Stearns · Supervisor

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GEOLOGIC MAP OF THE SOUTH HALF OF THE SHELTON AND SOUTH HALF OF THE COPALIS BEACH QUADRANGLES, WASHINGTON

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INTRODUCTION

This map is one of a series of 1:100,000-scale geologic maps compiled by staff geologists of the Division of Geology and Earth Resources and used as source maps for the southwest quadrant of the geologic map of Washington (Walsh and others, in press). Other maps in the series are available for all 1:100,000-scale quadrangles within the southwest quadrant, that is south of 47°15' north latitude and west of 120°30' west longitude.

The 1:100,000-scale maps in this series that have been released to date are:

Korosec, M. A., compiler, 1987, Geologic map of the Mount Adams quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-5, 41 p., 1 pl., scale 1:100,000

Korosec, M. A., compiler, 1987, Geologic map of the Hood River quadrangle, Washington and Oregon: Washington Division of Geology and Earth Resources Open File Report 87-6, 42 p., 1 pl., scale 1:100,000

Logan, R. L., compiler, 1987, Geologic map of the Chehalis River and Westport quadrangles, Washington: Washington Division of Geology and Earth Resources Open File Report 87-8, 18 p., 1 pl., scale 1:100,000

Logan, R. L., compiler, 1987, Geologic map of the south half of the Shelton and the south half of the Copalis Beach quadrangles, Washington: Washington Division of Geology and Earth Resources Open File Report 87-9, 17 p., 1 pl., scale 1:100,000

Phillips, W. M., compiler, 1987, Geologic map of the Mount St. Helens quadrangle, Washington and Oregon: Washington Division of Geology and Earth Resources Open File Report 87-4, 63 p., 1 pl., scale 1:100,000

Phillips, W. M., compiler, 1987, Geologic map of the Vancouver quadrangle, Washington and Oregon: Washington Division of Geology and Earth Resources Open File Report 87-10, 32 p., 1 pl., scale 1:100,000

Phillips, W. M.; Walsh, T. J., compilers, 1987, Geologic map of the northwest part of the Goldendale quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-13, 9 p., 1 pl., scale 1:100,000

Schasse, H. W., compiler, 1987, Geologic map of the Centralia quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-11, 27 p., 1 pl., scale 1:100,000

Schasse, H. W., compiler, 1987, Geologic map of the Mount Rainier quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-16, 43 p., 1 pl., scale 1:100,000

Walsh, T. J., compiler, 1986, Geologic map of the west half of the Toppenish quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 86-3, 8 p., 1 pl., scale 1:100,000

Walsh, T. J., compiler 1986, Geologic map of the west half of the Yakima quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 86-4, 12 p., 1 pl., scale 1:100,000

Walsh, T. J., compiler, 1987, Geologic map of the Astoria and Ilwaco quadrangles, Washington and Oregon: Washington Division of Geology and Earth Resources Open File Report 87-2, 30 p., 1 pl., scale 1:100,000

Walsh, T. J., compiler, 1987, Geologic map of the south half of the Tacoma quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-3, 12 p., 1 pl., scale 1:100,000

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DESCRIPTION OF MAP UNITS OF THE SOUTH HALF OF THE SHELTON AND SOUTH HALF OF THE COPALIS BEACH QUADRANGLES, WASHINGTON

Quaternary Sediments

Deposits of Non-glacial Origin

Qsb

Holocene beach deposits--Fine to coarse sand, forming beaches and associated active and stabilized back-beach dune fields, and minor estuarine deposits

Qal

Holocene alluvium--Silt, sand, and gravel deposited in streambeds and fans; surfaces relatively undissected; includes low-level terraces

Qls

Landslide debris--Can contain rock fragments, colluvium, soil material, and organic matter deposited as a result of mass wasting; unstratified and poorly sorted; surface commonly hummocky

Qg

Older unconsolidated Pleistocene alluvium--Predominantly pebble and cobble gravels stained various shades of red by weak iron-oxide cement; deposited in streambeds and piedmont fans; generally undeformed; may form low terraces whose surfaces are commonly dissected; weathered to depths greater than 35 ft so that smaller pebbles readily disaggregate and larger cobbles have thin rinds; may be in part equivalent to the Wedekind Creek formation of Carson (1970)

Qst

Damon silt--Pleistocene blue-gray to black, laminated to blocky silt; local peat beds and large wood fragments are common; unit is contained within sands and gravels derived from the Olympic Mountains (Moore, 1965)

QTg

Older deformed unconsolidated Pliocene(?)/Pleistocene sediments--Mostly sand and pebble gravel with local beds of coarse gravel and silt; moderately to intensely

deformed; deposited as piedmont gravels scattered along the southern and western flanks of the Olympic Mountains; usually deeply weathered so that pebbles and gravels can be cut by a knife; iron oxide imparts reddish-brown color and a moderate degree of cementation to gravels (Moore,1965)

Late Wisconsin Cordilleran Glacial Deposits

Qdvl

Vashon lacustrine deposits--Gray silt and clay stratified in 4-6 in. beds in deposits 10-15 ft thick; overlies Vashon till and recessional outwash; deposited during waning of the Vashon Stade (Molenaar and Noble, 1970)

Qdvm

Vashon moraine--Fresh clay, silt, sand and gravel; contains moraines and mixtures of till and outwash not separately mappable

Qdvt

Vashon till--Fresh, gray, unsorted, unstratified, highly compacted mixture of clay, silt, sand, gravel, and boulders deposited directly by glacial ice; locally contains outwash sand and gravel both within and overlying till, age of maximum ice advance in map area has been estimated to be 14,000 yrs (Porter, 1970) to 12,600 yrs (Carson, 1970)

Qov

Vashon outwash--Recessional and proglacial stratified, relatively unweathered sand and gravel; locally contains silt and clay

Qova

Vashon advance outwash--Outwash sand and gravel and lacustrine clay, silt, and sand deposited during advance of glaciers; sands commonly thick, well sorted, and fine grained, with lenses of coarser sand and gravel; locally contains nonglacial sediments. Consists of Colvos Sand and parts of the Vashon Drift

Late Wisconsin Alpine Glacial Deposits

Qoc

Chow Chow outwash deposits--Stratified sand and gravel composed of graywacke, basalt, and fine-grained volcanic rocks, phyllites, and sandstone; locally contains silt and clay; depth of weathering profile is between 2 and 5 ft with average weathering rind thickness on basalt clasts of 1-2 mm; constructional features are sharp, with easily discernible moraines, and drainage is poorly integrated (Moore, 1965); pollen stratigraphy supports the possibility of two post-Humptulips glacial events, the older at about 45,000 yr b.p. and the younger at 20,000 to 10,000 yr b.p. (Heusser, 1964)

Interglacial Deposits

Qsk

Skokomish Gravel--Pleistocene coarse, iron-oxide stained reddish gravel, generally poorly sorted with sand, silt, clay and local peat layers; underlies Vashon drift and locally interfingers with Kitsap Formation; gravel is mostly basaltic, derived from the Crescent Formation in the Olympic Mountains, with local reworked garnets and granitic rocks from Cordilleran glacial deposits. The lower 75-80 feet of the unit is considered correlative with the Kitsap Formation (Molenaar and Noble, 1970)

Qk

Kitsap Formation--Pleistocene clays and silts with minor sands and gravels; local presence of peat indicates nonglacial origin, and mineralogy suggests Cascade Mountains as source area; deposited during the Olympia Interglaciation (Molenaar and Noble, 1970)

Pre-Late Wisconsin Cordilleran Glacial Deposits

Qdp

Pre-Vashon drift, undifferentiated--Pleistocene till, outwash sand and gravel, and loess; includes "Helm Creek" and "Salmon Springs" deposits, both of Carson (1970). The Helm Creek deposits form high terraces along the Chehalis, Wynoochee, and Satsop Rivers and are composed of moderately oxidized but otherwise unweathered, horizontally stratified, crossbedded and well-sorted gravels with a maximum clast diameter of 6 in.; manganese- and iron-oxide staining

imparts dark purple and reddish-brown color to the deposits; a thick loess cover occurs on much of the unit; till is mottled orange and yellowish gray, containing a smaller ratio of clast to matrix than the "Salmon Springs" till. The "Salmon Springs" drift consists of reddish-brown oxidized till and sandy gravels with local loess, and represents the penultimate advance of the Puget ice lobe in this area; topography is more subdued than surrounding unglaciated areas but more highly dissected than adjacent areas overridden by Vashon ice (Carson, 1970). According to Easterbrook (1985), "Helm Creek" and "Salmon Springs" drifts of Carson (1970) can be respectively correlated with the Stuck Drift of Crandell and others (1958) and the Double Bluff Drift of Easterbrook (1966, 1969), indicating that Carson's "Helm Creek" is older than the type Salmon Springs and Carson's "Salmon Springs" is younger than the type Salmon Springs Drift that has been dated by Easterbrook and others (1981), at 0.66 to 0.87 m.y.b.p. However, Helm Creek Drift is normally magnetized (Woodward-Clyde Consultants, 1978), while type Salmon Springs and Stuck Drifts are reversely magnetized (Easterbrook and others, 1985) indicating that the Helm Creek Drift is also younger than the type Salmon Springs. The age of the Helm Creek Drift is estimated at 0.25 to 0.32 m.y. (Washington Public Power Supply System (WPPSS), 1982) to as much as 0.50 m.y. (Colman and Pierce, 1981; McCrumb and West 1981).

Pre-Late Wisconsin Alpine Glacial Deposits

Qdhu

Humptulips alpine till and undifferentiated drift--Pleistocene till and outwash sand and gravel composed of graywacke, basalt, fine-grained volcanic rocks, phyllite, and sandstone; both till and outwash are medium light gray where unweathered but moderate brown where oxidized; the till is densely compacted silt, pebbles, and boulders, and the outwash is less compacted pebble gravel and sand; depth of weathering profile on till is between 5 and 10 ft; average weathering rind thickness on basalt clasts is 3 mm; moraines are subdued but discernible, and drainage is well integrated (Moore, 1965)

Qohu

Humptulips outwash deposits--Pleistocene sand and gravel composed of graywacke, basalt, fine-grained volcanics rocks, phyllites, and "sandstone"; weathering profile is between 6 and 12 ft; average weathering rind thickness on basalt clasts is 3 mm (Moore, 1965)

Qdmo

Mobray drift, undifferentiated--Pleistocene outwash sand and gravel, till, and loess; the till is yellowish brown to gray where fresh and reddish brown to orange where weathered, containing pebbles and cobbles derived entirely from the Olympic Mountains; the outwash consists of gray to reddish-brown gravels with lenses of sand and silt. Mobray drift is the alpine age-equivalent of the "Salmon Springs" glaciation of Carson (1970), which has been correlated with the Double Bluff drift (Easterbrook, 1985)

Qwx

Weatherwax Formation--Pleistocene glaciolacustrine sediments deposited geographically between lobes of the "Salmon Springs" and Mobray glaciers of Carson (1970); consist of gray to orange and reddish-brown diamictons, gravel, sand, and laminated silt and clay

Qwe

Wedekind Creek Formation--Pleistocene outwash or possibly non-glacial alluvial gravels, sands, and silts occurring in patchy distribution capping interfluvial areas at elevations between 300 and 600 ft near the Satsop and Wynoochee River drainages. Clast lithologies are "graywackes" or basalt of Olympic Mountain origin. Unit is generally undeformed but locally weakly deformed. Intensely weathered clasts are easily cut with a knife and stained red, orange and brown (Carson, 1970) by iron-oxide. May be in part equivalent to unit Qg. Till has not been found in these deposits

Tertiary Sedimentary Rocks

Miocene Sedimentary Rocks

Tmn, Tmns, Tmnt, Tmnc

Montesano Formation--Middle to upper Miocene marine sedimentary rocks, coarse- to fine-grained, silty, friable lithofeldspathic and feldspatholithic sandstone, local to widespread conglomerate, siltstone, and mudstone; blue gray where fresh, orange brown where weathered; locally tuff-aceous; most commonly massive, but bedding locally enhanced by conglomerate lenses and beds, carbonized wood, mica flakes, and concretionary beds; mudstone and siltstone beds are common; contains foraminiferal faunas referable to the Mohnian and Delmontian Stages; sandstone dominated unit indicated by Tmns, siltstone unit by Tmnt, and conglomerate by Tmnc

Tas

Astoria (?) Formation--Lower to middle Miocene marine sedimentary rocks; fine-grained, silty feldspathic sandstone; friable, micaceous; gray where fresh, weathers to olive brown or creamy orange; massive to thin bedded; locally tuffaceous; abundant siltstone and silty sandstone containing macerated carbonaceous material; local basaltic sandstone, pebble conglomerate, and poorly sorted basal conglomerate; contains foraminiferal faunas referable to the Saucesian, Relizian, and Luisian (?) Stages

Eocene-Oligocene Sedimentary Rocks

Tlc

Lincoln Creek Formation--Upper Eocene to Oligocene marine sedimentary rocks, indistinctly bedded to massive, commonly concretionary, light-gray tuffaceous siltstone and fine-grained tuffaceous sandstone; lower strata contain discontinuous beds of basaltic and glauconitic sandstone; dominantly offshore marine but grades into nonmarine volcaniclastic rocks east of Chehalis; contains foraminiferal faunas referable to the Refugian and Zemorrian Stages

Tlcs

Lincoln Creek basaltic sandstome member--Upper Eocene basaltic lithic sandstone; massive, fine-grained, light greenish gray to medium olive brown; clasts are mostly basalt and andesite with minor amounts of feldspar, quartz and mica; local waterlaid pumiceous lapilli tuffs; wood fragments; contains marine fossils and local calcareous concretions (Snavely and others, 1958); contains foraminifers of the Refugian Stage

Eocene Sedimentary Rocks

Tht

Humptulips Formation--Middle to upper Eocene marine sedimentary rocks, primarily micaceous siltstone and mudstone, numerous beds of massive sandy siltstone and sparse sandstone beds; locally contains thin lamellae of macerated carbonaceous material; scattered calcareous concretions and concretionary layers; light-gray tuffaceous strata prevalent in lower parts of unit; contains foraminiferal faunas referable to the Narizian Stage

Tho

Hoh Assemblage--Lower(?) to middle(?) Eocene marine sedimentary rocks, medium to coarse-grained indurated graywacke sandstones, interbedded in places with siltstones; chaotic deformation and faulting are common; contains arenaceous foraminifers commonly found in strata of middle to early Eocene age (Rau, 1986)

Tme

Unnamed middle Eocene marine sedimentary rocks--Siltstone and massive to planar-laminated micaceous feldspathic sandstone locally with graded bedding; contains foraminiferal faunas referable to the Ulatisian Stage; equivalent to Unit A of Wolfe and McKee (1972), lower McIntosh Formation of Wagner (1967), sandstones of Megler (Wells, 1979), and sedimentary rocks of the Crescent Formation (Rau, 1966)

Tcrs

Crescent Formation sedimentary rocks--Lower to middle Eocene basaltic siltstone and sandstone interbeds found within the Crescent Formation that contain foraminiferal assemblages referable to the Ulatisian and possibly Penutian Stages (Rau, 1986)

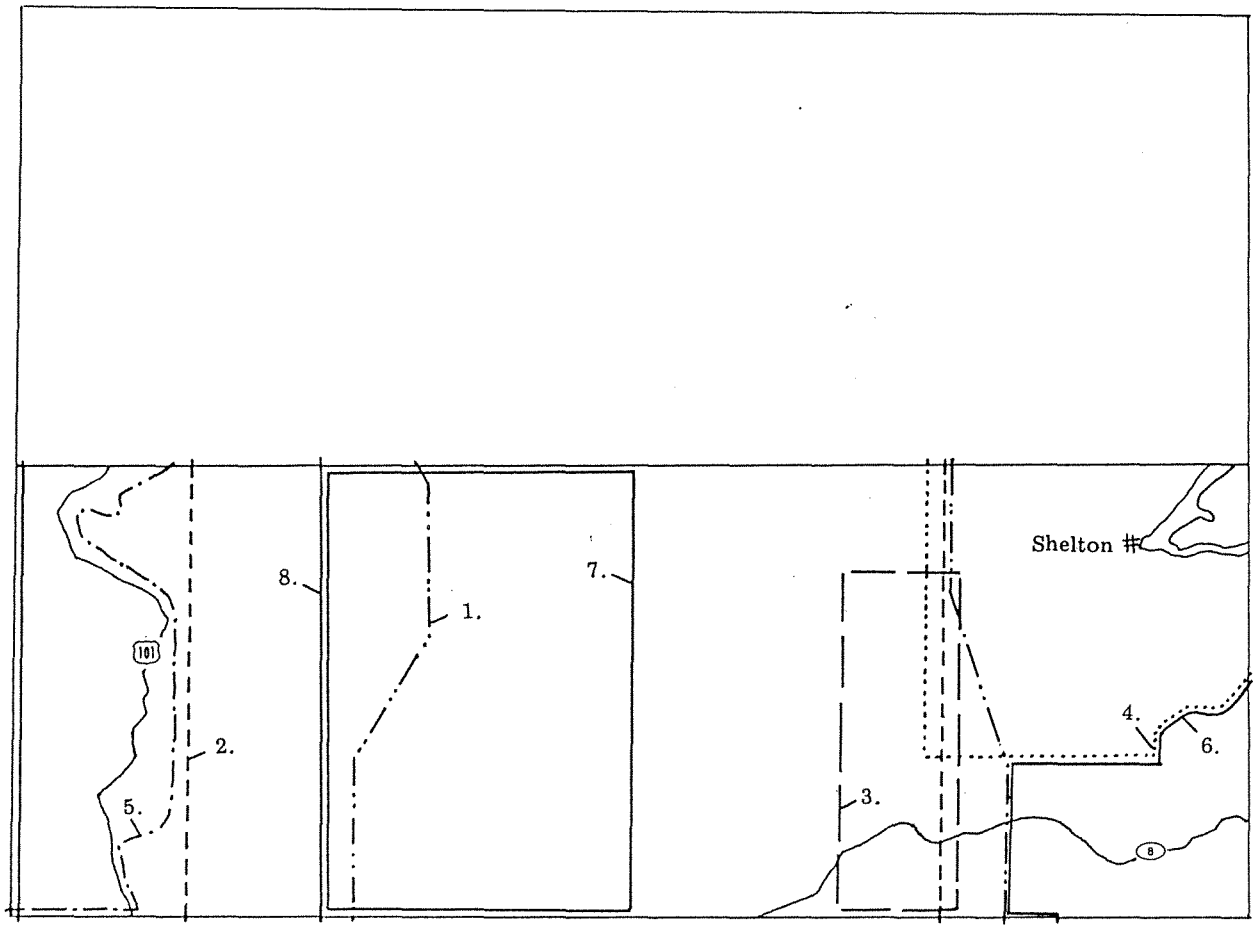
Tertiary Volcanic Rocks

Tcr

Crescent Formation--Lower to Middle Eocene, fine-grained, dominantly submarine tholeiitic basalt flows and flow breccia, typically with zeolite or chlorite alteration; pillows and altered palagonite common; locally contains thin interbeds of basaltic tuff and siltstone with foraminiferal faunas referable to the Ulatisian Stage; probably originated as mid-ocean ridge basalt and as seamounts; accreted to continent by middle Eocene time, about 48 m.y. ago (Duncan, 1982); forms basement in the Coast Range

Tcr(?)

Crescent Formation (?)--Several highly altered basaltic or andesitic boulders on beach at Copalis Head exhibiting extensive calcite replacement of original minerals; pillow lavas of unknown composition in offshore "knocker" (?) or possibly basement outcrop (P. D. Snavely, Jr., USGS, written commun., 1986)



SHELTON

Source of Data Map

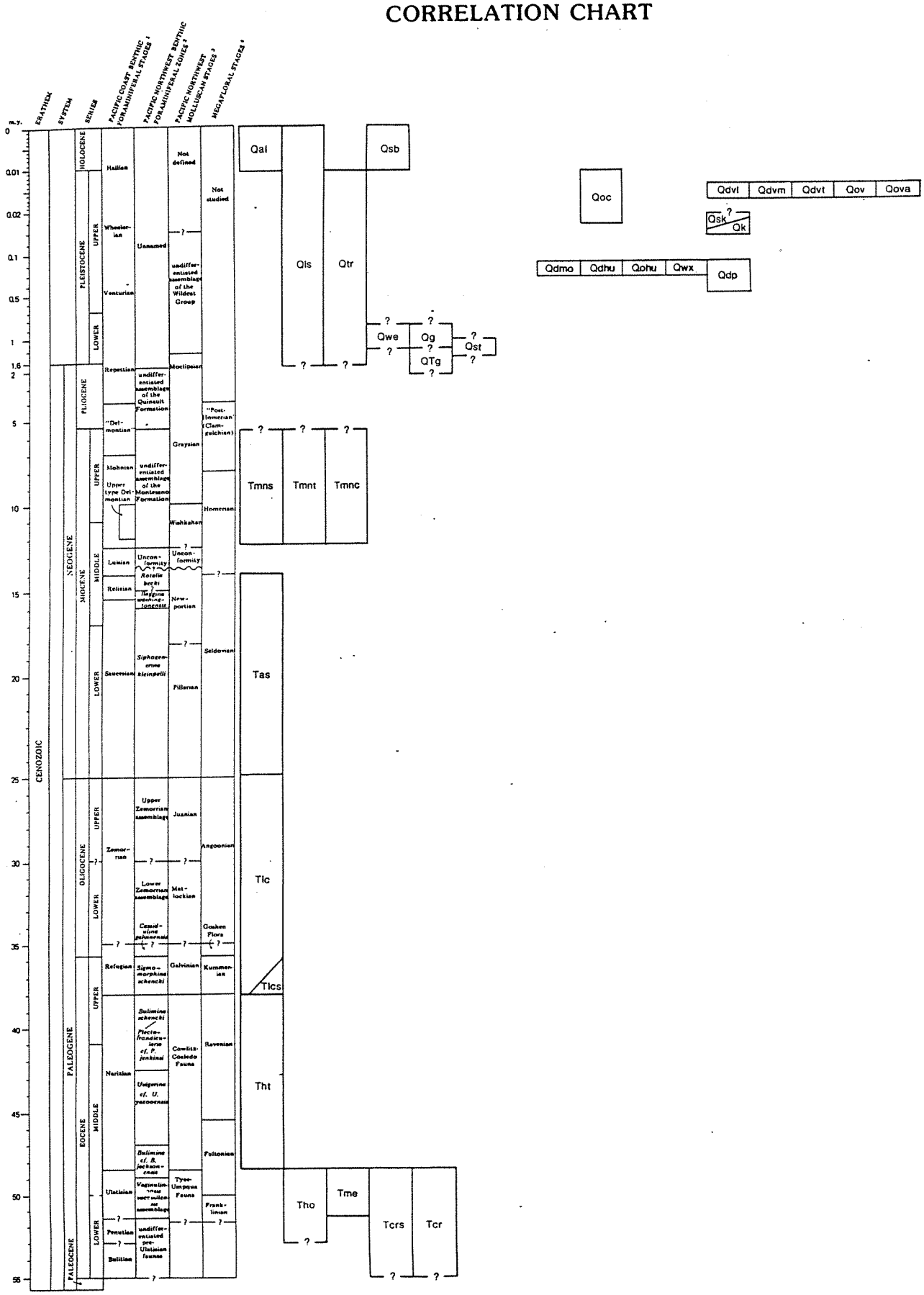
1. Carson, R. J., 1970.
2. Fowler, G.A., 1965.
3. Logan, R. L., 1986.
4. Molenaar, D. and Noble, J. B., 1970.
5. Moore, J. L., 1965.
6. Noble, J. B. and Wallace, E. F., 1966.
7. Rau, W. W., 1967.
8. Rau, W. W., 1986.

1. Moore, J. L., 1965.

COPALIS BEACH

Source of Data Map

SHELTON-COPALIS BEACH CORRELATION CHART



[1] From Kleinpell & others, 1980; Mallory, 1959.
[2] From Rau, 1981.
[3] From Addicott, 1976; Armentrout, 1981.
[4] From Wolfe, 1981.

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WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES
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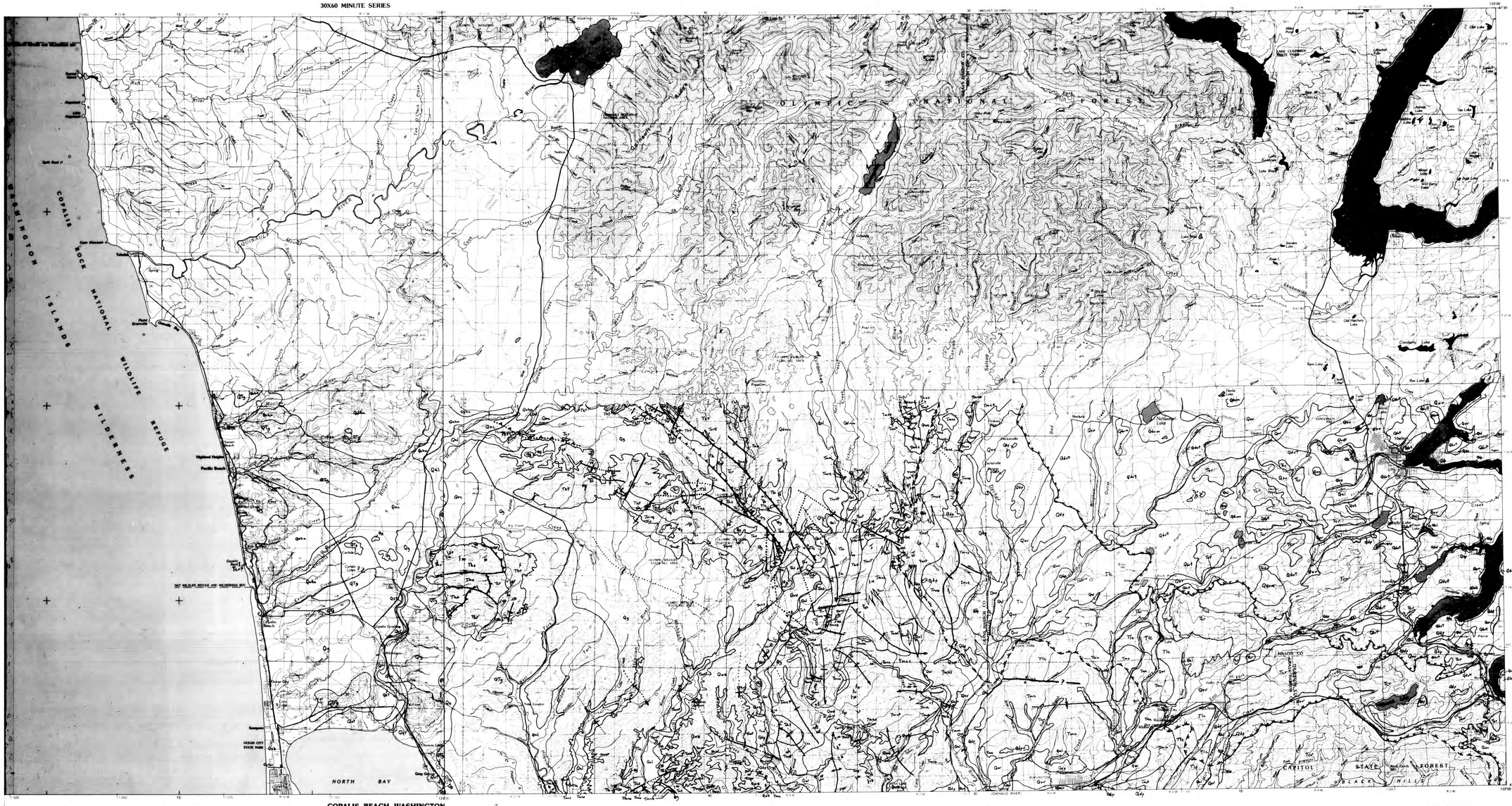
OPEN FILE REPORT 87-9

30X60 MINUTE SERIES

SHELTON QUADRANGLE

1:100 000-SCALE SERIES



COPALIS BEACH, WASHINGTON
N4700–W12400/30X60
1980

Compiled from USGS 1:62 500-scale topographic maps
dated 1952-1955 and 1:24 000 maps in progress. Planimetry revised

50 000-foot grid ticks based on Washington coordinate system,
south zone. 1927 North American datum
To place on the predicted North American Datum 1983
move the projection lines 24 meters north and
96 meters east

SCALE 1:100 000

NATIONAL GEODETIC VERTICAL DATUM OF 1929
To convert meters to feet multiply by 3.2808
To convert feet to meters multiply by 0.3048

SHELTON, WASH.
SW/4 SEATTLE (NL 10-8) 1:250 000-SCALE MAP
N4700–W12300/30x60

EXPLANATION

Quaternary Sediments

Deposits of Non-glacial Origin

Qsb	beach deposits
Qal	alluvium
Qls	landslide debris
Qg	older unconsolidated Pleistocene alluvium
Qst	Damon silt
QTg	older deformed unconsolidated Pliocene (?)/ Pleistocene sediments

Late Wisconsin Age Cordilleran Glacial Deposits

Qdvl	Vashon lacustrine deposits
Qdvm	Vashon moraine
Qdvt	Vashon till
Qov	Vashon outwash
Qova	Vashon advance outwash

Late Wisconsin Age Alpine Glacial Deposits

Qoc	Chow Chow outwash

Interglacial Deposits

Qsk	Skokomish Gravel
Qk	Kitsap Formation

Pre-Late Wisconsin Age Cordilleran Glacial Deposits

Qdp	Pre-Vashon drift

Pre-Late Wisconsin Age Alpine Glacial Deposits

Qdhu	Humptulips alpine till and undifferentiated drift
Qohu	Humptulips outwash
Qdmo	Mobray drift, undifferentiated
Qwx	Weatherwax Formation
Qwe	Wedekind Creek Formation

Tertiary Sedimentary Rocks

Tmn	Montesano Formation, undifferentiated
Tmns	Montesano Formation-sandstone dominated unit
Tmnt	Montesano Formation-siltstone dominated unit
Tmnc	Montesano Formation-conglomerate dominated unit
Tas	Astoria Formation

Eocene-Oligocene Sedimentary Rocks

Tlc	Lincoln Creek Formation
Tlcs	Lincoln Creek basaltic sandstone member

Eocene Sedimentary Rocks

Tht	Humptulips Formation
Tho	Hoh Assemblage
Tme	Unnamed middle Eocene marine sedimentary rocks
Tcrs	Crescent Formation sedimentary rocks

Tertiary Volcanic Rocks

Tcr	Crescent Formation
Tcr(?)	Crescent Formation(?)(rocks at Copalis Head)

MAP EXPLANATION

⊕	Horizontal beds
27	Strike and dip of beds
	Contact, dotted where uncertain or concealed
	Anticline, showing plunge; dashed where uncertain, dotted where concealed
	Syncline, showing plunge; dashed where uncertain, dotted where concealed
U D	Fault, showing sense of displacement; dotted where inferred or concealed
	Thrust fault, barbs on upper plate, dotted where inferred or concealed
	Maximum extent of Vashon Ice, dashed where not coincident with a contact
	Maximum extent of pre-Vashon Cordilleran Ice, dashed where not coincident with a contact

ROAD CLASSIFICATION

Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Street or other road
Trail
○ Interstate route ○ U.S. route ○ State route

GEOLOGIC MAP OF THE SOUTH HALF OF THE SHELTON AND SOUTH HALF OF THE COPALIS BEACH QUADRANGLES, WASHINGTON

Compiled by
ROBERT L. LOGAN

1987

THIS REPORT CONSISTS OF 1 MAP AND A 15 PAGE TEXT.

Geologic Units in the South Half of the Shelton and South Half of the Copalis Beach 1:100,000 Quadrangles (see explanatory note at bottom of spreadsheet)

Old Symbol	New Symbol	Age	Lithology	Named Unit
Qal	Qa	Holocene	alluvium	---
Qdhu	Qapw(2)	Pleistocene	alpine glacial till, pre-Fraser	Humptulips alpine till of Moore (1965)
Qdmo	Qapw(2)	Pleistocene	alpine glacial drift, pre-Fraser	Mobray drift
Qdp	Qgp	Pleistocene	continental glacial drift, pre-Fraser	---
Qdvl	Qga	Pleistocene	advance continental glacial outwash, Fraser-age	mostly Vashon Stade in western WA; unnamed in eastern WA
Qdvm	Qgd	Pleistocene	continental glacial drift, Fraser-age	mostly Vashon Stade in western WA; unnamed in eastern WA
Qdvt	Qgt	Pleistocene	continental glacial till, Fraser-age	mostly Vashon Stade in western WA; unnamed in eastern WA
Qg	Qapwo(2)	Pleistocene	alpine glacial outwash, pre-Wisconsin	younger
Qk	Qc	Pleistocene	continental sedimentary deposits or rocks	Kitsap Formation
Qls	Qls	Quaternary	mass-wasting deposits, mostly landslides	---
Qoc	Qap	Pleistocene	alpine glacial outwash, Fraser-age	Chow Chow outwash
Qoc	Qapo	Pleistocene	alpine glacial outwash, Fraser-age	Chow Chow outwash
Qohu	Qapwo(2)	Pleistocene	alpine glacial outwash, pre-Fraser	Humptulips outwash of Moore (1965)
Qov	Qgo	Pleistocene	continental glacial outwash, Fraser-age	mostly Vashon Stade in western WA; unnamed in eastern WA
Qova	Qga	Pleistocene	advance continental glacial outwash, Fraser-age	mostly Vashon Stade in western WA; unnamed in eastern WA
Qsb	Qb	Holocene	beach deposits	---
Qsk	Qapo	Pleistocene	alpine glacial outwash, pre-Fraser	Skokomish Gravel
Qst	Qc(d)	Pleistocene	continental sedimentary deposits or rocks	Damon silt
QTg	Qapwo(1)	Pleistocene	alpine glacial outwash, pre-Wisconsin	older
Qwe	Qapwo(1)	Pleistocene	alpine glacial outwash, pre-Wisconsin	Wedekind Creek Formation
Qwx	Qapwo(2)	Pleistocene	alpine glacial outwash, pre-Wisconsin	Weatherwax Formation
Tas	Mm(1)	Miocene, lower to middle	marine sedimentary rocks	Astoria Formation
Tcr	Ev(c)	Eocene, lower to middle	basalt flows and flow breccias, Crescent Formation	Crescent Formation
Tcr(?)	Ev(c)	Eocene, lower to middle	basalt flows and flow breccias, Crescent Formation	Crescent Formation
Tcrs	Em(1c)	Eocene, lower to middle	marine sedimentary rocks	Crescent Formation, sedimentary rocks of
Tho	Em(1h)	Eocene, lower to middle	marine sedimentary rocks	Hoh Assemblage
Tht	Em(2)	Eocene, middle to upper	marine sedimentary rocks	Humptulips Formation
Tlc	OEm(lc)	Oligocene-Eocene	marine sedimentary rocks	Lincoln Creek Formation
Tlcs	OEm(lcs)	Oligocene-Eocene	marine sedimentary rocks	Lincoln Creek Formtion, basaltic sandstone member of
Tme	Em(1c)	Eocene, middle	marine sedimentary rocks	---
Tmn	Mm(2)	Miocene, middle to upper	marine sedimentary rocks	Montesano Formation
Tmnc	Mm(2c)	Miocene, middle to upper	marine sedimentary rocks	Montesano Formation, conglomerate of
Tmns	Mm(2s)	Miocene, middle to upper	marine sedimentary rocks	Montesano Formation, sandstone of
Tmnt	Mm(2t)	Miocene, middle to upper	marine sedimentary rocks	Montesano Formation, siltstone of

Washington Division of Geology and Earth Resources Open File Report 87-09, Geologic map of the south halves of the Shelton and Copalis Beach quadrangles, Washington, compiled by Robert L. Logan, was released before the Division adopted a standard symbology for geologic units to be portrayed in 1:100,000, 1:250,000, and 1:500,000 geologic maps of Washington State. Therefore the geologic unit symbology on this map and in the accompanying text does not match that found on some later geologic maps that include the south halves of the Shelton and Copalis Beach 1:100,000 quadrangles. This makes it more difficult for the user to, for example, compare geologic unit descriptions between this map and others that have different symbols for the same unit or to compile a description for a geologic unit that occurs in more than one 1:100,000 quadrangle. This table is included to make it easier to relate the units on this map with units on later maps that use the standard symbology. The column headed "Old Symbol" lists the units on this map alphabetically. The column headed "New Symbol" lists the same units expressed in the standard symbology.

The geology on this map was, in part, re-compiled and released as part of Washington Division of Geology and Earth Resources Open File Reports numbered 2003-15

Geologic Units in the South Half of the Shelton and South Half of the Copalis Beach 1:100,000 Quadrangles (see explanatory note at bottom of spreadsheet)

Old Symbol	New Symbol	Age	Lithology	Named Unit

and 2003-16. The geology shown on this map was used in compiling GM-34, Geologic map of Washington--Southwest quadrant, but the re-compiled geology of OFR 2003-15, Geologic map of the Shelton 1:100,000 quadrangle, Washington, and OFR 2003-16, Geologic map of the Copalis Beach 1:100,000 quadrangle, Washington, was used in compiling GM-50, Geologic map of Washington--Northwest quadrant.

File Name: sheltoncopalisbeachunits.xls JES October 11, 2006