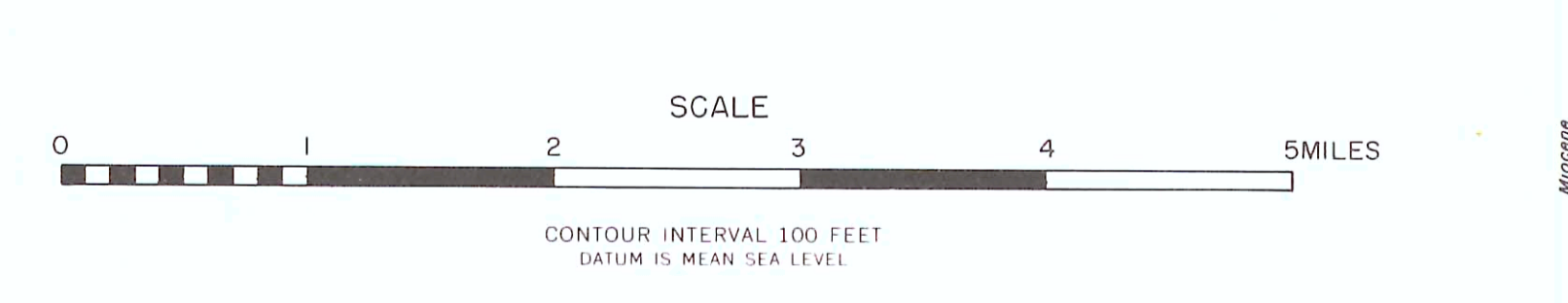


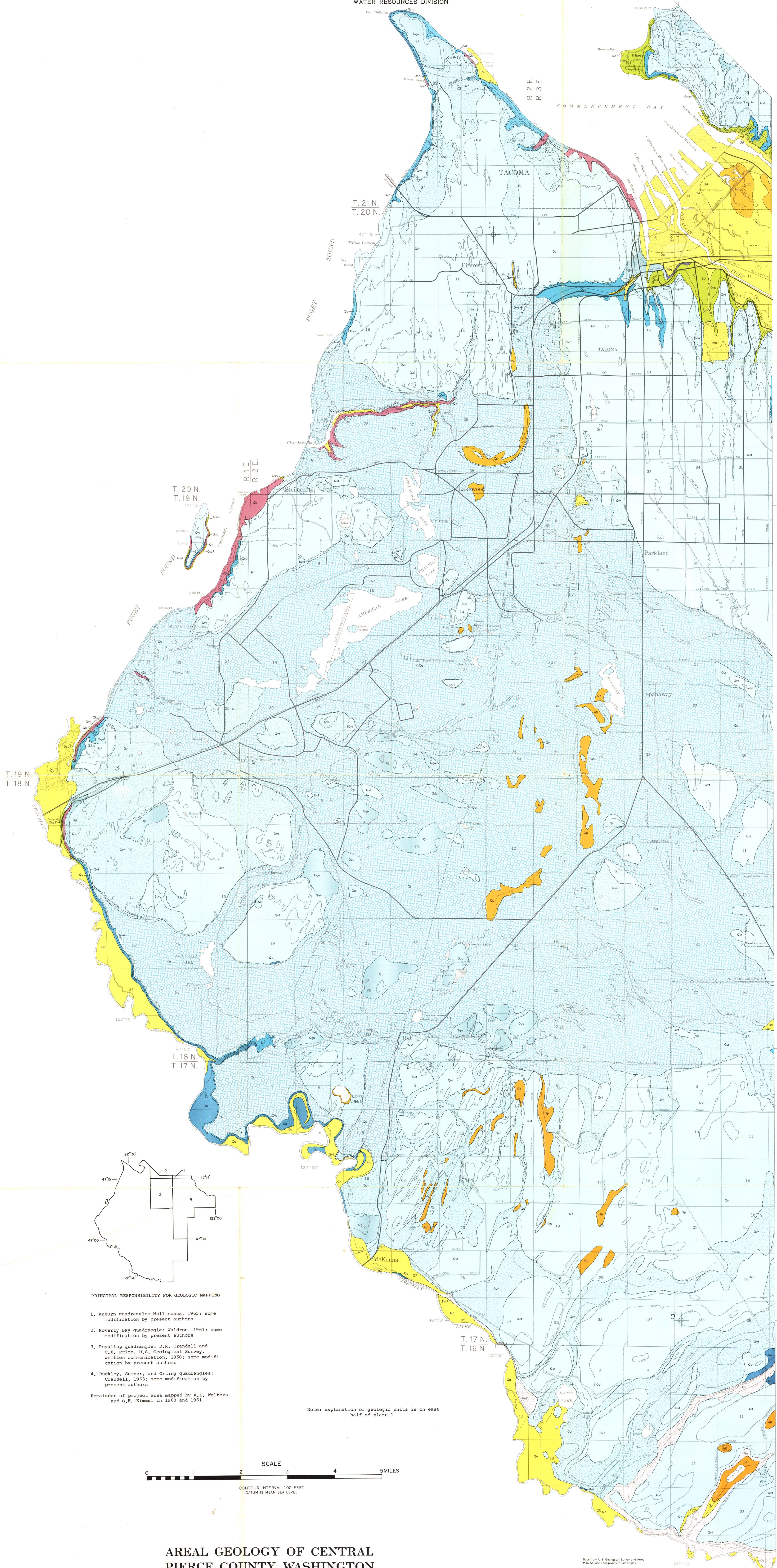
EXPLANATION

- me**
Meliried area
- Qa**
Alltarian
Gravel, sand, silt, and clay. Reported chiefly by modern streams, but includes some recent deposits. Includes marine deposits near the mouth of the Cowlitz River, and probably near the mouth of Skagitzy River. Thickness ranges from a few feet to as much as 400 feet. Yields small to moderate quantities of water to wells; locally capable of large yields.
- Qb**
Fill
Recent material deposited chiefly in closed depressions. Thickness ranges from a few feet to as much as 40 feet. In part, older than the Skookumchuck. Is not a source of potable water in central Pierce County.
- Qc**
Skookumchuck
Very compact, unsorted mixture of boulders and pebbles in a fine-grained matrix. Thickness ranges from a few feet to as much as 30 feet. Does not yield water to wells.
- Qd**
Skookumchuck
Similar in appearance to the Skookumchuck, but more widespread. Thickness ranges from a few feet to as much as 75 feet. Does not yield water to wells.
- Qe**
Skookumchuck
Pebbles to cobble gravel and boulders. Occurs chiefly in northwestern part of project area. Thickness ranges from a few feet to about 25 feet, except in hills where it is as much as 200 feet. Locally yields large quantities of water where saturated.
- Qf**
Skookumchuck
Practically stratified sand and gravel, but locally contains a lot of clay. Thickness ranges from a few feet to several hundred feet. Generally yields some water to wells; locally yields large quantities of water to wells.
- Qg**
Fill
Unconsolidated clay, sand, and gravel. Locally contains some pebbles and boulders. Thickness ranges from a few feet to as much as 100 feet. Yields small quantities of water to wells.
- Qh**
Alluvium
Practically stratified sand and gravel, but may contain silt and clay in matrix. Generally more over-consolidated than the Skookumchuck. Thickness ranges from 25 to 50 feet, but may be only a few feet locally. Yields small to moderate quantities of water to wells; locally yields large quantities of water to wells.
- Qi**
Columbia River
Practically sand, but contains some gravel and a hard sandy clay. Occurs only along northern margin of project area. Thickness locally is more than 100 feet. May yield moderate quantities of water to wells where saturated.
- Qj**
Kitsap Formation
Unconsolidated sand and gravel to lower part. Middle part consists of clay and pebbles, and upper part of unconsolidated sand and gravel. Occurs only in western part of area. Maximum observed thickness 100 feet. Lower part of formation locally yields moderate to large quantities of water locally. Middle and upper parts probably capable of only small yields.
- Qk**
Columbia River
Contains practically all unconsolidated sand and gravel, but contains thin beds of silt, clay, and fill. Ranges in thickness from a few feet to possibly as much as 100 feet. May yield moderate quantities of water to wells.
- Ql**
Puyallup Formation
Contains sand, gravel, and siltstone, some amounts of volcanic ash and tuff. Maximum observed thickness is about 175 feet. Probably yields only small quantities of water to wells.
- Qm**
Green River
Fill, lacustrine silt and sand, and glaciofluvial unsorted sand and gravel. Thickness ranges from a few feet to more than 40 feet. Probably not an important source of ground water in the project area.
- Qn**
Alderbrook Formation
Consists of sandstone, sand and gravel, pebbles, and volcanic ash. Thickness is as much as 100 feet. Not an important source of ground water.
- Qo**
Columbia River
Practically stratified sand and gravel, generally intensely oxidized. Contains some iron-bearing beds of compact fill. Skookumchuck formation is exposed in the study area. Probably yields small to moderate quantities of water; abundance of water-bearing characteristics are not known.
- Qp**
Columbia River
Fill, sand, and siltstone in upper part; practically unsorted to coarse-sorted, poorly sorted sand and gravel in lower part. Observed thickness more than 200 feet. Yields small to moderate quantities of water to wells in northern part of project area.
- Qq**
Columbia River
Blanco unconsolidated deposits, unstratified.
- Qr**
Columbia River
Volcanic sandstone, and lacustrine sand, silt, and clay. Maximum known thickness is about 140 feet. Water-bearing characteristics are not known.
- Qs**
Columbia River
Areas where consolidated bedrock crops out or is known to occur at shallower depths. Does not yield appreciable water to wells in central Pierce County.

Base from U. S. Geological Survey and Army
Map Service Topographic maps
Geologic symbols by E. C. Freeman



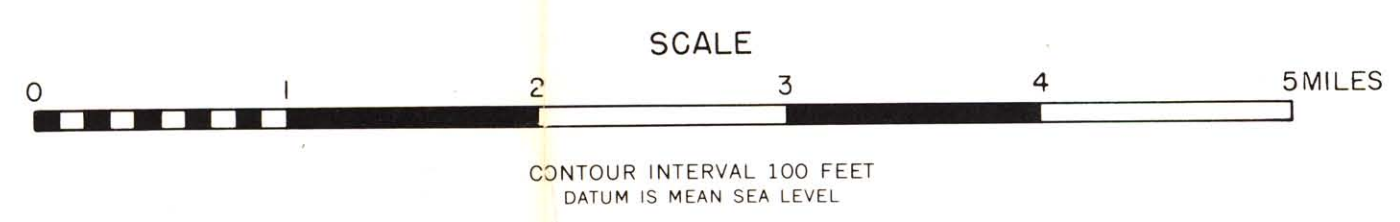
AREAL GEOLOGY OF CENTRAL
PIERCE COUNTY, WASHINGTON



PRINCIPAL RESPONSIBILITY FOR GEOLOGIC MAPPING

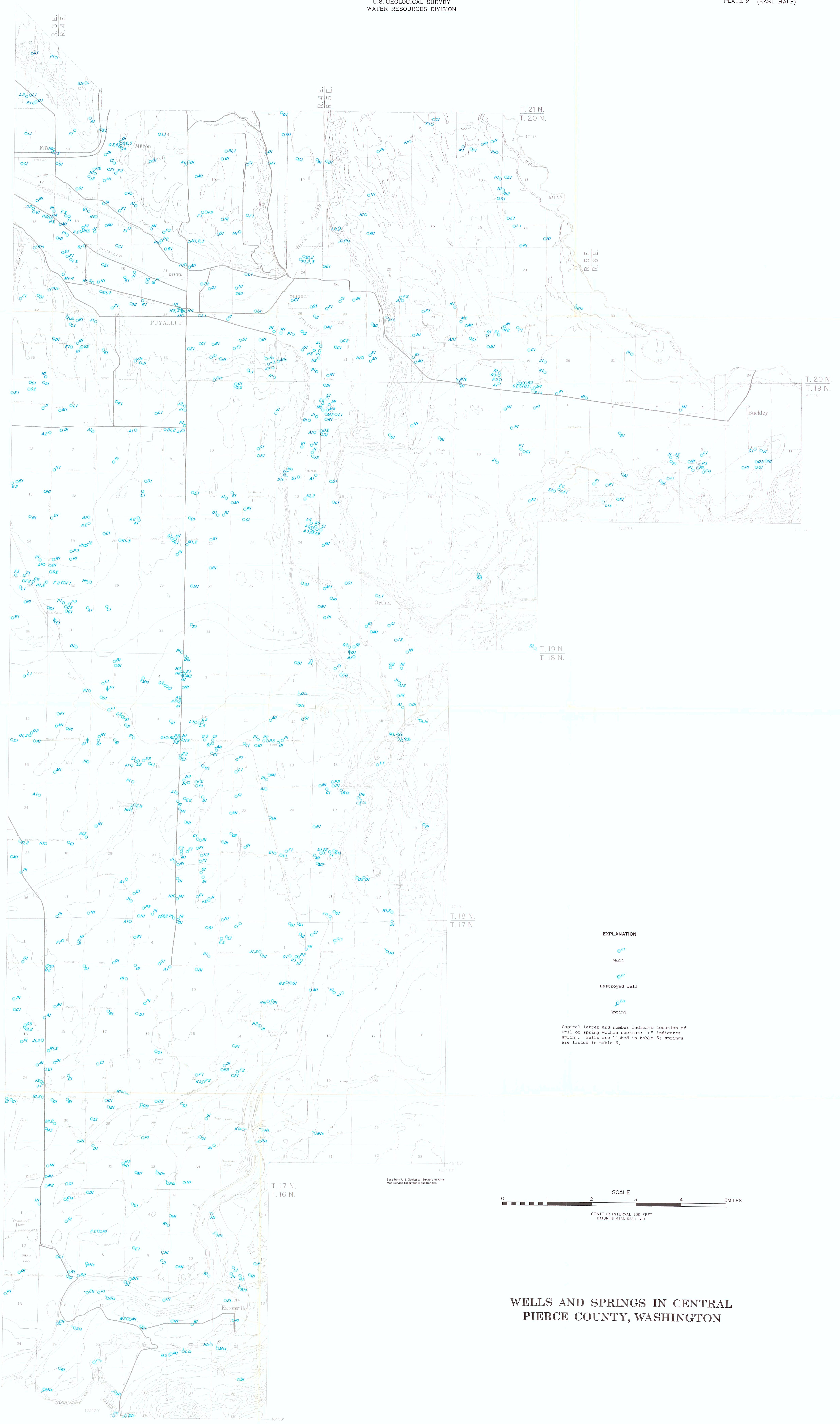
1. Auburn quadrangle: Mullineaux, 1965; some modification by present authors
 2. Poverty Bay quadrangle: Waldron, 1961; some modification by present authors
 3. Puyallup quadrangle: D.R. Crandell and C.E. Price, U.S. Geological Survey, written communication, 1958; some modification by present authors
 4. Buckley, Sumner, and Orting quadrangles: Crandell, 1963; some modification by present authors
- Remainder of project area mapped by K.L. Walters and G.E. Kimmel in 1960 and 1961

Note: explanation of geologic units is on east half of plate 1

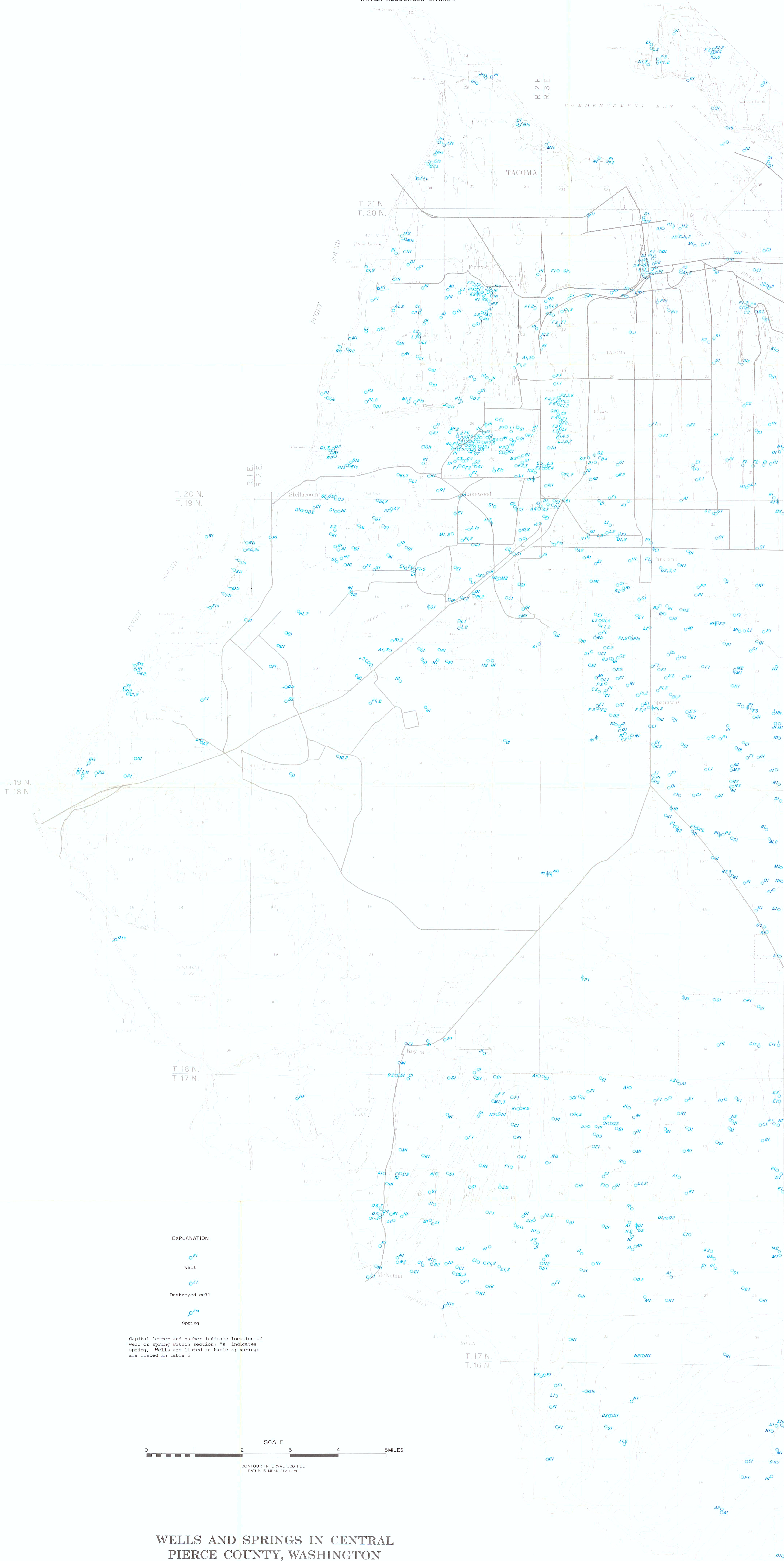


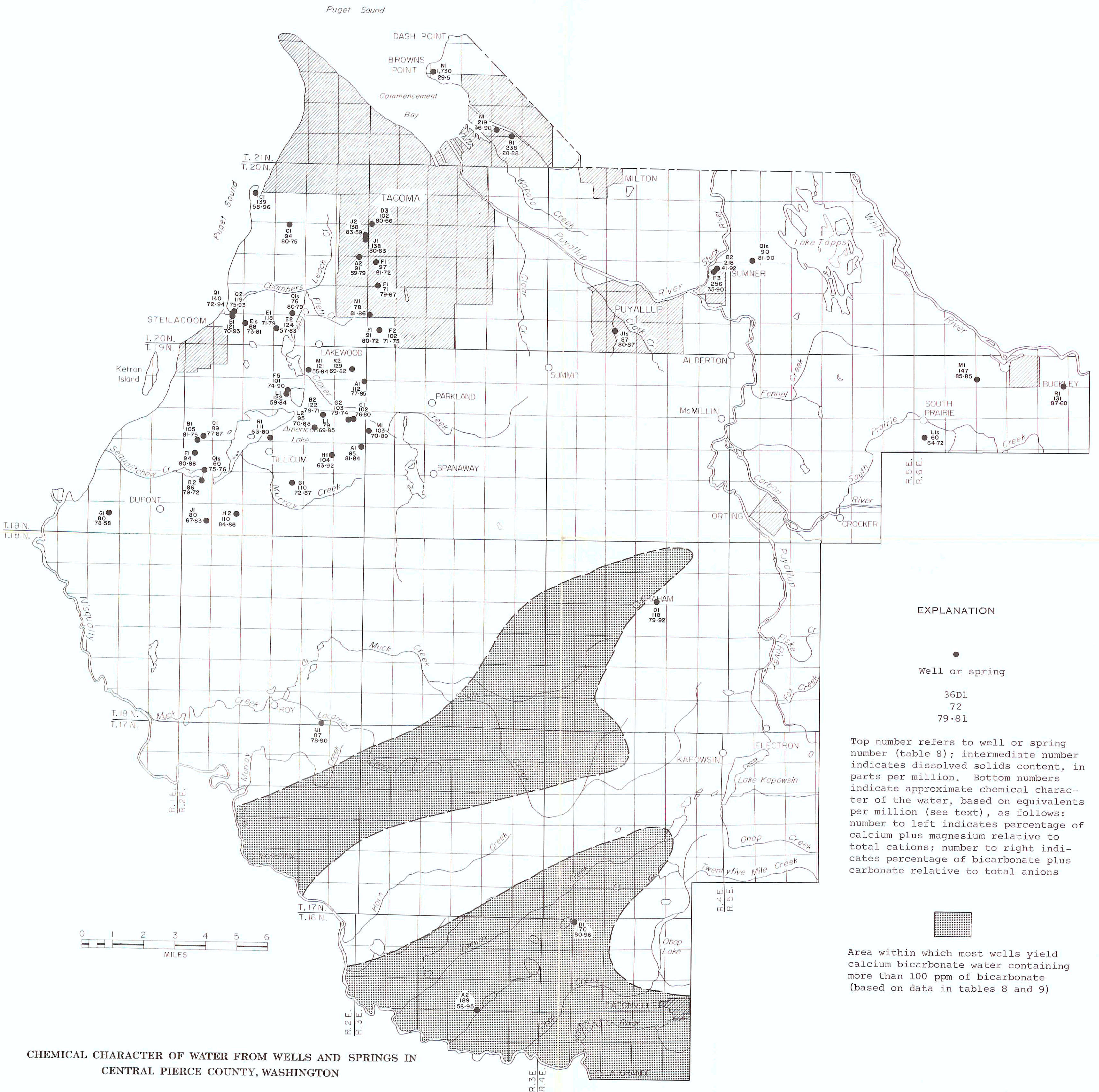
AREAL GEOLOGY OF CENTRAL
PIERCE COUNTY, WASHINGTON

Base from U.S. Geological Survey and Army Map Service topographic quadrangles
Geology written by E. C. Kinnison



**WELLS AND SPRINGS IN CENTRAL
PIERCE COUNTY, WASHINGTON**

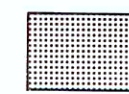




EXPLANATION

- Well or spring
- 36D1
- 72
- 79·81

Top number refers to well or spring number (table 8); intermediate number indicates dissolved solids content, in parts per million. Bottom numbers indicate approximate chemical character of the water, based on equivalents per million (see text), as follows: number to left indicates percentage of calcium plus magnesium relative to total cations; number to right indicates percentage of bicarbonate plus carbonate relative to total anions



Area within which most wells yield calcium bicarbonate water containing more than 100 ppm of bicarbonate (based on data in tables 8 and 9)

CHEMICAL CHARACTER OF WATER FROM WELLS AND SPRINGS IN
CENTRAL PIERCE COUNTY, WASHINGTON