OPEN-FILE REPORT 0-90-3
PRELIMINARY GEOLOGY MAP OF THE
KANE SPRINGS GULCH QUADRANGLE
MALHEUR COUNTY, OREGON

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1990

This unpublished Open-File Report has not been reviewed and may not meet all Oregon Department of Geology and Mineral Industries' standards.

Field work conducted in 1988/1989
Map Scale: 1:24,000

Funding Statement: Funded jointly by the Oregon Department of Geology and Mineral Industries, the Oregon State Lottery, and the U. S. Geological Survey COGEO MAP Program as part of a cooperative effort to map the west half of the 10' by 20' Boise sheet, eastern Oregon.
Alluvium (Holocene and Pleistocene) Unconsolidated and generally poorly sorted deposits of gravel, sand, and silt accumulated along modern streams and flood plains.

Colluvial and alluvial fan deposits (Holocene, Pleistocene, and Pliocene?) Mainly alluvial fan and slope deposits consisting of unconsolidated coarse gravels and silts. Colluvial deposits include scree and talus along slopes of ridges and thick accumulations of windblown silt (loess) and sand on the tops of benches and ridges and in the broad valleys.

Terrace gravels and interbedded tuffaceous lacustrine sedimentary rock (Pleistocene and Pliocene?) Mainly poorly consolidated deposits of nearly horizontally bedded basalt and rhyolite clast conglomerate with thin interbeds of limy silt and sandstone. Fines upward into white, poorly consolidated tuffaceous silt- and sandstone. Unconformably overlies unit Tic along the east side of Negro Rock Creek. Equivalent to the terrace gravels mapped by Doak (1953) and Corcoran and others (1962). Distinguished from unit Tig on basis of abundant basalt clasts in the gravels. Maximum thickness of the unit is about 150 feet east of Negro Rock Canyon.

Tuffaceous conglomerates and sandstones (Pliocene and upper Miocene?) Mainly tuffaceous arkosic sandstone and siltstone with interbedded lenses and sheets of black chert pebble conglomerate. Includes light colored fine-grained tuffaceous fluviatile and deltaic sandstone, conglomerate, siltstone, and mudstone. Conglomerate lenses range from 1/2 inches to 4 feet in thickness and range from discontinuous lenses to thick crossbedded sheets. Unit unconformably overlies limestone of unit Tic. Correlative with Pliocene arkosic sandstone and chert-pebble conglomerate exposed in the Adrian quadrangle (Ferns, 1989) to the east which are considered by Kimmel (1982) and Smith and others (1982) to be Equivalent to the Glens Ferry Formation of Malde and Powers (1962). Includes the upper part of the Chalk Butte Formation as defined by Corcoran and others (1962) and the Mitchell Butte Member of the Deer Butte Formation as defined by Kittleman and others (1965).
Tuffaceous siltstone, sandstone and limestone (Pliocene? and upper Miocene) Mainly lacustrine deposits of poorly consolidated light-gray fine-grained, tuffaceous sandstone, siltstone, and mudstone. Includes thin beds of diatomaceous siltstone, tuff, and pebbly sandstone. Unit is estimated to be about 300 feet thick west of Negro Rock Canyon. Correlative with the lower part of the Chalk Butte Formation of Corcoran and others (1962). Based on stratigraphic position beneath the arkosic sandstone and chert-pebble conglomerate of unit Tig, believed to be Equivalent to Late Miocene lake sediments exposed west of Adrian (Smith and others, 1982; Ferns, 1989) that are considered correlative with the Chalk Hills Formation of Malde and Powers (1962). Late Miocene age based in part on Hemphillian antilocaprid (prongbuck) jaw fragment from the adjacent Double Mountain quadrangle (Ramp and Ferns, 1989).

Olivine Basalts at Rock Springs (upper Miocene) "Snake River Type" olivine basalt flows and interbedded deposits of tuffaceous siltstone and sandstone. Stratigraphically, unit is made up of approximately equal amounts of flows and intraflow sedimentary rock. Flows are thin, dark black to bluish and greenish black amygdaloidal olivine basalts. Texturally holocrystalline and hyalocrystalline olivine basalt flows containing olivine and plagioclase phenocrysts with ophitic or intergranular clinopyroxene. Chemically distinguished by high TiO2 (>2.00%) and relatively high K2O (>0.60 %) content. Includes "water-affected basalts"; i.e. outcrops characterized by a tendency to weather to zones of granular soil composed of basalt fragments separated by basal red baked zones or paleosols. A K/Ar date of 7.4 my. is reported for a flow from this unit south of Sagebrush Gulch in the Grassy Mountain quadrangle (Fiebelkorn and others, 1982).
Basalt dike (upper Miocene) Holocrystalline olivine basalt dike exposed southeast of Kane Springs. Intrudes unit pyroclastic deposits related to unit Tbs and believed to be a vent area for Tbs.

Arkosaic conglomerates and interbedded diatomaceous siltstone (upper Miocene) Mainly tuffaceous and arkosic sandstone and siltstone with interbedded, poorly consolidated conglomerate. Arkosic conglomerates east of Kane Springs are poorly consolidated and contain well-rounded clasts of obsidian and granitic and silicic volcanic rocks and lack black chert clasts. Conglomerates west of Kane Springs contain abundant black chert clasts. Late Miocene age based on Clarendonian mammalian fossils in presumably equivalent sediments at Poison Springs (Kittleman and others, 1965) in the Sourdough Springs quadrangle to the southwest and camel and horse bones of probable Hemphillian age from the Double Mountain quadrangle (Ramp and Ferns, 1989). Unit is about 200 feet thick in the southwestern part of the quadrangle where separated by an angular unconformity from flows of overlying Trsb. Equivalent in part to units Tis and Trs as mapped by Ramp and Ferns (1989) in the Double Mountain quadrangle to the east.

Basalt, basaltic andesite, and andesite (upper Miocene) Mainly dark, holocrystalline olivine basalt and basaltic andesite flows. Includes a 200 foot thick plagioclase-phyric, platy andesite flow in Negro Rock Canyon. Base of section marked by an olivine basalt flow that contains subophitic clinopyroxene. Basal flow here is overlain by a quartz xenocryst-bearing basaltic andesite flow. Unit includes a small vent area composed of black to red scoria that is breached by the Tbi dike in section 9, T. 21 S., R. 43 E.. Correlative with the Tui unit of Storm (1975) and Tdmv unit of Ramp and Ferns (1989) which underlie Trsb. Individual flows appear to be confined to generally north-south trending ridges and cannot be traced laterally for any great distance.
Tuffaceous sedimentary rocks (upper Miocene)
Mainly massively bedded light colored tuff with
lenses of tuffaceous sandstones and volcanic clast
conglomerate. Tuffaceous sandstones contain scoria
clasts while the pebble conglomerates contain
abundant clasts of obsidian and mafic and silicic
volcanic rocks. Based on stratigraphic position,
believed to be in part correlative to unit Tis of
Ferns and Ramp (1990) in the Grassy Mountain
quadrangle to the south and to the upper part of the
Drip Springs Formation of Kittleman and others
(1965, 1967) in the Harper area to the west.
Separated from unit Trs on basis of intervening Tdmv
flows.
Geologic History

Arkosic sands (Tis) record an early period of fluviatile sedimentation in the quadrangle. These late Miocene sands were later buried by younger basaltic andesite and andesite flows (Tdmv) which flowed into north-south trending basins. Thickest flows may record local ponding of flows in stream channels. Shallow, ephemeral lakes may have formed in response to clogging of drainages by the Tdmv flows, locally forming diatomaceous lacustrine deposits (Trs) to the west and south. Rejuvenation of the streams is recorded by fluviatile-facies Trs sediments.

Northwest-trending fault zones apparently developed during Hemphillian (Late Miocene) time, following eruption of the first of the Trsb olivine basalt flows. Eruption of these flows is believed by Ferns and others (1993) to be in response to downwarping of the western Snake River Plain. Thick deposits of tuffaceous sandstone and siltstone (Tic) that overlie the Trsb olivine basalts can be traced eastward into the western Snake River Plain, where they form part of the Idaho Group. These sediments were deposited in a large Late Miocene - Pliocene lake (Lake Idaho) which covered much of west-central Idaho and extreme eastern Oregon. The widely-recognized, Pliocene regression within the lake section (Malde and others, 1962; Kimmel, 1982) may be recorded by chert-pebble conglomerates (Tig) which locally unconformably overlie Tic sediments.

Small lacustrine basins developed during downcutting of the Lake Idaho section, following the final draining of the lake north through Hells Canyon. Lacustrine sediments (QTs) in these basins are commonly interbedded with coarse, fluviatile gravels (also QTs). East-west trending faults in QTs sediments may indicate late tectonism in the quadrangle. Alluvial fan deposits, colluvium and small eolian deposits that locally overlie the QTs sediments record late Quaternary and Recent erosional processes.
Mineral Resources
No metallic or nonmetallic resources were identified within the quadrangle. A sample of a resistant ledge of Tig conglomerate from Negro Rock Canyon along the eastern margin of the quadrangle is slightly anomalous in gold (Sample 1, Table 1). The locality is peripheral to an area west of Double Mountain that is currently under exploration for gold.

There is a slight possibility that natural gas resources may occur within the quadrangle. Three natural gas exploration wells have been drilled in the adjoining Double Mountain quadrangle; the deepest being the 7460 foot deep hole in Sec. 5, T. 20 S., R. 44 E. drilled by El Paso Natural Gas Co. in 1955. Traces of gas were reported in all 3 wells (Newton and Corcoran, 1963). An odorless inflammable gas is reported at Mud Spring in the NW ¼ Sec. 29, T. 20 S., R. 45 E. (Washburne, 1909). The reported gas shows may be with unit Tic. All 3 wells penetrated into Tic.
Geochemistry
Sample Preparation
Samples for whole-rock analysis (Table 1) were crushed to minus -inch in a steel-jawed Braun chipmunk crusher and split in a Jones-type splitter in the Oregon department of geology and Mineral Industries (DOGAMI) laboratory. A split of about 100 g of each sample was ground to minus 200 in agate grinding media by X-ray Assay Laboratories (XRAL) of Don Mills, Ontario.
Samples for trace element analysis (Table 2) were crushed to minus -in. and split as indicated above. Each sample split was ground to about minus 200 mesh in chrome-steel grinding media in an Angstrom disc mill in the DOGAMI laboratory. Each minus-200 mesh split again to produce two subsamples: one for gold and one for the other trace elements to be determined.

Chemical analysis
Whole-rock analysis: X-ray fluorescence analyses were performed by XRAL. XRAL used a fused button for its analyses (1.3 g of sample at 950 C for one hour, fused with 5 g of lithium tetraborate, and melt cast into a button). Loss on ignition (LOI) was determined by the roasting.
Trace-element analysis: 1. Gold-Bondar-Clegg, Ltd., of North Vancouver, British Columbia, performed the analyses for gold. The method employed was fire assay preconcentration of the gold in a 20 g sample (gold was collected in added silver), acid dissolution of the resulting bead, and a directly coupled plasma (DCP) emission spectrometer finish. The detection limit was 1 part per billion (ppb).
2. Other trace elements -- Geochemical Services, Inc., (GSI) of Torrance, California, performed the analyses for 15 other trace elements. The method employed a proprietary acid dissolution/organic extraction of a 5 g sample. The finish was by induction coupled plasma (ICP), emission spectrometry. GSI considers the digestion to provide total metal contents except for gallium and thallium. The detection limit for a given element varies slightly as a result of GSI's monitoring process.
Symbols

- Contact, approximately located

Fault contact, dashed where approximately located, dotted where concealed
Ball and bar on down throw side

\( \rightarrow \)

Strike and dip of beds

\( \times \)

Horizontal bed

\( \nearrow \)

Trend of anticlinal fold axis

AZB-303
Location of whole rock sample analyzed in Table 1

AZB-228
Location of mineralized sample analyzed in Table 2
MAP SYMBOLS

—— Contact -- approximately located

—- Fault contact -- dashed where approximately located, dotted where concealed. Ball and bar on down throw side

\( \gamma \) Strike and dip of beds

\( \chi \) Location of whole rock sample analyzed in Table 1

Location of mineralized sample analyzed in Table 2
REFERENCES:


Ferns, M.L., 1989, Geology and mineral resources map of the Adrian quadrangle, Malheur County, Oregon and Owyhee County, Idaho: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-56, scale 1:24,000.


| LAB # | Field # | 1/4 1/4 Sec. T.(E.H.(E. | Lithology | Map | SiO2 | Al2O3 | TiO2 | Fe2O3 | FeO | MnO | CaO | MgO | K2O | Na2O | P2O5 | Cr | Co | Ni | Cu | Zn | Rb | Sr | Y | Zr | Nb | Ba | Li |
|-------|---------|--------------------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| A18-303 | 09-00-08 | NE | NE | 9 | 216 | 43E | Basalt | Tdev | 53.9 | 15.9 | 1.37 | 3.7 | 4.19 | 0.17 | 6.7 | 3.72 | 1.95 | 3.82 | 0.71 | 70 | 21 | 44 | 62 | 162 | 32 | 557 | 16 | 225 | 49 | 1070 | 10 |
| A18-304 | 09-00-79 | NW | SW | 9 | 216 | 43E | Basalt | Tdev | 53.0 | 15.0 | 0.69 | 2.72 | 4.52 | 0.15 | 9.32 | 5.64 | 1.68 | 2.58 | 0.18 | 196 | 23 | 91 | 78 | 46 | 31 | 197 | 14 | 91 | 20 | 597 | 17 |
| A18-305 | 09-00-82 | SW | SE | 12 | 216 | 43E | Basaltic andesite | Tdev | 56.3 | 16.0 | 1.51 | 4.57 | 3.75 | 0.15 | 8.18 | 2.59 | 1.9 | 3.91 | 0.41 | 170 | 20 | 29 | 49 | 96 | 45 | 458 | 22 | 177 | 17 | 783 | 11 |
| A18-306 | 09-00-87 | SW | SW | 9 | 216 | 43E | Olivine basalt | Tdev | 44.6 | 15.3 | 1.74 | 3.03 | 5.91 | 0.17 | 8.9 | 7.46 | 1.07 | 2.32 | 0.41 | 127 | 32 | 50 | 97 | 22 | 60 | 104 | 17 | 360 | 16 |
| A18-307 | 09-00-90 | NE | NE | 16 | 216 | 43E | Basalt | Tdev | 53.5 | 15.4 | 1.23 | 4.14 | 4.36 | 0.22 | 6.85 | 3.76 | 1.46 | 3.56 | 0.49 | 68 | 39 | 49 | 55 | 106 | 26 | 574 | 33 | 220 | 29 | 1010 | 11 |
| A18-331 | 09-00-152 | NE | NE | 1 | 216 | 43E | Basalt | Trsb | 45.8 | 18.0 | 1.85 | 8 | 3.42 | 0.18 | 9.73 | 6.68 | 0.7 | 2.49 | 0.43 | 105 | 29 | 93 | 60 | 99 | 31 | 232 | 21 | 153 | 29 | 334 | 10 |
| A18-332 | 09-00-153 | SW | NE | 31 | 260 | 44E | Basalt | Trsb | 50.3 | 15.2 | 1.94 | 6.97 | 4.0 | 0.17 | 8.27 | 3.53 | 1.56 | 3.68 | 0.57 | 55 | 27 | 52 | 125 | 123 | 30 | 392 | 25 | 121 | 36 | 549 | 9 |
| A18-333 | 09-00-154 | SW | SW | 23 | 260 | 43E | Basalt | Trsb | 45.5 | 15.5 | 1.97 | 5.73 | 7.42 | 0.26 | 9 | 6.28 | 0.83 | 2.85 | 0.58 | 49 | 29 | 61 | 137 | 129 | 25 | 355 | 26 | 110 | 30 | 469 | 17 |
**Table 2** Trace Element Analyses for Altered Rock Samples, Kane Springs Bulch Quadrangle, 0-90-3

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