Spatial Digital Database for the Geologic Map of the East Part of the Pullman 1° x 2° Quadrangle, Idaho

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Digital database, version 1.0

2001
(map originally published in 1979)

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U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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Introduction

The paper geologic map of the east part of the Pullman 1° x 2° degree quadrangle, Idaho (Rember and Bennett, 1979) was scanned and initially attributed by Optronics Specialty Co., Inc. (Northridge, CA) and remitted to the U.S. Geological Survey for further attribution and publication of the geospatial digital files. The resulting digital geologic map GIS can be queried in many ways to produce a variety of geologic maps. This digital geospatial database is one of many being created by the U.S. Geological Survey as an ongoing effort to provide geologic information in a geographic information system (GIS) for use in spatial analysis. Digital base map data files (topography, roads, towns, rivers and lakes, and others.) are not included: they may be obtained from a variety of commercial and government sources. This database is not meant to be used or displayed at any scale larger than 1:250,000 (for example, 1:100,000 or 1:24,000). The digital geologic map graphics and plot files (pull250k.gra/.hp /.eps) that are provided in the digital package are representations of the digital database.

The map area is located in western Idaho (fig. 1). This open-file report describes the geologic map units, the methods used to convert the geologic map data into a digital format, the ArcInfo GIS file structures and relationships, and explains how to download the digital files from the U.S. Geological Survey public access World Wide Web site on the Internet.

Description of Map Units

Rember and Bennett's (1979) description of map units is provided below as a courtesy to the reader.

Qal Alluvium (Holocene)

Qls Landslide deposits (Holocene)

Qtg Terrace gravels (Holocene)

Qp Palouse loess (Pleistocene)

QTs Quaternary-Tertiary sediments, undifferentiated

Tg Terrace gravels (Miocene)

Columbia River Basalt Group (Miocene)—Dark, fine-grained vesicular basalt

Tcs Saddle Mountain Basalt

Tcw Wanapun Basalt—Occasional phenocrysts of plagioclase and rare olivine

Tcg Grande Ronde Basalt—Aphyric, dense, fine-grained basalt

Tci Imnaha Basalt—Phyric, coarse-grained basalt with large plagioclase and olivine phenocrysts

Tcb Columbia River Basalt, undifferentiated

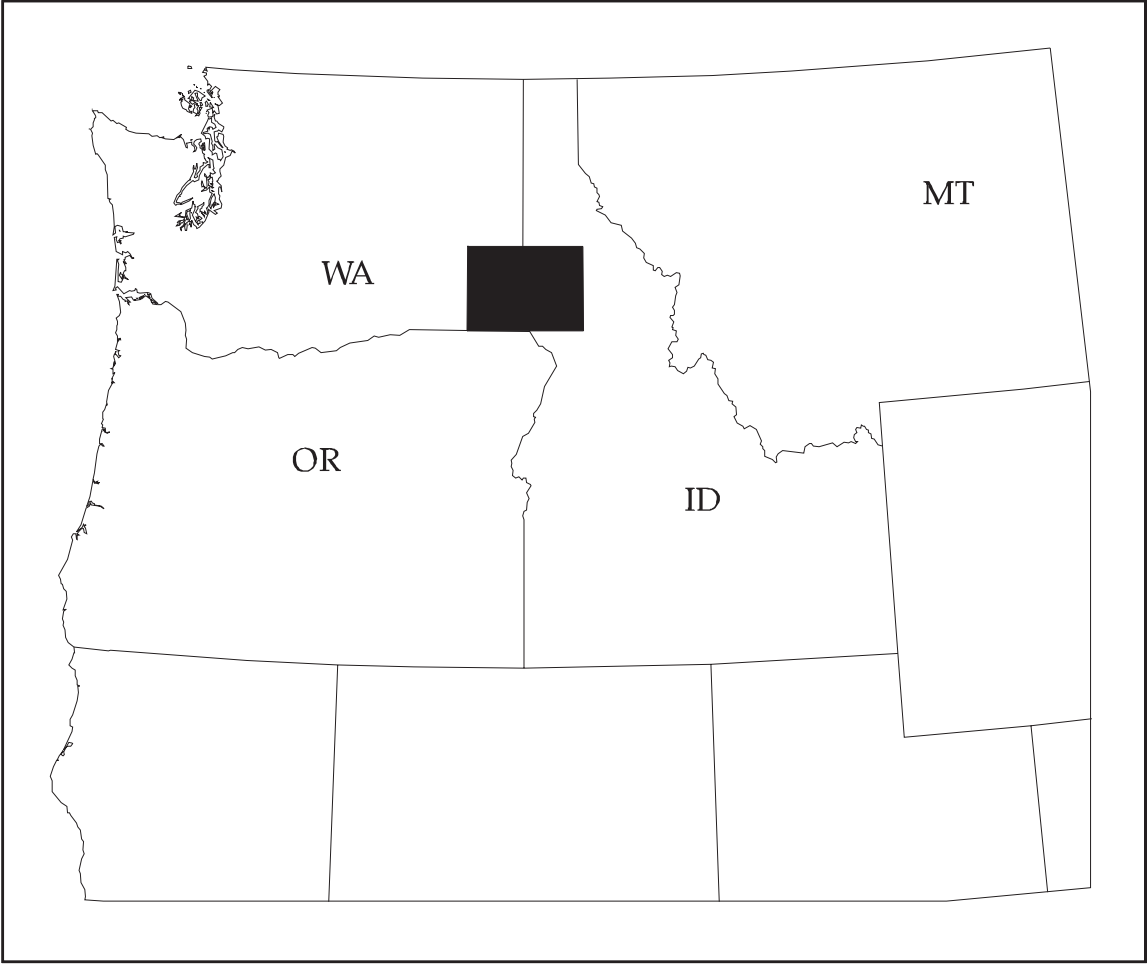

Figure 1. Index map showing the geographic extent of the Pullman quadrangle (black fill) with respect to the Pacific Northwest.

Tgd Granitic dikes (Oligocene and Eocene)

Tpv Potato Hill Volcanics (Oligocene and Eocene)—Light pink to gray rhyolite and dark purple to black volcanic breccia; contains xenoliths of older metamorphic and igneous rocks

Kamiah Volcanics (Oligocene and Eocene)

Tka Gray to reddish vesicular andesites

Tkq Light gray quartz latite: contains widely spaced glassy bands

Tsy "Bovill" syenite (Oligocene and Eocene)—(May be related to Potato Hill Volcanics or Gold Hill syenite)

Idaho Batholith (Cretaceous)

Kiqm Quartz monzonite—Gray, medium- to coarse-grained rock with biotite and hornblende

Kigr Granite—Gray to reddish, fine- to coarse-grained rock

Kid Quartz diorite—Coarse-grained rock with hornblende and biotite

Kit Tonalite—Medium-grained foliated rock containing biotite

Kgb Gabbro—Coarse-grained plagioclase- hornblende rock

Ki Idaho batholith, undifferentiated

Kis Gold Hill syenite (Cretaceous)—Moderately weathered hornblende syenite

Kodg Biotite-hornblende-plagiociase quartz dioritic orthogneiss (Cretaceous)

Jm Metadiabase (Jurrassic)—Coarse- to medium-grained hornblende-plagiociase-epidote rock

Lucile Group (Triassic)—(After Savage, 1965)

^h Hurwal Formation—Upper greenstone facies; lower unit includes calcareous shale, siliceous limestone, argillite, and phyllite

^m Martin Bridge Formation—Light to medium gray and black massive and thin units of limestone, marble, phyllite, and sandstone

^l Pittsburg Formation (?)—Light gray to black, coarse marble and limestone, some quartzitic sandstone, argillite, phyllite, and chloritic schist, with basal conglomerate

P^v Seven Devils Volcanics (Triassic and Permian)—Green to grayish green metamorphosed complex of lava flows, pyroclastics, and calcareous and noncalcareous sedimentary rocks

ag Amphibolite and garnet amphibolite (Precambrian)—Dark, well-foliated, medium-grained plagioclase-hornblende rocks

Belt Supergroup (Precambrian)

= l Libby Formation—Medium gray to olive-colored, thin-bedded siltite (which produces a soil similar to loess)

= sp Striped Peak Formation—Vitreous quartzite which includes feldspathic quartzite with micaceous sheen

= w Wallace Formation, undifferentiated
= ws Coarse-grained, garnet-mica schist
= wg Diopside gneiss, biotite gneiss, and biotite quartzite interbedded with schist

= u Precambrian, undifferentiated

Ravalli Group
= sr St. Regis Formation—Medium- to coarse-grained garnet-mica schist
= rq Revett Formation—Thick-bedded, coarse- to medium-grained pure quartzite with thin micaceous laminae

Prichard Formation
= ps Gray, coarse- to medium-grained garnet-mica schist
= pq Micaceous, medium-grained granular quartzite interbedded with schist

Data Sources, Processing, and Accuracy

The geologic map of the east half of the Pullman 1°x 2° quadrangle, Idaho, (Rember and Bennett, 1979) was originally a paper document, converted from a paper to a digital format by Optronics. Specialty Co., Inc. This initial product was remitted to the U.S. Geological Survey in an ArcInfo interchange format in scanner units. Registration points were used to transform the digital files to calculated latitude-longitude points for a Transverse Mercator map projection (see Appendix A). The digital files were then augmented with an interim geologic map data model (data base), further attributed and edited, and then plotted and compared to the original stable-base geologic map to check for digitizing and attributing errors. All processing by the U.S. Geological Survey was done in ArcInfo version 8.0 (installed on a Sun Ultra workstation).

The overall accuracy (with respect to the location of polygons) of the digital geologic map (see figs. 2 and 3 for page-size versions) is probably no better than +/55 meters. This digital database is not meant to be used or displayed at any scale larger than 1:250,000 (for example, 1:100,000 or 1:24,000).

GIS Documentation

The digital geologic map of the east half of the Pullman 1:250,000 quadrangle includes a geologic linework arc attribute table, PULL250K.AAT, that relates to the PULL250K.CON, PULL250K.ST2, and PULL250K.REF files and a rock unit polygon attribute table, PULL250K.PAT that relates to the PULL250K.RU and PULL250K.REF files (see fig. 4). These data files are described below.

Linear Features

Descriptions of the items identifying linear features such as boundaries (for example, lines of latitude and longitude, state boundaries) and geologic boundaries in the arc (or line) attribute table, PULL250K.AAT, are as follows:

PULL250K.AAT			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
linecode	integer	3	Numeric code used to identify type of linear feature. Linecodes < 100 represent contacts and boundaries that are described in the PULL250K.CON file. Linecodes > 100 and < 600 represent structural features which are described in the PULL250K.ST2 file.
name	character	30	Name given to structural feature
source	integer	4	Numeric code used to identify the data source for the linear feature. Complete references for the sources are listed in the PULL250K.REF file.)

List of Map Units

Figure 2. Explanation for the Simplified Digital Geologic Map of the East Part of the Pullman 1:250,000 Quadrangle

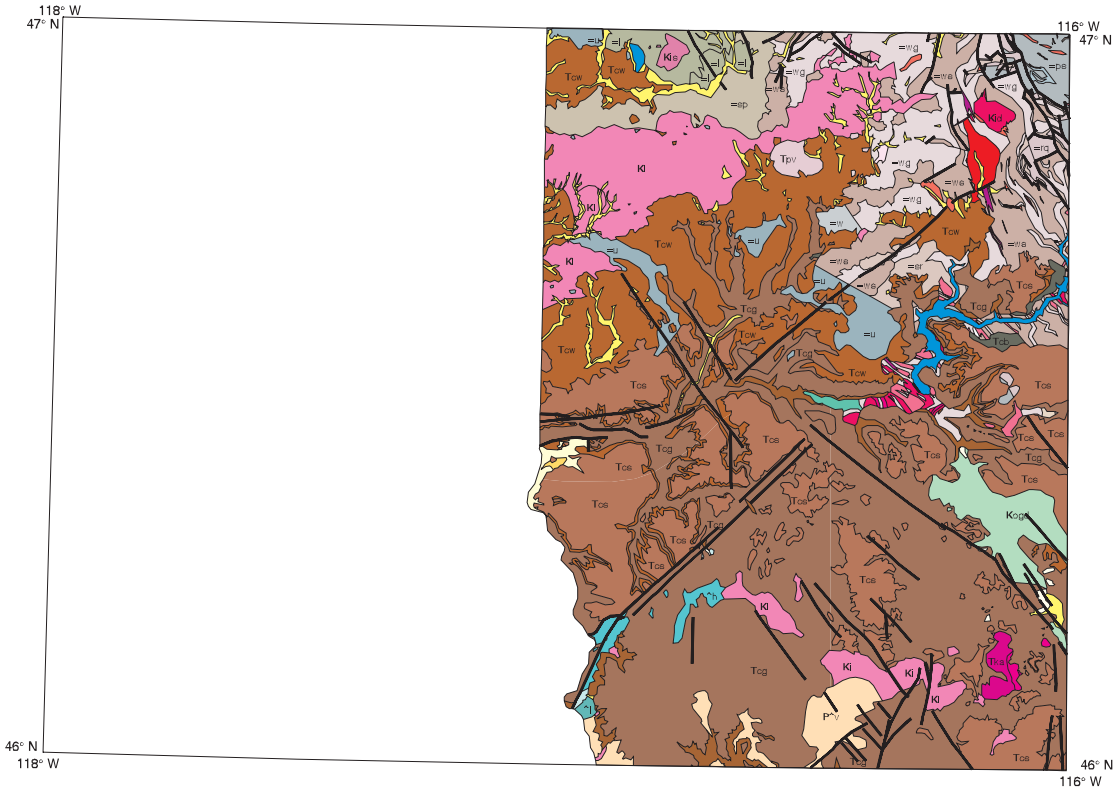

Figure 3. Simplified Digital Geologic Map of the East Part of the Pullman 1:250,000 Quadrangle

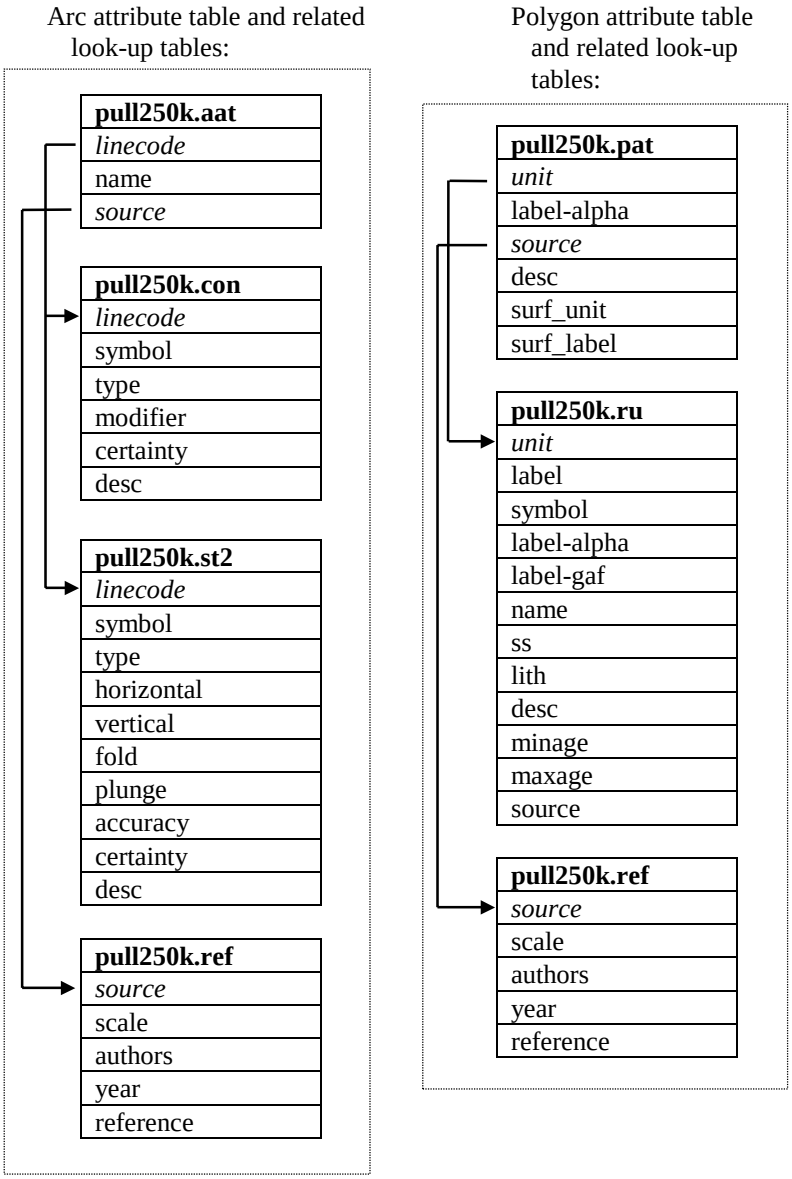

Figure 4: Relationships between feature attribute tables and look-up tables

Attribute descriptions for items in the contact (and boundary) look-table, PULL250K.CON [for use with the CARTO.LIN and GEOL_DIA.LIN linesets], are as follows:

PULL250K.CON			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
linecode	integer	3	Numeric code (a value < 100) used to identify type of contact or boundary. (This item also occurs in PULL250K.AAT.)
symbol	integer	3	Line symbol number used by ArcInfo to plot lines. Symbol numbers refer to the **GEOL_DIA.LIN lineset** for linecodes gt 0 and lt 100.
type	character	10	Major type of line, for example, contact, state boundaries, lines of latitude and longitude used for neatlines.
modifier	character	20	Line type modifier, i.e., approximate, concealed, gradational. No entry implies 'known.'
certainty	character	15	Degree of certainty of contact or boundary, i.e., inferred, uncertain. No entry implies 'certain.'
desc	character	100	Written description or explanation of contact or boundary.

Attribute descriptions for items in the structure look-up table, PULL250K.ST2 [for use with the GEOL_DIA.LIN lineset] are as follows:

PULL250K.ST2			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
linecode	integer	3	Numeric code (a value > 100 and < 600) used to identify type of structural feature. (This item also occurs in PULL250K.AAT.)
symbol	integer	3	Line symbol number used by Arc/Info to plot arc (line). Symbol numbers refer to the **GEOL_DIA.LIN lineset**
type	character	10	Major type of structure, i.e., fault, fracture, fold, other.
horizontal	character	20	Type of horizontal fault movement, for example, left-lateral, right-lateral. No entry implies 'unknown.'
vertical	character	20	Type of vertical fault movement, for example, normal. No entry implies 'unknown.'
fold	character	15	Type of fold, for example, anticline, syncline.
plunge	character	15	Type of plunge on fold, i.e., horizontal, plunging, plunging in, plunging out.
accuracy	character	15	Line type modifier indicating degree of accuracy, i.e., approximately located, concealed, gradational. No entry implies 'known.'
certainty	character	15	Degree of certainty of contact or boundary, i.e., inferred, uncertain. No entry implies 'certain.'
desc	character	100	Written description or explanation of structural feature.

Areal Features

Descriptions of the items identifying geologic units in the polygon attribute table, PULL250K.PAT, are as follows:

PULL250K.PAT			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
unit	integer	4	Numeric code used to identify the rock unit which is described in the PULL250K.RU look-up table. (This item also occurs in PULL250K.RU.)
label-alpha	character	10	Rock unit label (abbreviation) used to label unit on map. (This item was joined from the PULL250K.RU look-up table.)
source	integer	4	Numeric code used to identify the data source for the rock unit. Complete references for the sources are listed in the PULL250K.REF file.
desc	character	100	Formal or informal unit name. (This item was joined from the PULL250K.RU look-up table.)
surf_unit	integer	4	Numeric code used to identify the surficial rock unit that is described in the PULL250K.RU look-up table under the item **unit**. (The item **surf_unit** does not occur in PULL250K.RU.) The attribute values for **surf_unit** are a subset of the attribute values for **unit**. This item, **surf_unit**, is attributed only when the underlying bedrock has been identified. The PULL250K.AML file does not use the value in the **surf_unit** item to create the digital geologic map files (PULL250K.GRA /.HP and PULL-MAP.PDF).
surf_label	character	10	Surficial rock unit label (abbreviation).

Attribute descriptions for items in the lithology (rock unit) look-table, PULL250K.RU (for use with the WPGCMYK.SHD shadeset), are as follows:

PULL250K.RU			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
unit	integer	4	Numeric code used to identify rock unit. (This item also occurs in PULL250K.PAT.)
label	character	10	Rock unit label (abbreviation) used to label unit on map.
symbol	integer	3	Shadeset symbol number used by Arc/Info to plot a filled/shaded polygon. The symbol numbers used in this file refer to the **WPGCMYK.SHD** shadeset.
label-alpha	character	10	Rock unit label for use with standard alphabetic characters (for example, C for Cambrian).
label-gaf	character	10	Rock unit label for use with GeoAgeFullAlpha font (geofont.txt) to produce special geologic age characters (for example, _ for Cambrian)
name	character	7	The prefix portion of the rock unit label that does not include subscripts. (If subscripting is not used in the original unit label, then the 'name' entry is the same as the 'label' entry.)
ss	character	3	The suffix portion of the geologic unit label that includes subscripts.
lith	character	20	Major type of lithostratigraphic unit, for example, unconsolidated sediments, sedimentary rocks, metasedimentary rocks, intrusive rocks, extrusive rocks, metamorphic rocks, water, ice.
desc	character	250	Formal or informal unit name
minage	character	7	Minimum stratigraphic age of lithologic unit, for example, CRET, TERT, PCY.
maxage	character	7	Maximum stratigraphic age of lithologic unit
source	character	4	Numeric code used to identify the data source for the rock unit. Complete references for the sources are listed in the PULL250K.REF file.

Source Attributes

Descriptive source or reference information for the PULL250K ArcInfo datasets is stored in the PULL250K.REF file. Attribute descriptions for items in the PULL250K.REF data source file are as follows:

PULL250K.REF			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
source	integer	4	Numeric code used to identify the data source. (This item also occurs in the PULL250K.AAT PULL250K.PAT, and PULL250K.RU files.)
scale	integer	8	Scale of source map. (This value is the denominator of the proportional fraction that identifies the scale of the map that was digitized or scanned to produce the digital map.)
authors	character	200	Author(s) or compiler(s) of source map entered as last name, first name or initial, and middle initial.
year	integer	4	Source (map) publication date
reference	character	250	Remainder of reference in USGS reference format.

Obtaining Digital Data

The complete digital version of the geologic map is available in ArcInfo interchange-format with associated data files. These data and map images are maintained in a Transverse Mercator map projection:

Projection:	Transverse Mercator
Units:	meters
Parameters:	
Scale factor at the central meridan:	1.00000
Longitude at the central meridian:	-117 0 0
Latitude at the origin:	0 0 0
False easting:	0
False northing:	0

To obtain copies of the digital data, do one of the following:
1.Download the digital files from the USGS public access World Wide Web site on the Internet: **URL =** http://geopubs.wr.usgs.gov/open-file/of01-262/
or
2. Anonymous FTP from **geopubs.wr.usgs.gov,** in the directory
pub/ open-file/of01-262/

The Internet sites contain the digital geologic map of the east half of the Pullman 1:250,000 quadrangle both in ArcInfo interchange-format files (pull250k.e00) and as HPGL2, encapsulated PostScript, and portable document format plot files (pull250k.hp, pull250k.eps, pull-map.pdf) of the map area, as well as the associated data files and ArcInfo macro programs which are used to plot the map at a scale of 1:250,000.

To manipulate this data in a geographic information system (GIS), you must have a GIS that is capable of reading ArcInfo interchange-format files.

Obtaining Paper Maps

Paper copies of the digital geologic maps are not available from the U.S. Geological Survey. However, with access to the Internet and access to a large-format color plotter that can interpret HPGL2 (Hewlett-Packard Graphics Language) or PDF (portable document) files, a 1:250,000-scale paper copy of the map can be made, as follows:

1. Download the digital version of the maps, **pull250k.hp, pull250k.eps, or pull-map.pdf,** from the USGS public access World Wide Web site on the Internet using the **URL =** http://geopubs.wr.usgs.gov/open-file/of01-262/

or

2. Anonymous FTP the plot files, **pull250k.hp, pull250k.eps, and/or pull-map.pdf** from: **geopubs.wr.usgs.gov,** in the directory:

pub/open-file/of01-262/

3. These files can be plotted by any large-format color plotter that can interpret HPGL2, encapsulated postscript, or PDF files. The finished plot is about 28 inches by 33 inches.

Paper copies of the map can also be created by obtaining the pull250k.aml file and then creating a plot file in ArcInfo.

References Cited

Rember, W.C. and Bennett, E.H., 1979, Geologic map of the Pullman quadrangle, Idaho: Idaho Bureau of Mines and Geology Geologic Map Series, scale 1:250,000.

Savage, C.N., 1965, Economic geology of carbonate rocks adjacent to Snake River south of Lewiston, Idaho: Idaho Bureau of Mines and Geology, Mineral Resources Report 10.

Appendix A – Transformation File Listing

Arc: |> transform pullman pull250k2 affine <|
Transforming coordinates for coverage pullman

Scale (X,Y) = (6371.351,6375.799) Skew (degrees) = (0.013)
Rotation (degrees) = (-0.171) Translation = (-24040.464,5080341.281)
RMS Error (input,output) = (0.008,52.306)

Affine X = Ax + By + C
Y = Dx + Ey + F

A =	6371.323	B =	20.448	C =	-24040.464
D =	-19.011	E =	6375.766	F =	5080341.281

tic id	input x	input y	output x	output y	x error	y error
860	0.727	2.447	-19366.407	5095898.261	7.933	27.671
791	0.720	6.810	-19279.004	5123686.530	-33.655	61.881
861	3.766	2.452	0.000	5095867.868	7.040	37.903
862	6.809	2.465	19366.407	5095898.261	25.080	28.112
792	3.752	6.807	0.000	123656.147	3.021	11.244
793	6.777	6.810	19279.004	5123686.530	-4.378	-53.525
722	0.724	11.161	-19191.230	5151476.031	-8.618	13.519
653	0.725	15.513	-19103.089	5179266.763	-4.137	-29.511
584	0.727	19.874	-19014.581	5207058.726	15.162	-19.549
723	3.740	11.165	0.000	5151445.660	18.154	11.154
654	3.724	15.526	0.000	5179236.407	4.635	25.813
724	6.746	11.156	19191.230	5151476.031	-24.105	-132.459
655	6.720	15.516	19103.089	5179266.763	-11.899	-128.501
585	3.716	19.881	0.000	5207028.387	42.285	1.789
586	6.691	19.891	19014.581	5207058.726	-20.420	-27.396
863	9.847	2.485	38732.802	5095989.441	17.282	10.211
864	12.885	2.518	58099.172	5096141.411	4.496	7.733
794	9.799	6.844	38557.992	5123777.680	-24.177	10.952
795	12.829	6.877	57836.949	5123929.600	-0.370	12.789
865	15.922	2.548	77465.505	5096354.176	-10.613	-67.713
796	15.859	6.908	77115.859	5124142.295	29.770	-60.351
725	9.758	11.206	38382.442	5151567.144	-23.475	33.237
656	9.719	15.561	38206.157	5179357.832	-5.194	12.231
726	12.769	11.235	57573.617	5151719.002	-27.389	14.062
657	12.715	15.588	57309.181	5179509.618	-20.172	-24.615
587	9.680	19.927	38029.138	5207149.745	9.672	55.245
588	12.666	19.960	57043.645	5207301.446	20.083	59.471
727	15.787	11.287	76764.736	5151931.612	10.299	71.218
658	15.721	15.634	76412.140	5179722.125	31.865	1.622
589	15.642	19.998	76058.078	5207513.834	-28.176	35.764

Appendix B - List of files in the Pullman GIS (packaged as of01-262.tar.Z)

--Uncompress the **of01-262.tar.Z** file and extract the files from the resultant **of01-262.tar** file.
--Use the **'importfile.aml**' in Arc/Info to IMPORT all of the *.E00 files for use in ArcInfo.
--Use the ArcInfo 'DRAW' command to plot the *.GRA file to your screen. (Make sure the display is set with the ArcInfo 'DISPLAY' command.)
--Use the ArcInfo 'HPGL2' command to create a HPGL2 file from the *.GRA file.
--Use the UNIX 'lpr -P<plotter_name> pull250k.hp' command to send the pull250k.hp file to a large-format color plotter that can interpret Hewlett-Packard Graphics Language.
--To re-create the *.GRA file, open the ArcPlot module, enter 'display 1040', enter a new file name for the graphics file, enter '&run pull250k' (and enter 'quit' to exit the ArcPlot module). See the 00readme.txt file for further file details.

Report text in portable document format:

- of01-262.pdf

Primary ArcInfo interchange-format files (*.e00) and metadata (*.met) files for the digital geology:

- pull250k.e00
- pull250k.met

ArcInfo graphics (*.gra), HPGL2 (*.hp), encapsulated PostScript (*.eps), and portable document format (*.pdf) files for the geologic map sheet:

- pull250k.gra/.hp/.eps
- pull-map.pdf

Additional ArcInfo interchange - format files (*.e00) necessary to re-create the geologic map sheet:

- fnt026.e00 – font
- fnt037.e00 – font
- fnt038.e00 – font
- fnt039.e00 – font
- fnt040.e00 – font
- GEOAFA__.FON – font file
- GEOAFA__.TTF – font file
- geol_dia.lin.e00 - lineset
- pulltm.e00 - exterior boundary of the Pullman quadrangle
- wpgcmyk.shd.e00 – shadeset

AML, graphics, key, symbolset and text files necessary to re-create the geologic map sheet:

- scale2a.aml - plots scale bar on plate
- pull250k.aml - program that creates a graphics file of the geologic map
- indx_pull.gra - index map graphic
- usgslogo.gra – USGS logo
- pull-lin.key – lineset symbol values and descriptive text for lines
- pull-pol.key - shadeset symbol values and descriptive text for geologic map units
- geo.prj - a text file used to identify real-world (geographic) coordinates - for use in adding latitude and longitude notation around the margins of the map quadrangle
- tvm.prj - a text file to identify Transverse Mercator map projection - for use in adding latitude and longitude notation around the margins of the map quadrangle
- cal.dat – plotter calibration text file
- pull-crd.txt - text file listing map credits
- pull-dis.txt – text file with disclaimer statement
- pull-ref.txt - text file listing map references

Appendix C - ArcInfo Macro Language program (pull250k.aml) used to plot the geologic map

```
/*  pull250k.aml, 10/24/01 hzk
/*  This ArcInfo Macro Language (AML) program will plot the geologic map plate
/*  for the Pullman 1- by 2-degree quadrangle in color (scale 1:250,000).
/*  PLOT OF BEDROCK  ONLY
/***************************
/*  To run this AML:
/*    1. Type '&run pull250k' at the 'Arc:' prompt to start the program,
/*    2. Run the ArcInfo HPGL2 command to convert the GRA file to an HPGL2
/*       file, i.e., hpgl2 pull250k pull250k.hp # 1.0 opaque # 0 # # # cal.dat
/*    3. Execute the UNIX 'lpr' command to print the 1:250,000-scale geologic
/*       map plot on your plotter, i.e., lpr -Ppicasso pull250k.hp
/*    4. To make an Encapsulated PostScript file, at the ArcPlot prompt type
/*       'display 1040 2' and enter 'pull250k' for a pull250k.eps file.
/***************************
ap
display 1040
pull250k.gra

clear
clearselect

pagesize 33.0 28.0
pageunits inches
mapunits meters
mapscale 250000
mapposition ll 0.75 6.0

&set cover pull250k
&set quad pulltm
&set key1 pull-pol.key
&set key2 pull-lin.key
&s credits pull-crd.txt
&s disclaimer pull-dis.txt
&s reference pull-ref.txt
/* -->where 'cover' contains contacts and structures and rock units and 'quad' is the quadrangle boundary.

&label credits
/*list credits
textfont 93713
textquality proportional
textsize 0.12
move 23.3 7.1
textfile pull-crd.txt

&label disclaimer
textfont 93713
textquality proportional
textsize 0.12
move 28.9 2.45
textfile %disclaimer%

&label proj
/*plot map projection notes
textfont 93713
textquality proportional
textsize 0.12
move 2.0 7.0
text 'Transverse Mercator projection'
move 2.0 6.8
text 'NAD 1927                Clarke 1866'
move 2.0 6.6
text 'scale factor at central merdian = 1.0'
move 2.0 6.4
text 'longitude of central meridian = -117 0 0'
move 2.0 6.2
text ' latitude of origin = 0'
move 2.0 6.0
text 'false easting = 0'
move 2.0 5.8
text 'false northing = 0'

&label references
```

```
/* list references
textfont 93711
textsize 0.25
textcolor 1
move 28.9 6.75
text 'References'
move 28.9 6.5
textsize 0.12
textquality proportional
textfont 94021
textfile pull-ref.txt

mape %quad%
maplimits 0.0 2.4 26.5 26

/*draw outside box
linesymbol 9
linecolor 1
box 0.5 0.5 32.5 27.5
/*
textquality proportional
textfont 94021
linedelete all

/* cut marks
markerset plotter
markersymbol 1
markersize 0.1
marker 0 0
marker 0 28
marker 33.0 0
marker 33.0 28

&label shadepolys
/* color polygons for geologic rock units
shadedelete all
shadeset wpgcmyk
polygonshade %cover% unit
%cover%.ru

&label contacts
/* plot contacts and boundaries
linedelete all
lineset geol_sfo.lin
res %cover% arcs linecode gt 0 and
linecode lt 40
arclines %cover% linecode
%cover%.con
asel %cover% arcs
linedelete all
lineset geol_dia.lin
res %cover% arcs linecode gt 40 and
linecode lt 100
arclines %cover% linecode
%cover%.con
asel %cover% arcs
linedelete all
lineset geol_dia.lin
res %cover% arcs linecode = 81
arclines %cover% linecode
%cover%.con
asel %cover% arcs

&label structure
/* plot faults with line patterns
linedelete all
lineset geol_dia.lin
res %cover% arcs linecode gt 100 and
linecode lt 600
arclines %cover% linecode %cover%.st2
asel %cover% arcs

&label mapquad
/* plot quadrangle boundary
linedelete all
lineset plotter
linesymbol 5
arcs %quad%

&label geolabels
textsize 0.10
res %cover% poly area gt 750000
textset geofont.txt
textsymbol 37
labeltext %cover% unit %cover%.ru cc
asel %cover% poly

&label titles
textfont 93715
```

```
textquality kern
textsize 0.35
plot usgslogo.gra box 2.0 25.75 5.0
26.75
move 5.5 26.39
text 'U.S. Department of the Interior'
move 5.5 25.9
text 'U.S. Geological Survey'
move 31.5 26.5
text 'Open-File Report 01-262' lr
move 31.5 25.9
text 'Database, version 1.0' lr
textfont 93711
textsize 0.3
move 13.75 6.00
text  'Bedrock Geology' lc
textsize 0.4
move 13.75 5.30
text  'Spatial Digital Database for the
Geologic Map of the East Part of the
Pullman 1° x 2° Quadrangle, Idaho' lc
textsize 0.3
move 13.75 4.60
text ' Geology compiled by William C.
Rember and Earl H. Bennett' lc
move 13.75 3.90
text 'Digital database by Helen Z.
Kayser' lc
move 13.75 3.40
text '2001' lc
move 13.75 2.90
text '(map originally published in 1979)'
lc

&label explan
/* plot explanation - geologic units
shadedelete all
shadeset wpgcmyk
textfont 93711
textsize 0.25
move 26.45 24.3
text 'List of Map Units'
textsize 0.12
textquality proportional
textfont 4555552
keyarea 26.75 8.00 33.0 23.7
keybox 0.5 0.35
keyseparation 0.2 0.2
keyshade %key1%

&label linekey
/*  plot explanation - line key
linedelete all
lineset geol_dia.lin
keybox 0.6 0.0
keyline %key2% nobox

&label scale
/* plot scale bars
linedelete all
lineset plotter
textfont 94021
textsize 0.12
&r scale2a 13.75 2.40 other 250000

&label index-map
plot indx_pull.gra box 28.9 3.25 31.9
4.95
textfont 93713
textquality proportional
textsize 0.12
move 28.9 3.125
text 'Index map showing Pullman
quadrangle'

&label lat-long
/* plot neat line labels (latitude and
longitude)
mape %quad%
linecolor 1
mapprojection geo.prj tvm.prj
neatline -117.995 46.0 -116.00 47.0
geo.prj
neatlinehatch 0.25 0.25 0.2 0 geo.prj
textset font.txt
textsymbol 1
textsize 8 pt
textstyle typeset
textoffset -0.35 0.15
neatlinelabels 0.25 top all geo.prj dms '
```

```
textoffset -0.75 0.0
neatlinelabels 0.25 left all geo.prj dms '

&label done
quit
display 9999 3
draw pull250k
&return
```

Appendix D - Metadata file (pull250k.met) for the Pullman GIS

Identification_Information:

Citation:
Citation_Information:
Originator: Rember, W.C., Bennett, E.H., Kayser, H.Z.
Publication_Date: 2001
Title:
Spatial digital database for the geologic map of the east part of the Pullman 1 x 2 -degree quadrangle, Idaho

Edition: version 1.0
Geospatial_Data_Presentation_Form: map
Series_Information:
Series_Name: U.S. Geological Survey Open-File Report
Issue_Identification: Open File Report 01-262
Publication_Information:
Publication_Place: Menlo Park, CA
Publisher: U.S. Geological Survey
Online_Linkage:
URL = http://geopubs.wr.usgs.gov/open-file/of01-262

Description:

Abstract:
The paper geologic map of the east part of the Pullman 1 x 2 -degree quadrangle, Idaho (Rember and Bennett, 1979) was scanned and initially attributed by Optronics Speciality Corp. Inc. (Northride, CA) and remitted to the U.S. Geological Survey for furter attribution and publication of the geospatial digital files. The resulting digital geologic map GIS can be queried in many ways to produce a variety of geological maps.
Purpose:
This dataset was developed to provide a geologic map GIS of the east part of the Pullman 1:250,000 quadrangle for use in future spatial analysis by a variety of users. These data can be printed in a variety of ways to display various geological features or used for digital analysis and modeling. This database is not meant to be used or displayed at any scale larger than 1:250,000 (e.g. 1:100,000 or 1:24,000).
Supplemental_Information:
This GIS dataset consists of one major Arc/Info dataset: a line

and polygon file (pull250k) that contains geologic contacts and structures (lines) and geologic map rock units (polygons).

Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2001
Currentness_Reference: publication date

Status:
Progress: Complete
Maintenance_and_Update_Frequency: None Planned

Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -117.25
East_Bounding_Coordinate: -116.00
North_Bounding_Coordinate: 47.00
South_Bounding_Coordinate: 46.00

Keywords:
Theme:
Theme_Keyword_Thesaurus: none
Theme_Keyword: geology
Theme_Keyword: geologic map
Place:
Place_Keyword_Thesaurus: none
Place_Keyword: Clearwater County
Place_Keyword: Idaho County
Place_Keyword: Latah County
Place_Keyword: Lewis County
Place_Keyword: Nez Perce County
Place_Keyword: Idaho
Place_Keyword: Pacific Northwest
Place_Keyword: USA

Access_Constraints: none

Use_Constraints:
This digital database is not meant to be used or displayed at any scale larger than 1:250,000 (e.g., 1:100,000, 1:24,000).

Any hardcopies utilizing these data sets shall clearly indicate their source. If the user has modified the data in any way, they are obligated to describe the types of

modifications they have performed on the hardcopy map. User specifically agrees not to misrepresent these data sets, nor to imply that changes they made were approved by the U.S. Geological Survey.

Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Pamela D. Derkey
Contact_Organization: U.S. Geological Survey
Contact_Position: geologist
Contact_Address:
Address_Type: mailing and physical address
Address: 904 W. Riverside Ave., Rm. 202
City: Spokane
State_or_Province: WA
Postal_Code: 99201
Country: USA
Contact_Voice_Telephone: 1-509-368-3114
Contact_Facsimile_Telephone: 1-509-368-3199
Contact_Electronic_Mail_Address: pderkey@usgs.gov

Data_Set_Credit:
Optronics Specialty Corp., Inc. scanned the Rember and Bennett (1979) geologic map and provided minimally attributed ArcInfo interchange-format files to the U.S.G.S.;

Helen Z. Kayser (contractor) attached and attributed an interim geologic map data model; and

Michael Zientek (USGS) and Pamela D. Derkey (USGS) visually compared the hard copy plots with the source documents.

Native_Data_Set_Environment:
SunOS, 5.7, sun4u UNIX
ARC/INFO version 8.0

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
Attribute accuracy was verified by manual comparison of the source with hard copy printouts and plots.

Logical_Consistency_Report:
Polygon and chain-node topology present. Polygons intersecting

the neatline area closed along the border. Segments making up the outer and inner boundaries of a polygon tie end to end to completely enclose the area. Line segments are a set of sequentially numbered coordinate pairs. No duplicate features exist nor do duplicate points in a data string. Intersecting lines are separated into individual line segments at the point of intersection. All nodes are represented by a single coordinate pair which indicates the beginning or end of a line segment.

Completeness_Report:
This digital geologic map is wholly derived from Rember, and Bennett (1979).
Scratch boundaries were added by the author (Kayser, 2001).
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: +/- 55 meters

Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Rember, William C. and Bennett, Earl H.
Publication_Date: 1979
Title: Geologic Map of the Pullman Quadrangle, Idaho
Geospatial_Data_Presentation_Form: map
Series_Information:
Series_Name: Geologic Map Series
Publication_Information:
Publication_Place: Moscow, Idaho
Publisher: Idaho Bureau of Mines and Geology
Source_Scale_Denominator: 250000
Type_of_Source_Media: published paper map
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 1979
Source_Currentness_Reference: publication date
Source_Citation_Abbreviation: Rember and Bennett, 1979
Source_Contribution:
This map was the only map used to create the digital geologic map database.

Process_Step:
Process_Description:

The published paper geologic map was scanned by Optronics Speciality Corp., Inc.
Process_Date: 2000
Process_Step:
Process_Description:
The digital files were attributed by Helen Z. Kayser (contractor) at the USGS Spokane Field Office using an iterim geologic map data model. The data were checked for position by comparing plots of the digital data to the source.
Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Point
Point_and_Vector_Object_Count: 821
SDTS_Point_and_Vector_Object_Type: String
Point_and_Vector_Object_Count: 2243
SDTS_Point_and_Vector_Object_Type: GT-polygon composed of chains
Point_and_Vector_Object_Count: 822

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Map_Projection:
Map_Projection_Name: Transverse Mercator
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 1.00000000
Longitude_of_Central_Meridian: -117
Latitude_of_Projection_Origin: 0
False_Easting: 0.00000
False_Northing: 0.00000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 12.74271184007
Ordinate_Resolution: 12.74271184007
Planar_Distance_Units: Meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1927
Ellipsoid_Name: Clarke 1866
Semi-major_Axis: 6378206.4
Denominator_of_Flattening_Ratio: 294.98

Entity_and_Attribute_Information:
Overview_Description:

Entity_and_Attribute_Overview:
The 'Digital geologic map of the east part of the Pullman 1 x 2-degree quadrangle, Idaho ...' contains a detailed description of each attribute code. The database includes a geologic linework arc attribute table, pull250k.aat, that relates to the pull250k .con (contact look-up table), pull250k.st2 (structure look-up table), and pull250k.ref (source reference look-up table) files; a rock unit polygon attribute table, pull250k.pat, that relates to the pull250k.ru (rock unit look-up table) and pull250k.ref (source reference look-up table) files.

Entity_and_Attribute_Detail_Citation:
A detailed description of the items in the east part of the Pullman 250K database are given in the report text provided, available in Adobe Acrobat PDF format on the World Wide Web at: http://geopubs.wr.usgs.gov/open-file/of01-262/

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: U.S. Geological Survey
Contact_Instructions:
This report is only available in the electronic format at URL = http://geopubs.wr.usgs.gov /open-file/of01-262/ or via anonymous FTP from geopubs.wr.usgs.gov, in the directory pub/open-file/of01-262.

Distribution_Liability:
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This digital geologic map database of the east part of the Pullman 1 x 2-degree quadrangle is not meant to be used or displayed at any scale larger than 1:250,000 (e.g., 1:100,000 or 1:24,000).

Metadata_Reference_Information:
Metadata_Date: 20010521
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: U.S. Geological Survey
Contact_Person: Pamela D. Derkey
Contact_Position: geologist
Contact_Address:
Address_Type: mailing and physical address
Address: 904 West Riverside Avenue, Rm. 202
City: Spokane
State_or_Province: WA
Postal_Code: 99201
Country: USA
Contact_Voice_Telephone: 1-509-368-3114
Contact_Facsimile_Telephone: 1-509-368-3199
Contact_Electronic_Mail_Address: pderkey@usgs.gov
Metadata_Standard_Name:
FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none