Montana Bureau of Mines and Geology
Open File No. 597

Geologic and Structure Contour Map of the Circle 30' x 60' Quadrangle, Eastern Montana

S. M. Vuke, P. A. Hargrave, and L. N. Smith

2011

To view a full scale version of this map, click here.

Digital data link

Note— This map was originally published at a scale of 1;100,000 but the page sizes have been modified to fit average printer capabilities (8½ x 14; legal size paper). There is a an eighth inch overlap on these pages. A full sized colored print of this map can be ordered from the MBMG Publication Sales Office, 1300 West Park Street, Butte, MT, 59701-8997.

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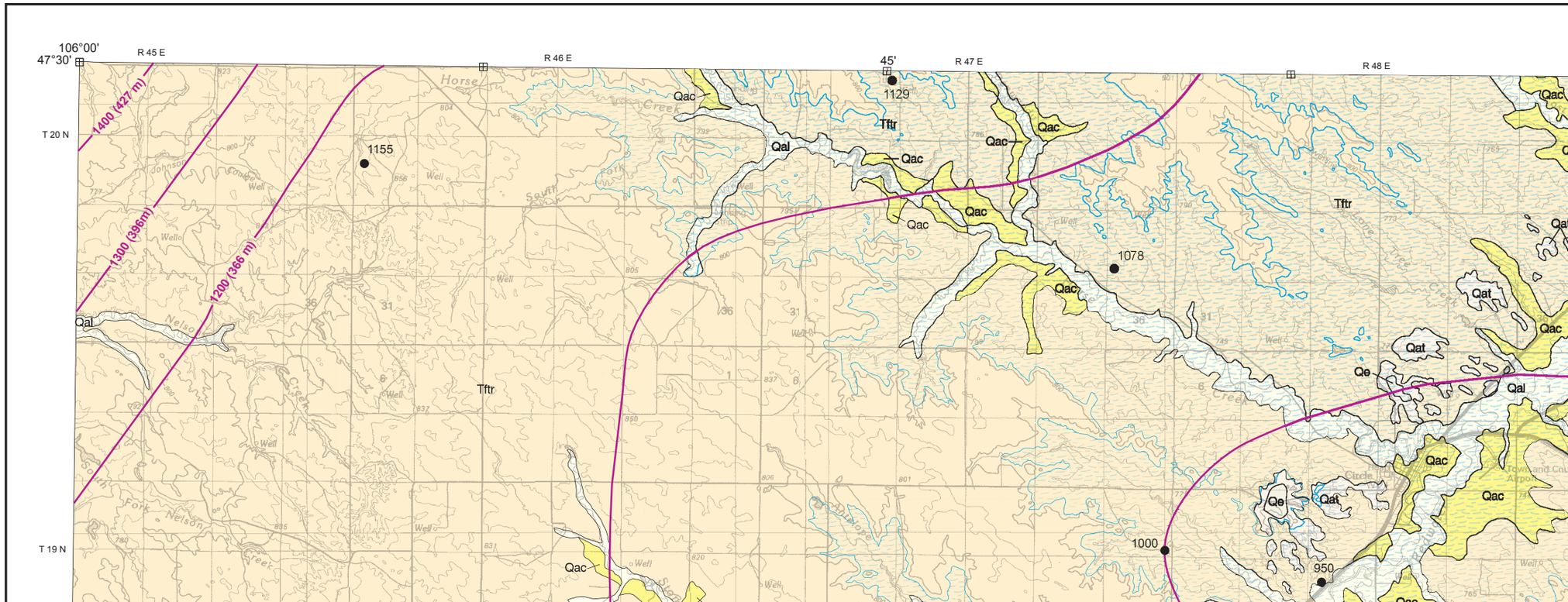
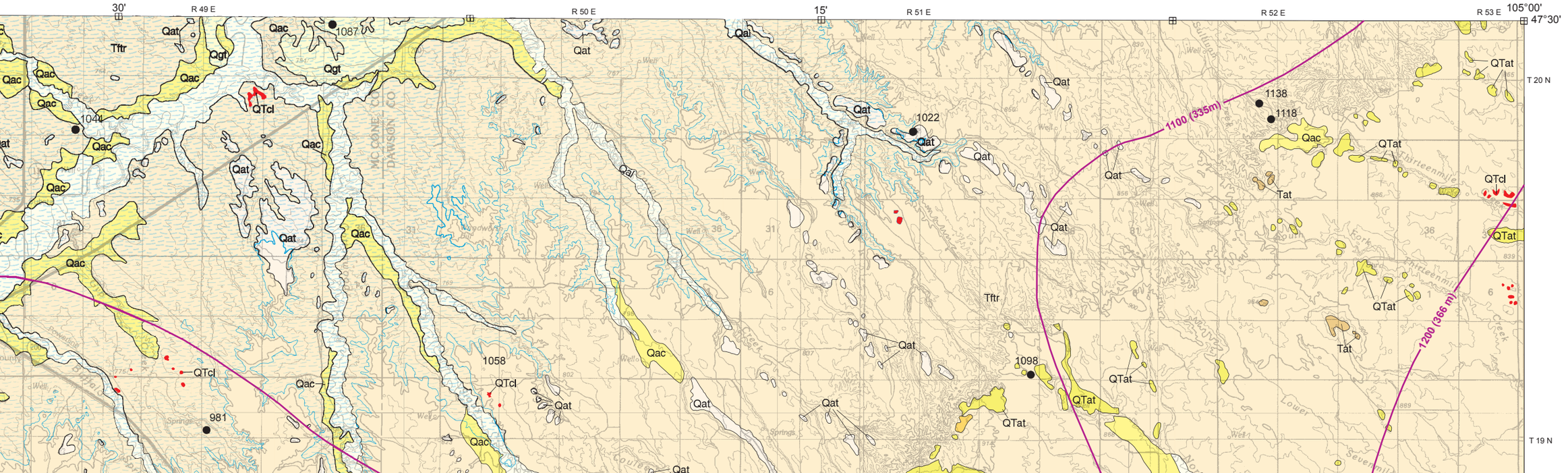
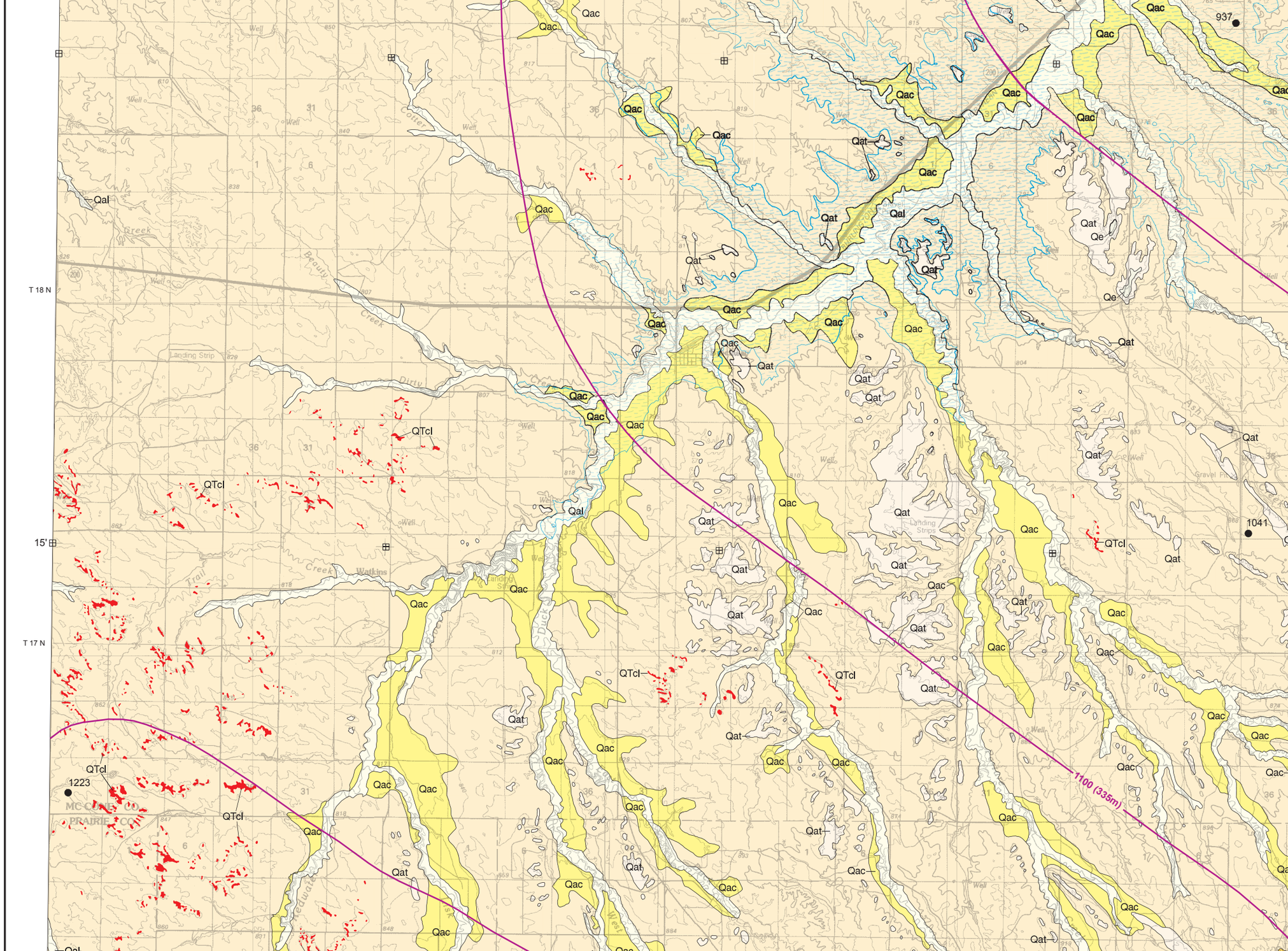
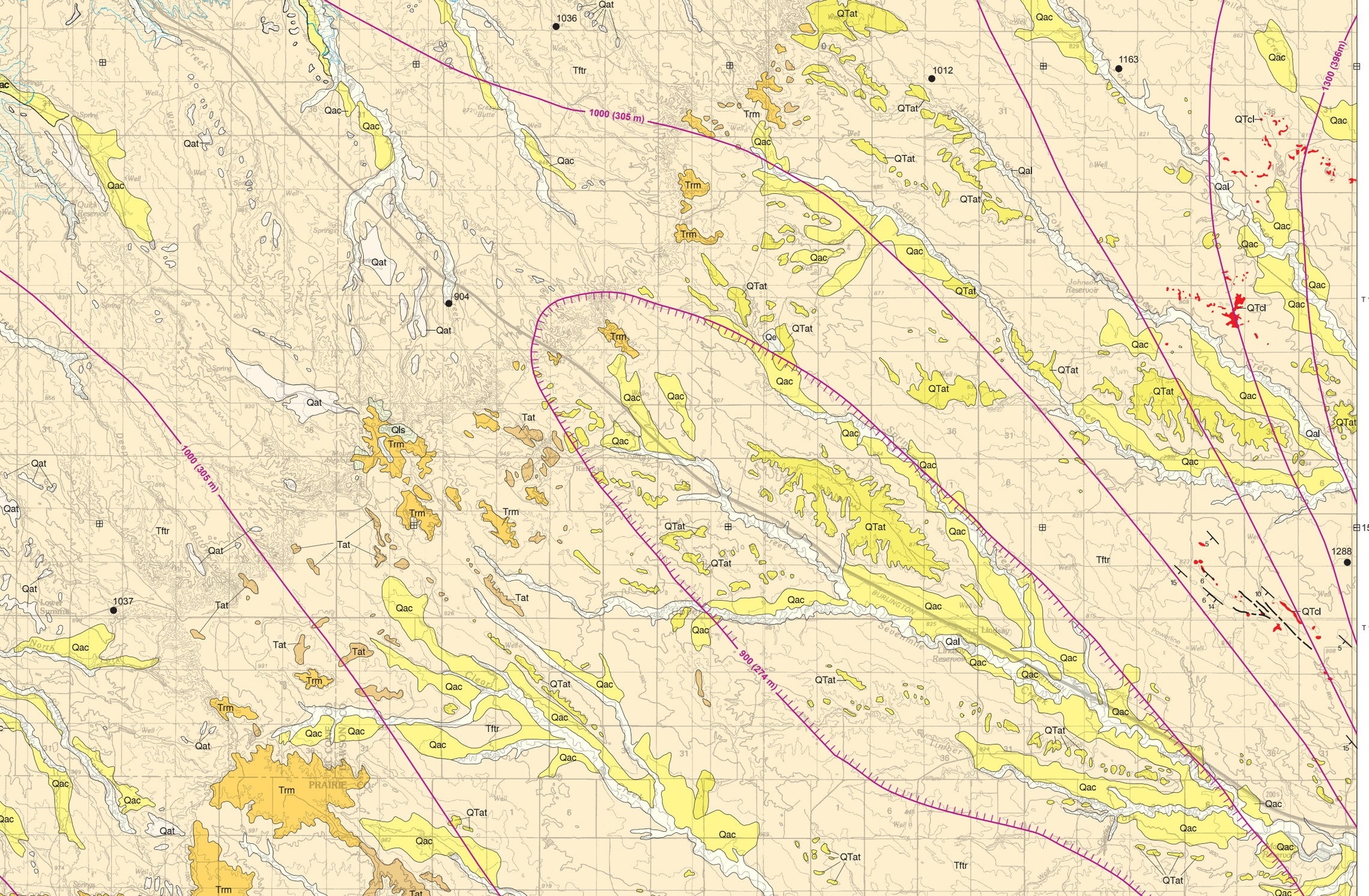
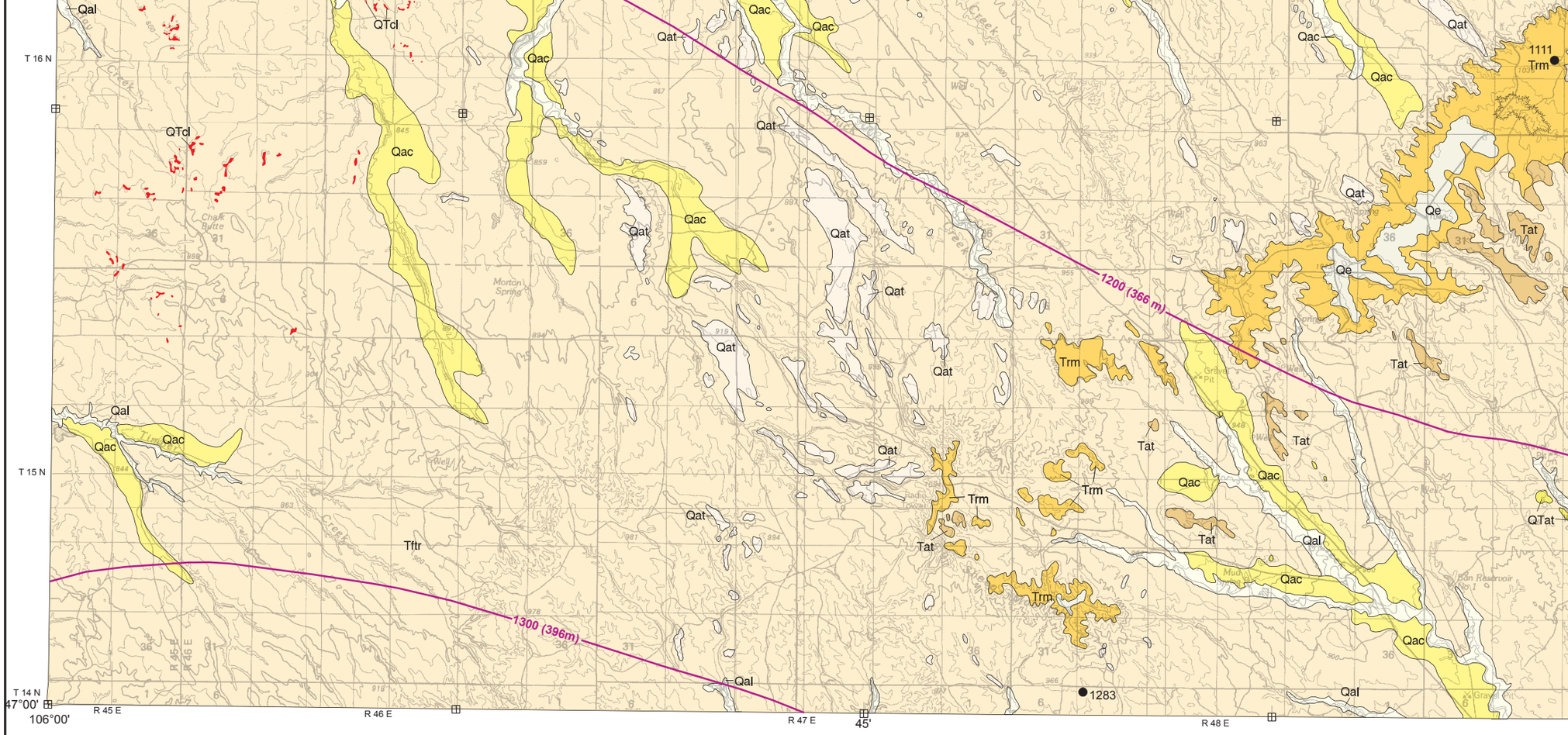



30'
R 49 E
R 50 E
15'
R 51 E
R 52 E
R 53 E
105°00'
47°30'
T 20 N
T 19 N
MC CONE CO
DAWSON CO
1100 (335m)
1200 (366 m)
Tftr
Qgt
Qac
Qat
Qal
QTcl
QTat
Tat
1087
1044
1022
1138
1118
1058
1098
981


T 18 N
T 17 N
15'
Qac
Qat
Qal
QTcl
937
1041
1223
1100 (335m)
MC
PRAIRIE CO.
Landing Strip
Landing Strips
Gravel Pit
Trail
Creek


1000 (305 m)
1300 (396m)
900 (274 m)
T 18 N
T 17 N
15'
Qac
QTat
Qat
Tat
Trm
Tftr
Qal
QTcl
Qls
Qe
1036
1012
1163
904
1037
1288

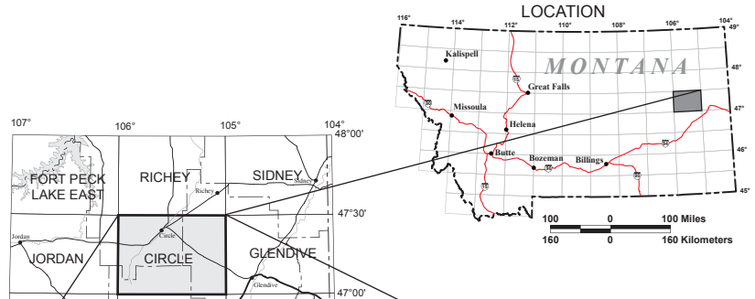


Base from U.S. Geological Survey
Circle 30'x60' topographic quadrangle
Map date: 1982
Projection: UTM zone 13; 1927 NAD
UTM grid declination 0°22' West
1982 Magnetic North Declination 14° East

KILOMETERS 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
MILES 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13

1 CENTIMETE

LOCATION



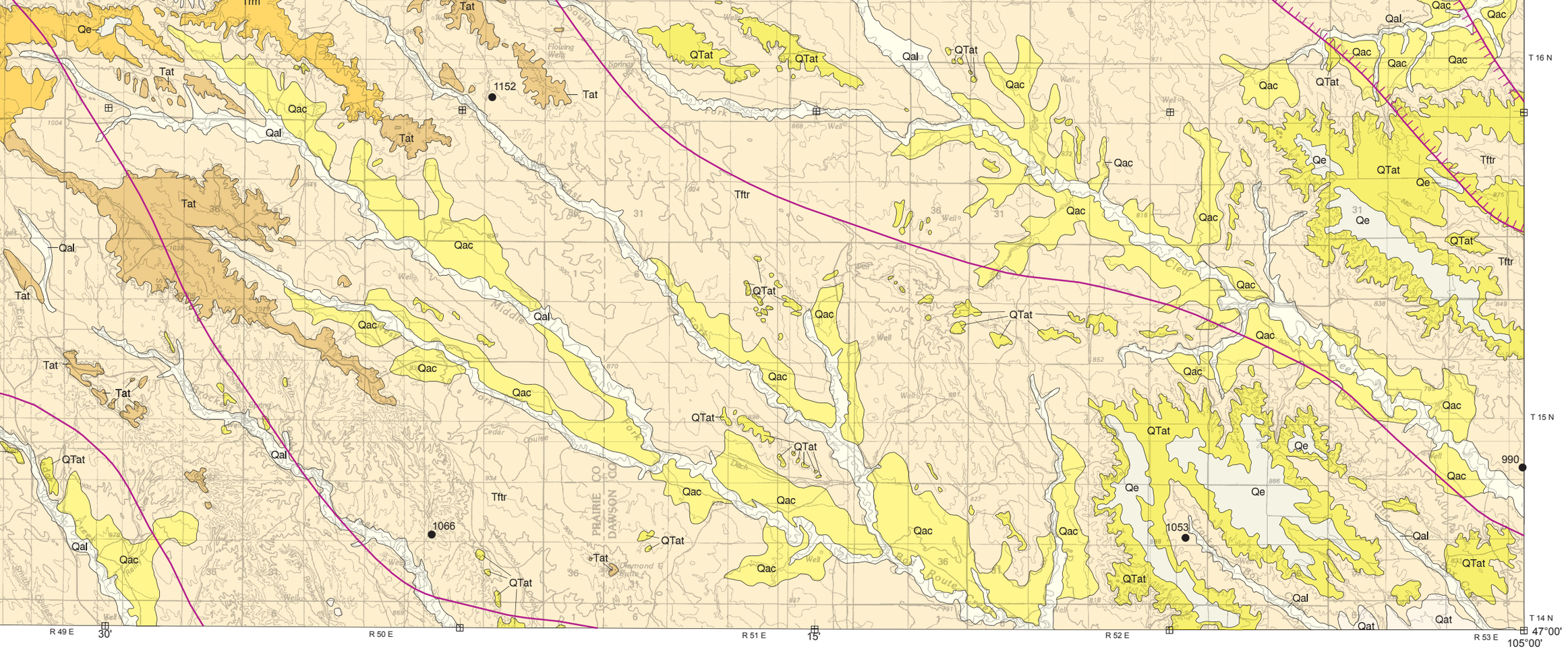
Map Symbols

Contact

Linear feature

5 Strike and dip of inclined beds

1300 (396m) Structure contours in feet on top of F
Contour interval: 100 feet. Hachured
Datum: mean sea level



SCALE 1:100 000

TER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND

CONTOUR INTERVAL 20 METERS

1000 0 5000 10 000 15 000 20 000 METERS

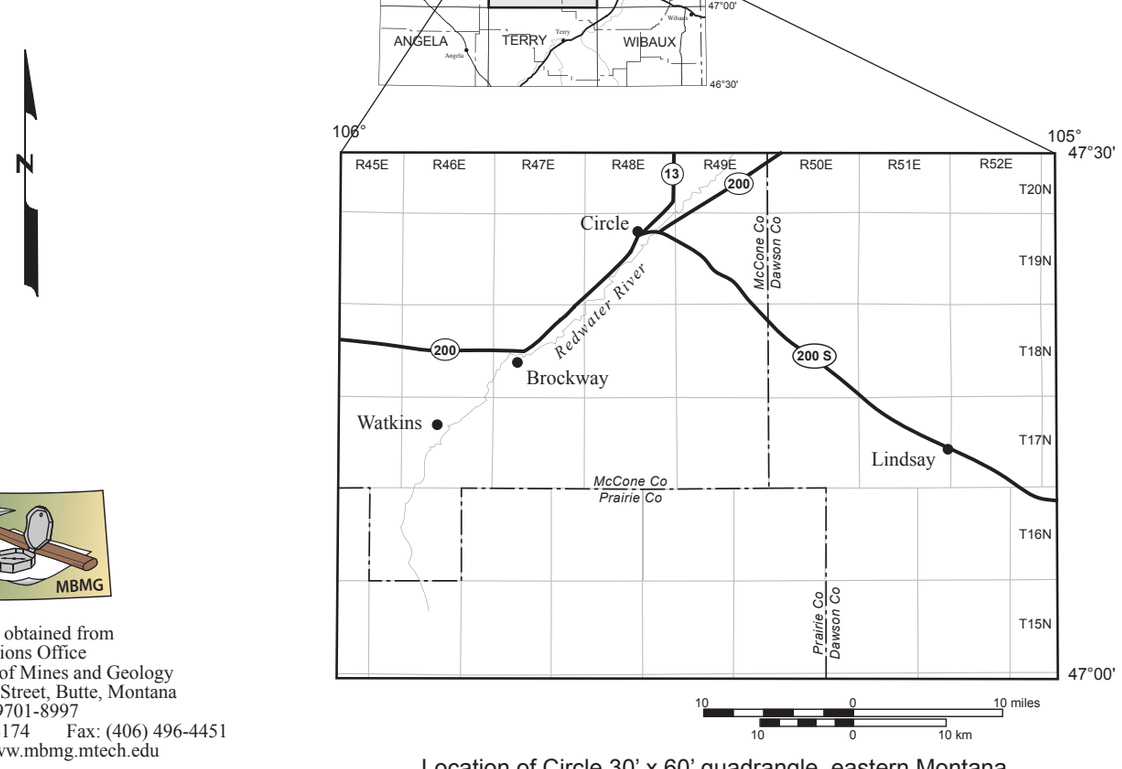
5000 0 10 000 20 000 30 000 40 000 50 000 60 000 70 000 FEET

f Pierre (Bearpaw) Shale; data from Smith (1999).
ed line indicates depression.

Circle 30’ x 60’ quadrangle
Index of 7.5’ quadrangles and map sources

106° 105°
47°30’ 47°30’

2 Johnson Coulee East *88-610*	1 Brockway NE *88-631*	2 Youngquist Mine *88-627*	2 Circle *88-630*	2 Woodworth Hill *88-626*	3 Olson Coulee North *88-620*	2 Johnson Reservoir NW *88-613*	3 Johnson Reservoir NE *88-611*
1	1	1	1	1	1	1	2



Location of Circle 30’ x 60’ quadrangle, eastern Montana

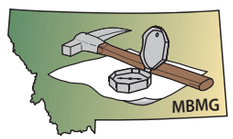
1155 Water or petroleum well. Number is

Volcanic ash bed in Rimroad Format

Extent of Glacial Lake Circle; thin de

To convert feet to meters multiply by 0.3048.

To convert meters to feet multiply by 3.2808.



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Digital map preparation supported by the U.S. Geologic
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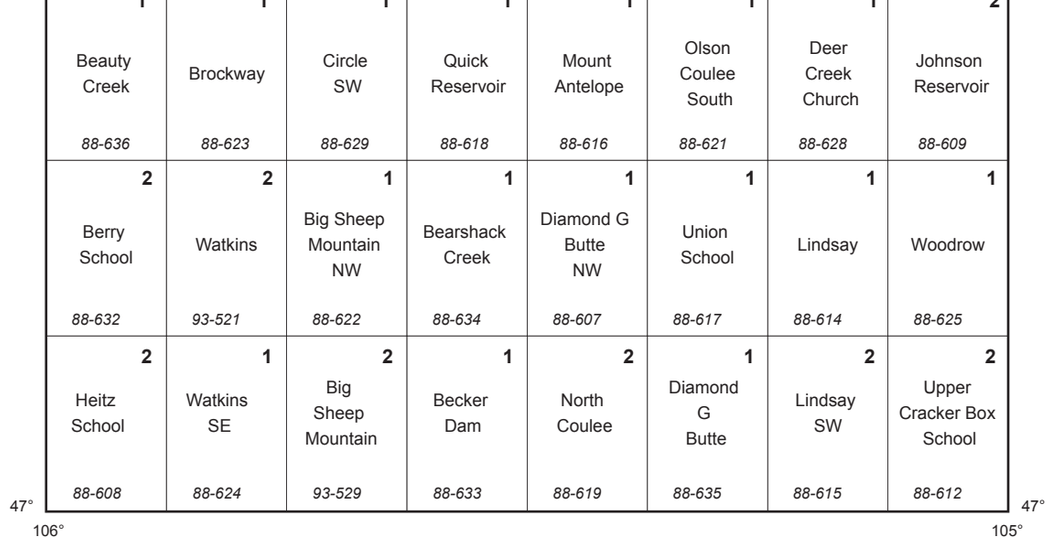
GIS production: Ken Sandau and Paul Thale, MBMG. M

s elevation of top of Pierre Shale in feet above sea level.

ation

deposits not mapped



U.S. Geological Survey *Open-file Report number* indicated at bottom of each 7.5' quadrangle.
Map sources:

1. Colton, R.B., McGraw, J.P., and Durst, S.L. 1994, scale 1:24,000.
2. Colton, R.B., McGraw, J.P., and Bozeman, D.K., 1994, scale 1:24,000.
3. Colton, R.B., McGraw, J.P., Bozeman, D.K. , and Durst, S.L. 1994, scale 1:24,000.

ical Survey, National Cooperative Geologic Mapping Program, under USGS award number G09AC00186. The views and conclusions
d should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

Map layout: Susan Smith, MBMG.

DESCRIPTION OF MAP UNITS

Qal — ALLUVIUM OF MODERN CHANNELS AND FLOOD PLAINS (HOLOCENE) – Light brown and gray, well stratified and well sorted, stream deposited, clay, silt, sand, and gravel. As much as 6 m (20 ft) thick under the flood plains of major creeks to less than a few meters thick under flood plains of tributaries/small streams. Unit limited to areas characterized by meander or braided pattern on aerial photographs. Surface of unit may be subject to occasional flooding. Thickness generally averages about 3 m (10 ft).

Qac — ALLUVIUM AND COLLUVIUM, UNDIVIDED (HOLOCENE) – Light brown and gray, poorly sorted and well stratified clay, silt, sand, and gravel deposited by gravitational movement and slope wash. Color and texture of the colluvium reflect upslope parent material. May interfinger with alluvium (Qal); includes alluvial fan deposits and much windblown clay, silt, and sand. Soil profiles vary from well-developed to poorly developed silt, sand, granules, and pebbles. Thickness as much as 10 m (33 ft); generally less than 5 m (16 ft); locally less than 2-3 m (7-10 ft) thick.

Qe — EOLIAN DEPOSIT (HOLOCENE) – Light to moderate brown, windblown sand and silt. Mapped only where dunes were identified on aerial photographs or small contour-interval topographic maps. In other places, light brown to light gray clay, silt, and sand which includes granules and pebbles carried up into the eolian deposits by bioturbation. Present mainly as a veneer as much as 2 m (6 ft) thick on terraces and fans of sand and gravel deposits; may be thicker on older

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and higher sand and gravel deposits (QTat). Thickness as much as 5 m (16 ft); generally less than 2 m (6 ft).

Qls — LANDSLIDE DEPOSIT (HOLOCENE AND PLEISTOCENE) – Slumps and earthflows. Clast size ranges from clay and silt to boulders. Thickness as much as 12 m (40 ft), generally less than 5 m (16 ft); locally from 8 m (26 ft) to 1 m (3 ft).

Qat — ALLUVIAL TERRACE DEPOSIT (HOLOCENE AND PLEISTOCENE) – Light brown to light gray, well-stratified to poorly stratified, well-sorted to poorly sorted sand and gravel deposited on alluvial terraces of the Redwater River and its tributaries.

Qgt — GLACIAL TILL (PLEISTOCENE) – Light olive brown to pale yellow mixture of clay- to boulder-sized materials. Estimated size distribution in percent: clay 15-20, silt 25-30, sand 35-40, granules 15-20, pebbles 5-10, cobbles 1, boulders 1. Contains small clasts of coal and clinker. Lenses of varved clay as thick as 4 m (13 ft) indicate deposition in a glacial lake. Thickness as much as 15 m (50 ft), generally less than 5 m (16 ft).

QTcl — CLINKER (HOLOCENE TO PLEISTOCENE) – Red to orange baked shale, sandstone, and siltstone of the Fort Union Formation that was heat-metamorphosed by combustion of lignite to hard, dense porcellanite; locally sediments fused and melted to form black, vesicular, glassy, scoriaceous rock called buchite which forms linings of chimneys and veins in the porcellanite. Coal ash forms a gray or white layer as much as 60 cm (24 in) thick at the base of the porcellanite. Thickness as much as 12 m (40 ft), generally less than 3 m (10 ft); locally less than 2 m (6 ft).

QTat — ALLUVIAL TERRACE DEPOSIT (PLEISTOCENE and /or PLIOCENE) – Light brown to light gray, generally well stratified, but rarely poorly stratified, well sorted to poorly sorted fluvial sand and gravel deposited on alluvial terraces of the paleo-Yellowstone River and its tributaries. Unit was considered Pliocene on 7.5′ quadrangle source maps based on relation with the Miocene-dated Rimroad Formation and assumption of a steady rate of southeastward migration and downcutting by the Yellowstone River. Subsequently the Pleistocene-Pliocene boundary has been extended from 1.8 Ma to 2.56 Ma (Gibbard and others, 2009) so the unit is now designated as Quaternary and/or Tertiary. Unit generally limited to altitudes between 945 m (3,100 ft) and 760 m (2,500 ft). May contain thin Pleistocene sand and gravel deposits. Thickness as much as 12 m (40 ft), but generally less than 6-3 m (20-10 ft).

Tat — ALLUVIAL TERRACE DEPOSIT (MIOCENE) – Light brown to light gray, well stratified to poorly stratified, well sorted to poorly sorted sand and gravel deposited on terraces of the paleo-Yellowstone River (mapped as Tmg on 7.5′ quadrangle sources). May include some small, thin, Pliocene and Pleistocene sand and gravel deposits. Local calcium-carbonate cementation in the Lindsay SW 7.5′ quadrangle. Thickness generally as much as 10 m (33 ft), but 24 m (80 ft) thick on Diamond G Butte in the Diamond G Butte 7.5′ quadrangle.

Trm — RIMROAD FORMATION (MIOCENE) – Light brown to gray, well stratified, well sorted to poorly sorted, and well-stratified to poorly stratified sand and gravel deposited on the oldest alluvial terrace of the paleo-Yellowstone River. Deposits occur as remnants along the drainage divide between the Yellowstone River south of the quadrangle, and Redwater Creek in the northwestern part of the

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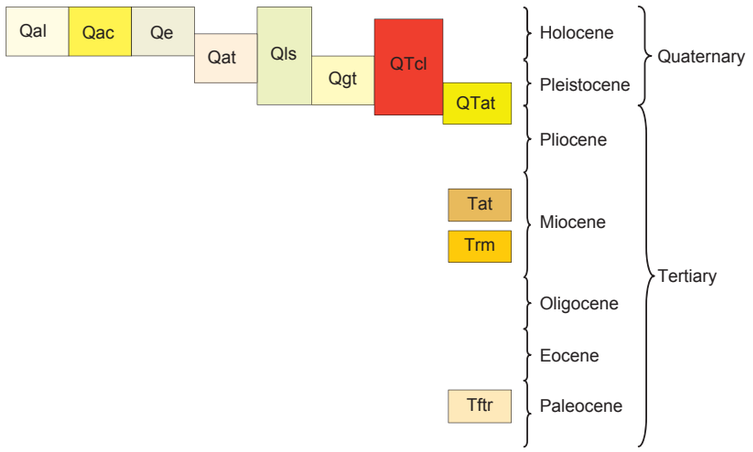
south of the quadrangle, and Redwater Creek in the northwestern part of the quadrangle. Gravel clasts are as large as 15 cm (6 in) in diameter. Clast composition dominantly quartzite, chert, and igneous rock, with scattered clasts of quartz, agate, silicified wood, and clinker (Howard, 1960). Zircons in the 4.3 m (14 ft) of volcanic ash within the Rimroad Formation have yielded a fission-track age of 7.1 +/- 1.4 Ma (Colton and others, 1983).The lower limit or base of the Rimroad deposit is at an altitude of approximately 975 m (3,200 ft). Map unit may also include some thin, younger gravel deposits. Thickness generally less than 20 m (66 ft).

Tftr — TONGUE RIVER MEMBER OF THE FORT UNION FORMATION (PALEOCENE) – Yellowish or light brown shale and sandstone; contains numerous lignite beds. Estimated original thickness more than 990 m (3,200 ft), but eroded to as thin as 90 m (300 ft) (Collier and Knechtel, 1939).

Correlation Diagram



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Montana Bureau of Mines and Geology
Open-File 597

Geologic Map of the Circle 30' x 60' Quadrangle Dawson, McCone, And Prairie Counties Eastern Montana

Susan M. Vuke[1], Phyllis A. Hargrave[1], and Larry N. Smith[2]

2011

Map and text compiled with modification by S.M. Vuke and P.A. Hargrave from thirty-two 7.5' quadrangle geologic maps by R.B. Colton and others; structure contours added by L.N. Smith.

[1]Montana Bureau of Mines and Geology, [2]Montana Tech of the University of Montana