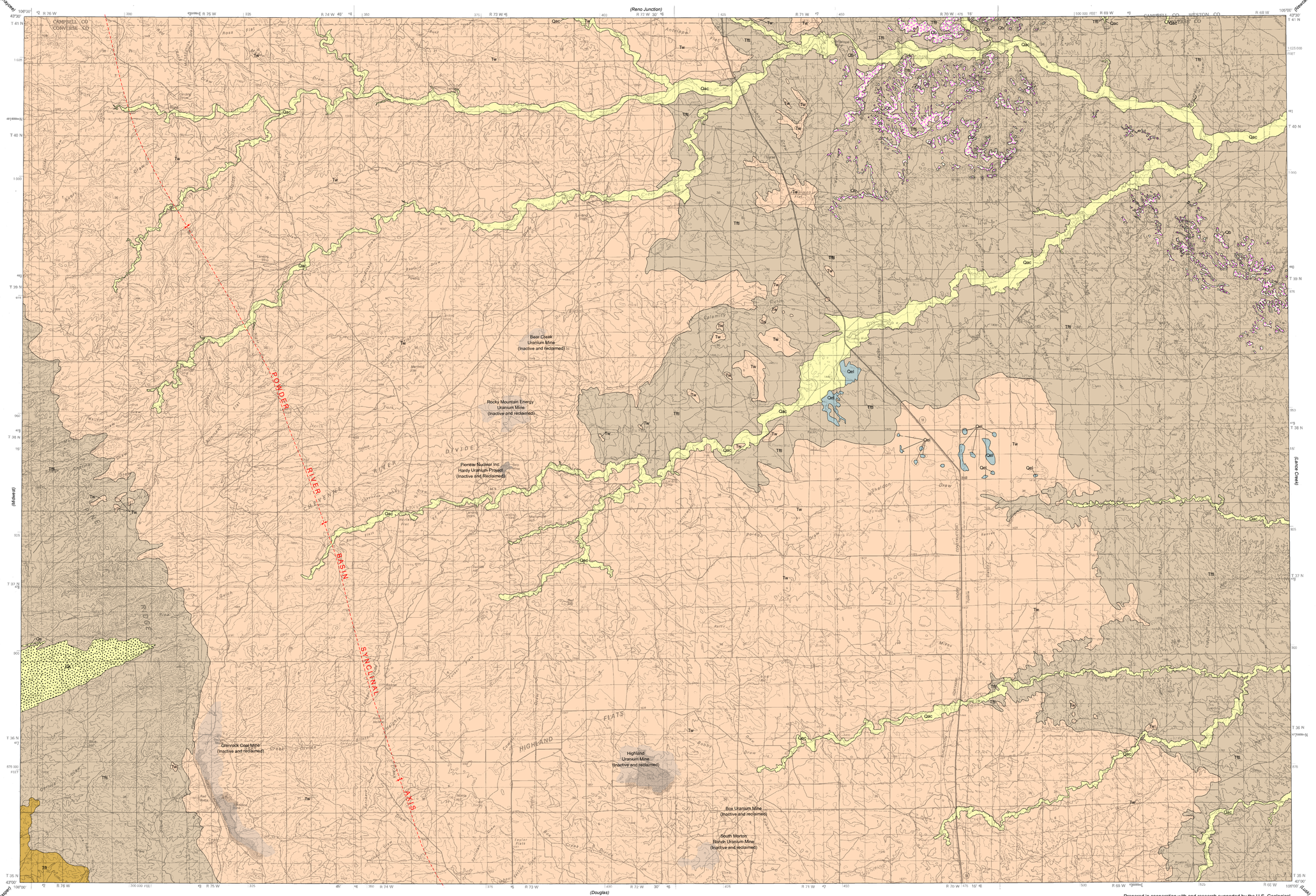
WYOMING STATE GEOLOGICAL SURVEY
Ronald C. Surdam, State Geologist
Laramie Wyoming

Geology - Interpreting the past to provide for the future

Prepared in cooperation with the U.S. GEOLOGICAL SURVEY

MAP SERIES MS-72
Bill 1:100,000 - scale Geologic Map



Base map from U.S. Geological Survey 1:100,000 - scale metric topographic map of the Bill, Wyoming
30' x 60' Quadrangle, 1979

Projection: Universal Transverse Mercator (UTM), zone 13
North American Datum of 1927 (NAD 27)
10,000-meter grid ticks: UTM, zone 13
25,000-foot grid ticks: Wyoming State Plane Coordinate System, east zone

SCALE 1:100,000
Contour Interval 20 meters

0 1 2 4 6 8 10 12 14 16 18 20 Kilometers
0 1 2 3 4 5 6 7 8 9 10 11 12 Miles
0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000 Meters
0 5,000 10,000 15,000 20,000 25,000 30,000 35,000 40,000 45,000 50,000 55,000 60,000 65,000 Feet

MN
GN
0°21'
6 MILS
13½°
240 MILS

UTM GRID CONVERGENCE (GN)
1979 MAGNETIC DECLINATION (MN) AT CENTER OF SHEET
DIAGRAM IS APPROXIMATE

GEOLOGIC MAP OF THE BILL 30' x 60' QUADRANGLE, CONVERSE, CAMPBELL, AND WESTON COUNTIES, WYOMING

compiled and mapped by

Robert W. Gregory and David C. Micale

2007

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EXPLANATION

CORRELATION OF MAP UNITS

Qac	Qel	Qs	Holocene and Pleistocene	Quaternary
Unconformity				
Tw			Eocene	Tertiary
Unconformity				
Ttfl			Paleocene	Tertiary
Ttft				

CENOZOIC

DESCRIPTION OF MAP UNITS

Quaternary surficial deposits

Qac **Mixed alluvium and colluvium (Holocene/Pleistocene)**—Unconsolidated clay, silt, sand, gravel, and baked and fused rock found above the level of present day flooding, deposited prior to the recent incision of streams. Includes slope wash and smaller alluvial fans that coalesce with alluvium. Thickness ranges from less than 3 feet to about 60 feet (0.9 to 18 m) (Boyd and Ver Ploeg, 1998)

Qel **Ephemeral lake deposits (Holocene/Pleistocene)**—Massive to thinly bedded gray clay and silt deposited in ephemeral lakes, white alkali visible in some places (Reheis and Coates, 1987). Mapped as playa lake and playa lake deposits by Hallberg and Case (2002)

Qs **Windblown sand (Holocene/Pleistocene)**—Loose particles of quartz, mainly from poorly lithified outcrops of Wasatch Formation, and silt deposited in dunes and sheets downwind from source areas. Thickness ranges from a thin sheet to 15 feet (4.6 m) (Boyd and Ver Ploeg, 1998)

Qb **Baked and fused rock (Clinker) (Holocene/Pleistocene)**—Hard, dense red to orange baked shale and siltstone, and bubbly sometimes glassy rock formed as overlying strata was altered by burning coal beds in the Fort Union Formation. Talus forms locally where blocks have detached from scarps of baked and fused rock and have moved down slope. Outcrops are from unpublished mapping by Ed Heffern, U.S. Bureau of Land Management (Personal Communication, 2005). Thickness ranges between 3 and 33 feet (0.9 and 10 m) (Boyd and Ver Ploeg, 1998)

Tertiary sedimentary rocks

Tw **Wasatch Formation (Eocene)**—Gray to buff claystone and siltstone, medium- to coarse grained crossbedded arkosic sandstone. Thin beds of carbonaceous shale and coal occur locally. Sediments are fluvial and paludal in origin. Thickness 1,575 to 2,250 feet (480 to 686 m) (Denson and others, 1989, and Reheis and Coates, 1987)

Fort Union Formation (Paleocene)

Ttfl **Tongue River and Lebo Members undivided**

Tongue River Member—Light to dark gray fine-grained sandstone interbedded with drab siltstone, claystone, and shale; thick coal beds, some more than 150 feet (46 m) thick, are found near the top. All of these rocks are from stream, swamp, or lacustrine environments (Denson and others, 1989, and Love and others, 1987)

Lebo Member—Interbedded gray, very fine-grained sandstone, siltstone, claystone, carbonaceous shale and coal; all fluvial and paludal in origin. Iron-rich calcareous concretions ranging from marble size to several feet in diameter are found throughout the unit of massive white sandstone and clayey shale. Thickness of the undivided Tongue River and Lebo unit ranges from 1,370 to 3,280 feet (418 to 1000 m) (Denson and others, 1989)

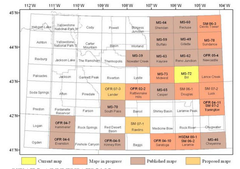
Ttft **Tullock Member**—Drab appearing massive sandstone interbedded with siltstone, claystone, shale, and thin coal beds. Distinguished from overlying Lebo Member by being significantly lighter in color. Thickness ranges from 780 to 1,700 feet (230 to 518 m) (Love and others, 1987, and Denson and others, 1989)

MAP SYMBOLS

Formation contact

Syncline—Approximate location of Powder River Basin synclinal axis

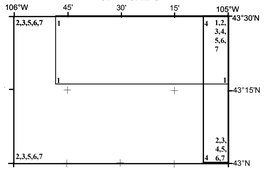
Mined areas—Stippled pattern indicates areas where bedrock has been disturbed, removed, or reclaimed from surface mining



KEY TO ABBREVIATIONS

Wyoming State Geological Survey maps: Map Series (MS), Open File Report (OFR), Hazards Section Digital Map (HSDM), and unpublished STATEMAP project (SM).

INDEX TO 1:100,000-SCALE BEDROCK GEOLOGIC MAPS OF WYOMING



INDEX TO GEOLOGIC MAPPING

REFERENCES CITED AND SOURCES OF GEOLOGIC DATA
(numbers are those on the Index to Geologic mapping)

Boyd, C.S., and Ver Ploeg, A.J., 1998, Geologic map of the Gillette 30' x 60' Quadrangle, Campbell, Crook, and Weston Counties, Wyoming: Wyoming State Geological Survey Map Series MS-49, scale 1:100,000.

1 Denson, N.M., Dover, J.H., and Osmonson, L.M., 1980, Lower Tertiary coal bed distribution and coal resources of the Reno Junction–Antelope Creek area, Campbell, Converse, Niobrara, and Weston Counties, Wyoming: U.S. Geological Survey Miscellaneous Investigations Map I-1201, scale 1:125,000.

2 Denson, N.M., Macke, D.L., and Schumann, R.R., 1989, Geologic map and distribution of heavy minerals in Tertiary rocks of the Bill 30' x 60' Quadrangle, Converse, Campbell, and Weston Counties, Wyoming: U.S. Geological Survey Miscellaneous Investigations Map I-2026, scale 1:100,000.

3 Denson, N.M., Pierson, C.T., and Grundy, W.D., 1995, Geologic map showing thickness of sedimentary rocks from the ground surface to the top of the Upper Cretaceous Pierre Shale in the south half of the Powder River Basin, northeastern Wyoming and adjacent areas: U. S. Geological Survey Miscellaneous Investigations Series Map I-2433-B, scale 1:200,000, color.

4 Dobbin, C.E., Kramer, W.B., and Horn, G.H., 1957, Geologic and structure map of the southeastern part of the Powder River Basin, Wyoming: U.S. Geological Survey Oil and Gas Investigations Map OM-185, scale 1:125,000.

5 Gregory, R.W., and Ver Ploeg, A.J., 2006, Preliminary geologic map of the Bill 30' x 60' Quadrangle, Converse, Campbell, and Weston Counties, Wyoming: Wyoming State Geological Survey Open File Report 06-7, scale 1:100,000.

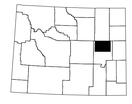
6 Hallberg, L.L., and Case, J.C., 2002, Preliminary surficial geologic map of the Bill 30' x 60' Quadrangle, Converse, Campbell, and Weston Counties, Wyoming: Wyoming State Geological Survey Open File Report 03-7, scale 1:100,000.

7 Love, J.D., Christiansen, A.C., and McGrew, L.W., 1987, Geologic map of the Newcastle 1° x 2° Quadrangle, northeastern Wyoming and western South Dakota: Wyoming State Geological Survey Map Series 25-I, scale 1:250,000.

Reheis, M.C., and Coates, D.A., 1987, Surficial geologic map of the Reno Junction 30' x 60' Quadrangle, Campbell and Weston Counties, Wyoming: U.S. Geological Survey Coal Investigations Map C-106, scale 1:100,000.

Ver Ploeg, A.J., and Boyd, C.S., 2004, Geologic map of the Reno Junction 30' x 60' Quadrangle, Campbell and Weston Counties, Wyoming: Wyoming State Geological Survey Map Series 62, scale 1:100,000, color.

Wittke, S.J., and Ver Ploeg, A.J., 2007, Geologic map of the Midwest 30' x 60' Quadrangle, Natrona, Converse, and Johnson Counties, Wyoming: Wyoming State Geological Survey Map Series MS-73,000, color.



QUADRANGLE LOCATION

Prepared in cooperation with and research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under USGS awards HQAG0049 and 06HQAG0049.The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

Digital Cartography by Robert W. Gregory, Alice J. Vogelmann, and Greg R.W. Veregin

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