GEOLOGIC MAP of the MISSISSIPPI RIVER ALLUVIAL PLAIN

Bolivar, Washington, Sunflower, Leflore, Coahoma, Tunica, Tallahatchie, Issaquena, Sharkey, Humphreys, Quitman, Yazoo, Warren, Holmes, Adams, Panola, Wilkinson, Desoto, Carroll, Jefferson, Grenada, Claiborne, and Tate Counties, Mississippi

Open-File Report 354

2025

Geology by

Jonathan R. Leard, RPG, James E. Starnes, RPG, and Timothy J. Palmer, RPG

Mississippi Department of Environmental Quality
Mississippi Office of Geology - Surface Mapping Division
Mississippi Geological Survey
700 North State Street
Jackson, Mississippi 39225

This geologic map was funded by the State of Mississippi and the United States Geological Survey, National Cooperative Geologic Mapping Program.

Descriptions of Map Units

Geomorphological Units at the Surface of Mississippi River Alluvial Plain

Qaf

Alluvial Fan (Holocene to Pleistocene)
Alternating silt, sand, and gravel. Coarsest at the apex of the fan, fining laterally (radially) from the apex of the fan, interfingering with adjacent fans and coalescing with the alluvium of the Mississippi River.

Qbs

Backswamp (Holocene to Pleistocene)
Gray to black, silty to fine sandy clay, weathers tan to brown with red mottles, caliche common. Grades laterally and interfingers with the adjacent meander systems and alluvial fans. Anastomosing incised drainage features and partially buried abandoned channels at the surface.

Qmb

Meander Belt (Holocene to Pleistocene)
Tan to brown, fine-grained sand, silt, and clay, older soil horizons (Pearson soil series) weathered to distinctive orange color. Surface features are dominated by migrating point bar ridge and swale topography, natural levee deposits, and abandoned course channels (cut-off channels mapped separately). In many cases, these features have been re-occupied by younger streams.

Qcc

Cut-Off Channel (Holocene to Pleistocene)
Brown to black, silty to lignitic carbonaceous clay. Oxbow lakes and clay plugs of abandoned meander courses.

Cross Section and Subcropping Units Not Exposed at the Surface

Qal

Mississippi River Alluvium (Holocene to Pleistocene)
Alternating silt, sand, and gravel up to boulder sized deposited by the Mississippi River. Clay is gray to dark brown, silty to fine-sandy, carbonaceous to lignitic. Sand is gray to tan, dominantly quartzose, locally contains heavy mineral concentrations. Gravels predominantly chert but also contain igneous clasts of rhyolite, granite, basalt, trachyte, syenite, a variety of low-grade metamorphic clasts of slate, phyllite, and cannel coal. Siderite nodules, cannel coal, Pleistocene vertebrate fossils, and Lake Superior agate clasts common. The maximum thickness is 144 feet.

Grand Gulf Group

Tp

Pascagoula Formation (Miocene)
Deltaic sand, silt, and clay. Clay is blue-green, gray, brown, weathers pink to off white, silty to sandy, locally lignitic; Sand is gray, pale yellow to white, fine-to coarse-grained, cross bedded to massive with bedded pea gravels (gravels consist of highly polished, sub-angular to well-rounded black, gray, brown chert, and milky quartz), often indurated to sandstone and siltstones where subaerially exposed beneath the Mississippi River alluvium, predominantly quartzose with lesser amounts of chert, metaquartzite, mica, and heavy minerals, slightly glauconitic in places, silicified and coalified wood common. The Pascagoula Formation conformably overlies the Hattiesburg Formation. Total thickness is not represented.

Tha

Hattiesburg Formation (Miocene)
Clay is green, gray, brown, weathers white to brown, silty to sandy, locally lignitic; Sand is gray, pale yellow to white, fine-to coarse-grained, cross-bedded to massive with rare thinly- bedded pea gravels (gravels consist of highly polished, sub-angular to well-rounded black chert and milky quartz), often indurated to sandstone and siltstones where subaerially exposed beneath the Mississippi River alluvium, predominantly quartzose with lesser amounts of chert, metaquartzite, mica, and heavy minerals, slightly glauconitic in places, silicified and coalified wood common. The base of the Hattiesburg Formation is designated at the base of a sand unit of regional extent that occurs at the approximate horizon of the base of the Fleming Formation in Louisiana and the middle-Miocene Amos Sand in Alabama. The Hattiesburg Formation unconformably overlies the Catahoula Formation. Thickness is projected to approximately 1320 feet.

Tca

Catahoula Formation (Miocene to Oligocene)
Deltaic sand, silt, and clay. Sand is gray, pale yellow to white, fine-to coarse-grained, cross-bedded to massive, predominantly quartzose with lesser amounts of chert, metaquartzite, mica, and heavy minerals, slightly glauconitic in places with rare thinly-bedded pea gravels (gravels consist of highly-polished, immature, subangular to well-rounded black chert and milky quartz). Clay is green, gray, brown, weathers white to brown exhibiting a "popcorn" appearance, kaolinitic, commonly lignitic basally, silty to sandy. Often indurated to opaline-cemented sandstone and rarer orthoquartzites where subaerially exposed beneath Mississippi River alluvium, silicified wood and fossil palm common. Ironstone common where sand overlies clay. Catahoula Formation unconformably overlies the Bucatunna Formation. Thickness is projected to approximately 540 feet.

Vicksburg Group

Tbu

Bucatunna Formation (Oligocene)
Clay, dark brown to dark gray, weathers light brown to light gray, silty to sandy, carbonaceous, micaceous, laminated to massive, sparingly fossiliferous. The Bucatunna Formation conformably overlies the Byram Formation. The Bucatunna Formation unconformably overlies the Vicksburg Limestone. Thickness is approximately 40 feet but is often partially eroded by basal Catahoula channels.

Tv

Vicksburg Limestone Undifferentiated (Oligocene)
Includes the Byram Formation, Glendon Limestone, Marianna Limestone, and Mint Spring Formation. The Glendon Limestone is white to gray, commonly indurated to semicrystalline bioclastic limestone, either massive or with alternating ledges separated by thinly bedded glauconitic marl. The Glendon Limestone commonly contains solution cavities at or near outcrop. Larger cavities usually form at contact with the underlying Marianna Limestone. The Marianna Limestone is white to pale-yellow, soft to indurated, glauconitic marl, containing an admixture of fine-grained sand and clay in places. There is an abundance of the large foraminifera *Lepidocyclina mantelli* in the Marianna Limestone and *Lepidocyclina supera* in the Glendon Limestone and the echinoid *Clypeaster rogersi*. The Vicksburg Limestone unconformably overlies the Forest Hill Formation. Thickness ranges from 60 to 80 feet.

Tfh

Forest Hill Formation (Oligocene)
Deltaic sands, silts, and clays. Sand is fine- to coarse-grained, silty, quartzose. Clay is carbonaceous, laminated to massive, commonly containing lignite and fossil wood along fissile partings. The Forest Hill Formation unconformably overlies the Yazoo Formation. Thickness ranges up to approximately 200 feet where basal sands incise into the Yazoo Clay.

Jackson Group

Ty

Yazoo Formation (Eocene)
Locally referred to as the Yazoo Clay. Clay is bluish-green to bluish-gray, weathers yellowish brown to tan, montmorillonitic, calcareous, silty, locally fossiliferous, locally contains framboidal pyrite. The Yazoo Formation conformably overlies the Moodys Branch Formation. Thickness ranges up to approximately 520 feet.

Tmb

Moodys Branch Formation (Eocene)
Sandy fossiliferous marl containing an abundance of marine invertebrates, typically *Glycymeris* and *Venericardia* shells. Conformably grades into the overlying Yazoo Formation. The Moodys Branch Formation unconformably overlies the Cockfield Formation. Thickness ranges up to approximately 30 feet.

Claiborne Group

Tco

Cockfield Formation (Eocene)
Clay, brown, reddish-brown to gray, silty to fine sandy, slightly carbonaceous to lignitic, slightly micaceous, pyritic; Sand, gray, weathers orange to tan in color, fine- to medium-grained, predominantly quartzose and slightly micaceous, cross-bedded to massive, carbonized and silicified plant fossils common. Uppermost beds known as the "Creola Member" can be fossiliferous containing an estuarine to shallow marine mollusk assemblage. The Cockfield Formation unconformably overlies the Cook Mountain Formation. Thickness ranges up to approximately 530 feet.

Tcm

Cook Mountain Formation (Eocene)
Clay, olive gray to brownish gray, weathers light gray to white, carbonaceous to lignitic, dense or interlaminated with gray to light olive gray or dark yellowish brown, slightly glauconitic, very fine-grained sand and silt. This argillaceous interval is the confining layer above the widely utilized Memphis Sand Aquifer. The Cook Mountain Formation unconformably overlies the Kosciusko Formation. Thickness ranges up to approximately 220 feet.

Tk

Kosciusko Formation (Eocene)
Sand, gray to white, fine-to medium-grained, cross-bedded to massive with rare quartz pea gravel, locally indurated to sandstone and siltstones at the surface, predominantly quartzose, micaceous, and trace heavy minerals; silicified and coalified wood common. Clay, brown to gray-green, weathers off-white to brown, silty to sandy, carbonaceous, locally micaceous, locally lignitic. Thickness ranges up to approximately 550 feet.

Tz

Zilpha Formation(Eocene)
Clay, gray to brownish black, weathers light gray to reddish pink to white, massive and homogeneous or interbedded to interlaminated with silt and sand, gray to light olive gray, quartzose, micaceous, carbonaceous, locally glauconitic; lignite. Thickness ranges up to approximately 60 feet.

Twn

Winona Formation (Eocene)
Sand, gray to greenish gray, weathers very light gray to reddish orange, quartzose, micaceous, glauconitic, carbonaceous, silty. Sandy horizons of the interval constitute a portion of the Memphis Sand Aquifer. The Winona Formation unconformably overlies the Tallahatta Formation. Thickness ranges up to approximately 20 feet.

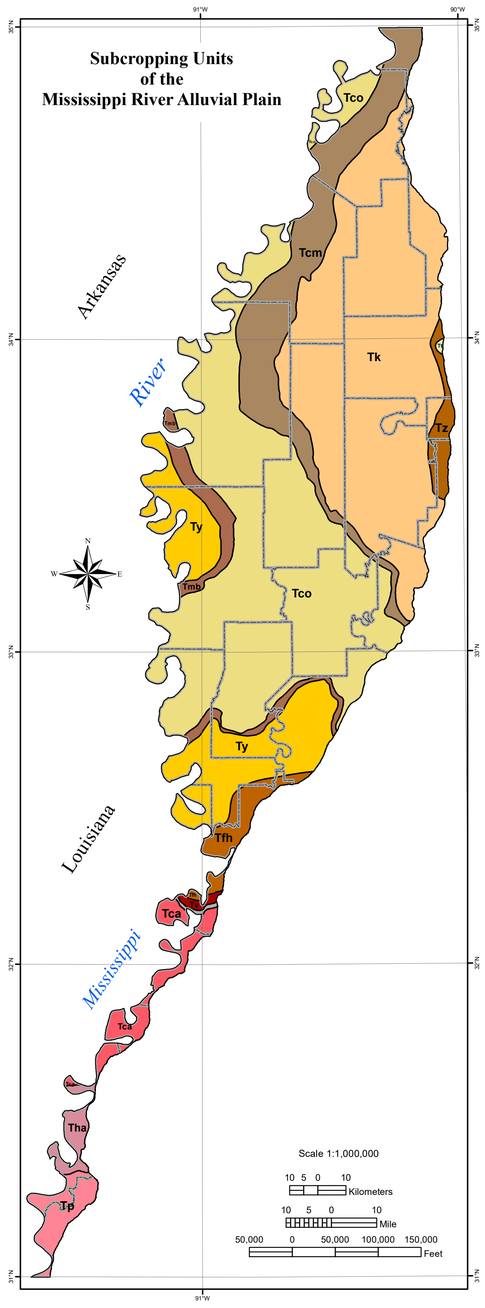
Tt

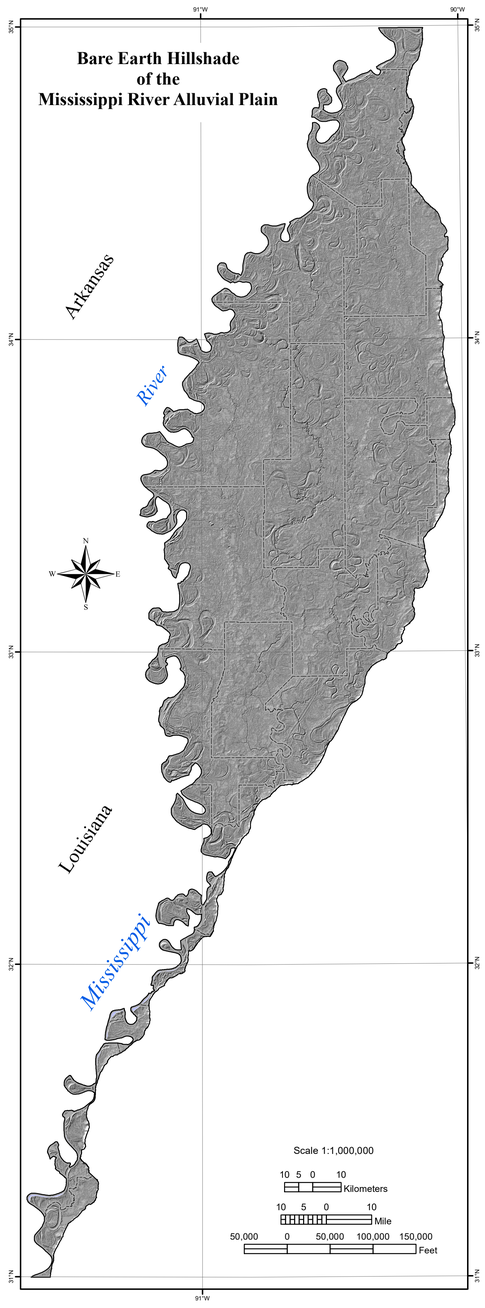
Tallahatta Formation (Eocene)
Clay and silt, olive gray to brownish gray, weathers yellowish gray to very light gray or white, carbonaceous to lignitic, locally indurated, near surface exposures may exhibit siderite nodules and jointing with limonite infilling, interbedded to interlaminated with sand, gray to very light gray, weathers pale yellowish orange to reddish orange, very fine- to medium-grained, quartzose, micaceous, carbonaceous, pyritic, locally slightly glauconitic (Basic City Shale). The Tallahatta Formation is shown subcropping beneath an alluvial fan in Tallahatchie County due to faulting. The Tallahatta Formation unconformably overlies the Meridian Sand. Thickness ranges up to approximately 440 feet.

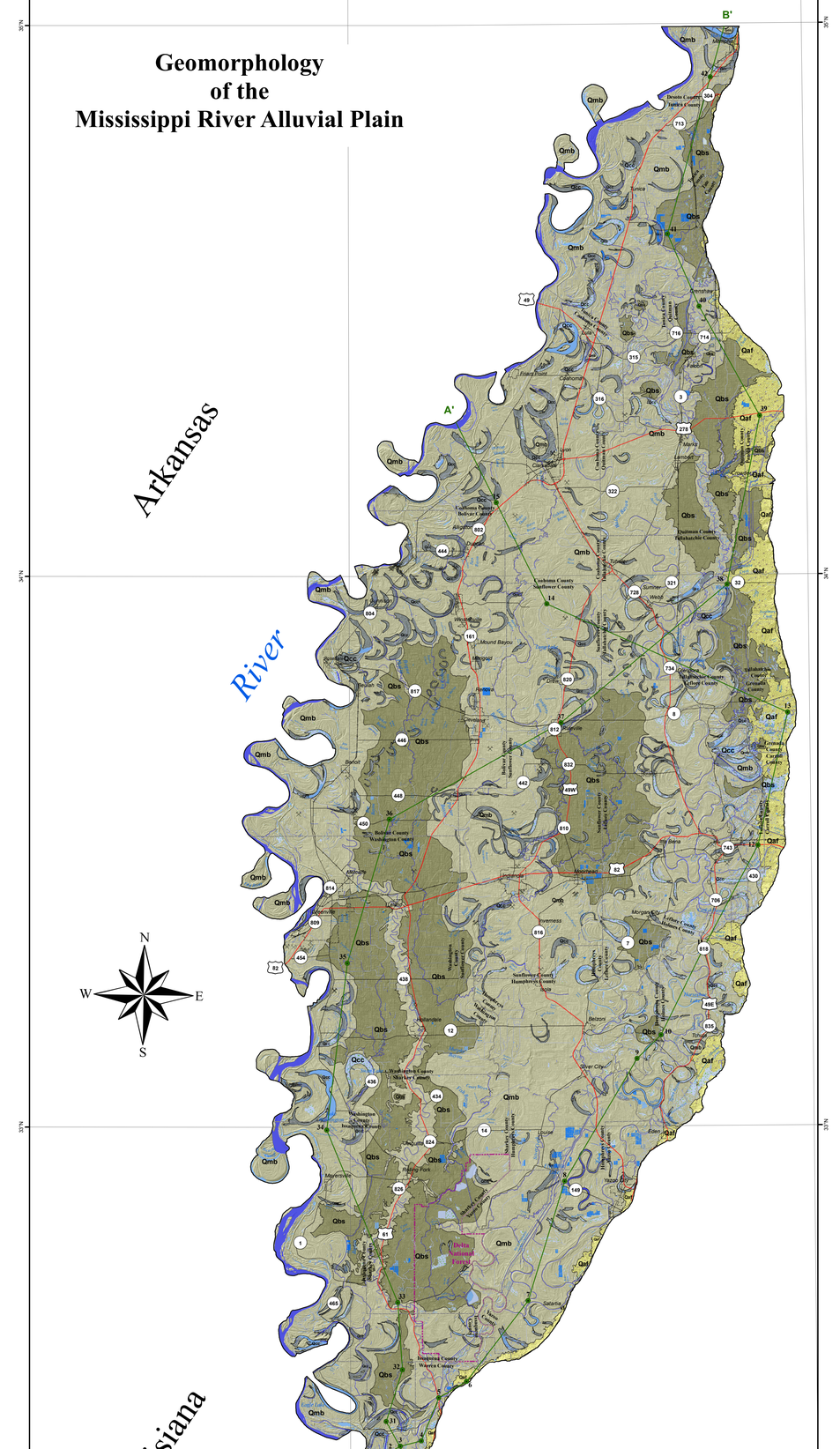
Wilcox Group

Tw

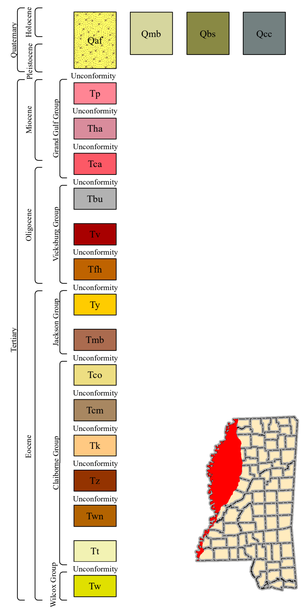
Undifferentiated Wilcox Formation (Eocene)
The upper sand member, often grouped with the overlying Tallahatta Formation, is predominantly quartzose sand with a very coarse-grained texture and constitutes the Meridian Sand. The lower members are tan- to very light gray, fine- to coarse-grained sand, subangular to subrounded quartz, cross-bedded, micaceous, glauconitic, includes upper clayey interval at the top which underlies the Meridian Sand. Total thickness is not represented.

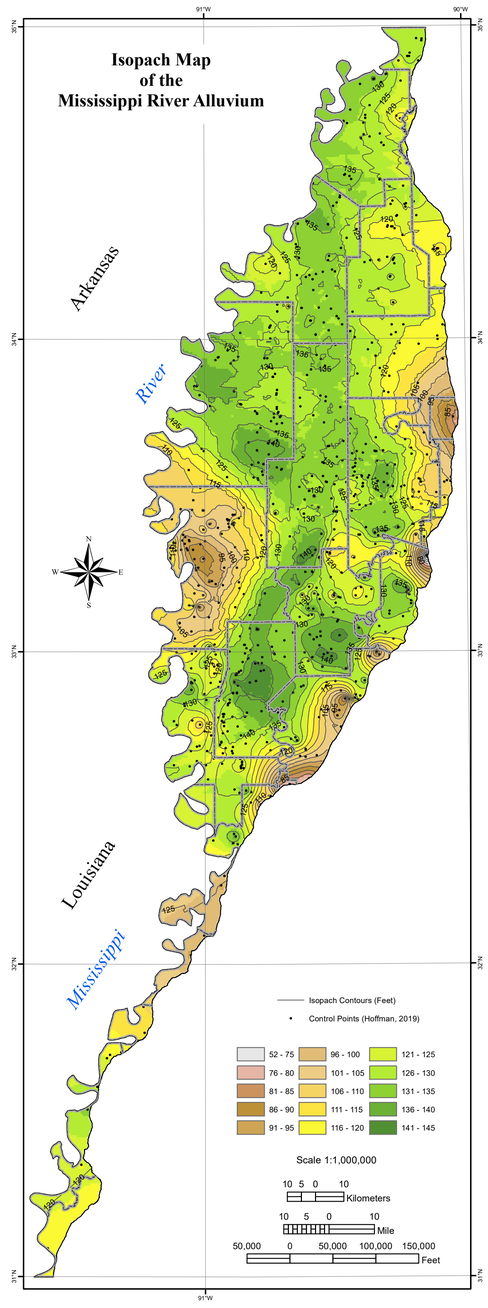






Correlation of Map Units





Base Map produced by the Mississippi Geological Survey
Coordinate System: NAD 1983 UTM Zone 16N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter
Declination: NOAA World Magnetic Model, May 19, 2025, estimated Magnetic North declination for Vicksburg (90°52'56"W, 32°20'53"N) is 1° 6' W ± 0° 21' changing by 0° 5' W per year.
Borehole data from Mississippi Office of Geology (MOG) and Mississippi Oil and Gas Board (MSOGB).
Basemap data sourced from https://maris.mississippi.edu/.
Bare-earth hillshade model generated using LiDAR data with a vertical exaggeration factor of Z=100 from mosaic by Brad Segrest.

Geologic maps are only a guide to current understanding and do not eliminate the need for detailed investigations of specific sites for specific purposes. The views and conclusions contained in this Open-File Report are those of the geologists and should not be interpreted as representing the official policies, either expressed or implied, of the State of Mississippi or of the United States Government.

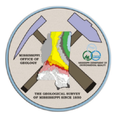
References:

Mason, P.G., and Starnes, J.E. (2012). Recharge Zones in the Mississippi-Yazoo Alluvial Plain. Mississippi Department of Environmental Quality, Office of Land and Water Resources, OLWR Hydrologic Map 2011-7.

Hoffmann, J.H. (2019). OF-305: Effects of Geologic Structure on Tertiary Formations of Northwestern Mississippi. Mississippi Department of Environmental Quality, Office of Geology.

Hoffmann, J.H., & Kymes, C.M. (2019). OF-293: North-South Structural Cross-Sections Through the Mississippi River Alluvial Plain of Northwestern Mississippi. Mississippi Department of Environmental Quality, Office of Geology.

Starnes, J.E., Leard, J.R., & Reginelli, A.L. (2021). Geologic Map of the 1:100,000 Greenwood Quadrangle: Bolivar, Sunflower, Tallahatchie, Leflore, Carroll, Grenada, Washington, and Coahoma Counties, Mississippi. Mississippi Office of Geology, Open-File Report 323, 35 sheets, scale 1:100,000.



No.	Well ID	Source	No.	Well ID	Source	No.	Well ID	Source
1	149J0019	MOG	15	027H0001	MOG	29	149M0016	MOG
2	149E0011	MOG	16	2315720907	MSOGB	30	149J0021	MOG
3	149E0012	MOG	17	2300122894	MSOGB	31	2305500019	MSOGB
4	149F0009	MOG	18	001C0003	MOG	32	2305500054	MSOGB
5	149B0011	MOG	19	2300103169	MSOGB	33	2312500033	MSOGB
6	149C0002	MOG	20	2300121147	MSOGB	34	2305500034	MSOGB
7	163P0003	MOG	21	2300103212	MSOGB	35	151G0002	MOG
8	163F0006	MOG	22	2300101051	MSOGB	36	011S0001	MOG
9	055G0003	MOG	23	2306300144	MSOGB	37	133F0002	MOG
10	2305120004	MSOGB	24	063G0041	MOG	38	135K0001	MOG
11	051B0052	MOG	25	2306320270	MSOGB	39	107P0024	MOG
12	083L0145	MOG	26	021F0068	MOG	40	119A0001	MOG
13	043E0039	MOG	27	021B0003	MOG	41	143H0001	MOG
14	133A0002	MOG	28	021B0006	MOG	42	033E0083	MOG