State Board of Examining Water Well Drilling Contractors and Pump Installation Contractors

April 2018

Wyoming Water Well Contractors' Newsletter

NEWS FROM THE DIRECTOR'S DESK

There's a good chance that a majority of your clients don't understand the various types of aquifers that are present throughout Wyoming or even what equipment, or drilling methods exist. More than likely they are not aware of the various types of pumps and the importance of matching the pump to the depth of the water well, pressure tank, etc. As a professional water well contractor, knowledge of the local hydrogeology is crucial in order to select a method to drill and complete a well, and to determine the type of pump to be installed. I am sharing the featured article written by Kevin Boyce, a Professional Geologist with the Wyoming Water Development Commission, so you can better understand of one of Wyoming's aquifers, the Flathead Sandstone Aquifer.

Be safe & enjoy the warmer weather!

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State Board of Examining Water Well Drilling Contractors and Water Well Pump Installation Contractors

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The Flathead Sandstone Aquifer, *by Kevin Boyce, PG*

Another in a series of articles highlighting aquifers around the State…….

Old, brittle, hidden, and buried deeply in the recesses of the "geologic feast of Wyoming" is a dull reddish-brown, coarse-grained rock formation known as the Flathead Sandstone… A Cambrian-age deposit (≈525 million years old) that resides at the bottom of the layer-cake assemblage of sedimentary rocks that inhabit the basins and basin margins of the central and western areas of the State. The Flathead Ss. has a low primary porosity due to its lock-tight cementation but high permeabilities are encountered where the rocks were fractured and jointed over time by major deformation events. These properties in combination with hydro-geographic recharge opportunities make the Flathead a significant aquifer in certain quadrants of the State.

Wyoming, in the Cambrian time period was located on the margin of the ancestral North American continental landmass southeast of a region (now Utah and Idaho), that was experiencing subsidence and resulting thick accumulation of marine sediments. Plate tectonic, or "continental drift" orientation of the earth in Cambrian time placed Wyoming lands near the equator and rotated about 60° clockwise. Flathead deposition occurred while the sea began to transgress slowly from the northwest into Wyoming. Depositional bedding forms and lithology indicate that most of the formation originated in nearshore, shallow-shelf, beach, and intertidal sandflat environments. However, other sedimentological evidence suggest braided stream (channel and fan) deposition along an advancing shoreline. Deposition reached upwards of 500 to 600 feet thick with significant local thinning due to an irregular (hilly) pre-deposition landscape. (Middleton, et al, 1980)

CONGRATULATIONS TO THE NEW LICENSEES!

WELL

Jacob Allred
Thomas Drilling
Afton, WY

Rex Polan
Western American Drilling
Craig, CO

PUMP

Dana McCormick
Johns Pump Service
Torrington, WY

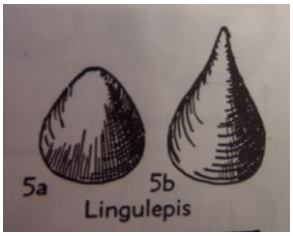
Cassidy Mikesell
M & M Contracting
Dixon, WY

Zachary Rogers
Wild Cat Services, LLC
Buffalo, WY

WELL & PUMP

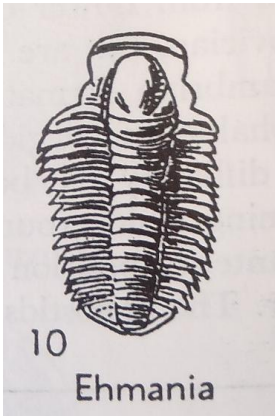
Rick Nelson
Johns Pump Service
Torrington, WY

Organic life on earth began to dramatically flourish in the Cambrian period but was limited to algae, myriad protozoa, "sea weeds", sponges, simple shell fish (brachiopods), and beginning populations of the extinct group of arthropods, called trilobites, that would virtually rule the earth for all of Paleozoic time (≈200 million years). Very few fossil remains are found in the Flathead Ss. in Wyoming, but those that are (*Lingulepis; Ehmania?*) provide evidence for relative dating of the rocks they inhabit (Miller, 1936; Shaw, 1954).



Cambrian-age Brachiopod (Wisconsin)

Best accessible outcrop exposures to view and explore the Flathead Ss. are at Rawlins, WY (Union Pacific railroad cut south, and hills directly north of the city), and the Wind River Canyon about 1 mile north of the US HWY 20 tunnels. Remote exposures are found sparingly along the flanks of the Wind River and Big Horn Mountain ranges. The most prominent placement of the Flathead Ss. is as the summit cap-rock of Mount Moran (Elev. 12,605') in Teton, National Park. Groundwater development of the Flathead Ss. aquifer is largely governed by lack of production in overlying aquifers that direct drilling to the more prolific Flathead. Such is the case for several irrigation wells both east and north of Tensleep, WY, where the Tensleep Sandstone, Madison Limestone, and Big Horn Dolomite don't produce quantities to supply pivot-sprinklers like the Flathead manages to provide. A Wyoming Water Development Commission (WWDC) well drilled in Fremont County in 2004, to test the Tensleep and Madison Formations for Lander, WY, municipal supply potential, was deepened in 2007 (6¼" open hole) and penetrated through 201 feet of Flathead Ss. A three-hour artesian flow test was conducted at 100 gpm with a partial shut-in of 286 p.s.i. and end-of-flow pressure of 150 p.s.i. After installation of a 10-inch gate valve on the wellhead, shut-in built to **525 p.s.i.!!** (Weston Engineering for WWDC, 2007) The City of Lander has plans to possibly drill a Flathead Ss. supply well in 2019 with WWDC funding.



Cambrian-age Trilobite (Montana)

Calendar of Upcoming Events:

NDA	On-Line Certification Exams	Website	https//nda4u.com
AGWT	Educational Videos and Books	Website	WWW.AGWT.org
ISWD	International School of Well Drilling Online Courses	Website	welldrillingschool.com
NGWA	Introduction to Groundwater Resources (#1012)	Website	Online self-paced course
NGWA	Selection and Operation of Meters for Safe and Successful Electrical Troubleshooting for Water Well Pump Systems (#7132-1)	Website	Online self-paced course
TLC	Technical Learning College	Website	Self-paced courses
CPS	2018 Contractor Training Schedule https://cpsdistributors.com/knowledge-center/	Website	Classroom & Online Training
WGWA	Mud Class	Casper, WY	April 13, 2018
NGWA	Field Methods: Groundwater Geochemistry	Westerville, Ohio	June 7-8, 2018
WWQ & PCA	Wyoming Water Quality & Pollution Control Association's 48 Annual Education Conference	Casper, WY	October 23-24, 2018
NGWA	Fracture Trace and Lineament Analysis	State College, Pennsylvania	October 29-Nov 1, 2018
NGWA	Groundwater Week	Las Vegas, NV	December 3-6, 2018

WGWA – Wyoming Ground Water Association

NDA – National Drilling Association

NGWA – National Ground Water Association

NWDA – Nebraska Well Drillers Association

CWWCA – Colorado Water Well Contractors Association

WARWS – Wyoming Association of Rural Water Systems

WWA- Wyoming Water Association

WWQ & PCA – Wyoming Water Quality & Pollution Control Association

WWWCB – Wyoming Water Well Contractors Licensing Board

BIDP – Baroid Industrial Drilling Products

AGWT – American Ground Water Trust

SEDC – Shallow Exploration Drillers Clinic

IGWA – Idaho Ground Water Ass. Inc.

ISWD – International School of Well Drilling www.welldrillingschool.com

CPS - CPS Distributors

Goulds - Goulds Water Technology Factory School WebEx Training

Technical Learning College www.abctlc.com

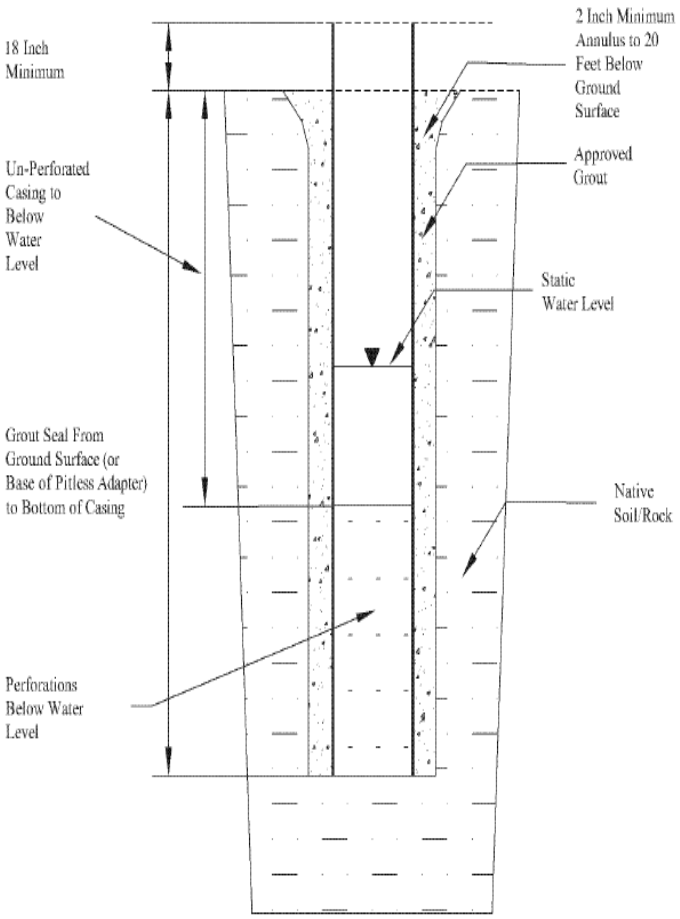
For continuing education opportunities please refer to each respective association's website for additional information.

Well Sealing/Grouting (Water Well Minimum Construction Standards, page 3-6)

Well casing shall be sealed to prevent vertical movement or leakage of fluid in the annular space between casing and borehole wall. Non-Slurry bentonite grouts must in place before significant hydration occurs. Plans for well construction shall include allowances for maximum effective emplacement of grout as a seal to protect the source aquifer and/or assure structural integrity of the entire cased well. Well cuttings are not allowed to be used as grout, filler, or aggregate material for well sealing.

TEST YOUR KNOWLEDGE *answers below*

1. To properly abandon a Type II well, the casing should be removed or destroyed. True or False?
2. A well that produces groundwater that is interconnected with a surface water source may be regulated along with surface water right priorities. True or False?
3. Is the diagram below a Type I, II, III, IV, V or VI well according to the State Engineer's Office Water Well Minimum Construction Standards?



Basal Flathead Sandstone resting on a Pre-Cambrian granite erosion surface
Sinks Canyon, Fremont County WY (42°43'44" N, 108°52'53" W)
Photo taken by: Kevin Boyce, PG, 2018

Flathead Sandstone Outcrop, Sinks Canyon, Fremont County WY (42°43'48 N, 108°51'48" W)
Note horizontal fractures and sub-vertical jointing
Photo taken by: Kevin Boyce, PG, 2018

ANSWERS TO TEST YOUR KNOWLEDGE

1. True (if possible, casing shall be removed prior to plugging procedures).
2. True
3. Type V – Fully-Cased Wells – Fully Cased Wells are drilled to produce water from an aquifer containing multiple water-bearing intervals. Water production is achieved by screening and/or perforating opposite one or more of the most viable water-producing aquifer zones. Overlying formations are cemented or grouted off to prevent caving and aquifer cross-connection. Wells of this type are usually drilled relatively deep and general intercept aquifers under confined conditions.