

# Wyoming Water Well Contractor's Newsletter

## NEWS FROM THE DIRECTOR'S DESK

The benefit of being familiar with local geology is crucial to a well driller. Geology factors into almost every decision made while drilling: from why the drilling is being undertaken at a particular location (soil, water, minerals) to the bits the driller chooses to make the hole. Different bits advance holes in different ways. It is important for the driller to know the earth materials he will encounter. If the equipment chosen is wrong for the task, the driller is in for a hard, frustrating time and can lead to increased cost to the client. My guest columnist this month is Kevin Boyce. Mr. Boyce has worked for the Wyoming Water Development Office for over 20 years and is a licensed Wyoming Professional Geologist. I think you will find his article on the Madison Limestone Formation very interesting and informative. Enjoy!

### The Madison Formation Aquifer,

By Kevin Boyce PG, Wyoming Water Development Office

The major topographic river basins of Wyoming are underlain in the subsurface by various bedrock materials that capture, convey, and store significant quantities of usable water resources in structured groundwater basins. Groundwater basins in the state may simply share those same boundaries as its common river basin or may cross surface divides depending on the subsurface geologic structure (e.g. the contiguous Powder River geologic basin splits surface drainage to the Yellowstone River and the Missouri River). Or, a river may cross groundwater basin divides such as the Wind-Bighorn River crossing from the Wind River geologic/topographic basin to Big Horn geologic/topographic basin through the Owl Creek Mountains via Wind River Canyon.

This article is the first of a series to highlight aquifers around the State....

Over the past fifty years, one groundwater source has "saved our bacon" as a resource for drinking water supplies and other uses in this state. The Paleozoic-age (deposited ~ 350 million years ago) Madison Limestone Formation stands prominent as a source aquifer in terms of yields and water quality where it is developed on basin margins. Continue on Page 2



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

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## The Madison Formation Aquifer, continued from page 1

Key municipal supplies in Wyoming that depend on Madison wells or springs include Worland, Gillette, Greybull, Hulett, Glenrock, Douglas, Newcastle, Sundance, Basin/ Manderson, Ten Sleep, Hyattville, Moorcroft, Pine Haven, Kaycee, and Afton. The Madison Formation has also been an important source to supplement irrigation and to the state's oil and gas industry for enhanced recovery purposes (water floods).

One of the little-known "Wonders of Wyoming" is the City of Worland well field, located on a geologic feature known as the Paintrock Anticline at the eastern margin of the Bighorn Basin. The two flowing artesian wells that serve as Worland's sole supply were completed in the Madison Formation and were open-flow tested, when drilled, as collectively producing almost 20,000 gallons per minute. The City of Gillette's Madison well field, located on the flank of Wyoming's Black Hills a few miles south of Devils Tower, consists of 10 wells concentrated in an area less than 1 square mile that serve Gillette via a 42 mile long pipeline. A very rare geologic feature known as the "Periodic Spring" serves the Town of Afton in the Star Valley of western Wyoming. This "cold water geyser" is located about 5 miles west of Afton in the Salt River Range and issues from vertically standing Madison Limestone in periodic pulses or cycles of flow varying from zero flow to many cubic feet per second depending on the season, previous snowpack, etc.

Over the past 25+ years, the Wyoming Water Development Commission has provided funding for exploration and development of the Madison Formation aquifer. In recent years the WWDC has drilled one to two Madison wells per year as new source supply development for municipalities. As normal demands for groundwater increase and/or as dry conditions force development of drought-proof source supplies, development of the Madison Formation aquifer is likely to remain. Madison Formation groundwater is particularly sought after as a source for drinking water supplies because of high yield potential, minimal treatment needs (disinfection chlorination only), and a high percentage of the total aquifer reservoir is unappropriated. Drilling costs are expensive however and locating new development wells requires intensive siting studies. Future river basin needs in Wyoming will focus and depend on reliable source supply from the Madison Formation.

## TEST YOUR KNOWLEDGE answers on Page 3

1. A Wyoming groundwater right: A.) Attaches to the point or area of use B.) Is granted for a specific quantity of water C.) Is granted for a specific well location D.) All of the above
2. Chlorine shall be introduced so that an average chlorine residual of 100 mg/l is in the entire volume of water in the casing and all parts of the plumbing system (pump, drop-pipe, wiring, pitless assembly, etc.) for a minimum contact period of not less than 2 hours before flushing and ridding the chlorine solution from the well. True or False?
3. A well that produces groundwater that is interconnected with a surface water source: A.) Must be plugged B.) Cannot be used C.) May be regulated along with surface water right priorities D.) Can be pumped any time.



## Calendar of Events:

The codes in the first column are as follows:

WWWA – Wyoming Water Well 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

ISWD – International School of Well Drilling

CPS - CPS Distributors

Goulds - Goulds Water Technology Factory School WebEx Training

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

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## Upcoming Events

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
<b>WWCB</b>	<b>Board Meeting</b>	<b>Cheyenne, WY</b>	<b>September 6, 2017</b>
<b>WWWA</b>	<b>Board Meeting</b>	<b>Casper, WY</b>	<b>October 13, 2017</b>
WWQ & PCA	47 <sup>th</sup> Annual Conference	Casper, WY	October 23, 2017
	2017 Groundwater Foundation, National Conference	Boise, ID	October 24-26, 2017
NGWA	Summit	Nashville, TN	December 4-7, 2017
NGWA	Groundwater Week	Nashville, TN	December 5-7, 2017
<b>WWWA</b>	<b>2018 Convention</b>	<b>Casper, WY</b>	<b>January 24-26, 2018</b>

Answers to Test Your Knowledge from page 2

1. D. All
2. True
3. May be regulated along with surface water right priorities

## Discover the Geology of Hell's Half Acre



Many travelers are puzzled when they come across a bizarre badland in the center of Wyoming known as Hell's Half Acre. This area between Casper and Shoshoni is a half acre merely in name. It is actually around 320 acres of badlands surrounded by miles of flat-lying, dry plains.

In the last few million years, wind and water have eroded all of those colorful layers of sandstone and shale into the jagged and often uniquely shaped landforms before you today. Some of the rocks show steeply dipping layering; those are the older Cretaceous and Paleocene formations deposited about 70–55 million years ago. They were tilted and eroded off during the Laramide mountain-building event, which uplifted the Casper arch, about 60–55 million years ago. About 50 million years ago, sediments were shed from the Casper arch and deposited on top of the older tilted layers, forming an angular unconformity. Within Hell's Half Acre, you can see some of the layers are tilted steeply, while others are closer to horizontal.

If the landscape looks familiar, you probably saw it in the science-fiction movie, “Starship Troopers.”

More information about Hell's Half Acre can be found in the [Traveler's Guide to the Geology of Wyoming](#) and [Roadside Geology of Wyoming](#).

