Montana Bureau of Mines and Geology NGWMN Final Technical Report

Award Number: G16AC00080

Agency Name: Montana Bureau of Mines and Geology

Title: Montana Bureau of Mines and Geology State-Wide Groundwater Level

and Groundwater Quality Monitoring Network, Current Data Provider

Maintenance Funding

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Term Covered: July 21, 2016 to July 20, 2019

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## **Background**

The Montana Bureau of Mines and Geology (MBMG) maintains a statewide groundwater monitoring network to collect water-level and water-quality data from about 850 wells. Many of these wells are completed in Principal Aquifers that include the heavily developed intermontane basin aquifers in the west (S100NRMTIB), and the less intensively developed but widely used alluvial (N100ALLUVL), Lower Tertiary (N300LTRTRY), Upper Cretaceous (N300UPCTCS), Lower Cretaceous (N300LCRTCS), and Paleozoic aquifers (N500PLOZOC) in the east. MBMG became a NGWMN data provider in 2015 and at the start of this project provided water-level data for 227 sites, and water-quality data for 58 sites.

# Description of work done to support the NGWMN as a data provider

The work performed for award G16AC00080 was under Objective 2: to maintain persistent data services between MBMG and the NGWMN portal. Specific tasks included: updating the registry with new or dropped sites, maintaining MBMG database tables for all wells that are in the NGWMN, reviewing and revising MBMG database structures to accommodate any NGWMN enhancements, and maintaining software and providing updates as necessary.

The MBMG Data Center databases are housed in Microsoft SQL Server, either 2012 Standard or 2016 Enterprise Edition. The databases store the data elements served to the NGWMN portal including well construction details, lithologic descriptions, water levels, and inorganic water quality data.

During the performance period, seven wells were dropped from the NGWMN either because of difficult access, well damage, or the landowner no longer granted access. The sites are still included in the registry but the display function has been deactivated. The NGWMN Site ID's are listed below:

NGWMN Site ID	National Aquifer	Local Aquifer	Aquifer Type	Well Depth (ft)	WL Network?	QW Network?
MBMG:25200	Lower Cretaceous aquifers	217KOTN, KOOTENAI FORMATION	CONFINED	400	Yes	No
MBMG:23991	Upper Cretaceous aquifers	211EGLE EAGLE SANDSTONE	CONFINED	680	Yes	No
MBMG:22380	Upper Cretaceous aquifers	211JDRV JUDITH RIVER FORMATION	CONFINED	965	Yes	Yes
MBMG:15907	Upper Cretaceous aquifers	211EGLE EAGLE SANDSTONE	UNCONFINED	97.6	Yes	No
MBMG:1330	Upper Cretaceous aquifers	211LNCE LANCE FORMATION	CONFINED	445	Yes	Yes
MBMG:95030	Upper Cretaceous aquifers	211FHHC FOX HILLS-HELL CREEK AQUIFER	CONFINED	360	Yes	No
MBMG:74121	N. Rocky Mountains Intermontane Basins	400BELT BELT SUPERGROUP	CONFINED	369	Yes	No

Also during the performance period, MBMG monitored overall NGWMN service usage and availability, when necessary responding to questions from NGWMN portal staff.

## Description of any updates made to web services during period of award

MBMG Data Center upgraded Geoserver and transferred service delivery from the old webserver to new webservers during MBMG equipment upgrades in May 2018.

Additionally, MBMG modified services and added fields to maintain currency with NGWMN standards. The following fields were modified to meet the Minimum Data Element Requirements:

- Accuracy of water-level measurement (water levels)
- Analytical Method Name (water quality)
- Depth of Casing interval unit of measure (casing)
- Depth of Screen interval unit of measure (completion)
- Lithology ID (lithology)
- Observation Method (lithology)

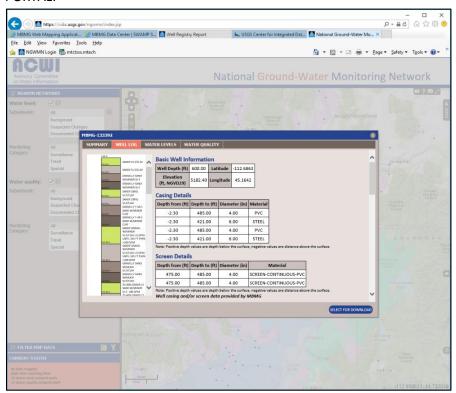
# • Description of any problems encountered in serving data to the NGWMN data portal

An internal MBMG quality assurance review discovered an issue with casing and screen data being duplicated in the portal "Well Log" tab. An example from MBMG-133392 is presented below:

### MBMG - GWIC:

<u>Add re</u>	<u>cord</u>			Casing table records			View A	<u>View Audit History</u>	
Opt	From	То	D	Wall ia Thick	Pressure	Joint Type	Material	Admin	
Edit	-2.3	3 48	35	4			PVC	<u>Delete</u>	
Edit	-2.3	3 42	21	6 0.28		WELDED	STEEL	<u>Delete</u>	
	cord			Com	plation table	rocorde	Vious A	udit Hictor	
Add re		To I	Din	Num of	Size of				
Opt	From		Dia 4		Size of Openings	Des	scription	Admin	
Opt <u>Edit</u>	<b>From</b> 475	485	4	Num of	Size of		scription		
Opt <u>Edit</u>	From	485	4	Num of	Size of Openings	Des	scription	Admin	

### PORTAL:



After consultation with NGWMN Portal staff, we determined that an MBMG script was the source of the error. This was quickly rectified.

• Notice of any changes in databases or web services that are being planned that would impact future integration of the web services with the NGWMN data portal

There are no planned changes to the MBMG web services.