MEMO

State of Idaho
Department of Water Resources
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Date:	May 4, 2016
To:	Gary Spackman, P. E., Director
Through:	Tim Luke, Water Compliance Bureau Chief
From:	Tom Neace, P.G. and Chad Hersley, P.G.
Subject:	Staff Memorandum regarding evaluation of the City of Meridian petition to create a West Ada Area of Drilling Concern.

Regulatory Background

Idaho Code 42-238(15) authorizes the Director (Director) of the Idaho Department of Water Resources (Department) to designate as he determines necessary "areas of drilling concern" (ADC) within which water well drillers must comply with additional requirements to protect public health and to prevent waste or contamination of ground water or surface water. Wells drilled or modified within an area of drilling concern must comply with the following additional requirements:

1) Additional bonding requirements, as determined by the Director, to insure that the well is constructed or decommissioned in compliance with the adopted standards for well construction.
2) Additional experience and knowledge in drilling wells encountering warm water or pressurized aquifers as required by rules adopted by the Water Resource Board.
3) Document that specialized equipment necessary to drill wells in an ADC, as determined by the Director, is or will be available to the driller.
4) Provide a notice of intent to drill, deepen or modify a well, submit plans and specifications, and a description of the drilling methods that will be used, as required by the Director, and receive written approval of the Director before commencing to drill, deepen, or modify any well in a designated ADC.

Prior to designating an ADC the Director shall conduct a public hearing in or near the area to determine the public interest concerning the designation. Notice of the hearing shall be published in two consecutive weekly issues of a newspaper of general circulation in the area prior to the date set for the hearing.

Proposed Area of Drilling Concern

The City of Meridian (Meridian) has submitted a petition to the Department for the designation of an ADC in a portion of West Ada County. Meridian's petition for a West Ada Area of Drilling Concern (WAADC) includes a detailed report prepared by Meridian and Hydro Logic,

Inc. documenting the hydrogeologic conditions in the Meridian area (Barry and Squires, 2015). The boundaries of the proposed WAADC are established based on the ground water source area for wells in the Meridian area; with hydrologic boundaries on the north, south and southeast, the West Boise Area of Drilling Concern to the east and the Ada/Canyon County boundary to the west (see attached map).

The City of Meridian proposes the WAADC to protect the ground water resources by preventing the comingling of ground water from different aquifers and sub-aquifers (production zones) which have different ground water chemistries and hydraulic head. The report details the ground water quality and artesian pressures of the different aquifers and sub-aquifers.

Technical Evaluation of the Hydrogeologic Conditions

The report characterizes the upper 300 to 400 feet of the geologic section under Meridian consisting primarily of sand with thin layers of silt, clay and gravel. Low permeability zones consist of thin clay-silt layers, buried soil horizons, cemented sands and clay bearing sands.

Most of the wells drilled in the proposed WAADC have been installed using either air-rotary or cable-tool drill rigs. Generally, the wells are completed using drill and drive methods where steel well casing is advanced periodically as the hole is drilled. The report concludes that wells constructed using drill and drive methods disrupt the natural layering of the sediments and the low permeability zones. The drive shoe normally used to advance the casing creates a small annular space between the casing and formation. The annular space, along with disruption of the natural layering, creates a conduit for comingling of aquifers and sub-aquifers along the entire length of the well except for the zone covered by the surface seal. Most surface seals in the area are either 18 feet (if drilled prior to 7/2009) or 38 feet (after 7/2009).

The report indicates drill and drive methods using air-rotary and cable-tool drilling creates additional large voids outside the casing. Air-rotary drilling uses high pressure air to clean out the cuttings from the boring. The report concludes that this method causes unconsolidated sediments to cave into the borehole and be blown out, and up through the casing on to the surface. Likewise, in cable-tool drilling, the suction created from bailing often causes unconsolidated sediments to collapse into the borehole. The sediments are then removed by bailing from the bottom of the borehole. Both of these methods result in large voids outside the well casing, which promotes comingling of different aquifers. This is illustrated by the volume of grout needed to decommission some of the older wells in Meridian. The report documents the volume of grout used to decommission seven Meridian wells was ten (10) to one hundred (100) times more than the calculated volume of grout. The additional grout was necessary to seal the excessive annular space created by drill and drive methods.

Ground water studies conducted by the City of Meridian and Hydro Logic Inc. show that aquifer pressures vary considerably with depth. This observation is supported by comparing static water levels from wells completed at different depths and by nested monitoring wells installed to determine sub-aquifer pressures and ground water quality. For example, Meridian City Supply Well #19 was completed between 556 and 720 feet below ground surface (bgs) with an artesian head of 22.7 feet above ground surface. Meridian City Monitoring Well # 19, located 50 feet laterally from City Supply Well #19, was completed at depths between 340 to 420 feet bgs and exhibits an artesian head of 5.93 feet (above ground surface). This 16.77 foot head difference illustrates the different aquifer pressures in the subsurface dependent on completion depth.

Geochemistry of the different aquifer and sub-aquifer units also varies as documented in the report. Three of the four wells in the Meridian Heights Subdivision (Meridian Heights #1, #2 and #3) were completed between approximately 180 to 310 feet bgs and detected uranium concentrations above the maximum contaminant level (MCL) of 30 ug/L. Laboratory results from Meridian Heights #3B, which was completed between approximately 450 to 525 feet bgs, did not report uranium above the analytical detection limit. Uranium Levels in excess of the MCL were also detected in the United Water Idaho Hope well completed at 311 bgs (personal communication between Hydrologic, Inc., and United Water Idaho, (Barry and Squires, 2015. Figure 13). The report suggests, based on the data evaluated, that the ground water beneath Meridian, between approximately 200 and 300 feet bgs, contains elevated radionuclides. The report documents elevated arsenic contamination at some locations and depths which restrict the use of that particular sub-aquifer.

The WAADC report also discusses anthropogenic ground water contamination in the area. DEQ has designated the Ada- Canyon County Nitrate Priority Area, which is present within portions of the proposed WAADC boundaries. Nitrate contamination of the ground water has been documented in the shallow aquifer. The West Boise Area of Drilling Concern is present on the east edge of the proposed WAADC. The West Boise ADC was established in 2001 based on perchlorethylene (PERC) contamination of the aquifer from a leaking above-ground storage tank. PERC, a chlorinated solvent, is heavier than water and often sinks to deeper depths as the plume spreads, especially if the plume intercepts unsealed annual space in existing wells.

Elevated nitrate, pesticides, arsenic, uranium and alpha radiation are present in the aquifer system of the Treasure Valley, as reported by Boyle, et. al, 1997; Cosgrove and Taylor, 2007; Neely and Crockett, 1999; Hagan, 2004; Neely, 2001; Neely 2002; Neely 2008 and Hanson et. al, 2011.

Proposed Management Practices

The WAADC petition from the City of Meridian proposes the following changes in the administrative procedures, drilling methods and well construction for this ADC:

1) **Require a long form drilling permit - Eliminate the use of start-cards**
2) **Require a drilling prospectus with each permit application**
3) **Require approved drilling contractors**
4) **Require mud-rotary drilling methods**
5) **Recommend borehole geophysical logging of new wells**
6) **Require additional documentation and reporting forms**
7) **Require full depth casing seals to the production zone**
8) **Require pumped grout annual seals**
9) **Require PVC plastic or high-strength/low-alloy steel well casing**
10) **Require installation of stainless steel well screens**
11) **Recommend hydraulic testing of all new wells**
12) **Require water quality sampling of new wells**
13) **Recommended camera inspection of all new wells**
14) **Require special well decommissioning procedures**
15) **Recommended installation of monitoring tubes on each new well**
16) **Recommended well head security**

Ground Water Protection Program Recommendations

Meridian's report and request for a designation of a WAADC has been reviewed and evaluated by Department Staff. The report includes hydrogeologic data that documents differences in the geochemistry and artesian pressures within different aquifers and sub-aquifers beneath the Meridian Area. The City's report also documents water quality contamination from both natural and anthropogenic sources. The petition provides examples of poor well construction which provide pathways for contaminants to spread to different aquifers and sub-aquifers.

Department staff concludes that the Meridian petition has sufficient technical data supporting consideration of the proposed WAADC. Department staff recommends that a public hearing be held in accordance with Idaho Code 42-238 to determine the public interest in the proposed WAADC designation.

References

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