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Subject: Re: Revised Approach to GW Sample Collection from Packed Boreholes

DOI concurs with the method described below for sampling from packed boreholes.

Pamela Innis
DOI Topock Project Manager

Blackberry Handheld Wireless

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Sent: Wed Mar 30 15:35:31 2011
Subject: Revised Approach to GW Sample Collection from Packed Boreholes

Hello Chris and Pam,

As discussed during the Mar-24 technical call, PG&E is proposing a revised procedure for groundwater sample collection from the bedrock boreholes equipped with packer systems. Given the low yield of the packed-off boreholes and specialized equipment associated with the packer systems, a revised procedure is preferred to:

- Increase sample collection efficiency – By reducing the total purge volume, the duration required for sample collection and analysis will be reduced by weeks.
- Attempt collection of more representative groundwater samples – Based on the sparse distribution of conductive fractures indicated by the flow characterization data collected from these boreholes during installation and testing, three borehole volumes may represent the groundwater contained in a large volume of fractured rock. Purging three borehole volumes could cause water to be drawn from areas far from the subject borehole, and therefore result in samples that are not representative of the adjacent area open to the well. Extensive pumping of low hydraulic conductivity or fractured formations can result in volume-averaged samples that may complicate data interpretation concerning concentration and spatial distribution of constituents. Considering this concept, reducing the purge volume will likely result in samples collected in a manner that better maintains the depth-discrete nature of the zone targeted for characterization.

The proposed procedure, which is generally consistent with the GMP, is to purge a single borehole volume (i.e., the effective borehole volume of the packed-off interval) prior to sample collection. The protocol used for the GMP program for low-yield wells involves purging the well dry, allowing it to recharge, and then collecting a sample the next day. The standard water quality parameters (i.e.

temperature, pH, electrical conductivity, oxidation-reduction potential, and dissolved oxygen) are monitored during purging. This is the protocol we would be following in the packed off East Ravine bedrock wells if these wells could be equipped with electric submersible pumps. However, the special small diameter air-lift pumps in the packed bedrock boreholes do not produce enough water to pump the boreholes completely dry in one continuous effort, and therefore, we have been following the three borehole purge volume method.

We are currently in the field collecting another round of samples from the subject wells. Therefore, please provide your concurrence, or comments, as soon as possible.

Regards,

Mike Cavaliere, P.G.

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