Kulis, Jerzy, NMENV

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Sent: Friday, March 27, 2009 9:11 AM
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Cc: Yanicak, Steve; katzman@lanl.gov; 'Shen, Hai'; Mark Everett; huberpr@lanl.gov
Subject: PCI-2 proposed design
Attachments: PCI-2 Well Design.doc

Gentlemen,

Attached is LANL's proposed design for completing a single-screen well at PCI-2. Please review the proposed well design and provide your comments and approval by e-mail. Please contact Danny Katzman or me if you have any questions or concerns.

Thanks,

Dave

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PCI-2 Well Objectives

The primary purpose of monitoring well PCI-2 is to investigate potential contamination in perched-intermediate groundwater identified beneath Pajarito Canyon during drilling of regional well R-17. An additional objective is to verify results of tritium data collected from pore water in core obtained during drilling at R-17 in 2005. To accomplish these objectives, two boreholes are being drilled at the existing R-17 regional well site. This document addresses the design for well PCI-2 that is being installed in the first borehole to monitor perched-intermediate groundwater. The second borehole, not yet completed, will provide core for pore water analyses of rocks of the upper vadose zone beneath Pajarito.

PCI-2 Recommended Well Design

It is recommended that PCI-2 be installed as a single-screen well with a 10-ft stainless-steel, 20-slot, wire-wrapped well screen extending from 512 ft to 522 ft bgs. The primary filter pack will consist of 10/20 sand extending 5 ft above and 5 ft below the well screen. A 2-ft secondary filter pack consisting of 20/40 sand will be placed above the primary filter pack. The proposed well design is shown in Figure 1.

This well design is based on the objectives stated above and on the information summarized below.

PCI-2 Well Design Considerations

Preliminary lithologic logs indicate that the geologic units encountered at PCI-2 are, in descending stratigraphic order: Alluvium (0–33 ft), Tshirege Member (Qbt 1g) of the Bandelier Tuff (33–131 ft), Cerro Toledo interval (131–156 ft), Otowi Member of the Bandelier Tuff (156–488 ft), Guaje Pumice Bed (488–498 ft), Puye Formation (498–557 ft), and dacite lava (557–566 ft TD). Perched groundwater at PCI-2 occurs within very coarse deposits of the Puye Formation that consist of poorly sorted clast- and matrix-supported dacitic boulders, cobbles, and pebbles. Although Puye deposits are very coarse throughout, the silt content of the rock matrix is greater in 530–555 ft interval. The silty rock matrix in this interval is probably less transmissive than the overlying rocks, and it may represent the confining layer on which groundwater is perched.

Groundwater at PCI-2 was expected to occur between depths of about 518 ft and 585 ft based on data collected during drilling well R-17 in 2005. Observations during drilling and water levels measured at PCI-2 are generally consistent with the predicted groundwater occurrences.

At PCI-2, a measured water level of 505 ft was obtained when the borehole was 511 ft deep and the drill casing retracted to 490 ft. The water level recovered to 505 ft after airlifting water from the borehole several times. The borehole was then advanced to a depth of 566 ft (into the top of the dacite lava) to investigate the saturated thickness of the perched zone and to provide enough depth for well installation. The borehole sloughed to 560 ft depth after the drill casing was retracted to 485 ft, and a stable water level of 536 ft was obtained after resting the borehole overnight. A borehole video log showed water entering the borehole at a depth of 507.2 ft with flow becoming progressively stronger down hole to a depth of at least 520 ft. These relationships indicated that by advancing the borehole to a depth of 566 ft, the confining layer for the perched zone was penetrated and groundwater was draining into deeper unsaturated rocks. The borehole was backfilled with bentonite to a depth of 535 ft, creating a seal near the top of the interpreted confining layer (silt-bearing Puye deposits from 530–555 ft). With the borehole at 535 ft depth, stable water levels of 505.5–506.7 ft were obtained after resting the borehole 12–21 hrs.

The well design in Figure 1 is based on submerging the top of a 10-ft long well screen 5 ft below the water level of 507 ft. This screen placement allows monitoring of perched groundwater near the top of

saturation where the effects of potential contaminants arriving from the overlying vadose zone are likely to be greatest.

Other Zones Considered for PCI-2 Well Screens

Perched groundwater was also encountered within the Cerro Toledo deposits while drilling PCI-2. Water was first encountered while fluid-assisted air-rotary drilling at a depth of 139 ft, noticeably increasing the rate of fluid discharge to the cuttings pit. After a water sample was collected, the casing was advanced to 141.5 ft and water production stopped. The casing was retracted to 138 ft, and the borehole was rested overnight. The water level the next morning was 139.25 ft. During video logging of the R-17 borehole in 2005, a slightly wet zone was noted from 139 to 146 ft bgs (in the Cerro Toledo interval) on the borehole walls; however, by the following morning, no moisture was observed in that zone during a second video log run. Analytical data for the borehole groundwater sample collected at PCI-2 are not yet available.

These observations suggest PCI-2 may have penetrated a thin-perched groundwater zone within the Cerro Toledo interval. If present, this additional perched zone appears to be small, and based on the available data it is unclear whether it is necessary to install a monitoring well. Another opportunity to collect information about this zone will be provided by the corehole that will be installed near PCI-2 for characterizing pore water in the upper vadose zone. The corehole will help to define the thickness and extent of this potential perched zone. These new data in conjunction with observations and groundwater analyses from PCI-2 will be used to determine if a monitoring well in the Cerro Toledo interval is needed.

PCI-2 Well Design

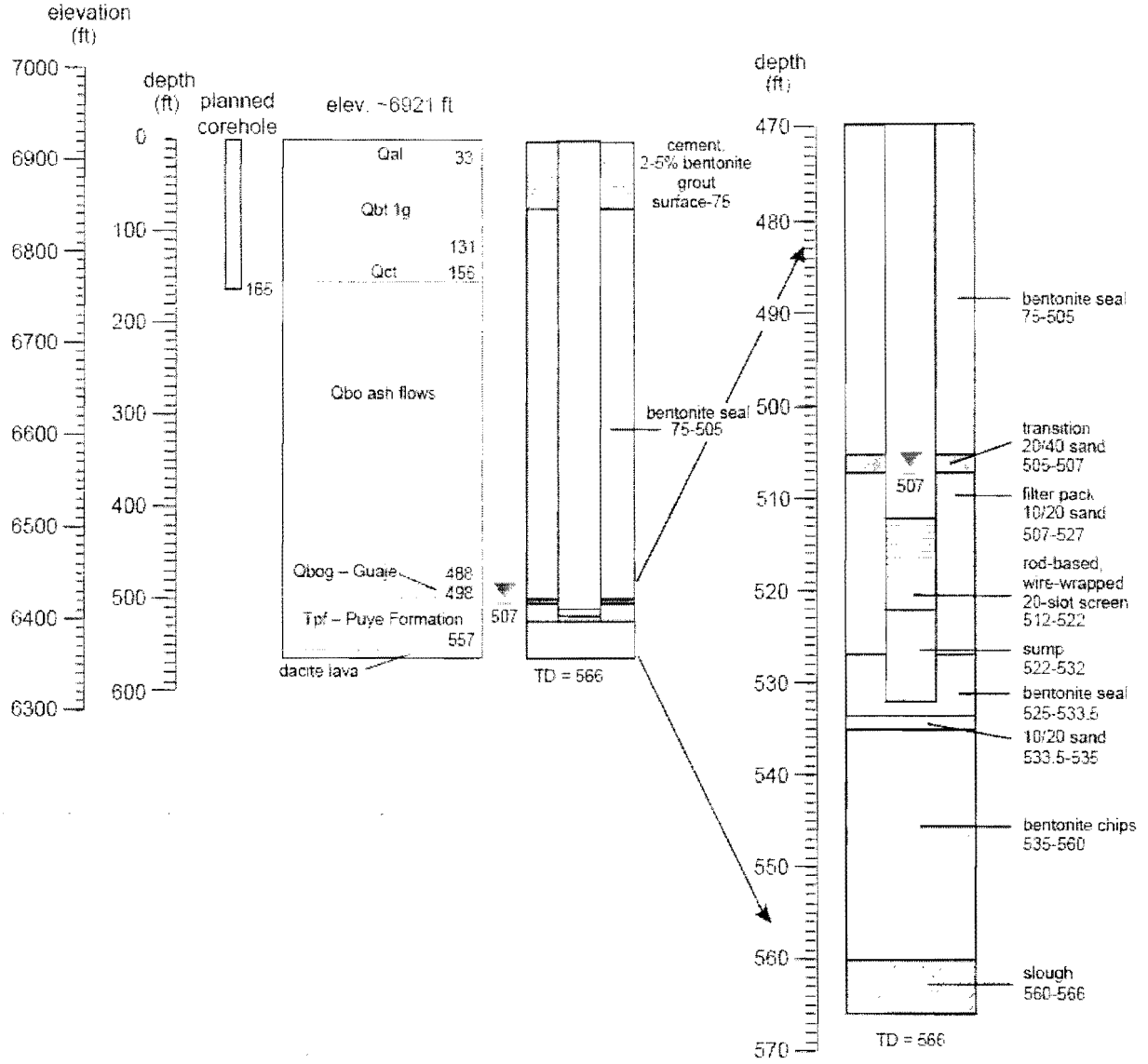

Figure 1. Proposed well design for PCI-2.