Geophysical Log Interpretations
Lake Region Water Treatment Plant Test Production Well TP-1

13 ⅝-inch diameter open hole from 1,150 to 1,436 feet below land surface (ft bls) run on 4/1/05
Geophysical logging was performed after acidification.

Gamma Ray Log

Depth (ft bls)	Description
1,150 - 1,415	Consistently low gamma ray activity (8 - 19 GAPI).
1,415 - 1,423	Increase in gamma ray activity to values in 20 to 23 GAPI range. Increase is correlated with a decrease in borehole diameter.

Caliper Log

Depth (ft bls)	Description
0 - 280	Approximately 15.1 to 15.2-inch diameter round casing, no suggestion of any deformation.
280 - 1,148	14-inch diameter round casing, no suggestion of any deformation.
1,148 - 1,175	In open hole, enlarged. Borehole diameter is mostly in the 25 to 30-inch range.
1,175 - 1,365	Decrease in borehole diameter. Borehole has about 2 inches of asymmetry (difference between x and y caliper readings). Diameters are mostly 17 to 18.5 inches for x-caliper and 18.5 to 21.2 inches for the y-caliper.
1,365 - 1,416	Increase in borehole diameter to x-caliper values consistently in the 20.0 to 22.2 inch range.
1,416 - 1,424	Sharp decrease in borehole diameter.

Dual Induction Log

Depth (ft bls)	Description
1,155 -1,418	Deep, medium, and shallow tracks have very minimal separation. Resistivity values are between 10 and 20 ohm-m. Lowest resistivities occur from 1,155 to 1,200 ft bls. If anything, there is a slight increase in resistivity with depth. Relatively constant resistivity of 14 tp 17 ohm-m below 1,292 ft bls, which suggests relatively uniform lithology and salinity.

Borehole Compensated Sonic

Depth (ft bls)	Description
1,150 - 1,174	Sonic transit times are greater than 110 µsec/ft in this enlarged borehole interval.
1,174 - 1,310	Decrease in borehole diameter to values mostly in the 105 to 130 µsec/ft range. Average value is approximately 125 µsec/ft. Spikes of lower sonic transit times (< 100 µsec/ft) at 1,216, 1,214, 1,275, and 1,292 may be dolomitic or better cemented beds.
1,310 - 1,416	Slight decrease in overall sonic transit times to values mostly between 100 and 120 µsec/ft.

Flowmeter Log (dynamic and static)

Since the caliper log shows only minimal variation in borehole diameter below the enlarged zone from 1,150 to 1,175 ft bls, the flowmeter log can be interpreted directly. Dynamic test was performed at a rate of approximately 1,400 gpm.

Depth (ft bls)	Description
1,150 - 1,180	Dynamic flowmeter log has a large borehole diameter response; dynamic log response decreases with increasing borehole diameter and then increases as borehole diameter decreases.
1,180 - 1,247	Major flow zone. Dynamic flowmeter log indicates that most of flow enters the well in this interval.
1,247 - 1,340	Relatively minor flow into the well
1,340 - 1,424	No significant flow into the well.

Fluid Conductivity and Temperature Logs (dynamic and static)

Depth (ft bls)	Description
1,120 - 1,170	Dynamic fluid conductivity and temperate are near constant at approximately 4,330 µmhos/cm and 79.8° C.
1,180 - 1,303	Steady increase in conductivity and temperature with depth to approximately 4,470 µmhos/cm and 80.7° C.
1,303 - 1,308	Minor jump in conductivity to 4,570 µmhos/cm.

1,308 - 1,380	Stable dynamic fluid conductivity and temperature.
1,380 - 1,400	Increase in fluid conductivity to approximately 4,700 µmhos/cm. Temperature increases to 81.1° C.
1,400 - 1,425	Conductivity fluctuates but not overall change.

Borehole Video Survey

Depth (ft bls)	Description
0 - 280	PVC casing; round and in good condition. Faint vertical striations are evident. Casing is clean for most part. Some surficial rough spots with iron sulfide staining from drill/tool impacts. Couplings are evident with no clear cement leakage.
280	Reducer bushing.
280 - 1,146	PVC casing, as above.
1,146 - 1,180	Enlarged irregular borehole.
1,180 - 1,247	Smaller, closer to gauge, borehole, slightly ovate. Common vugs (small cavities) either created or opened by acidification. Vugs are mostly ½ to 6-inches in diameter. Abundance of vugs varies between horizontal beds.
1,247 - 1,325	In general, vugs are less than abundant than above, although still common. Variation in the abundance of vugs occurs between beds.
1,325 - 1,405	Decrease in the overall abundance of vugs, which corresponds with a decrease in flow on the flowmeter logs. Horizontal bedding is well developed. Common beds with smooth borehole wall.
1,405 - 1,424	Increase in abundance of vugs.
1,424	Borehole is filled with sediment and cement.