Comments on Pumped Aquifer Test
Conducted at Proposed Hills of Castle Rock Development
George Rice, August 26, 2007

The information on HOCR's pump test and water quality analysis was taken from a report produced by LBG-Guyton: *Construction and Testing of Water Well No. 2 at the Hills of Castle Rock, Medina County, Texas*, Sept. 2006.

Test date

August 16 – 18, 2006

Test duration

Approximately 48 hours

Test wells

Well 2 (pumped)
Observation well (102 feet from well 2)
Well 13 (3330 feet from well 2, no water level changes observed during test)

Depth of pumped well, geologic units

1030 feet. Well completed in the Middle Trinity Aquifer (Lower Glenn Rose Limestone, Bexar Shale, Cow Creek Limestone, and Hammett Shale)

Static water level in pumped well

408 feet below land surface

Pumping rate

802 gpm

Maximum drawdowns during test

Well 2: 62.9 feet.
Observation well: 8.5 feet

Aquifer properties

Transmissivity[1]: 26,470 – 28,230 gal/day-ft
Storage coefficient: 2.26×10^{-4}

[1] First value from pumped well, second from observation well.

Water Quality

A water sample was collected from well 2 during the pump test. The sample was analyzed by the LCRA laboratory.

Constituent/Property	Value[2]	Remarks
Temperature[3]	25 C	
pH	7.0	
Specific Conductivity	2270 µmhos	
Odor	None	Report notes that no odor of hydrogen sulfide was detected
Total dissolved solids (TDS)	2320	Exceeds TCEQ secondary standard of 1000 mg/L. Note: the EPA secondary standard for TDS is 500 mg/L.
Calcium	370	
Iron	0.0555	
Magnesium	196	
Potassium	11.1	
Sodium	13.7	
Chloride	15.0	
Fluoride	3.48	Exceeds TCEQ secondary standard of 2.0 mg/L. Note: the EPA primary standard[4] for fluoride is 4.0 mg/L.
Nitrate	< 0.01	
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Sulfate	1420	Exceeds TCEQ secondary standard of 300 mg/L. Note: the EPA secondary standard for sulfate is 250 mg/L.
Alkalinity (as $CaCO_3$)	222	
Aluminum	0.00493	
Arsenic	< 0.00204	
Copper	< 0.00102	
Manganese	0.00195	
Zinc	0.281	

The concentrations of sulfate, fluoride, and TDS exceed TCEQ secondary standards[5]. TCEQ would probably require HOCR to treat the water to meet the secondary standards.

[2] Values given as mg/L unless otherwise indicated.
[3] Temperature, pH, specific conductivity, and odor were measured in the field.
[4] Primary standards are health-based standards.
[5] Secondary standards are not health-based standards. Secondary standards are established for esthetic reasons (taste, odor, staining, etc.).

Comments

Pumped aquifer test

I've evaluated the pump test information in the report produced by LBG-Guyton. My estimates of aquifer properties agree with the estimates given by LBG-Guyton.

If it is assumed that each house in the development uses one-half acre-foot of water per year (approximately 0.31 gpm, or 450 gallons per day), a well producing 800 gpm[6] could supply water for about 2600 houses. This estimate does not account for the reduction in effective well production caused by poor water quality (see water quality section below).

However, the pump test may have been ended prematurely. Looking at figure 5 of the LBG-Guyton report, there appears to be something going on in the last few hours of the test – a steeper rate of water level decline[7]. A longer test (72 – 96 hours) may show that the transmissivity of the aquifer is lower than the value estimated by LBG-Guyton. A lower transmissivity would result in a lower water production rate.

Water Quality

TCEQ would probably require HOCR to treat the water it produces before delivering it to homes in the development. Treatment would probably reduce the effective yield of HOCR's supply wells. This is because the water would probably be treated by a method (e.g., reverse osmosis) that produces a fresh (potable) fraction and a saline fraction. The fresh fraction may represent 75%, or less, of the water that is pumped from a supply well.

A HOCR drinking water treatment plant would probably produce several hundred thousand gallons of saline water per day[8]. HOCR would have to dispose the saline fraction in a manner acceptable to TCEQ (e.g., evaporation, deep well injection, discharge to surface water).

References

Kimley-Horn and Associates, Inc. (KHA) 2006a, *Contributing Zone Plan Hills of Castle Rock - Tract 1, S.H. 16 @ Park Road 37, San Antonio, Texas*, December 2006.

KHA, 2006b, *Contributing Zone Plan Hills of Castle Rock - Tract 2, S.H. 16 @ Park Road 37, San Antonio, Texas*, December 2006.

LBG-Guyton, 2006, *Construction and Testing of Water Well No. 2 at the Hills of Castle Rock, Medina County, Texas*, Sept. 2006.

[6] The 800 gpm figure is somewhat arbitrary. The well might be able to sustain a higher pumping rate. Or, several pumping wells might be able to sustain a total rate of more than 800 gpm.
[7] This is difficult to determine from the figure alone. I am attempting to obtain the raw test data.
[8] This estimate is based on 3500 housing units, each using 450 gallons of water per day.