

SCANLAN ENGINEERING

Groundwater and Environmental Engineering

July 28, 2001

Elizabeth Cody
City of Boise
Public Works Department
P.O. Box 500
Boise, ID 83701-0500

Subject: Final Report on the Quarry View Park Well Project

Dear Liz:

The Quarry View Park Well reconstruction project was completed in June of this year. The work consisted of converting the existing irrigation well into a two-level observation well.

Stevens and Sons Well Drilling was the drilling contractor. Well construction work began in February and continued intermittently into early April. Piezometer development and site repair were completed in early June.

The original irrigation well construction consisted of a 10-inch surface casing to 45 feet, 8-inch well casing to 498 feet, and 6-inch perforated liner from 486 to 857 feet. The inside of the liner was filled with sand and debris to approximately 700 feet. Gravel pack material had been added outside the 6-inch liner from the surface through a gravel make-up pipe extending into the annular space between the 8-inch and 10-inch casings. The water-bearing zone of the well was believed to be primarily from 600 to 700 feet. Background information regarding well construction and history are provided in my work plan letter to you that was dated March 28, 2000.

The initial work plan contemplated pulling the liner and casing from the borehole, and installing three piezometer pipes at depths of 800 to 850, 650 to 700, and 200 to 260 feet. However, the contractor was only able to pull the liner approximately 90 feet above the bottom of the borehole, and was unable to pull the 8-inch casing. Furthermore, it was apparent that the borehole annulus behind the 8-inch casing was open. The open annulus made the ability to isolate the uppermost proposed piezometer (200 to 260 feet) questionable. Therefore, only the two deep piezometers were eventually installed.

The work was completed as follows.

1. The first step was to bail out approximately 150 feet of fill material from inside the liner. Several days of drilling and bailing were required to accomplish this work due to a significant quantity of debris. The debris included a lost geophysical tool, metallic objects such as chunks of rebar and cast iron, and numerous large pieces of gravel in the upper 50 feet of so of the fill. It appears that the well had been open at one time and that vandals had thrown

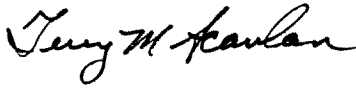
many of these materials into the well. Most of the fill below 750 feet consisted of fine-grained sand and silt.

2. After the well was bailed down to approximately 850 feet, the contractor speared the 6-inch liner and attempted to extract it from the well. However, the liner was pulled up only 90 feet before becoming stuck. Significant amounts of gravel pack material came into the borehole when the liner was pulled. These materials were bailed out.
3. A decision was made to leave the liner in place, cut the 8-inch casing above the liner by perforating around the pipe with a Mills Knife, and then pull the 8-inch casing from the well. However, the contractor was unsuccessful in cutting the 8-inch casing in two attempts. He indicated that the Mills Knife would perforate the pipe on the first few cuts, but as more of the pipe was cut, the pipe would simply bend into the open annulus. The contractor then perforated the liner from 216 to 260 feet for grouting purposes.
4. The lower piezometer was installed to 848 feet. The lower piezometer is constructed of 2-inch steel pipe that is torch-perforated from 813 to 848 feet.
5. Pea-gravel ($\frac{1}{4}$ -inch minus) was poured from the surface and tagged at 805 feet.
6. Bentonite chips (850 lbs) were poured from the surface and tagged from 805 to 770 feet.
7. Pea-gravel was poured from the surface and tagged at 700 feet.
8. The upper piezometer was installed to approximately 700 feet. The piezometer is constructed of 2-inch steel pipe that is torch-perforated from 600 to 700 feet.
9. Pea-gravel was poured from the surface and tagged at 544 feet.
10. Bentonite grout was used to seal from the top of the gravel pack to surface on April 5. The grout was pumped from the bottom up through tremie pipe using a positive displacement pump. The grout was installed in stages, so that the tremie pipe was raised as the grout pumping rate slowed due to high pressure.
11. The top of the 8-inch casing was sealed with a steel plate with penetrations for the two piezometer pipes. The taller piezometer pipe (0.76 of stickup above the steel plate) is the lower (deep) piezometer. The steel plate is the measuring point for water level measurements.
12. The work site was repaired during April and May. The repair work included rebuilding the well/pump vault (but to a lower level) and landscape repair.
13. The piezometer pipes were developed by air-lift pumping on June 7. The upper piezometer produced approximately 20 gpm when blowing through 168 feet of 1-inch pipe. The lower piezometer produced only 1 gpm when blowing through 168 feet of 1-inch pipe.

I measured water levels of 36.49 feet in the deep piezometer and 36.64 feet in the shallow piezometer on July 20, 2001. The measurements are depth to water below the steel plate.

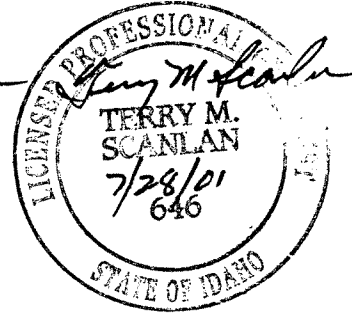
A schematic diagram of the completed well is enclosed, along with photographs of construction materials and the completed well head. Please contact me with any questions.

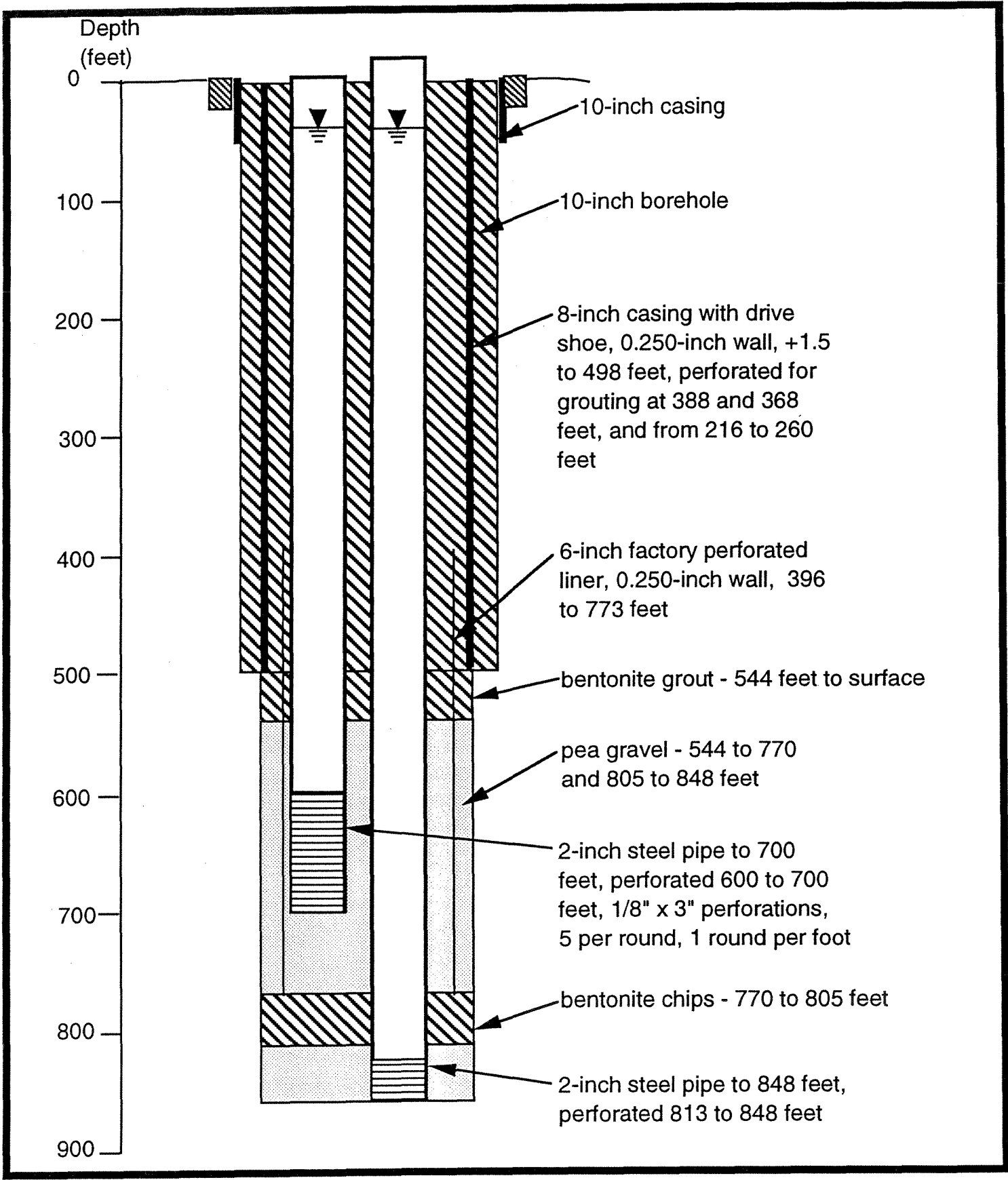
Sincerely,



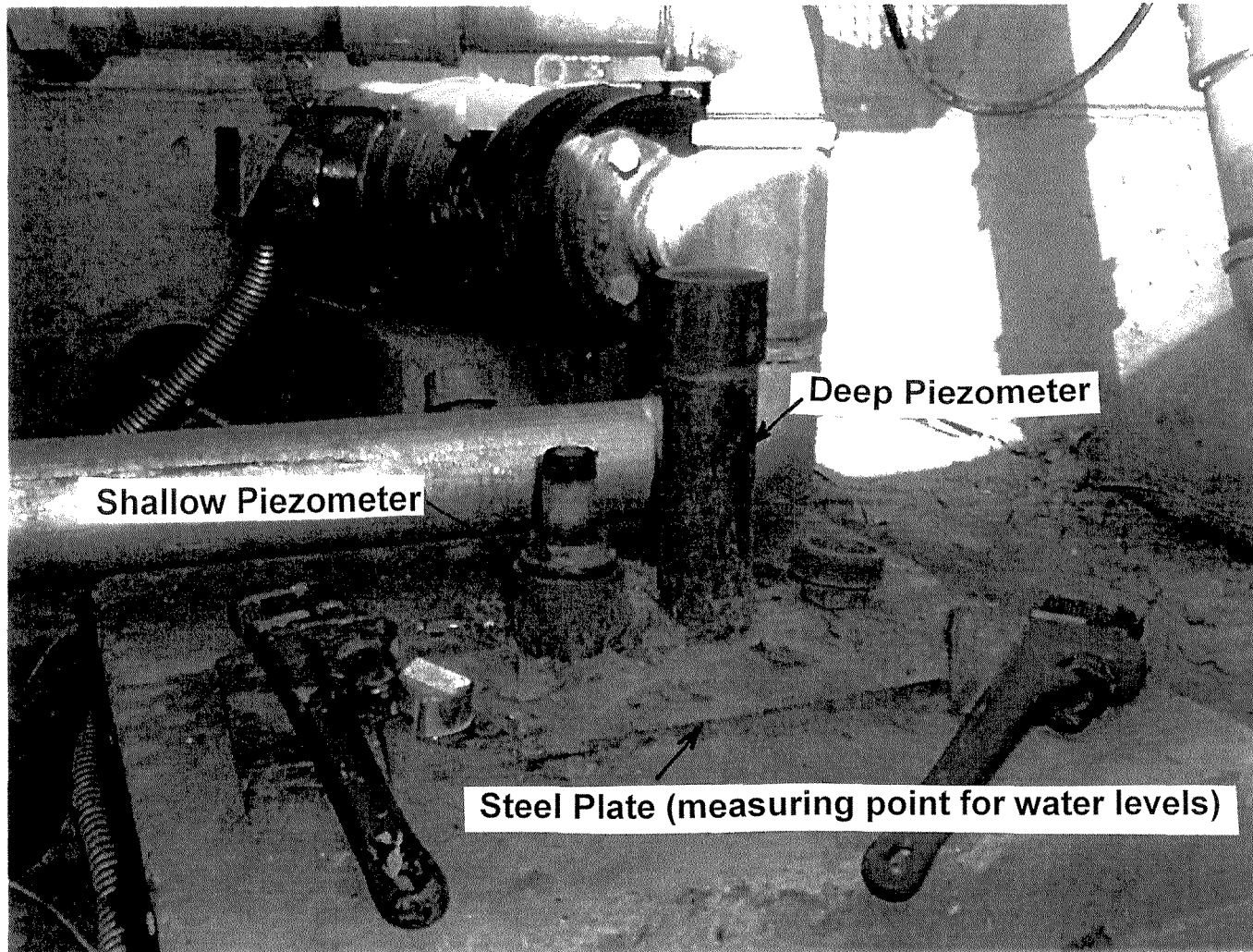
Terry M. Scanlan, P.E., P.G.

Cc: Paul Castelin
Christian Petrich





As-Built Diagram - Quarry View Park Well - June 2001



Completed Well Head



2-inch Torch Perforated and Blank Pipe



**Gravel Pack Material in Dump Truck
(pipe to the right is tremie pipe)**