A Tale of Two Wells

Reconstruction of Aging Water Supply Wells
Two wells with similar problems
• Initially identified as water quality issue
• Looked at potential causes
• Completed preliminary evaluation of available data
• Developed a plan

Scenario 1
• Aging well drilled in 1970
• Acquired as part of a small system
• Limited Well construction information
• Problem: coliform bacteria
Concerns

• Fix the problem
• Not changing the capacity of the well/Permitting
• Wellhead Protection Area (WHPA)

Approach

• Viewed a video of the well
• Evaluated the original well log and regional geology
• Reviewed pumping/operation data
Options

- Abandon well
- Reconstruct Well

Develop a plan

Well reconstruction

- Set casing deeper to eliminate suspected shallow contamination
- Clear with DEP that we could reconstruct without losing grandfathered status – Not deepen or drill new water bearing zones
How ???

- Consider current construction
- Consider needs and options for pump and appurtenances
- Can’t line well; already 6-inch
- Only option – remove casing
- 20 feet of ten inch with ~ 43 feet of 6-inch
- Grouted
Ungrouted casing with holes
Conclusion

- Better constructed well to current standards
- Improved water quality (met drinking water standards and low risk MPA)
- No new infrastructure
- Saved a source, saved money
Scenario 2 - Background

- Well was completed in 1998
- Constructed as 10 x 15 -inch well with Casing set at 60 feet bgs
- Macadam pad at Wellhead with constructed berm to divert Runoff
- In service approximately 15 years without problems
Problem

- Water Quality testing identified problem
- Rains >1-1.25 inches resulted in increased turbidity and nitrate concentration.
- Took off line and self-reported to DEP

Source of problem

- Stream
- Shallow surface water
- Abandoned monitoring well
- Transmission line bedding
Mechanism

• Casing and or grout failure
• Fracture system connecting creek to well
• Flow from farm fields to shallow bedrock fractures
• Conduit- Monitoring well/transmission line bedding

Data collection and review

• Existing data, new sampling
• Downhole logging
  Video
  Optical televiewer
  Temperature
  SP, Conductivity
  Gamma, Caliper
What did data tell us?

Existing data
- Direct and quick response to precipitation events (~1+ inches)
- Nitrates in particular were very high

Sampling and logging
- Stream and Well were physically and chemically different
- Problems with well integrity

Casing Shoe
Optical televiwer

Mitigation Options

• Set Plug/Squeeze/drill out
• Line w/casing K-packer, cement
• Swage
• Overdrill
• Plug/Abandon/redrill
• Packer
• Cut-off discharge line bedding
Casing Liner

Additional Mitigation
Results

- Turbidity dropped to approximately 0.3 NTU’s, even following several storm events exceeding 3 inches
- Nitrate concentrations dropped to less than 10 mg/l (generally 5-8 mg/l)
- MPA Low Risk
Additional testing

Because it was determined to be GUDI and off line for over a year:

- Swip Testing
- New Source Testing
- Passed Swip and met drinking water standards
- Brought back on line

Conclusions

- Changes in Chemistry alerted to problem
- In both cases, was a result of compromised well construction
- Evaluated data and completed testing to develop approach /remedy
• Maintained ‘Status Quo’ i.e., didn’t try to get more water or water from different zones
• Saved the source at existing location
• Improved the construction
• Cost Savings compared to New Source
• Worked with DEP