

Well Cleaning and Maintenance

Managing Your System and Supply For Water Efficiency

October 2020

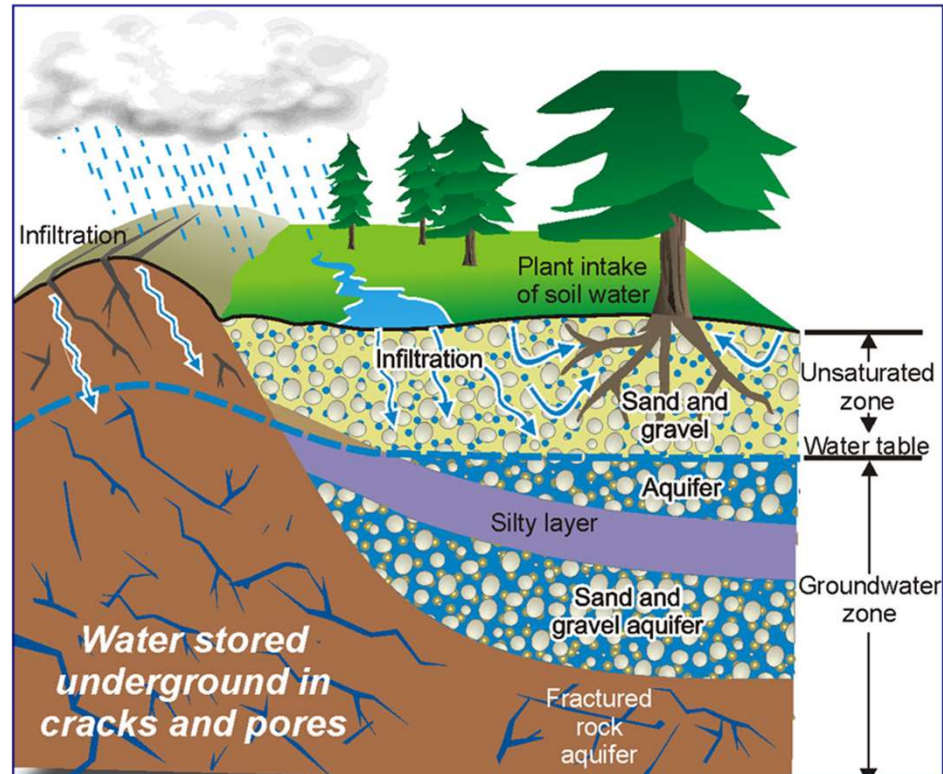
Lauren Thistle, Hydrogeologist



Myth! No Underground Rivers



Where does our groundwater come from?

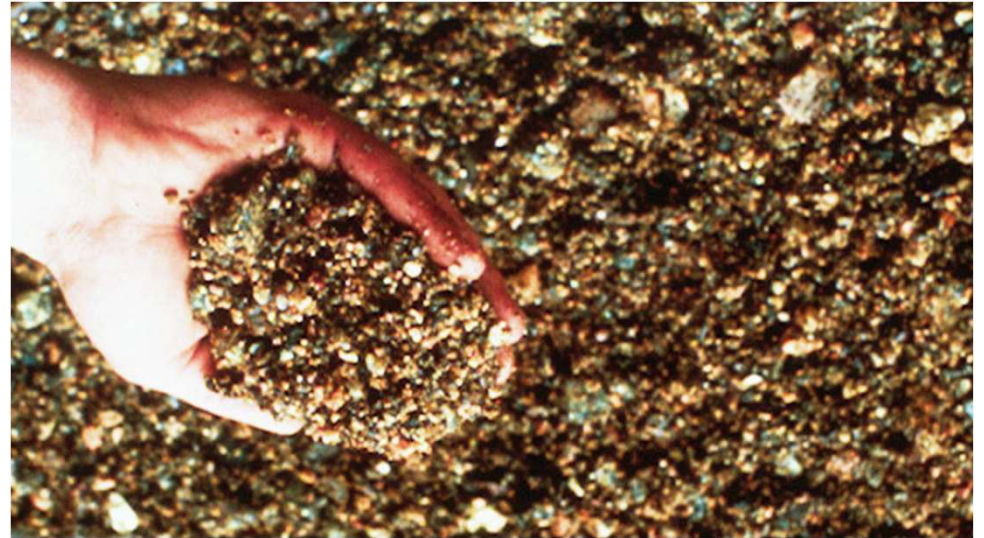


Groundwater Fills Fractures and Pore Spaces

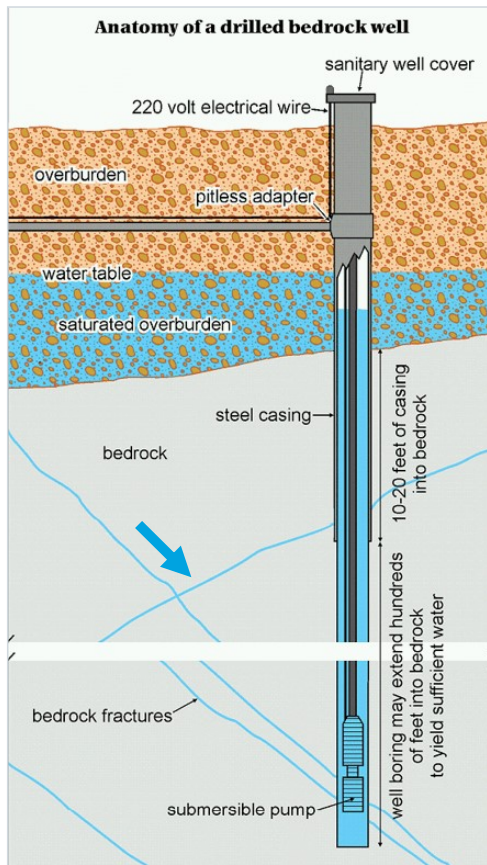
Bedrock



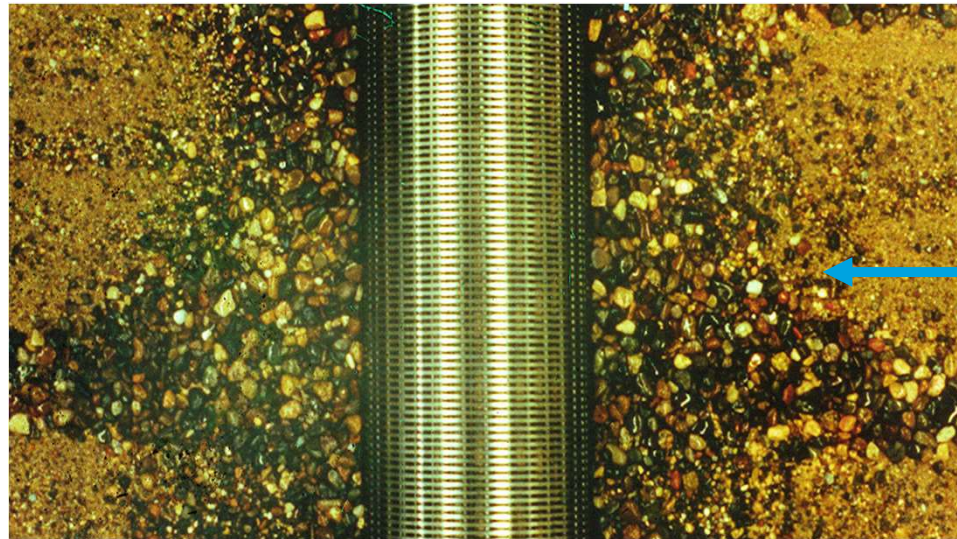
Sand & Gravel



Where does our well water come from?



Well screen in aquifer; soil natures filter

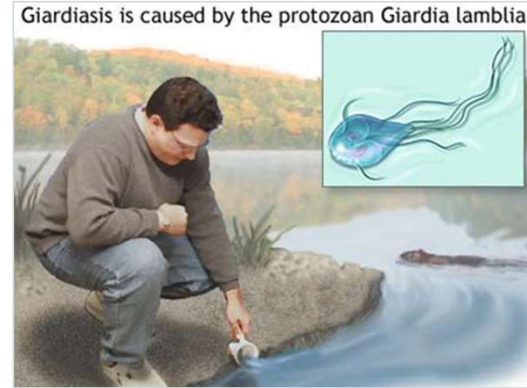


Bacteria and Viruses

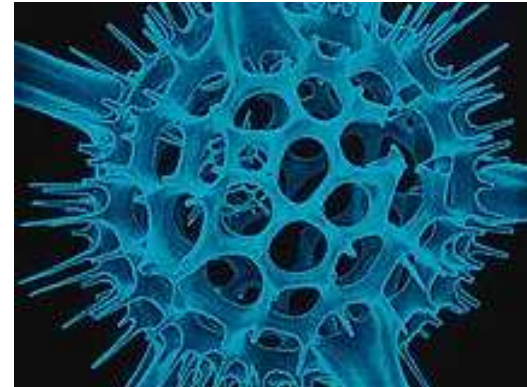
Giardia



Giardia

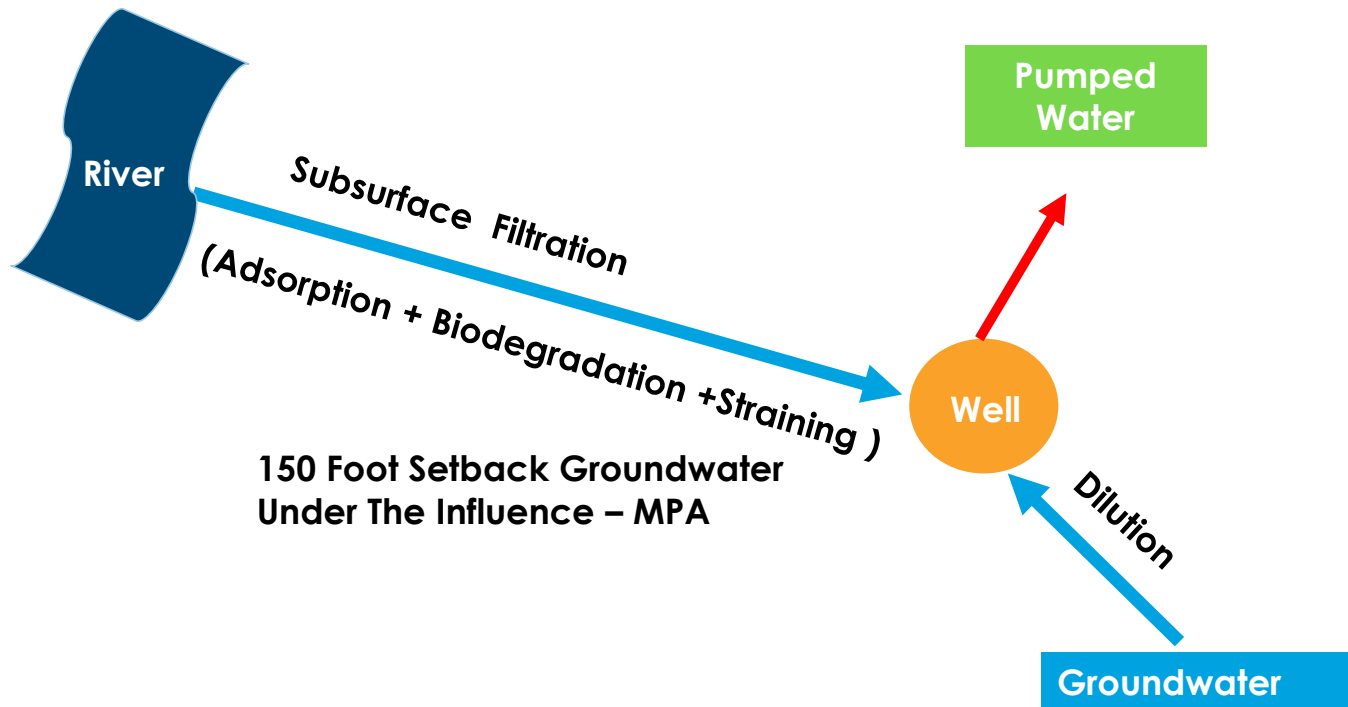


E-Coli Bacteria



Water Protozoa

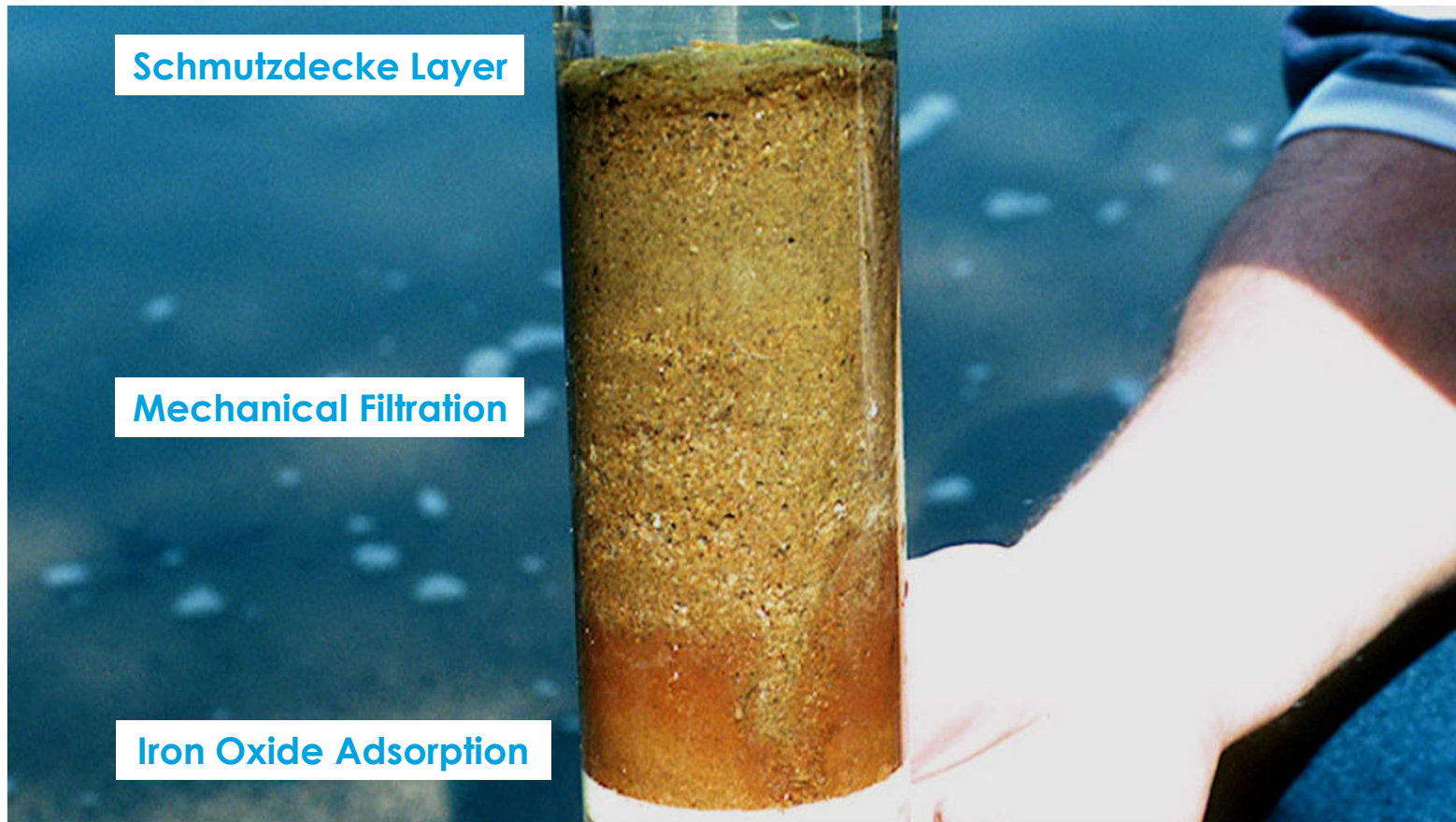
Natural Filtering Processes Taking Place



Natural Filtering Processes Taking Place



Natural Filtering Processes Taking Place



Beginnings Of A Sustainable Water Supply



Groundwater Exploration – What resource do we have?



Successful Test Well Exploration

Beginnings Of A Sustainable Water Supply



Pump Test-A Success



Drill Production Well

Small vs. Large Diameter Well



12 inch



24 inch



48 inch, only 10% increase
In Yield w/Doubling Well
Diameter

Record Keeping Key To Sustainability

Strategy

- **Measure and Record Drawdown Daily/Weekly**
- **Graph/Plot Data To Identify Water Level Trends**
- **Check Pump Amperage/Noise-Bearings**
- **Inspect Meter and Calibrate**
- **Time To Fill Storage Tank – Increase**
- **Odors – Rotten Egg/Turbidity/Color/Taste**
- **Train Others**

What do you do when the well runs dry?



- What happens when the water stops flowing from the tap
- Operator can't figure out what is wrong!

What do you do when the well runs dry?

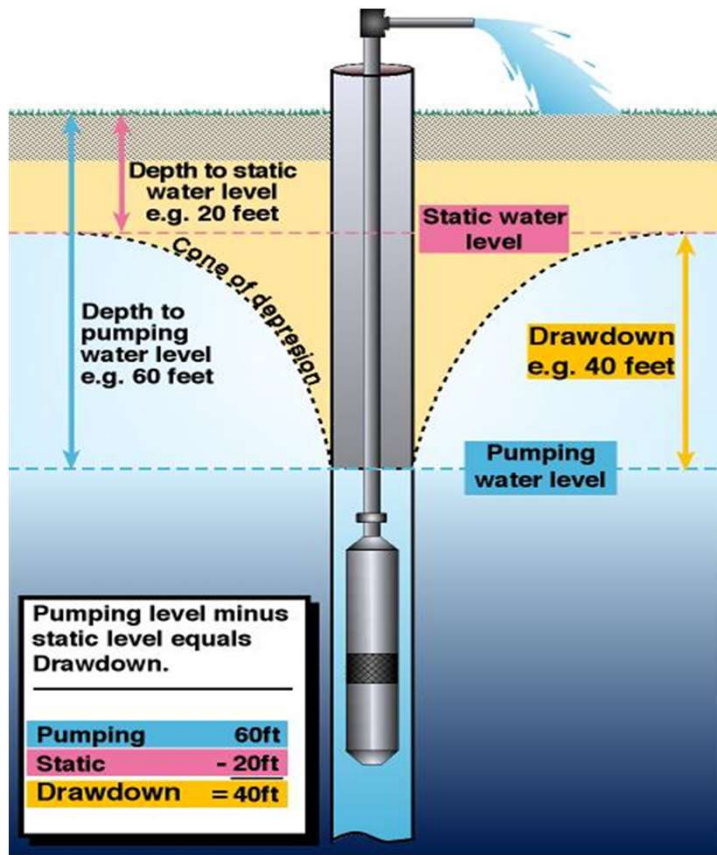


- **Need to take a close look at the heart of the system**

Measure Water Levels Inside and Outside of Production Well



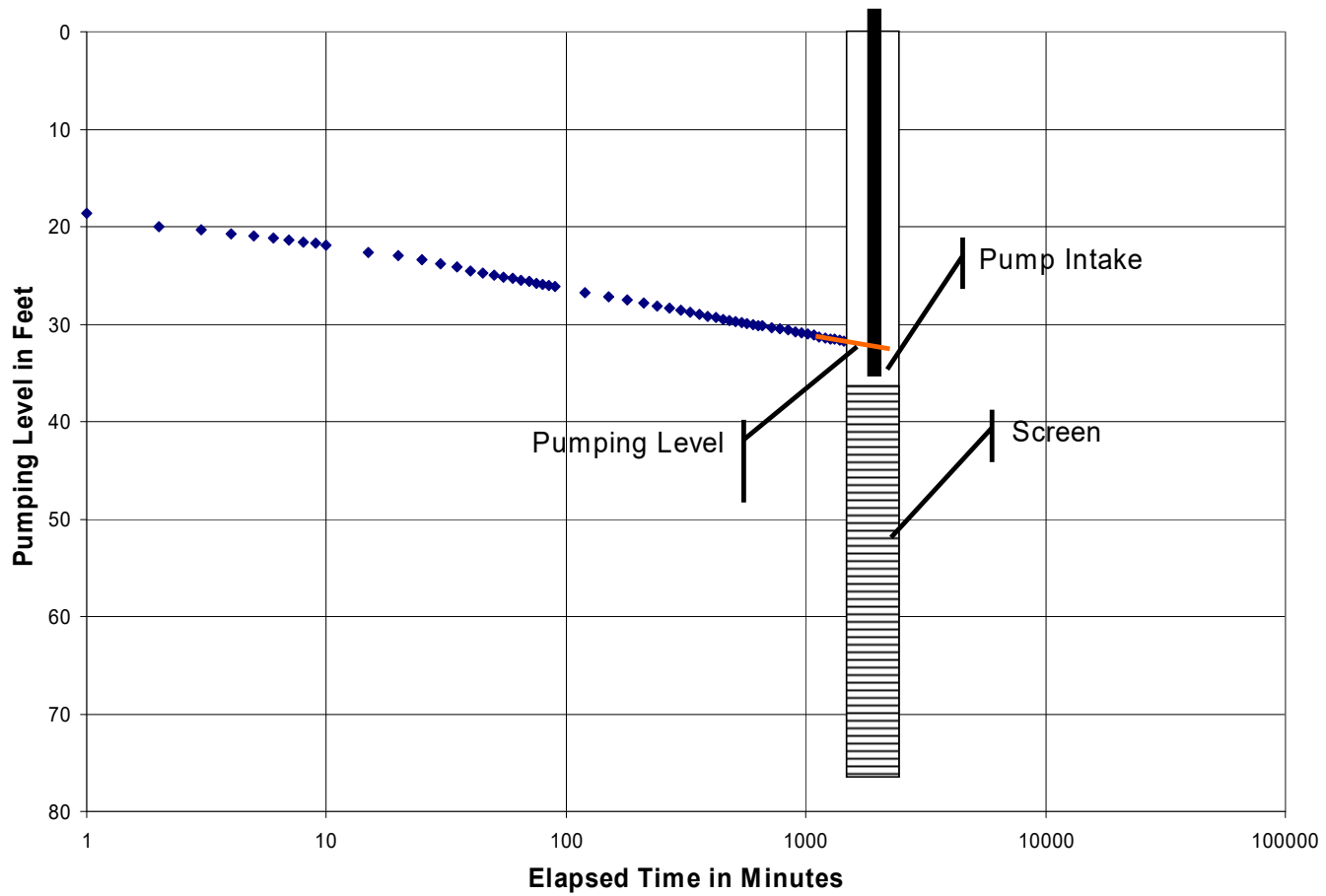
The Meaning of Specific Capacity



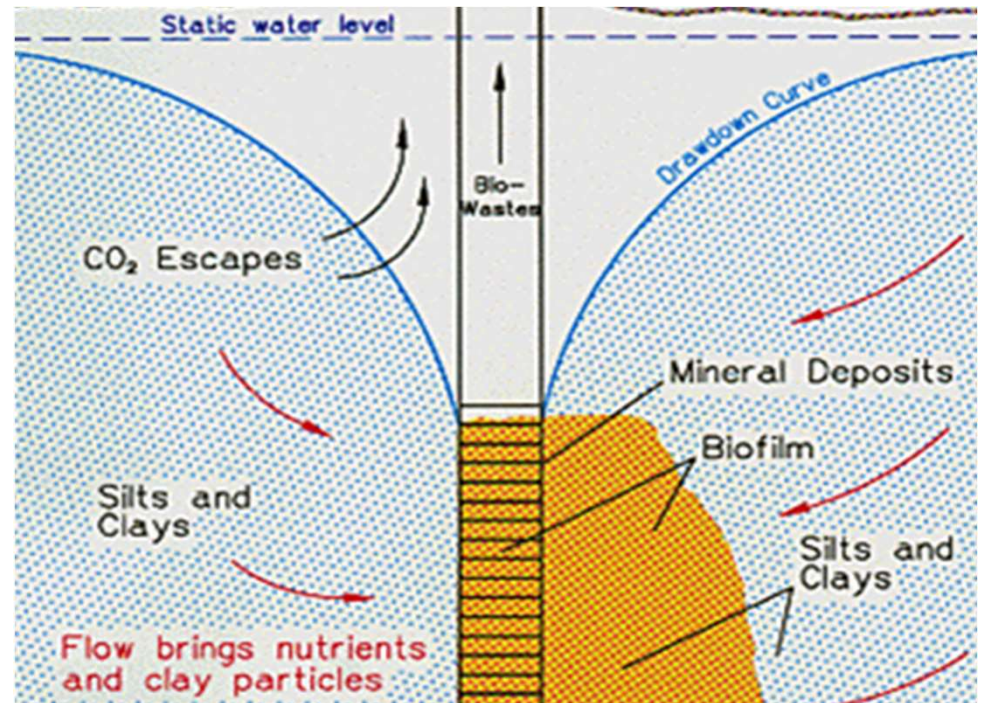
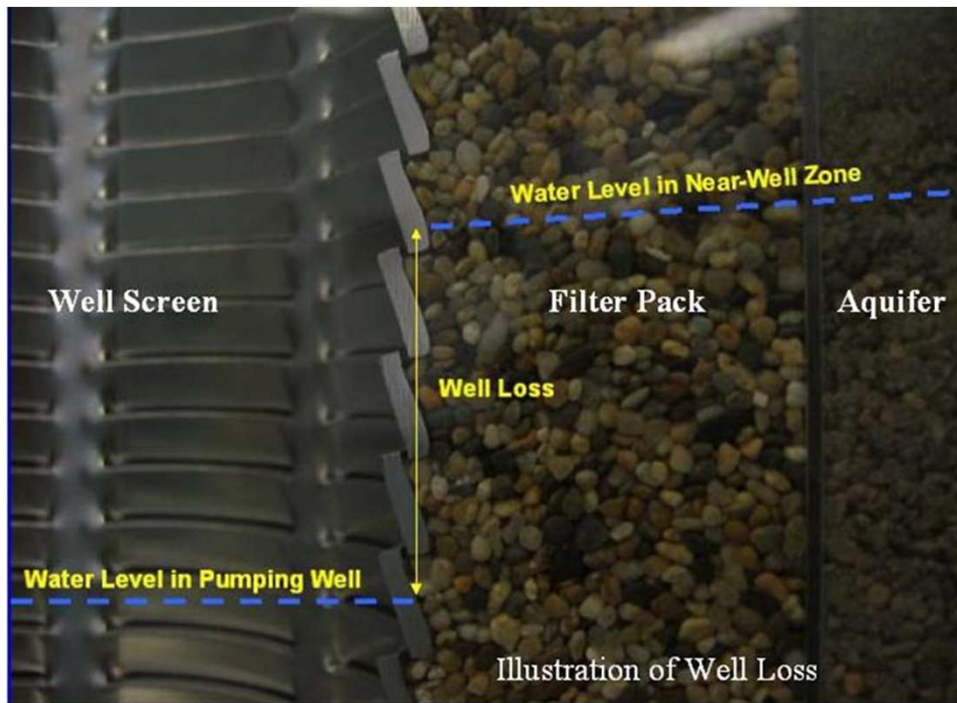
Specific Capacity =
Pumping Rate (GPM) / Drawdown

(gallons per minute per foot of drawdown)

Compare Historical Performance

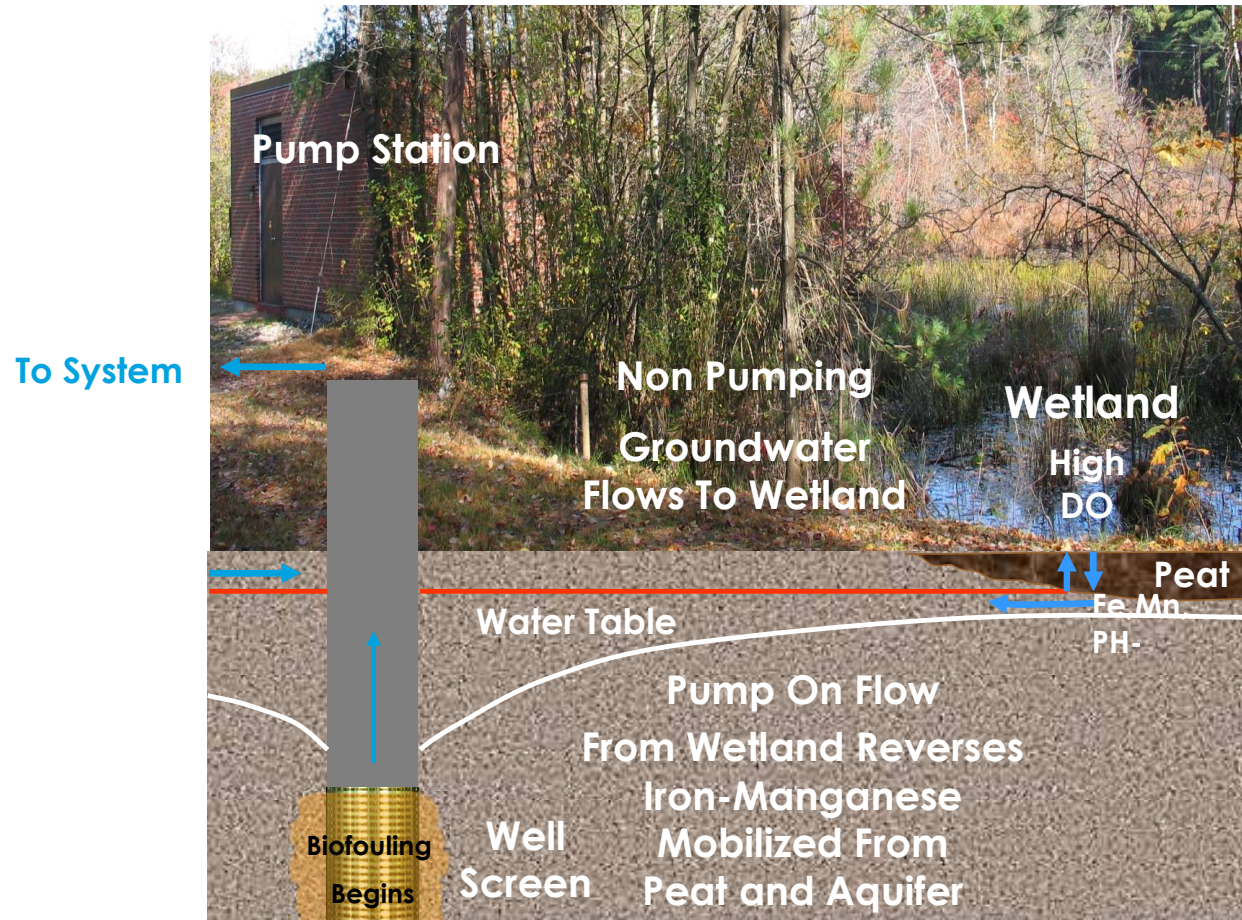


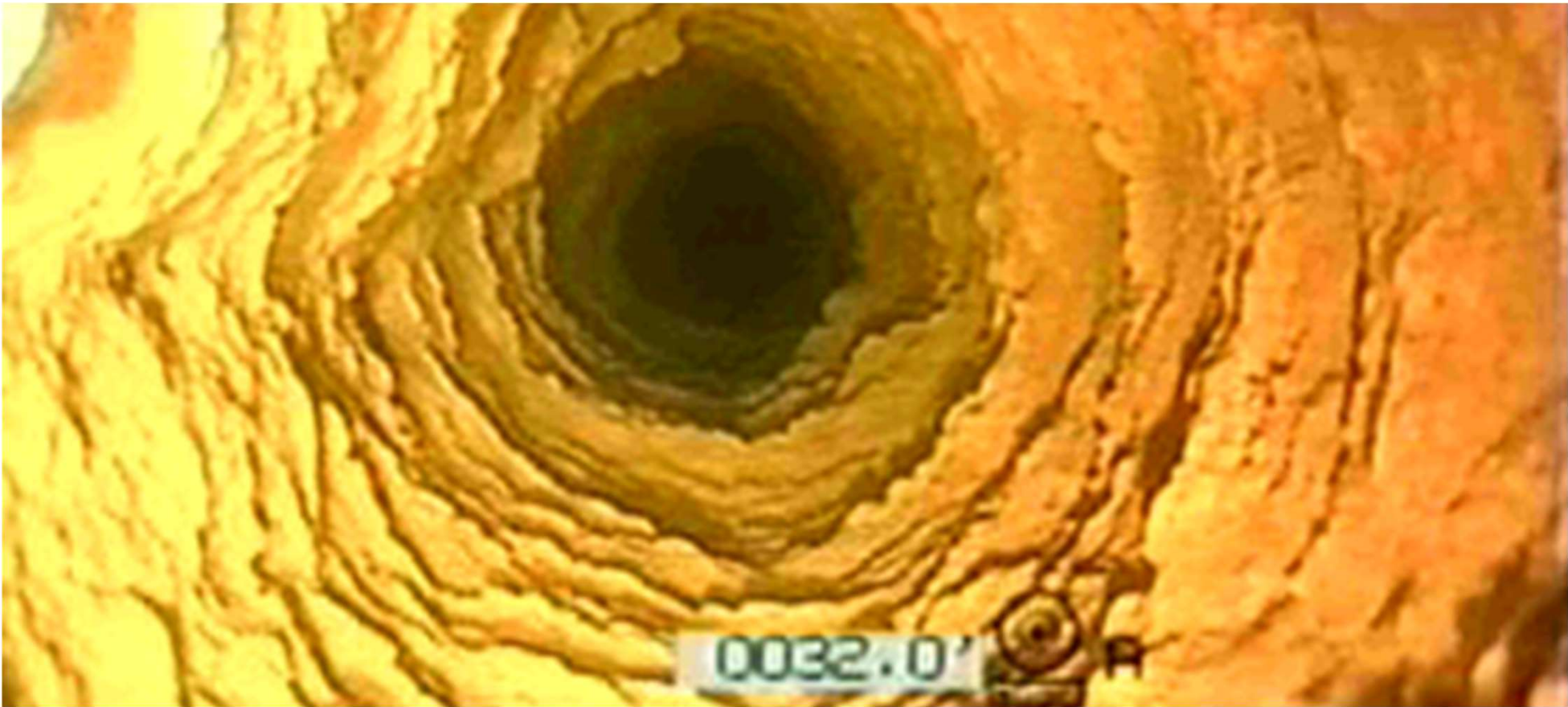
Causes of Head Loss



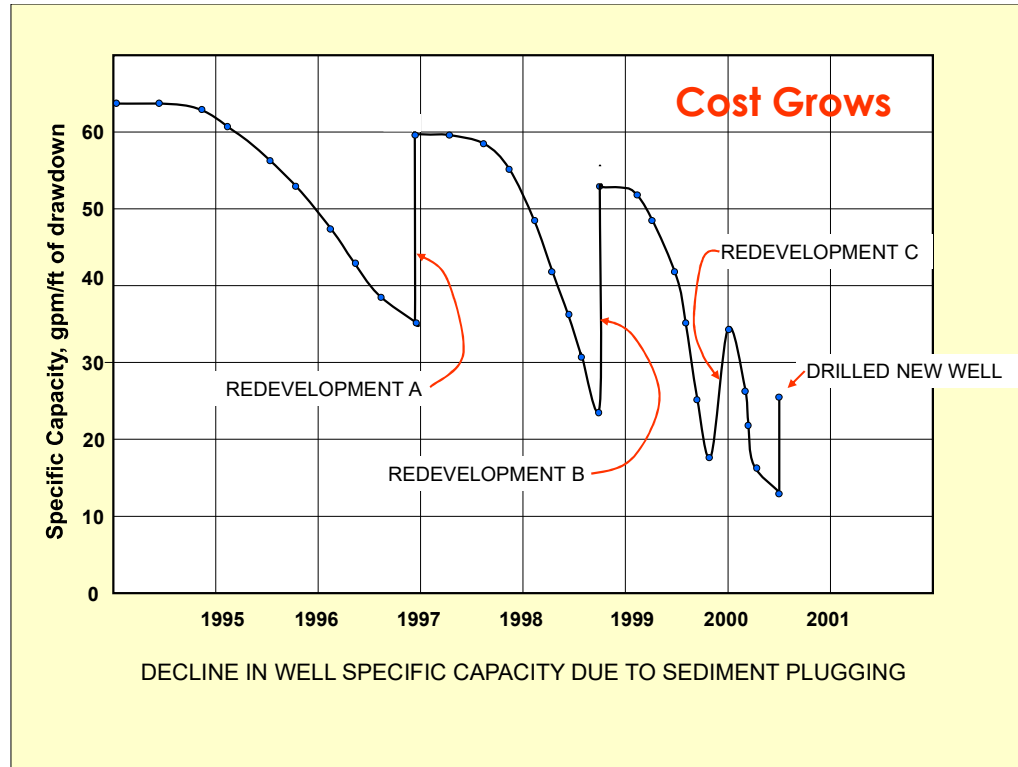
Problems commonly associated with a decline in well yield

Wetlands: Good or Bad? Source of Iron and Manganese





Waiting too long to react can result in an expensive solution



Pumping Level Declines Steadily Over Months Or Years

Pump Performance and Flow Declines



Cost Due to Increased Pumping Level

	Option 1	Option 2
Drawdown Increases (ft)	20	15
Pump Efficiency %	0.75	0.75
Power Cost	\$0.12	\$0.12
Cost Per Year	\$5,695	\$4,271

Be Proactive Not Reactive

- **Typical to wait until S/C declines 50% or more**
- **Too late and often impossible to restore yield to original capacity**
- **Initiate cleaning 10-20% decline in specific capacity**

What to do next?

- **Re-clean Wells Using Correct Acid Types**
 - Glycolic/Acetic Acids – Better Bactericidal
 - Combine With Hydrochloric/Sulfamic Acid
- **Do Not Use Polyphosphates**
 - Food For Iron Bacteria Growth
- **Use Polymers Instead**
 - Liquid Dispersant Of Clays and Silts
 - Reduces Development Time = \$ Savings
- **Use Sodium Hypochlorite 50 to 100 ppm**
- **Not Calcium Hypochlorite**
- **Why? Ca Raises pH**
- **Make Sure pH 6.0 to 6.5 – Most Effective**



Low Cost Way to Regain Volume



Problem	Approach	Solution
Well Capacity Decline	Downhole Television Preventative Maintenance	Redevelopment Satellite or Replacement
Sand Pumping	Downhole Television Rossum Sand Tester	Redevelopment Reline Screen
Iron & Manganese	Wetlands Nearby? Leaking Casing	Reduce Well Depth/Rate Move Well Farther Away

Downhole Well Video



Well Rehabilitation - Redevelopment

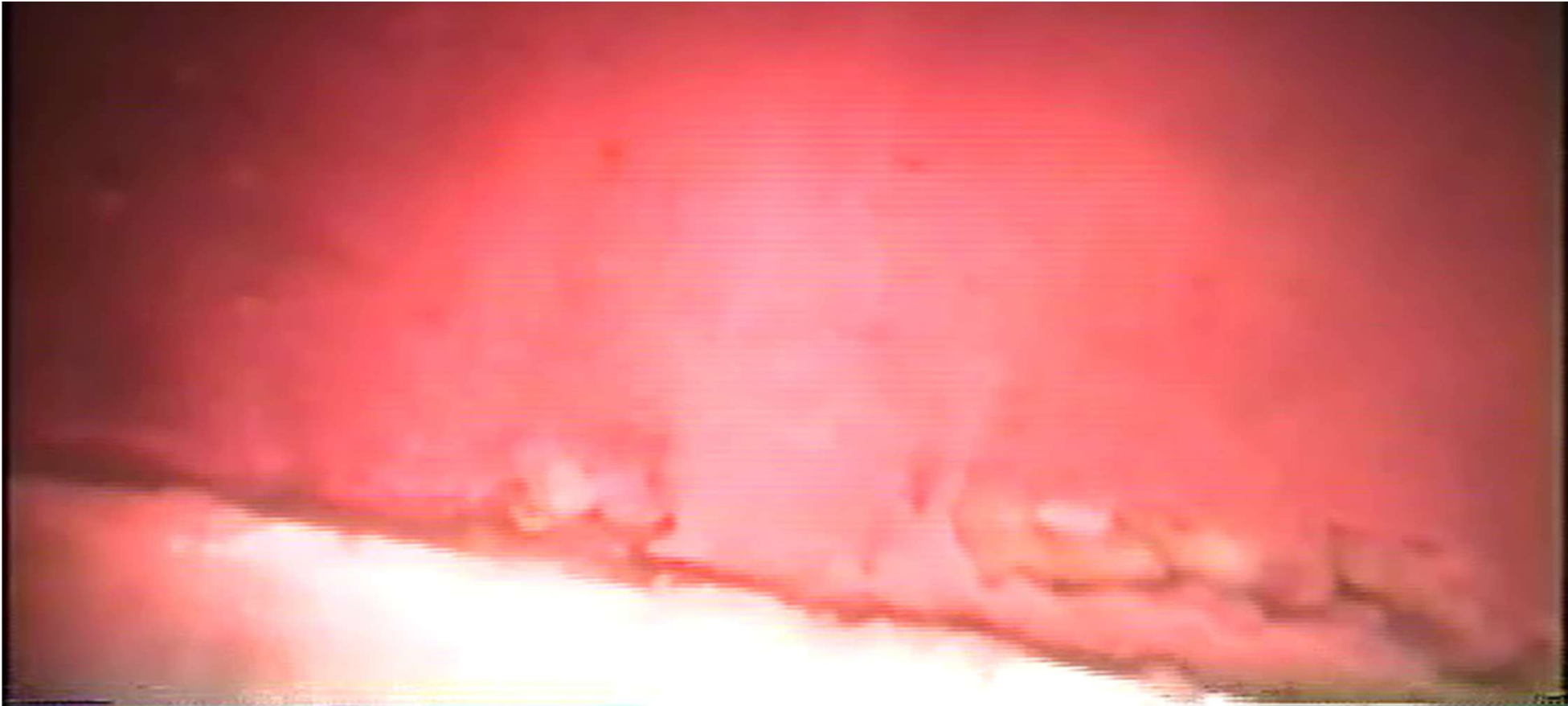


Other Solutions to Sustain Yield



- Construct Well Screen In Shallow Zone of the Aquifer
- Increase Screen Slot Opening
- Lower Pump Rates
- Cathodic Protection/Neoprene Packer/ PVC High Collapse Strength Casing
- Space Wells Farther Apart and From Surface Water/ Wetlands
- Increase Number of Pumping Wells
- Pump Constantly- Steady Flow

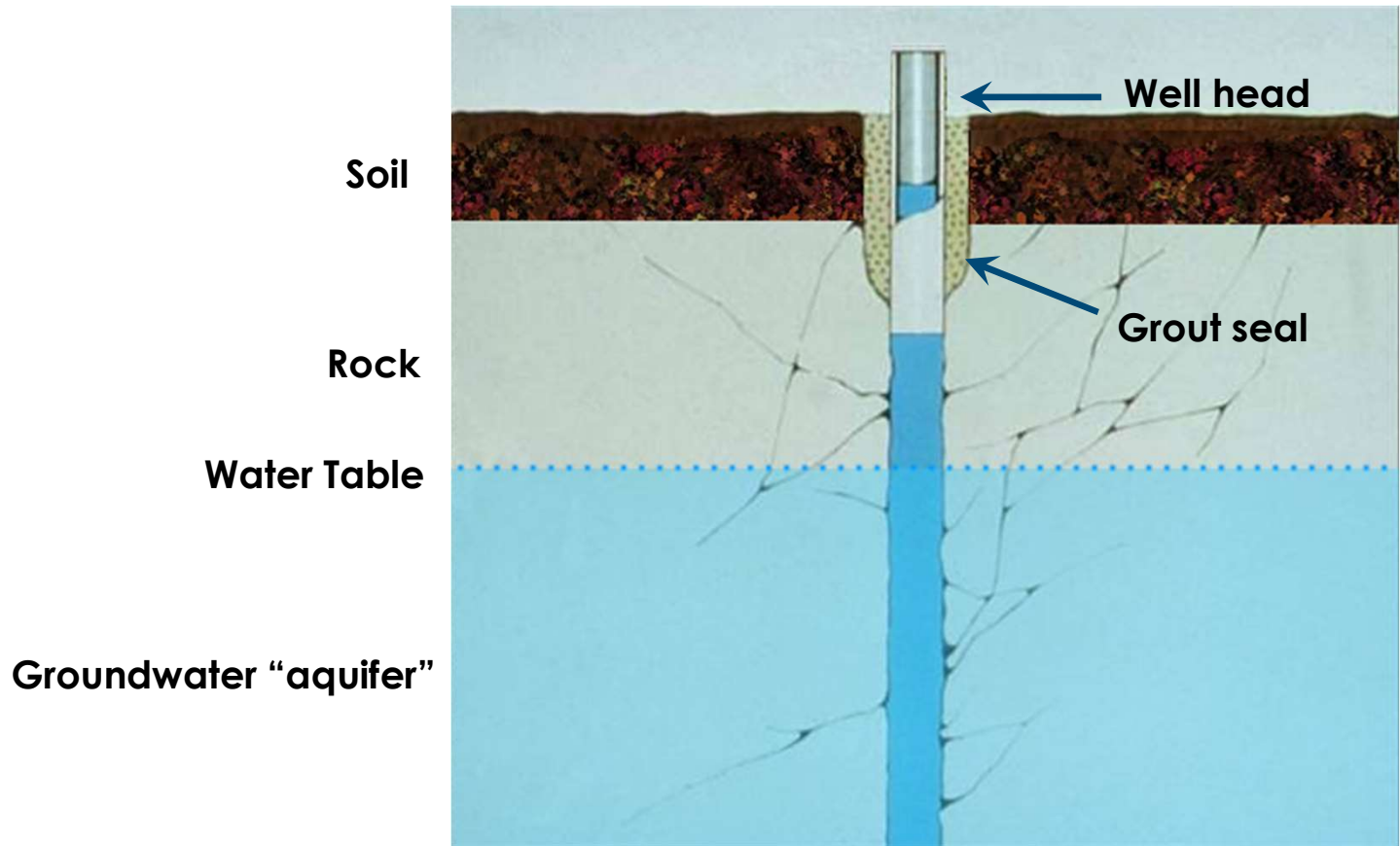




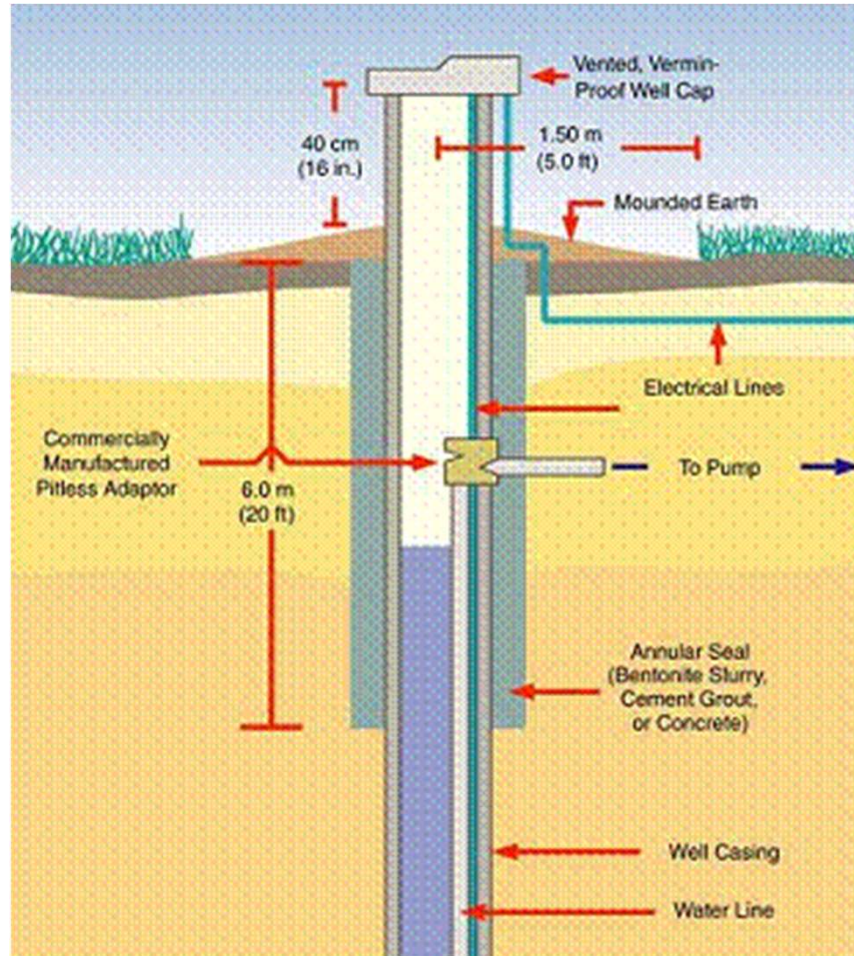
Compromised Well Integrity



Think about it! Bacteria can easily gain entrance to the water well.



Think about it! Bacteria can easily gain entrance to the water well.



Sanitary Well Cover



Redundant Supply – Backup well being drilled



Contact Information



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THANK YOU
