



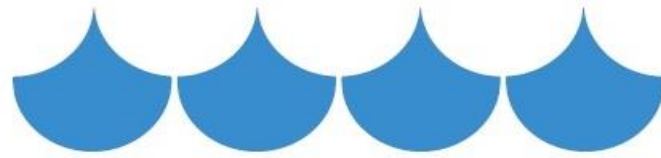
DEVELOPING & REHABILITATING WATER SUPPLY WELLS

Steve Schneider

Schneider Water Services

St. Paul, OR – Richland, WA

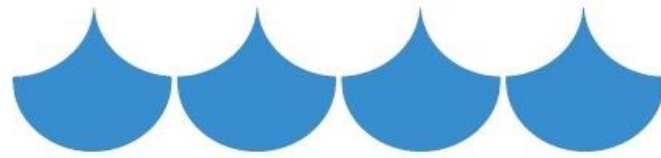
www.schneiderwater.com



DEVELOPMENT

The act of repairing damage to the formation caused during drilling procedures and increasing the porosity and permeability of the materials surrounding the intake portion of the well (Driscoll 1986)

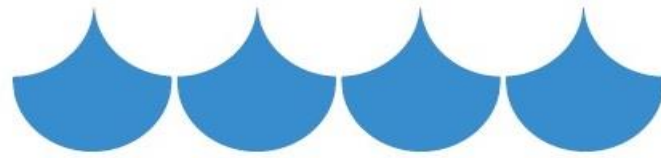
NGWA Lexicon of Groundwater and Water Well System Terms



REHABILITATION

The restoration of a well to its most efficient condition using a variety of chemical treatments, mechanical techniques, or reconstruction methods that are often combined for optimum effectiveness (Driscoll 1986)

NGWA Lexicon of Groundwater and Water Well System Terms



DEVELITATION

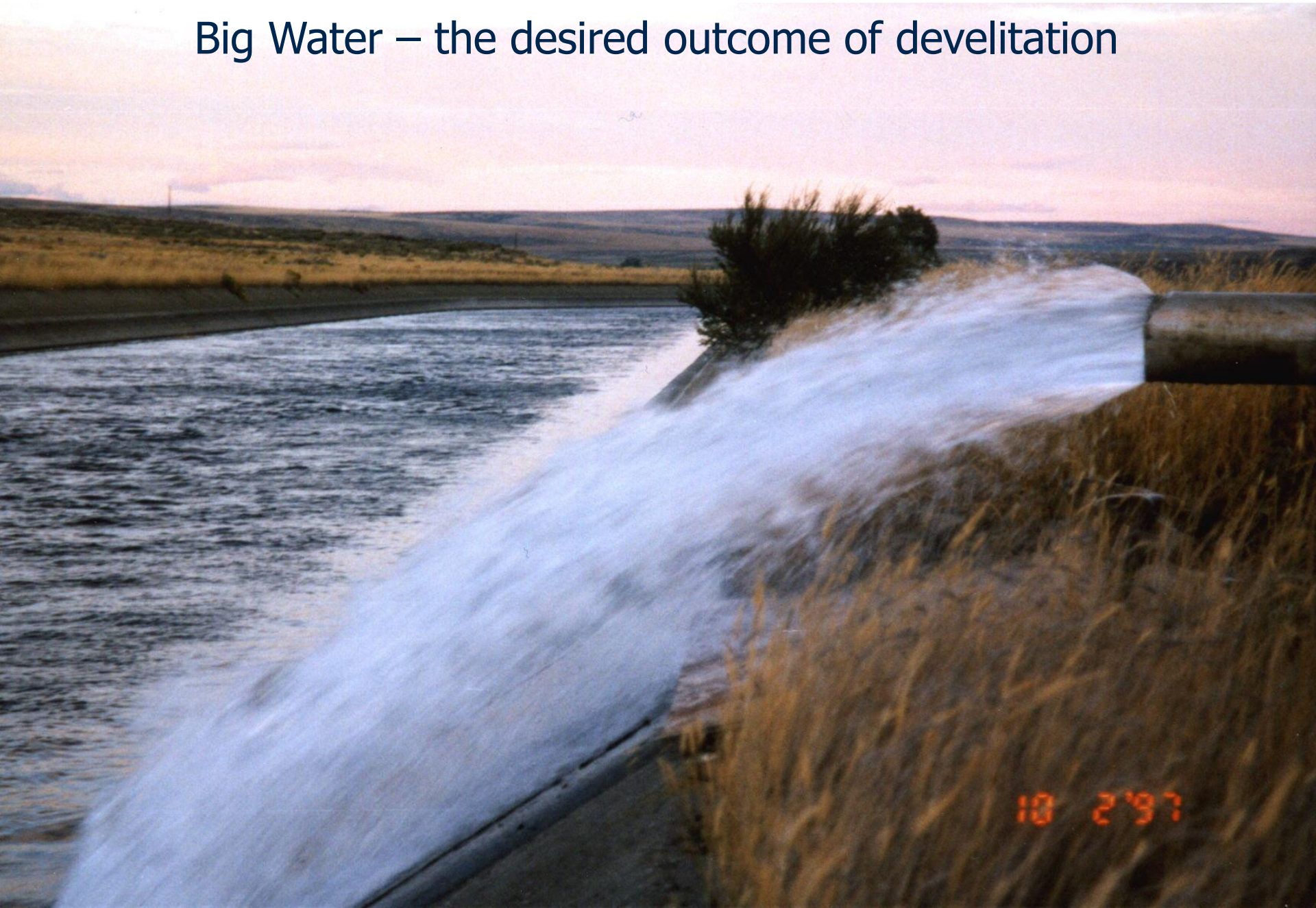
Repair Damage (from drilling, bacteria, mineral/chemical)

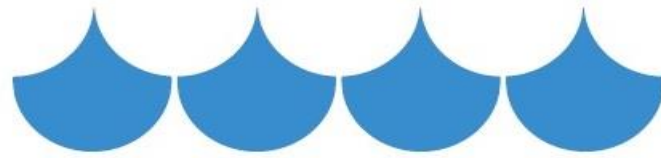
Restore Efficiency (increase porosity & permeability)

Use Mechanical Techniques (always)

& Chemicals (always & w/ mechanical – at least disinfectant)

Big Water – the desired outcome of develitation

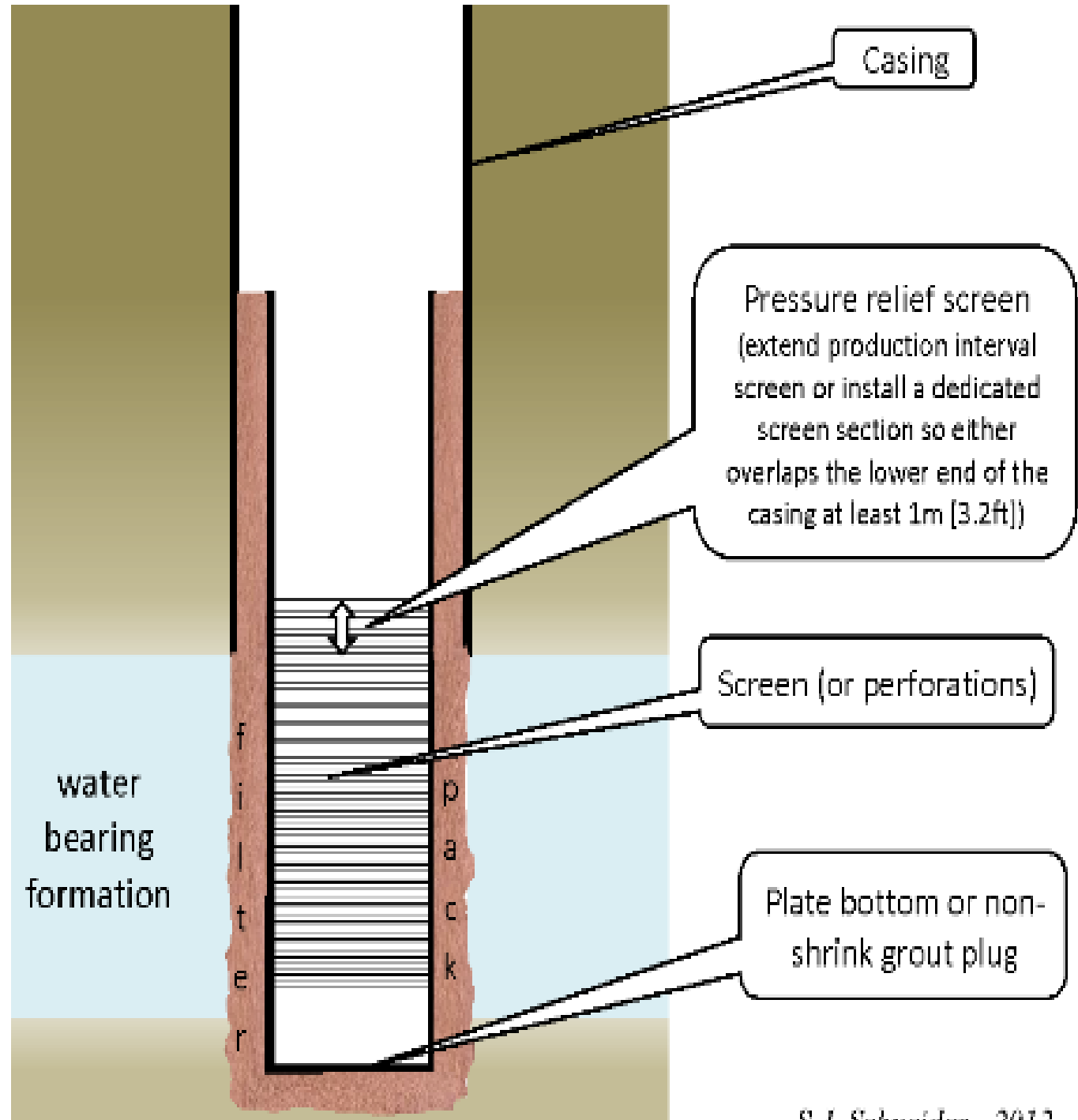
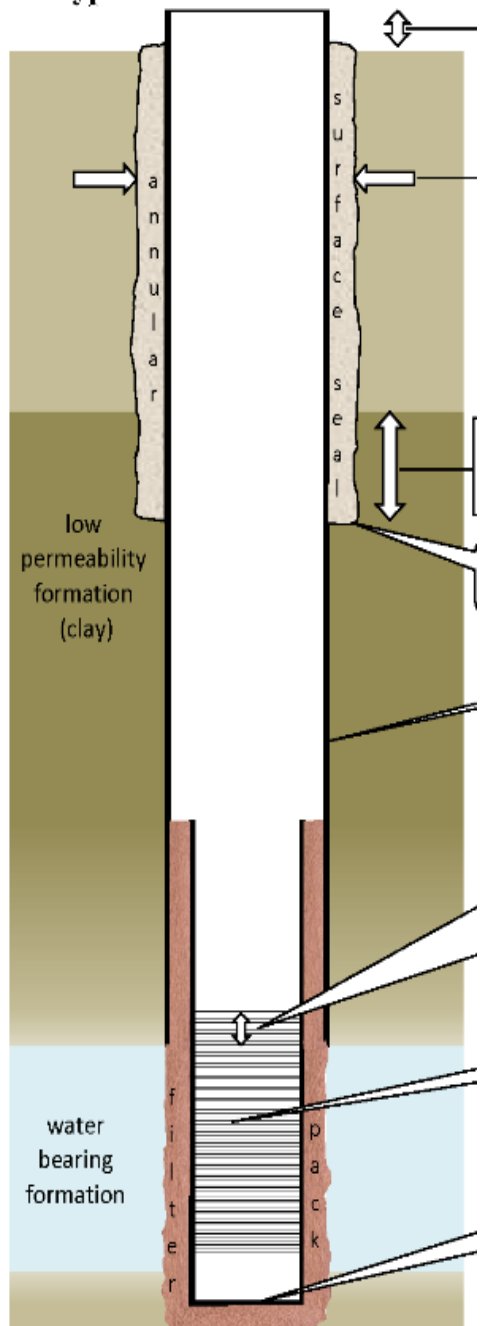


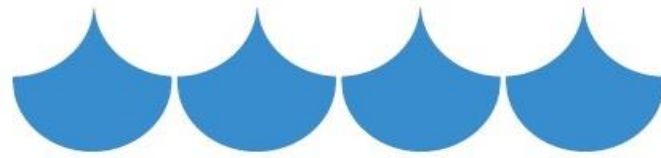


RESEARCH / DIAGNOSTICS – a.

- Well log
 - Mat'ls of construction (e.g. PVC SS or mild steel, screen/perfs & slot size, filter pack & size)
 - Diameters and depths (locations)
 - K-packers / relief screens
 - WBZ formation materials
 - SWL and date (seasonal)
 - Yield information (e.g. airlift, test pump)

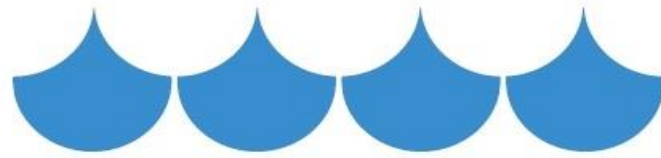
Unconsolidated Formation Type II Filter Packed Well





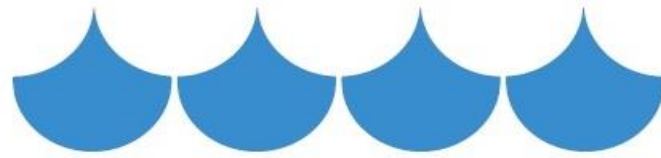
RESEARCH / DIAGNOSTICS – b.

- Drill method(s) used (new well or log)
- Video(s)
 - Original as built
 - Subsequent (if multiple videos, may show trend)
- Chemical analysis
 - On scale
 - On water
 - Visual - better than nothing (color, odor, hardness)



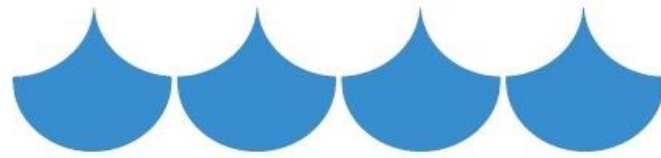
RESEARCH / DIAGNOSTICS – C.

- Subsequent SC or performance data
 - GPM/Ft DD
 - Duration
 - Trends? (e.g. sudden after recent pump repair)
- Site conditions
 - Access – for equipment
 - Fluid disposal (e.g. surface water nearby?)
 - Well in bldg or outside (pitless units are great!)



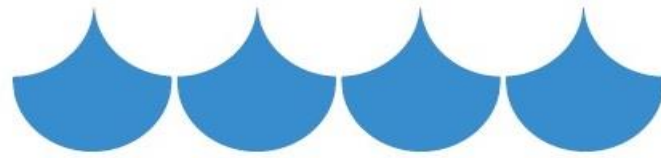
DEVELOP PLAN

- **Pre test - for specific capacity comparison**
 - 30 minute
 - Constant rate
 - 5 minute readings
- **Chemical analysis (if not recently done)**
 - Visual (esp. on scale – color, hardness, odor)
 - IB (clear container & Cl₂ test)
 - Other (e.g. Iron, Mg, Calcium)



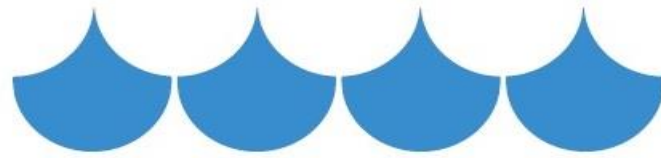
DEVELOP PLAN

- **Video**
 - Quality matters
 - Clarify well
 - Side view
 - Zoom, focus, iris, white balance, etc
- **Brush**
- **Other Mechanical**
- **Interim tests**



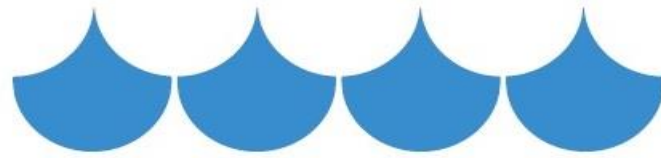
DEVELOP PLAN

- Chemical w/agitation
- Monitor & adjust chemicals
- Interim test (SC – 30 min)
- Video
- Pump – rawhide
- Post test (SC – 30 min or longer)



DEVELOP PLAN

- A. Pre test (30 min - CR SC, 5 min)
- B. Chemical analysis
- C. Video
- D. Brush
- E. Other Mechanical
- F. Interim tests
- G. Chemical w/agitation
- H. Monitor & adjust chemicals
- I. Interim test
- J. Video
- K. Pump – rawhide
- L. Post test

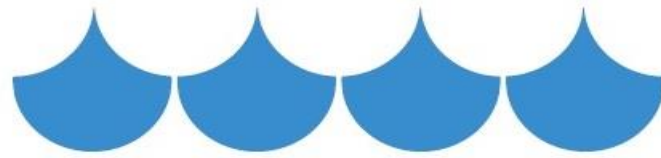


PEARSON'S LAW

*"When performance is measured,
performance improves."*

*"When performance is measured and
reported back, the rate of improvement
accelerates."*

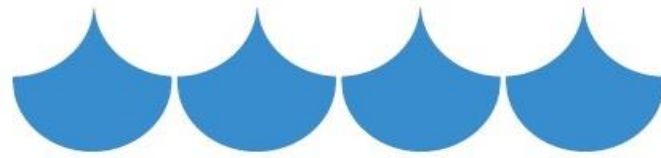
Karl Pearson



INSANITY DEFINED

**Insanity: doing the same
thing over and over again and
expecting different results.**

Albert Einstein



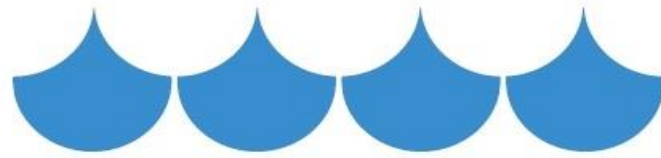
PEARSON'S LAW

"That which is measured improves. That which is measured and reported improves exponentially."

Document results at each step.

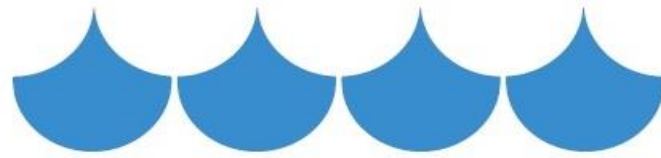
Review reported results.

Repeat or change approach.



UNDERSTANDING TERMS

- **Brush**
- **Surge block**
- **Swab**
- **Jetting**
- **Rawhide**
- **Other tools/methods**
- **Impulse Generator (impulse resonator)**

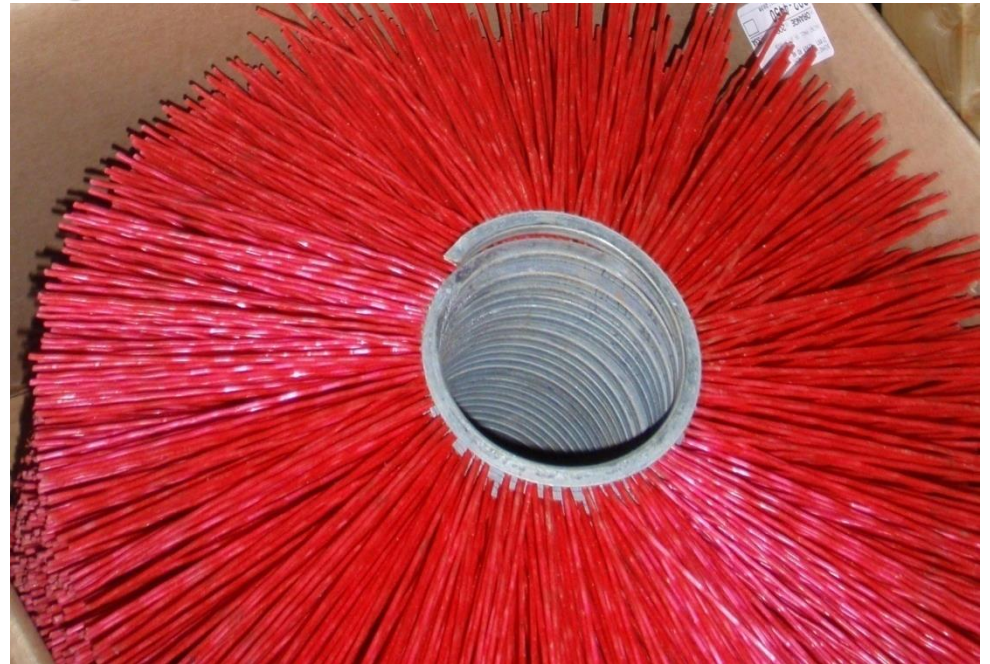


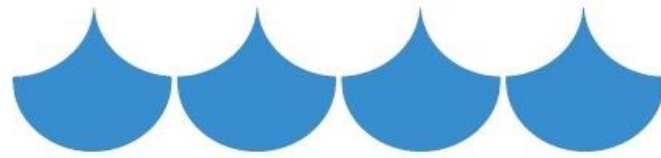
BRUSH

Wire – for casing, including perforations; esp. encrusted.



Nylon – mud; wire wrap screens





SURGE BLOCK (cable tool)

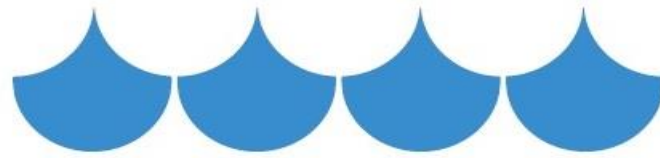
A plunger-like tool consisting of leather or rubber discs sandwiched between steel or wooden discs that may be solid or valved that is used in well development

SURGING – ...surge block is alternatively lifted and dropped within the borehole above or adjacent to the screen to create a strong inward and outward movement of water...

NGWA Lexicon of Groundwater and Water Well System Terms

■ APPLICATION

- CABLE TOOL
- WIRE WRAP SCREENS

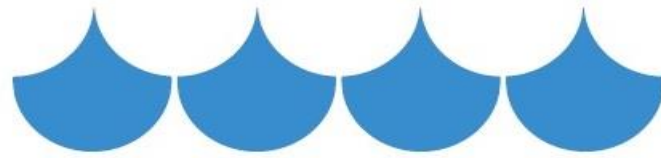


SWAB

Hi speed sandline & HP
Thru perfs / screens
Above perfs / screens

Differential pressure
Pull water over top (high SWL)
Compute ~gpm

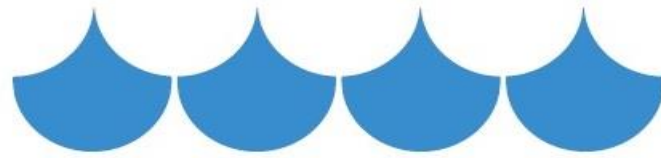




JETTING

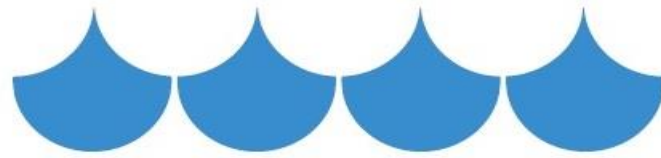
- Water (air not recommended)
- Pump (constant or intermittent to remove fines)
- Clean water (dirty is abrasive & plugs)
- PSI, gpm, hole diameter per GW & Wells
- Screens - not recommended for perfs





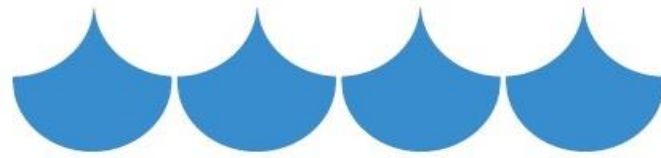
PUMP DEVELITATION

- **Common Terms:**
 - Rawhiding
 - Pump-and-surge
 - Backwashing
 - Overpumping
- **No foot valve**
- **Last mechanical step in plan**
- **If TP, > design Q at max PL (e.g. 50%>)**



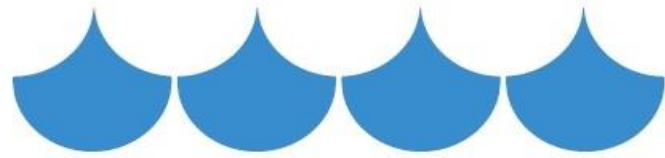
OTHER TOOLS/METHODS

- Freezing – been there, done that
 - Liquid CO₂
 - Path of least resistance, not where problem is
 - Bottle your own carbonated water
- Blasting
 - One shot
 - Dangerous
 - Leaves residue/debris
 - Requires explosive lic. (Homeland Sec.)

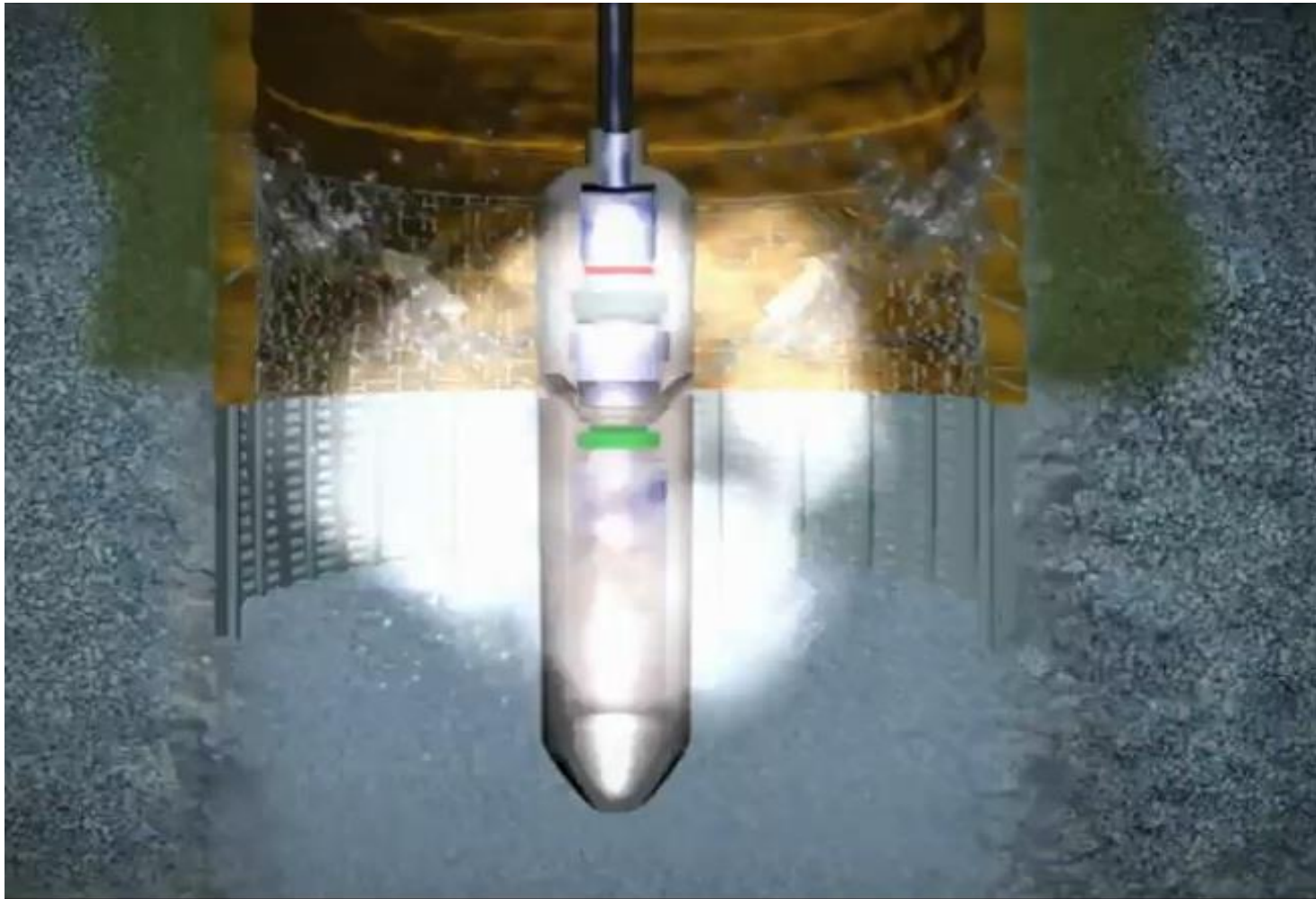


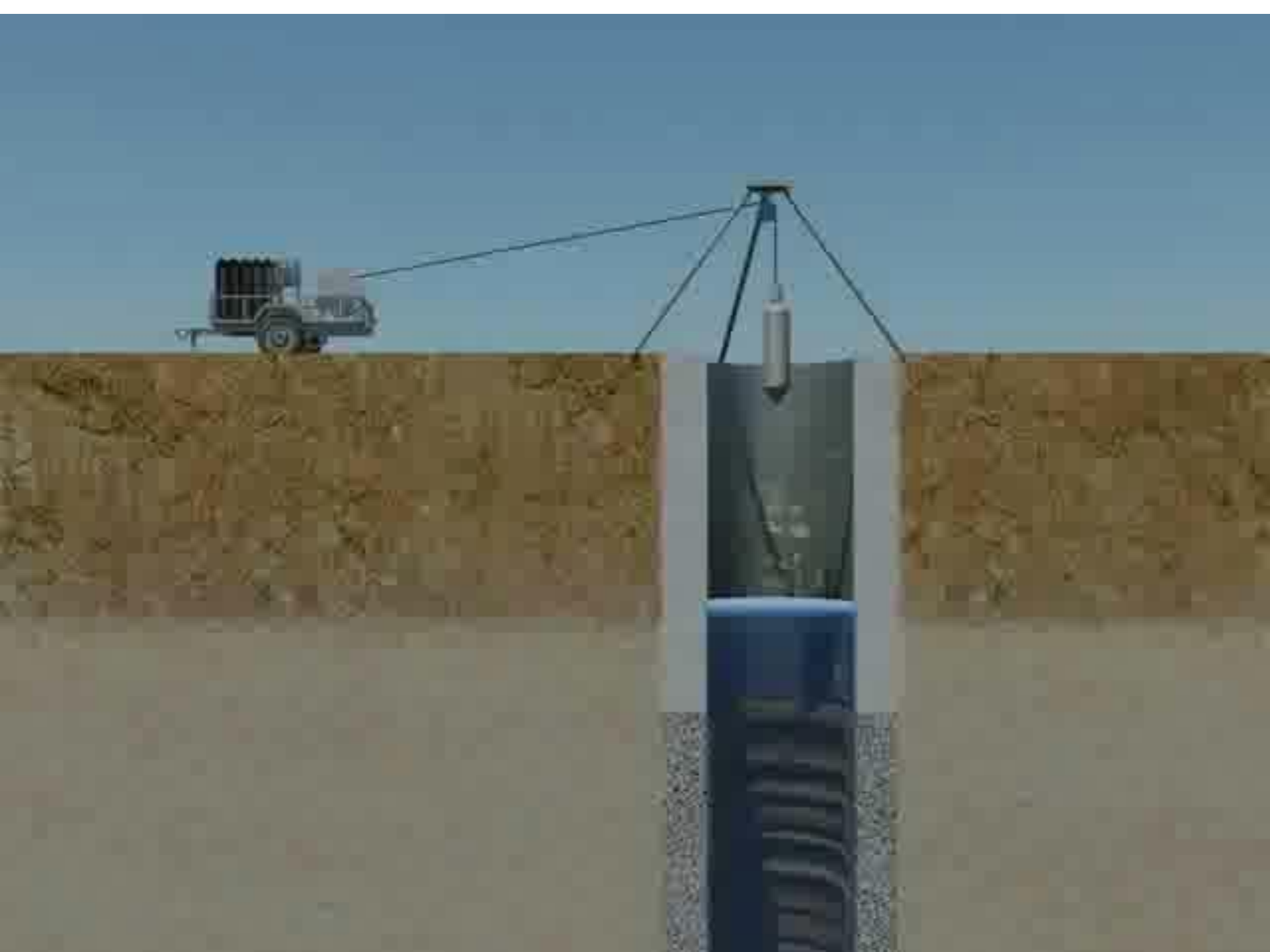
OTHER TOOLS/METHODS

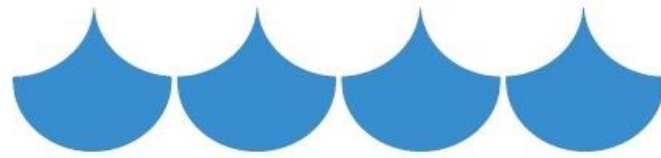
- **Hydrofrac**
 - High PSI water injection
 - Application: Very low yield rock wells
 - Requires packer against formation below well annular seal
 - NA for filter pack wells
 - Requires liner removal



IMPULSE GENERATOR

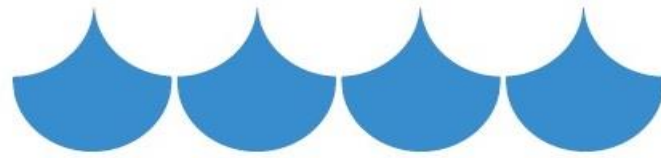






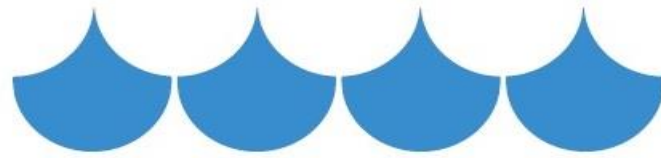
IMPULSE GENERATOR

- Repeated instantaneous releases of high-pressure gas
- Creates concussive shock waves
- Expanding, contracting and oscillating bubbles
- Intensely surges water in and out of the gravel pack, screen and/or aquifer
- Breaks up scale and encrustation
- Removes bacteria slime/biofouling



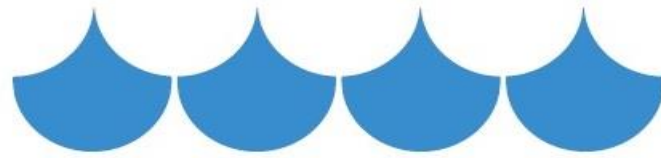
IG ADVANTAGES

- Safe and Environmentally friendly
 - Green process (inert gas)
 - No chemical by-products
 - No explosives
- Highly effective for both screened and open boreholes
- Minimizes well downtime
- Can isolate treatment to specific areas – precisely directs energy (e.g. dual disc isolator)



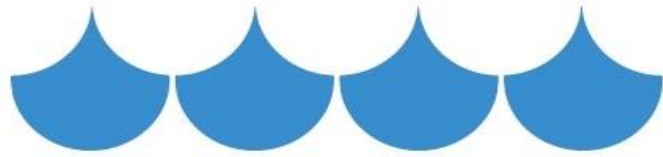
IG ADVANTAGES

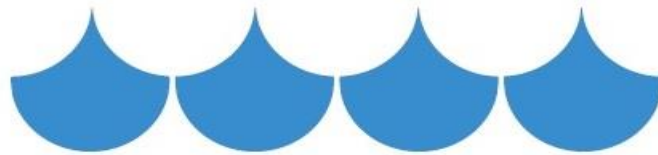
- Adjustable energy intensity @ surface
- Multiple passes without tool removal
- Can pump and monitor effectiveness during operation
 - create underbalance to improve effectiveness (recommended)



IG ADVANTAGES

- Will not facilitate bacteria growth
 - No oxygenation
 - No organic material introduced
- Can be used in combination with chemical
 - Disperses
 - Agitates





WELL DRILLING
PUMP * CONTROLS
SALES & SERVICE

SCHNEIDER
EQUIPMENT, INC.
WATER SERVICES

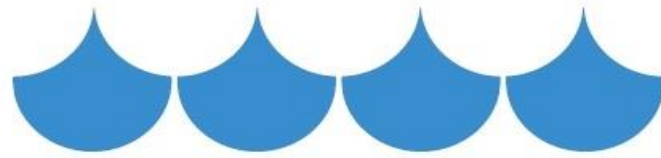
ST. PAUL, OR
(503) 633-2666

SINCE 1945
OR CCB: 39265
WA UBI: 600202757

RICHLAND, WA
(509) 943-0331

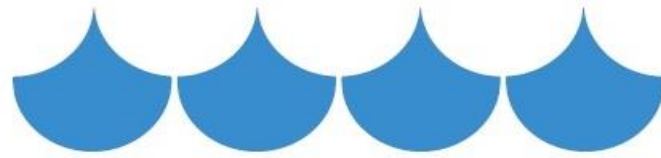
21881 River Rd N.E., St. Paul, OR 97137
www.seidc.com

AIRSHOCK



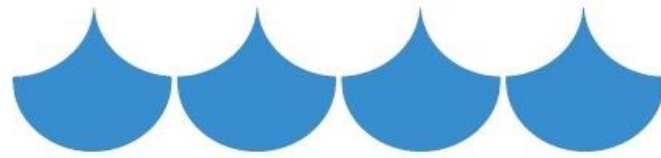
PRICING DEVELOPMENT

- Mobilization / demobilization (LS)
 - Jetting
 - IG
 - Test pump
 - Chemical (injection and treatment)
- Materials (LS, unit price, or cost plus)
 - Chemicals
 - Nitrogen
- Video (each)
- Hourly
 - Swab, bail, brush, pump, IG, etc.



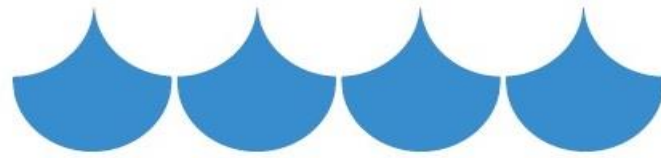
IN-SITU REHABILITATION

- **Dedicated access tube**
 - Attach to, and run past, pump
 - Guide into liner/screen assy
 - 2" or larger
- **Video**
 - Static conditions
 - While pumping (if cautious)
- **IG – (static & while pumping)**
- **Chemicals (IG to agitate)**



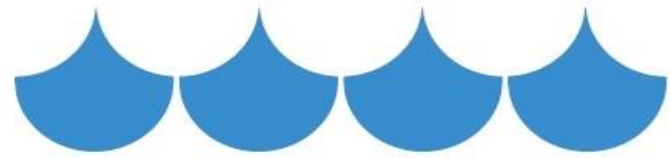
RECOMMENDATIONS

- **ANNUAL SWL – March or prior to start of seasonal use**
- **Add short SC test @ annual SWL**
- **Add bacti test @ annual SWL– if have any domestic uses, incl other well(s)**
- **Video if remove pump**

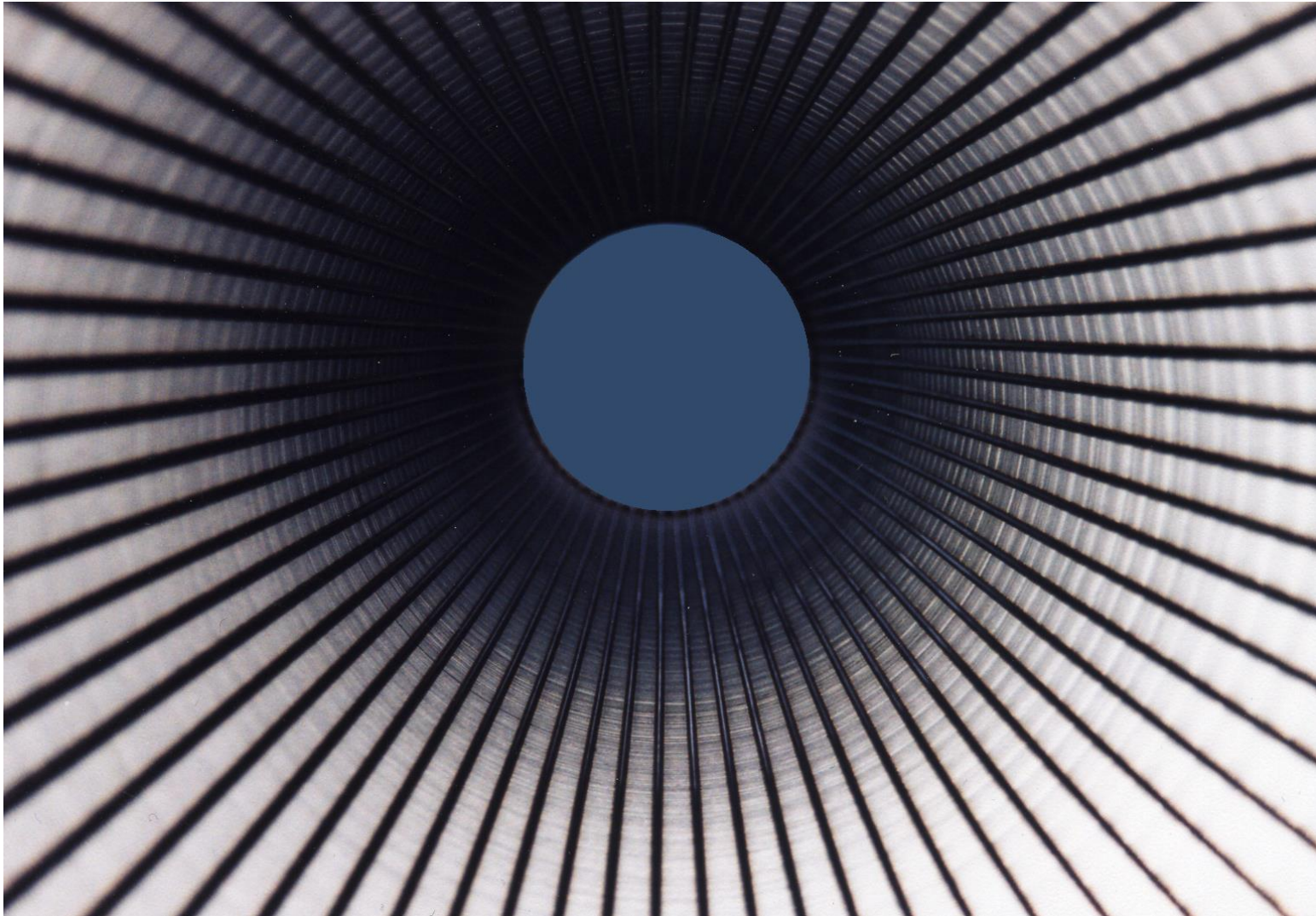


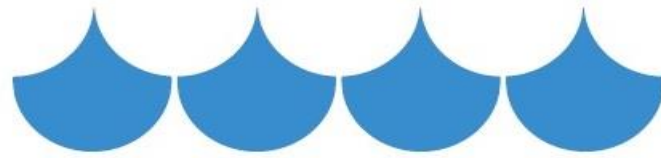
RECOMMENDATIONS

- Don't put off rehabilitation
 - 10% drop in SC or pump removal
 - Extend life of well past 25-35 years
- DOCUMENT
- DOCUMENT
- DOCUMENT



RESULTS





QUESTIONS - DISCUSSION?



Steve Schneider

steve@schneiderwater.com

Kriss Schneider

kriss@schneiderwater.com

Schneider Water Services

www.schneiderwater.com