

WELL DEVELOPMENT & REHABILITATION

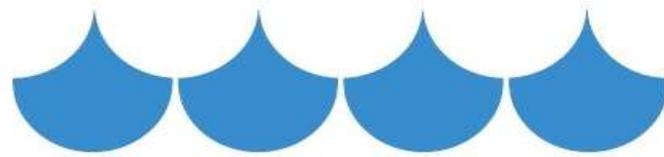
Kriss Schneider and Steve Schneider
President Vice President

Schneider Water Services

St. Paul, OR – Richland, WA

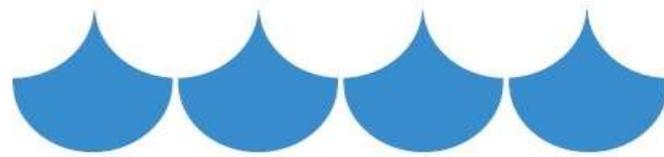
www.schneiderwater.com

PNWS AWWA Conference – Bellevue 2015



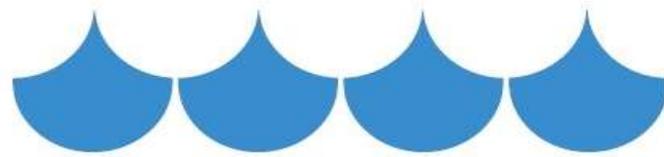
WHO IS KRISS?

- President and 3rd generation owner of SWS
- Bachelors Degree from George Fox University
- Responsible for the Sales and Service Div. (Pumps, Electrical, Machine Shop, etc.)
- Licensed/Bonded driller in OR, WA and ID
- Licensed Electrician/Pump Installer OR, WA
- 26 Years of Drilling and Well Repair Experience



WHO IS STEVE?

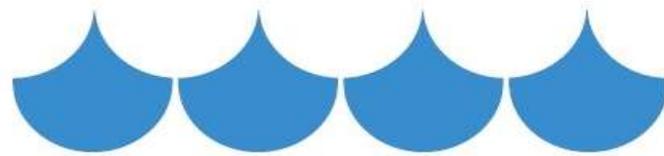
- Vice President and 2nd generation owner of SWS
- Mechanical Engineer from OSU
- Responsible for the Drilling Division
- Licensed/Bonded driller in OR, WA and ID
- 40+ Years of Drilling and Well Repair Experience
- Involved with Education and Training in the US and Developing Countries



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

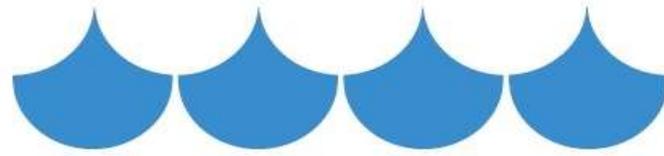
National Ground Water Association's

Lexicon of Groundwater and Water Well System Terms



drill collar
heat sink
percent water
zone of saturation
water table
vertical closed loop
well development
filtrate
leachate
loop field
water budget
yield point
hollow-stem auger
borehole
slug test
monitoring well
tremie line
induced infiltration
aquifer
groundwater
recharge
plume
hydrogeology
abandoned well
bailer





DEVELITATION

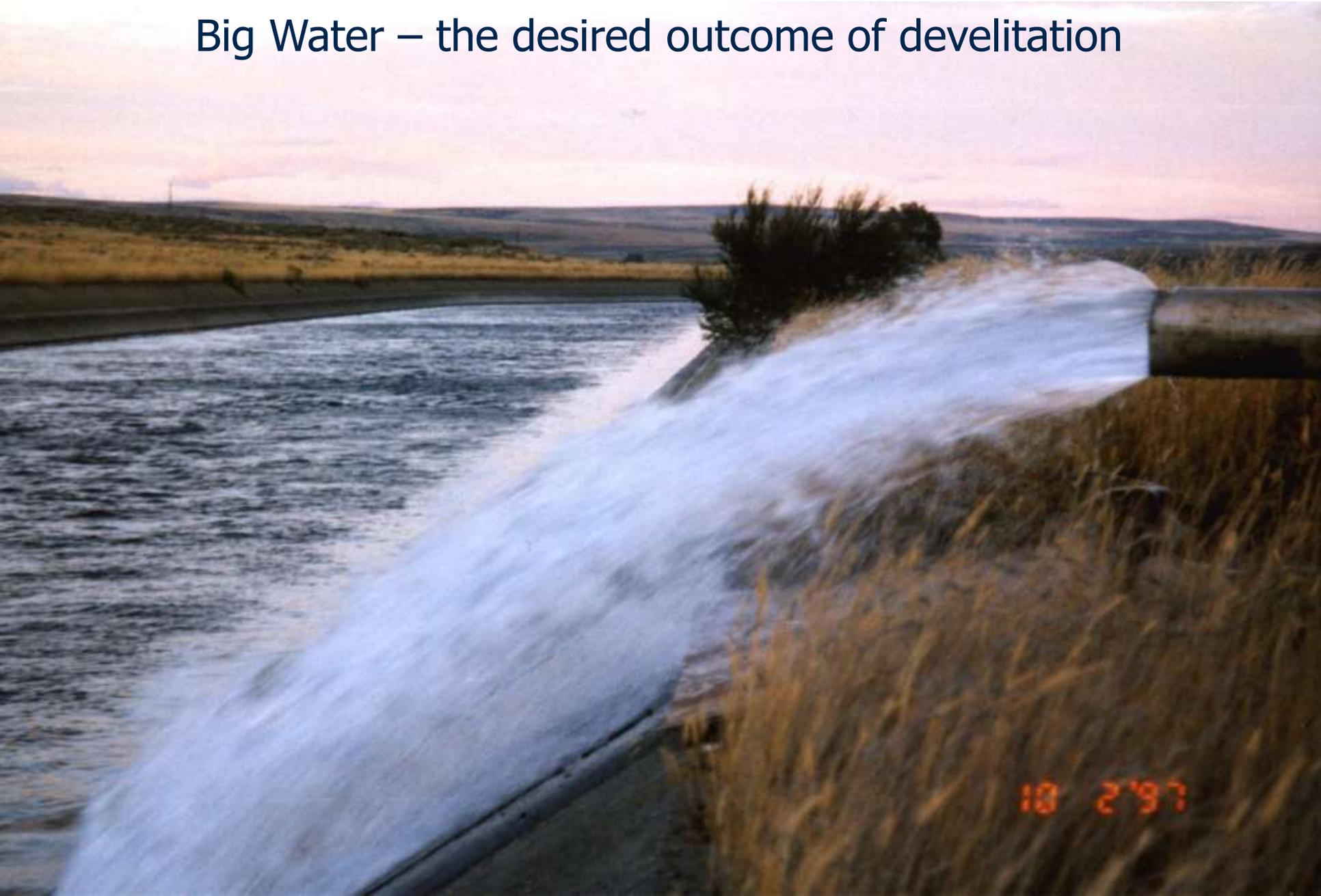
Repair Damage (from drilling, bacteria, mineral/chemical)

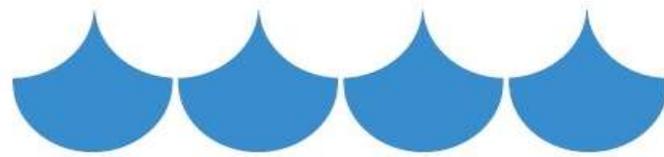
Restore Efficiency (increase porosity & permeability)

Use Mechanical Techniques (always)

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

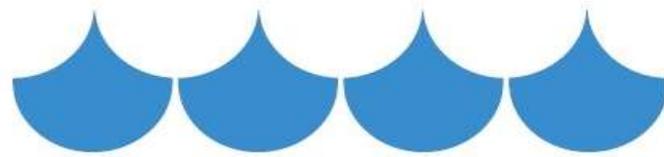
Big Water – the desired outcome of develitation





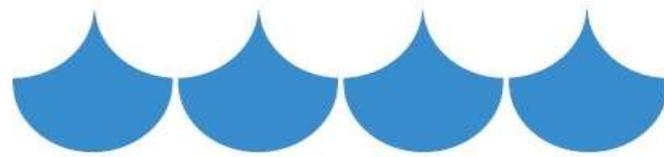
RESEARCH / DIAGNOSTICS

- Well log (incl. mat'ls of construction)
- Drill method(s) used
- Chemical analysis (scale & water)
- Video(s)
- Specific capacity data (GPM/Ft DD)
- Site conditions (access, fluid disposal, etc)



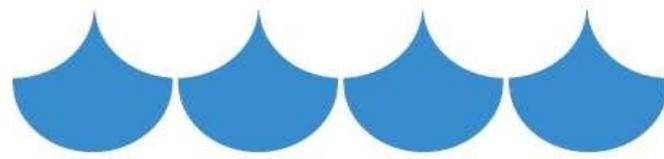
DEVELOP PLAN

- 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



UNDERSTANDING TERMS

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



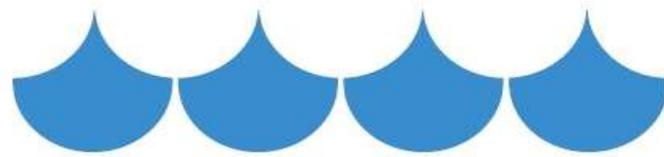
BRUSH

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



Nylon – mud; wire wrap screens





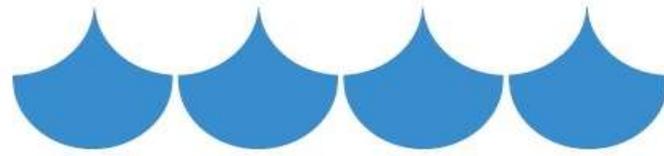
SURGE BLOCK (cable tool)

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**

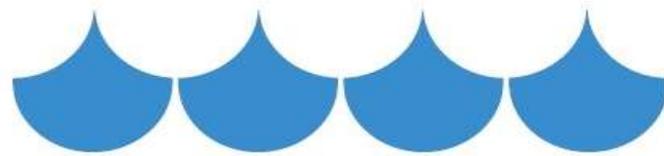


SWAB

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

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

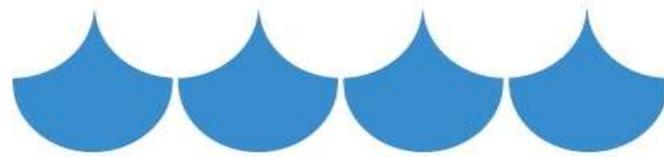




JETTING

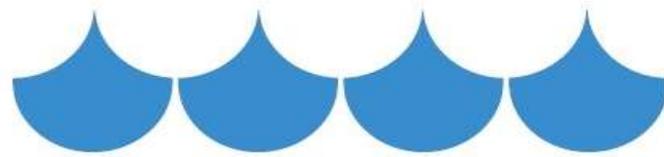
- Water (air not recommended)
- Pump (constant or intermittent to remove fines)
- Clean water (dirty is abrasive & plugs)
- PSI, gpm, hole diameter per GW & Wells
- Screens - not recommended for perfs





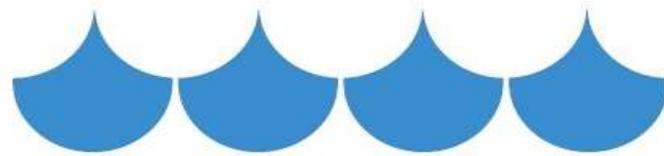
PUMP DEVELITATION

- **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%>)**



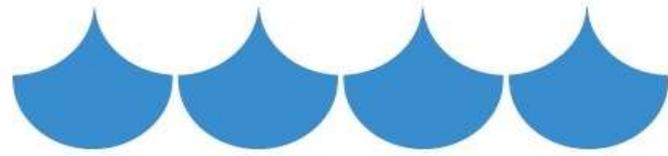
OTHER TOOLS/METHODS

- 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



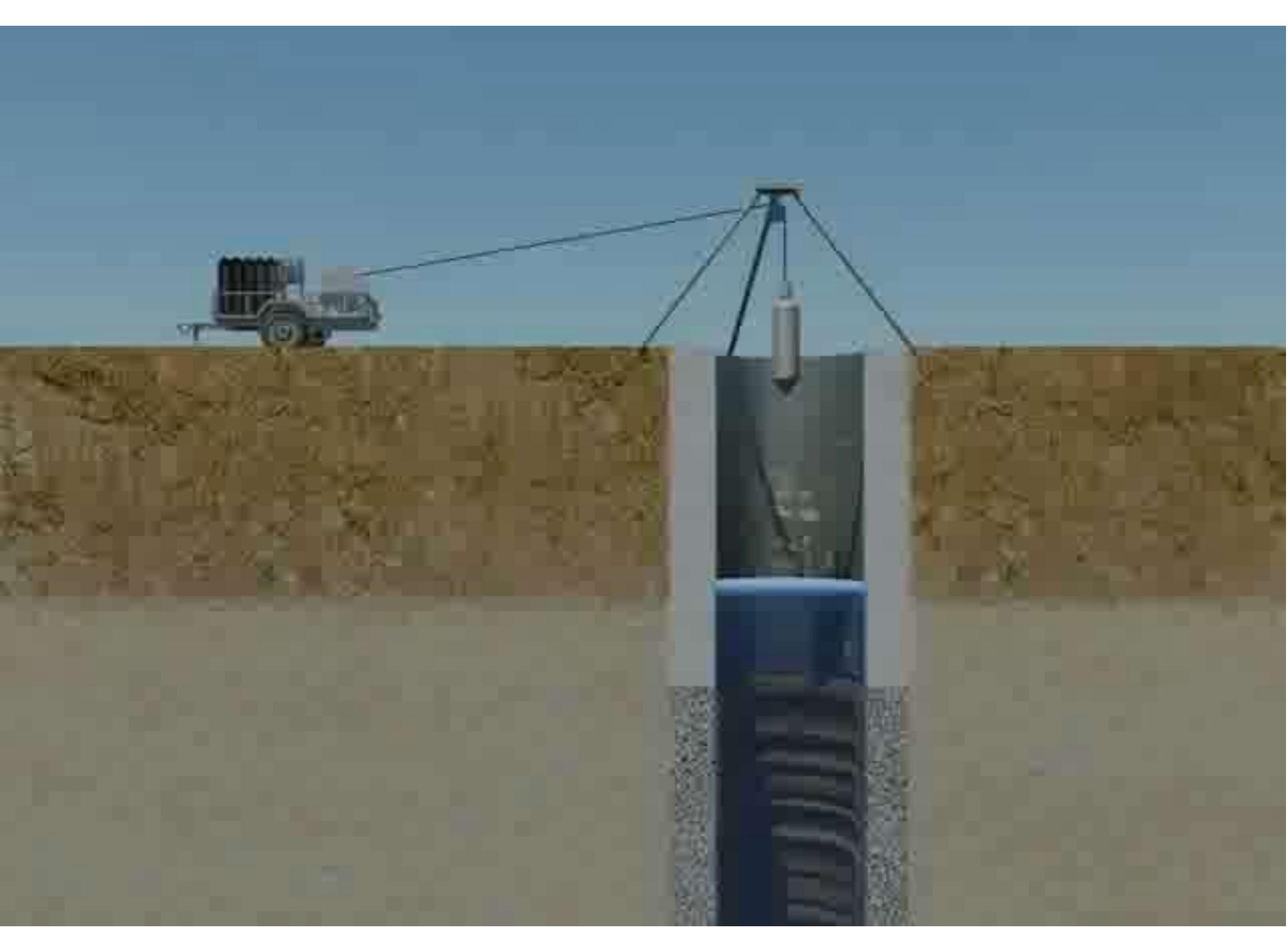
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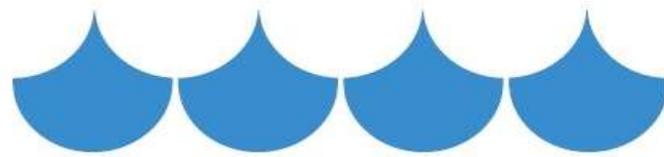
- **Hydrofrac**
 - High PSI water injection
 - Application: Very low yield rock wells
 - Requires packer against formation below well annular seal
 - NA for filter pack wells
 - Requires liner removal



IMPULSE GENERATOR

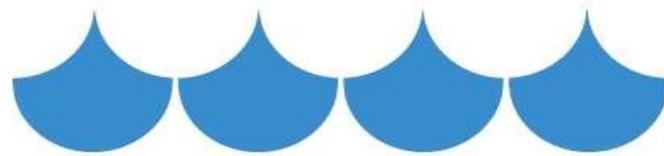






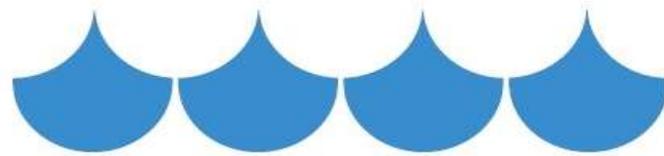
IMPULSE GENERATOR

- 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



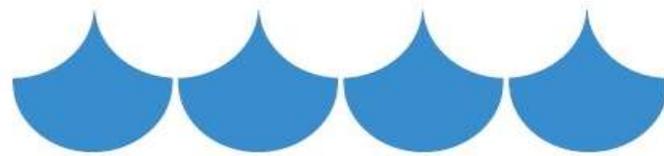
IMPULSE GENERATOR

- Can be used in conjunction with pumping
- Improved cleaning when well is underbalanced
- Use with dual isolation pumping



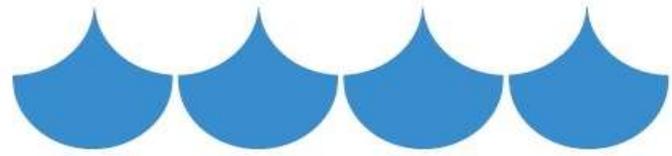
IG ADVANTAGES

- **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**



IG ADVANTAGES

- Adjustable energy intensity @ surface
- Multiple passes without tool removal
- Can pump and monitor effectiveness during operation
- Will not facilitate bacteria growth
 - No oxygenation
 - No organic material introduced
- Can be used in combination with chemicals (Disperses & agitates)



MOVIE TIME





WELL DRILLING
PUMP * CONTROLS
SALES & SERVICE

SCHNEIDER

EQUIPMENT, INC.

WATER SERVICES

SINCE 1945
OR CCB: 39065
WA UBI: 600202757

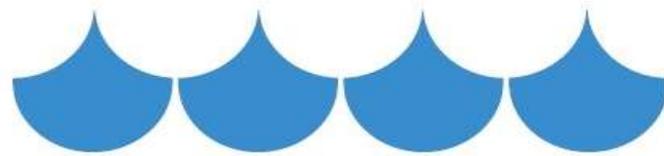
ST. PAUL, OR
(503) 833-2688

RICHLAND, WA
(509) 943-0331

21881 River Rd N.E., St. Paul, OR 97137

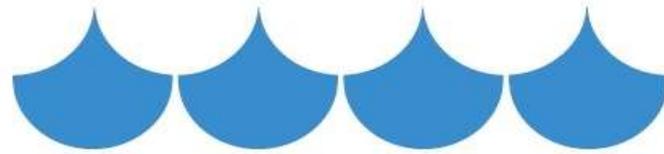
www.seidc.com

AIRSHOCK



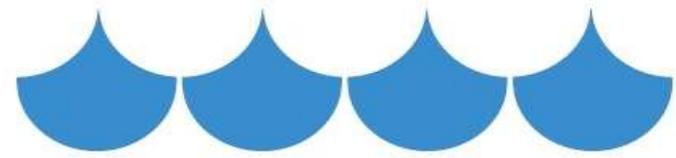
RECOMMENDATIONS

- **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**

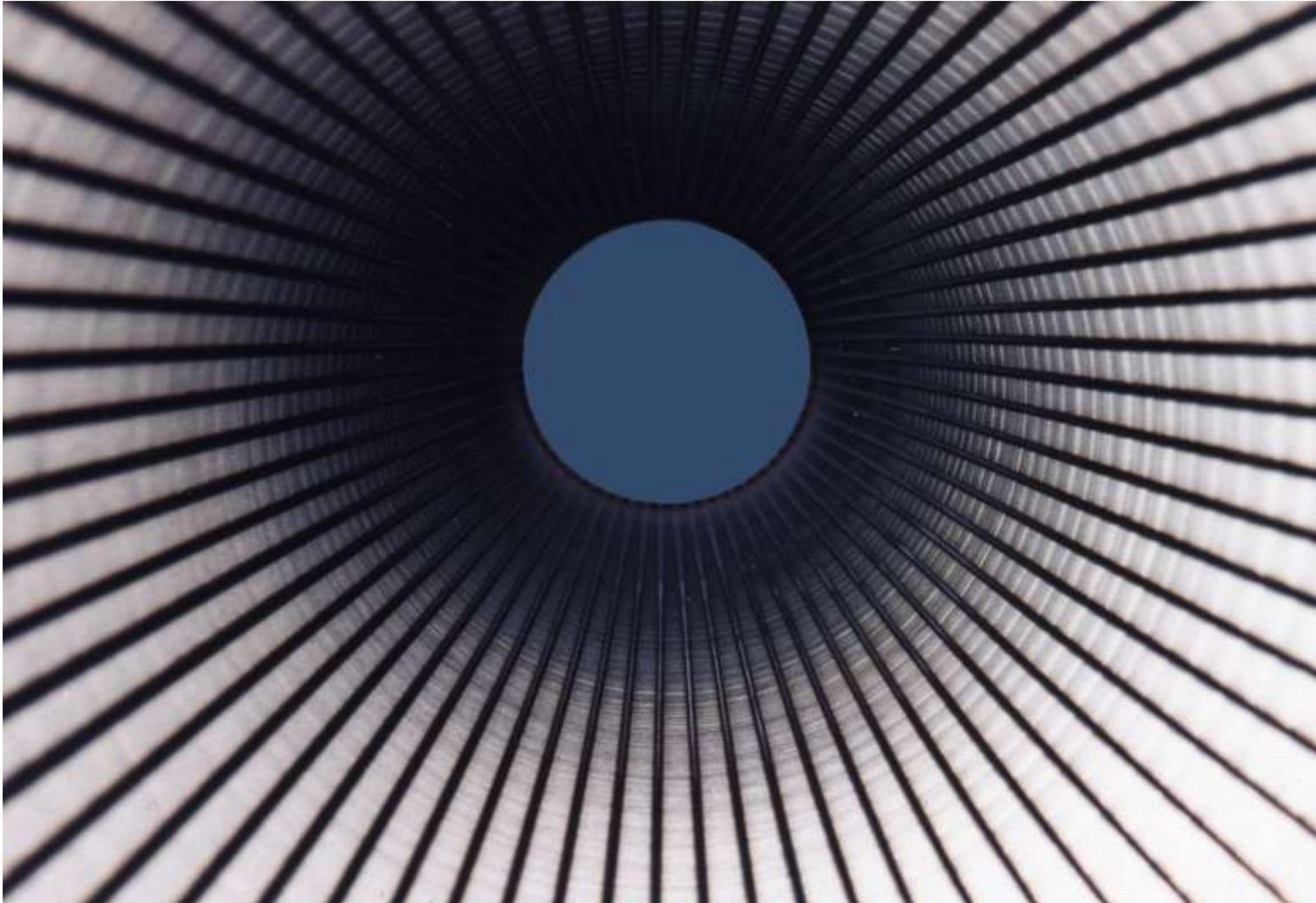


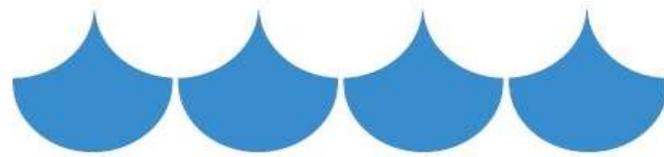
RECOMMENDATIONS

- 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?



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