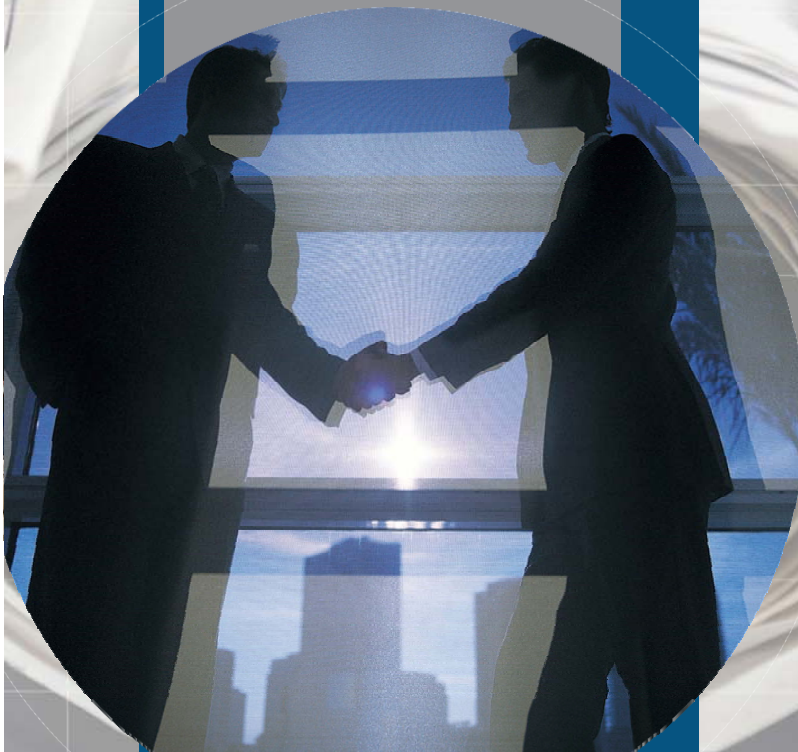


PRESENTED AT
PNWS AWWA
2008 Conference

The Triple "T" of Groundwater Development and Supply



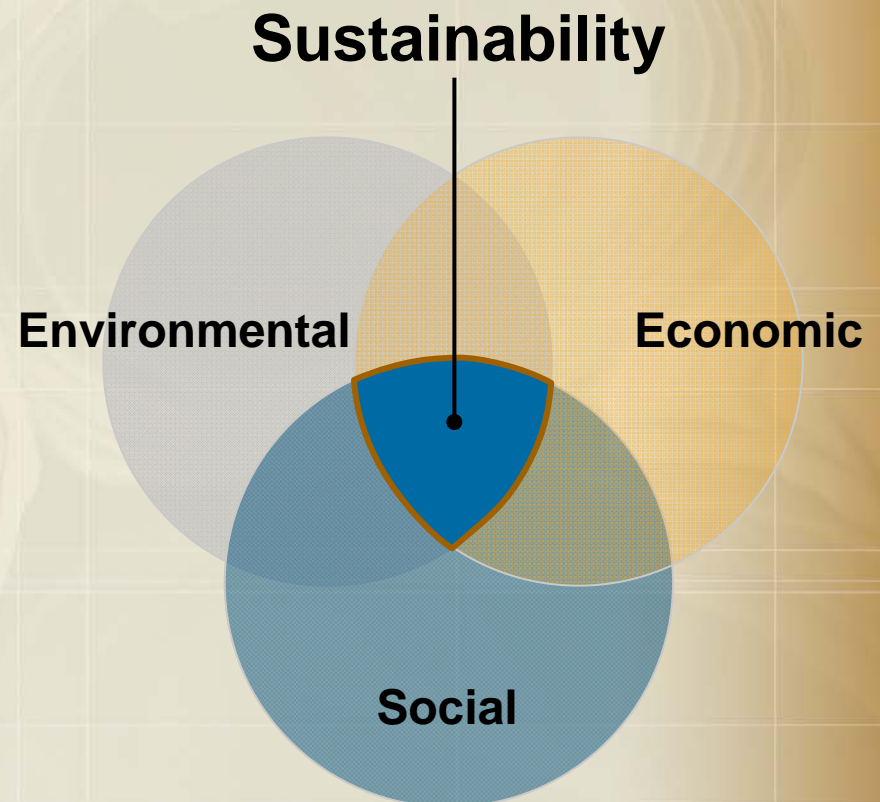
R·W·BECK

Mind Powered: Insight with Impact.

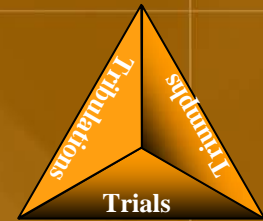
MAY 2008

Triple Bottom Line vs Triple "T"

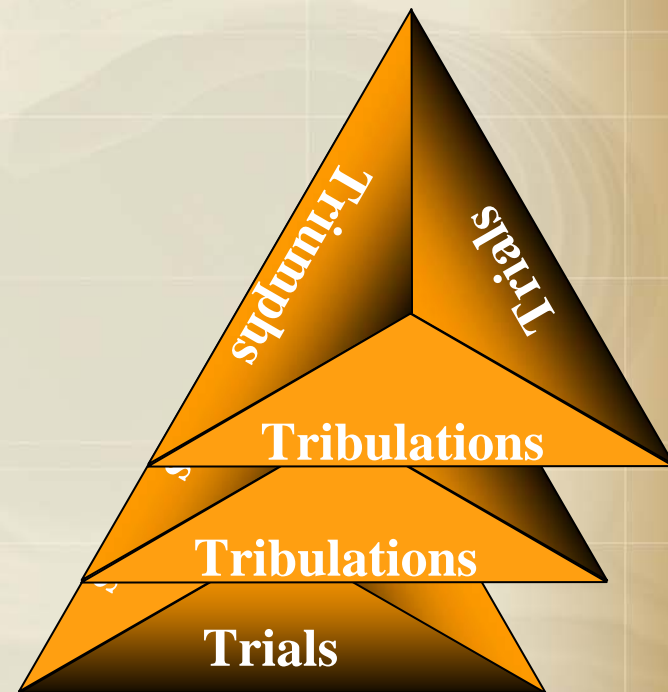
- **Triple Bottom Line:** improving economic, social, environmental success.
- This presentation is not about Triple Bottom Line



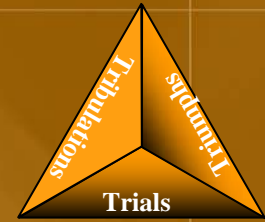
What is Triple "T"



- **Trials**
- **Tribulations**
- **Triumphs**

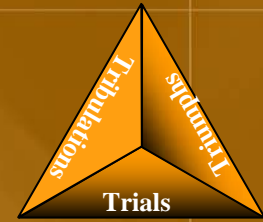


A compendium of groundwater projects – Their Trials, Tribulations, and Triumphs



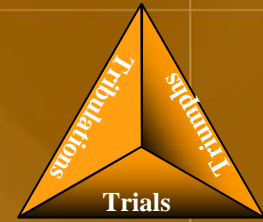
- The Case Study projects are real
- The Case Study projects are unnamed
- All projects were Triumphantly Completed –
(Although there may have been bumps along the way)

A Comparison of Industries



- The Board has a wealth of information on other's mistakes. You can search more than 140,000 incidents. You can search by date, location, type, registration or any of a number of criteria.
- The National Transportation Safety Board has a wealth of information on other people's mistakes. You can search more than 140,000 aviation incidents. You can search by date, location, aircraft type, registration or any of a number of criteria.

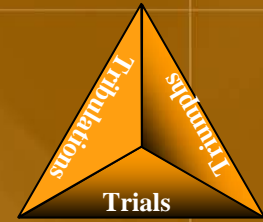
Today's General Topic



- Mistakes are a great way to learn.
- Learn from the trials, tribulations and triumphs of others, when you can.

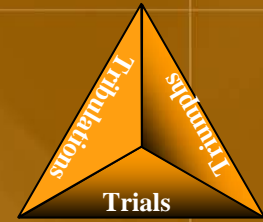


What can we learn from the NTSB and the Airplane Industry ?



- Top Two Causes of Small Civil Airplane mishaps:
 - Fuel Mis-Management
 - Get There "Itis"
 - Subset - VFR in IMC
- NTSB's most common reports for Civil Aviation Incidents/Accidents:
 - Pilot Error (not mechanical equipment failure)
- What can we learn from the aircraft industry?
 - Ensure you have looked at all the details
 - Identify the risks
 - Keep your head out of the clouds

NTSB Reports - Nearly Every Incident is Pilot Error



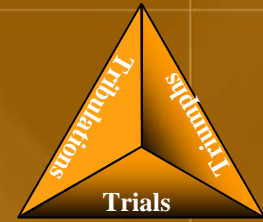
Pilot Failure -
Unable to
Maintain
Proper
Attitude in
Flight due to
Lack of Speed



Pilot Error: Inadequate
preflight/planning - loss of power in one
engine due to fuel starvation

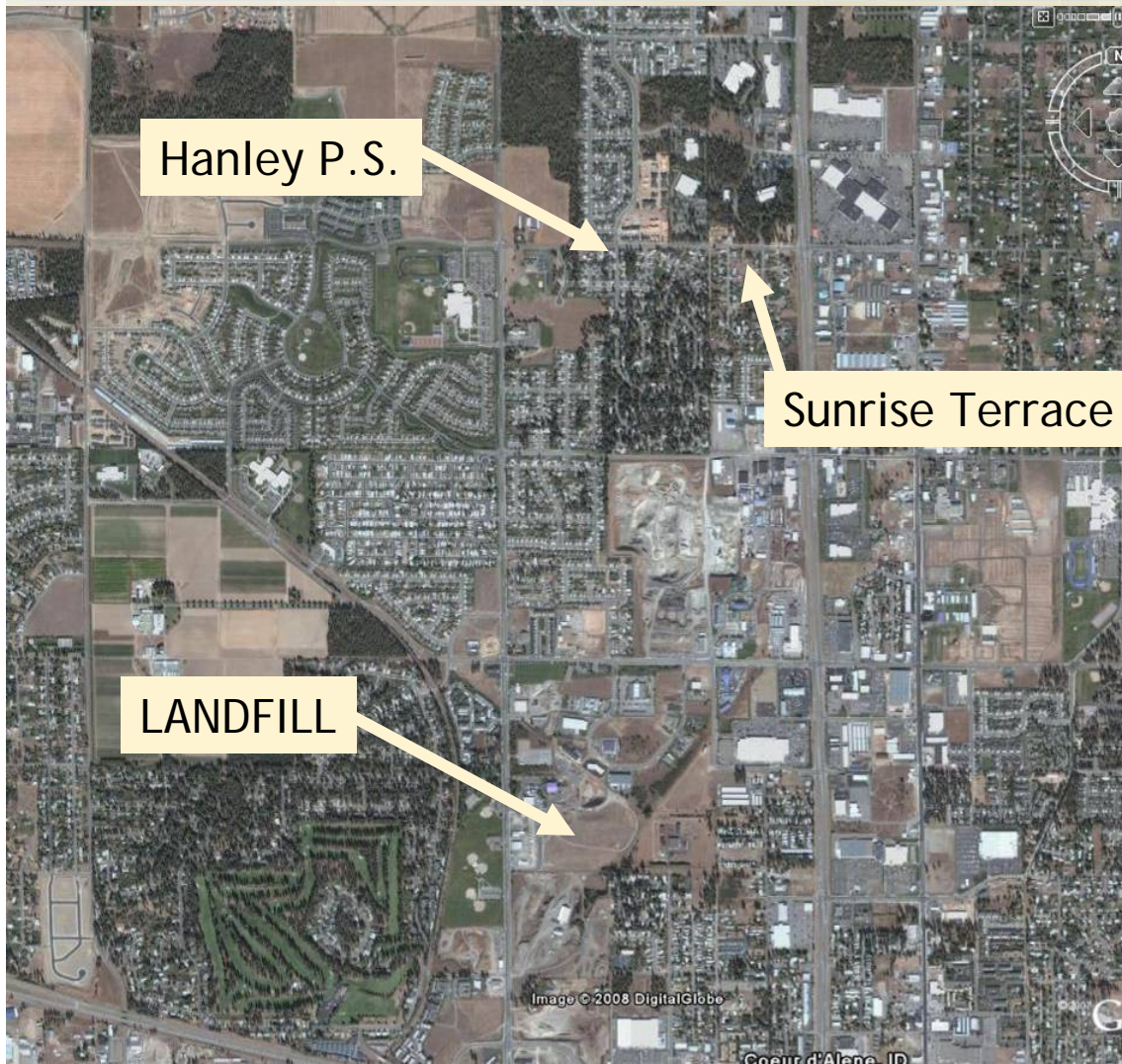
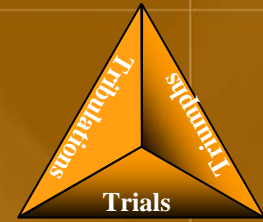
Clearance to the Ground

Atlas Pump Station



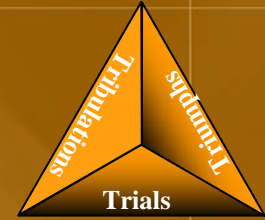
- Existing 2000 gpm pump station
- Upgrade to 4000 gpm capacity
- Provide Backup Power for Fire Protection
- Neighbors Complain of Vibration
- Bearing Problem Discovered

Hanley Pump Station



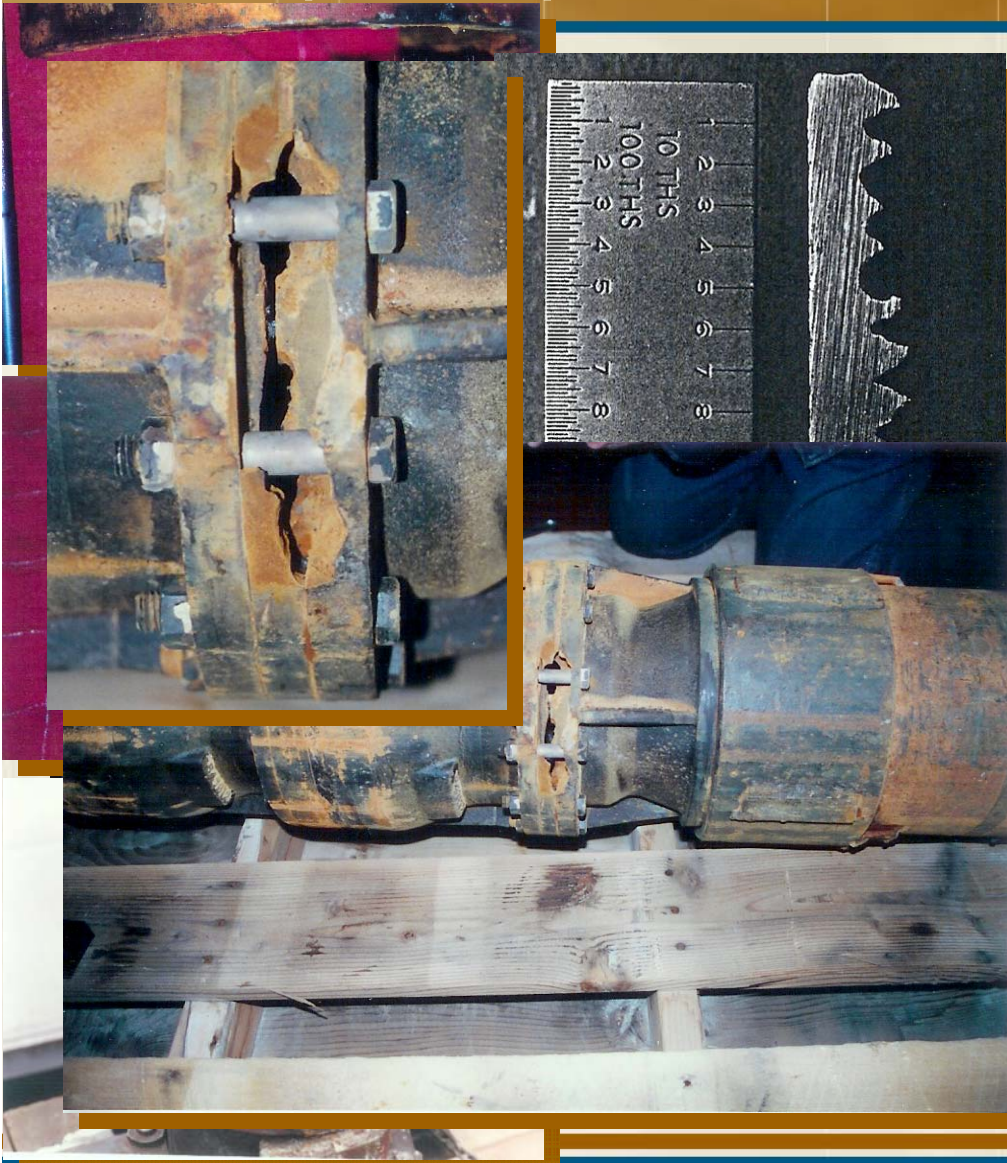
- Motor Failures
- Mercury Escape
- Regional TCE Contamination

Lawai and Kapaa Pump Stations



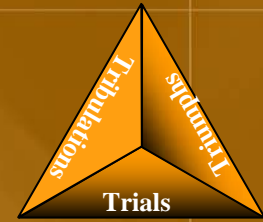
- Lawai Pump Station
 - Mercury
- Kapaa Pump Station
 - Mercury
 - Wrong Hole Size
 - Replacement Pump Performance

Landfill Extraction Well (Dump Pump)

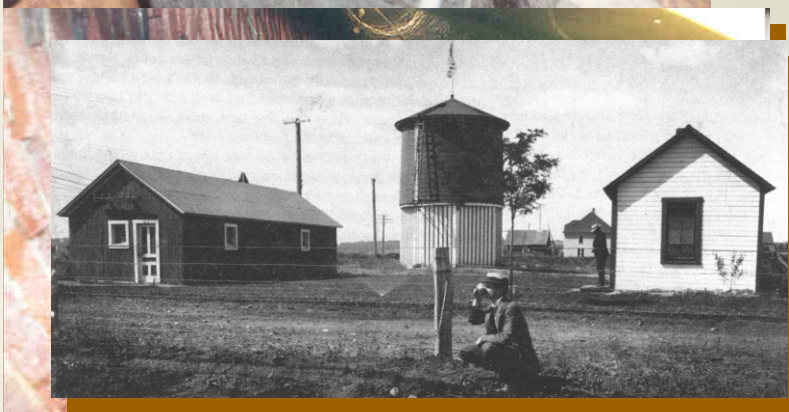


- Landfill Extraction Well - Elevated PCE Concentration
- 1st Failure
 - Complete Separation of Pump from Column
- 2nd Failure
 - Threaded Coupling Failure- Crevice Corrosion - (5 Mos)
 - Pump Discharge Coupling Failure -
- 3rd Failure
 - Reduced Pumping Capacity
 - Motor Failure
 - Improper Depth Setting - Pump Run Dry
- 4th Failure
 - Reduced Pump Capacity
 - Coupling Failure
 - Iron Bacteria Discovered
 - Different Pump Purchased

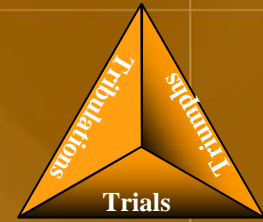
Pump Stations #1, #2, #3, #5, #6, #7, #8, #11



- Hand Dug Wells
 - Assessment
 - Well Deterioration
 - Repair / Rehab / Replace
- Rehabilitate Pump Stations
- Replace Pump Stations

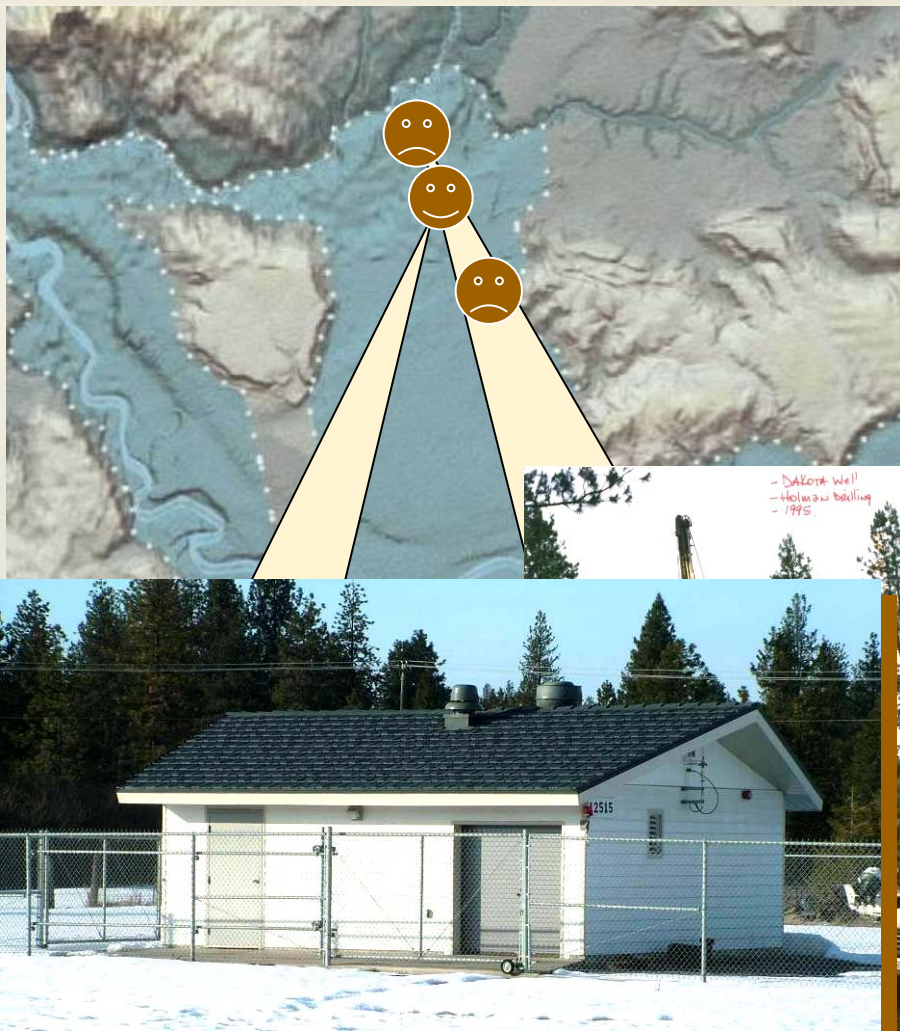
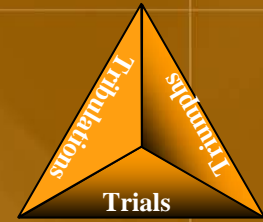


Pump Station #1, #2, and #4



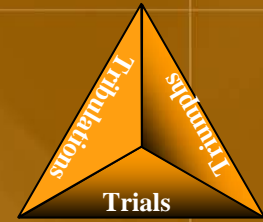
- P.S. #1 Built Mid-1900's
 - No Issues
- P.S. #2 Built 2002
 - Ambient Noise Complaints
- P.S. #4 Built 2006
 - Siting Issues (Noise Concerns)

Dakota Well



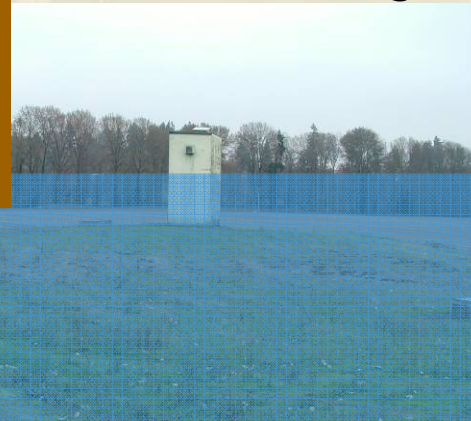
- Replacement Well for TCE Contaminated Wells
- Drill New Well
 - Dry Hole
- Neighboring Utility Drills "Gusher" Well 2,500 ft to SW
- Options Investigation
- Relocate Well
- Successful !
 - (Reduced Production)

Wells #7 & #8



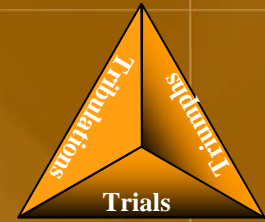
■ Issues

- Loss of Supply Capacity -
- Added Capacity Needed
- Flooding Conditions



neration

Lessons Learned



- Look at all the details
- When your wings start to fold - adjust to the changes and keep people informed
- Don't go out on a wing (or a strut) !



- The End