

State Water Resources Control Board Water Needs Assessment Cost Evaluation



May 10th, 2019

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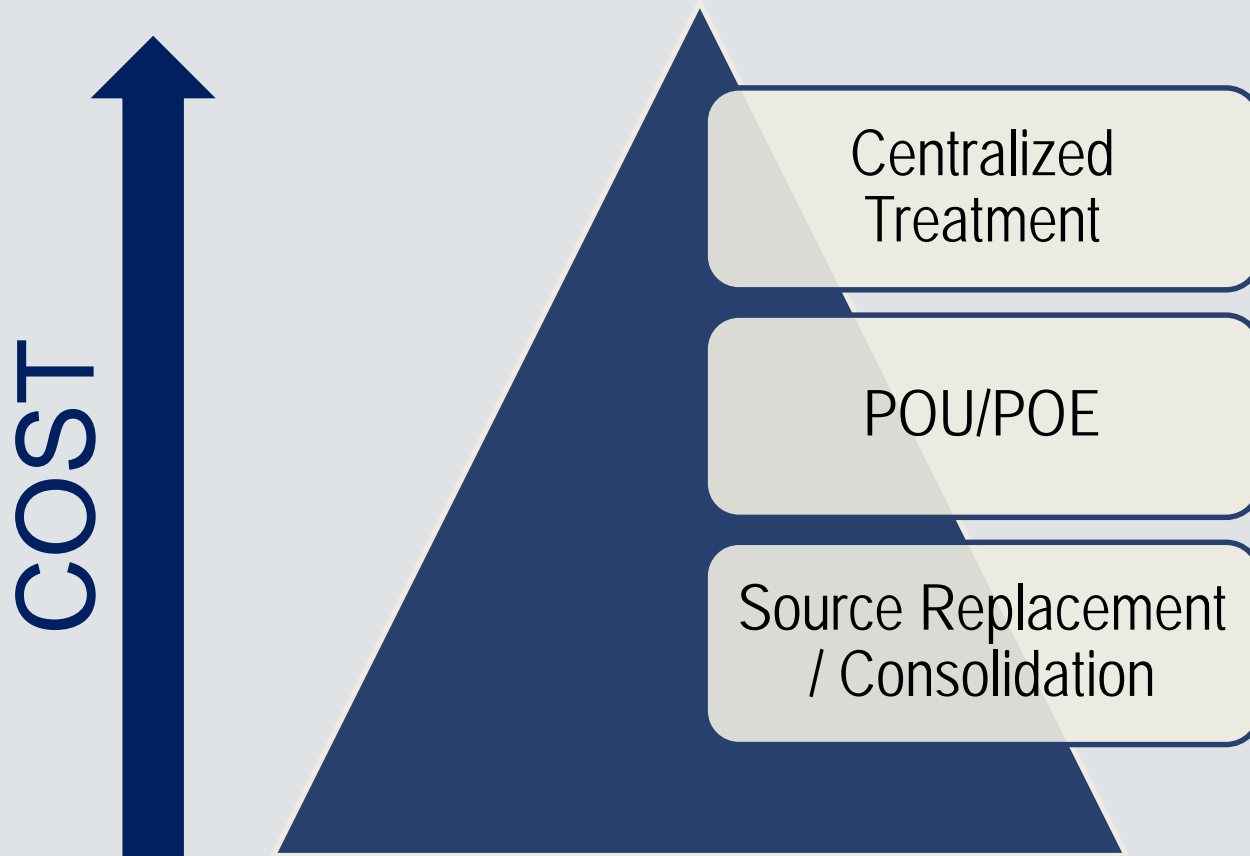
Types of Challenged Systems

- Small disadvantaged communities
 - Economically disadvantaged
 - TMF challenged
- Large disadvantaged communities
 - Population > 10,000
 - Can go from full compliance to all sources out of compliance
 - Los Banos hexavalent chromium (all 13 wells)
- Mutual water companies
 - 10 – 40 homes
 - Not necessarily disadvantaged
 - TMF challenged
 - Poor economy of scale for needed projects

Engineering Feasibility Studies

- Early involvement in water supply projects
- Feasibility Study to evaluate all feasible alternatives is typically the first step
 - Non-treatment: blending, well modification/replacement
 - Consolidation
 - POU/POE
 - Centralized treatment
- Engineer collaborates with water system staff and SWRCB District Engineer

Feasibility Study Framework



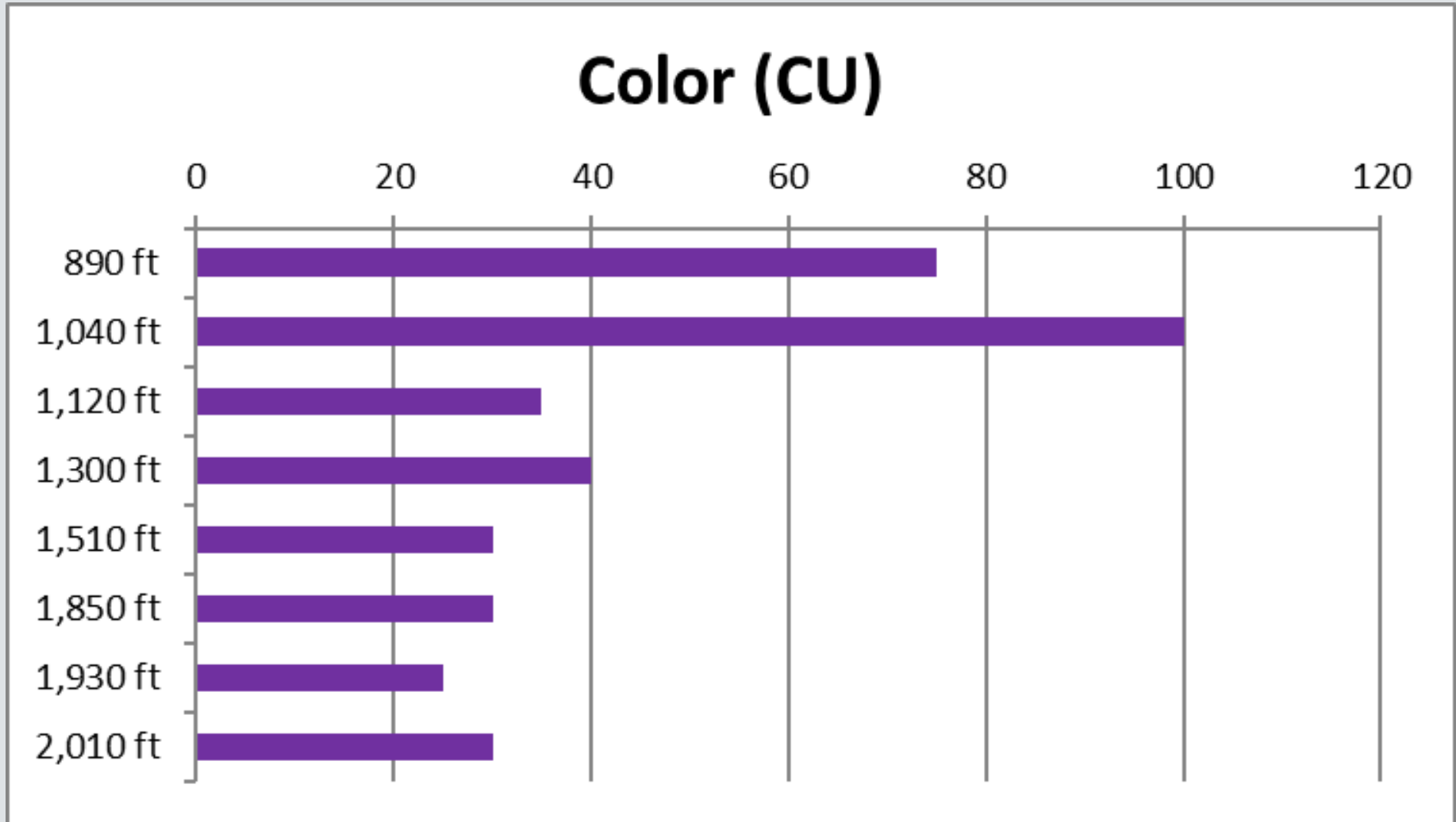


Source Replacement

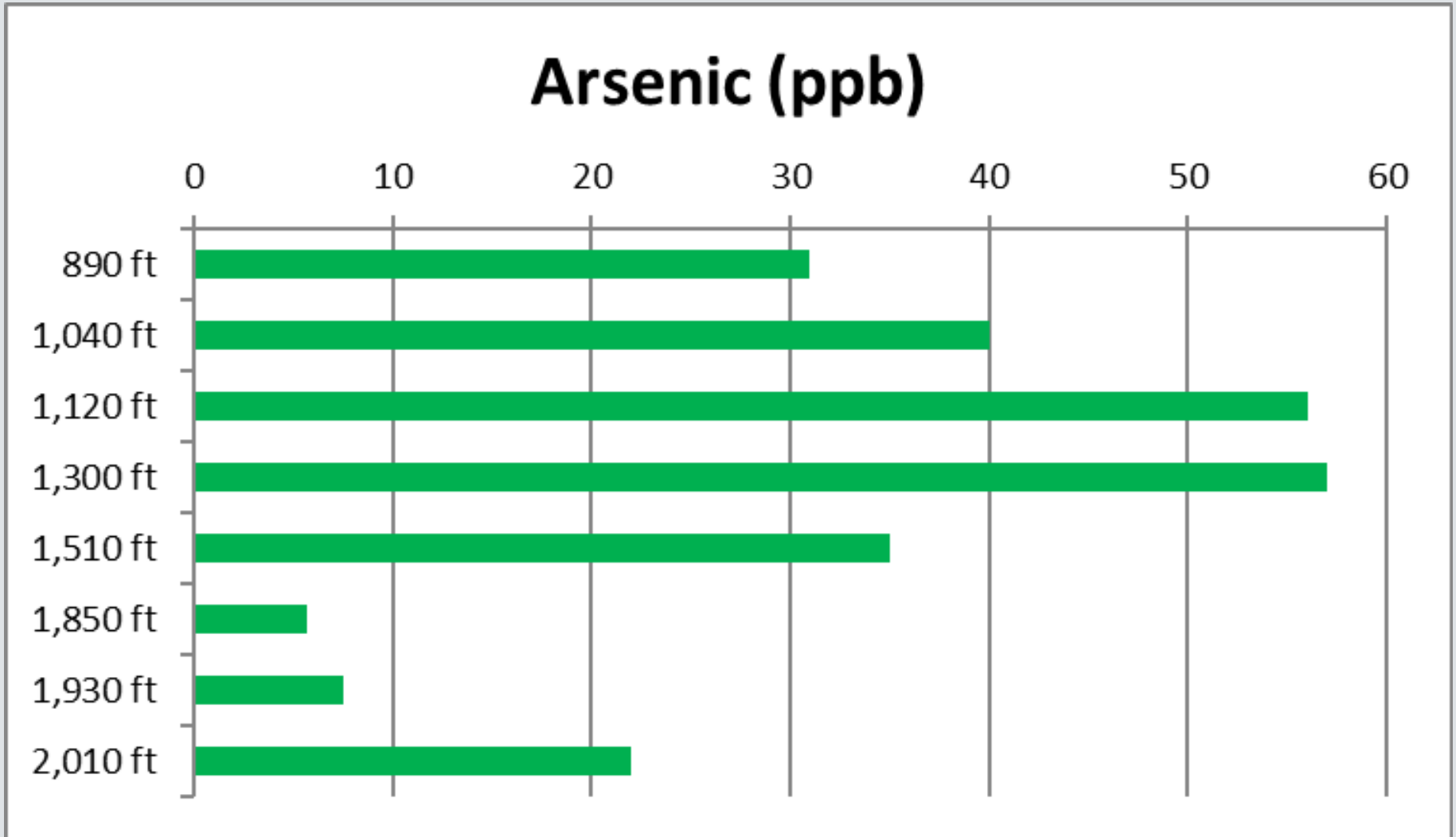
Source Replacement – Zone Testing

- Zone testing
 - Starts with deep test well or pilot hole
 - Water producing formations isolated and tested from bottom to top
 - Water quality in each zone tested for a wide range of contaminants
- Cost
 - Additional 15-20% if well constructed during planning project
 - Additional 50-60% if well must be completed during construction project
- Limitations
 - No guarantee good water exists
 - Must use a qualified driller
 - Need for field observation by experienced geologist/engineer

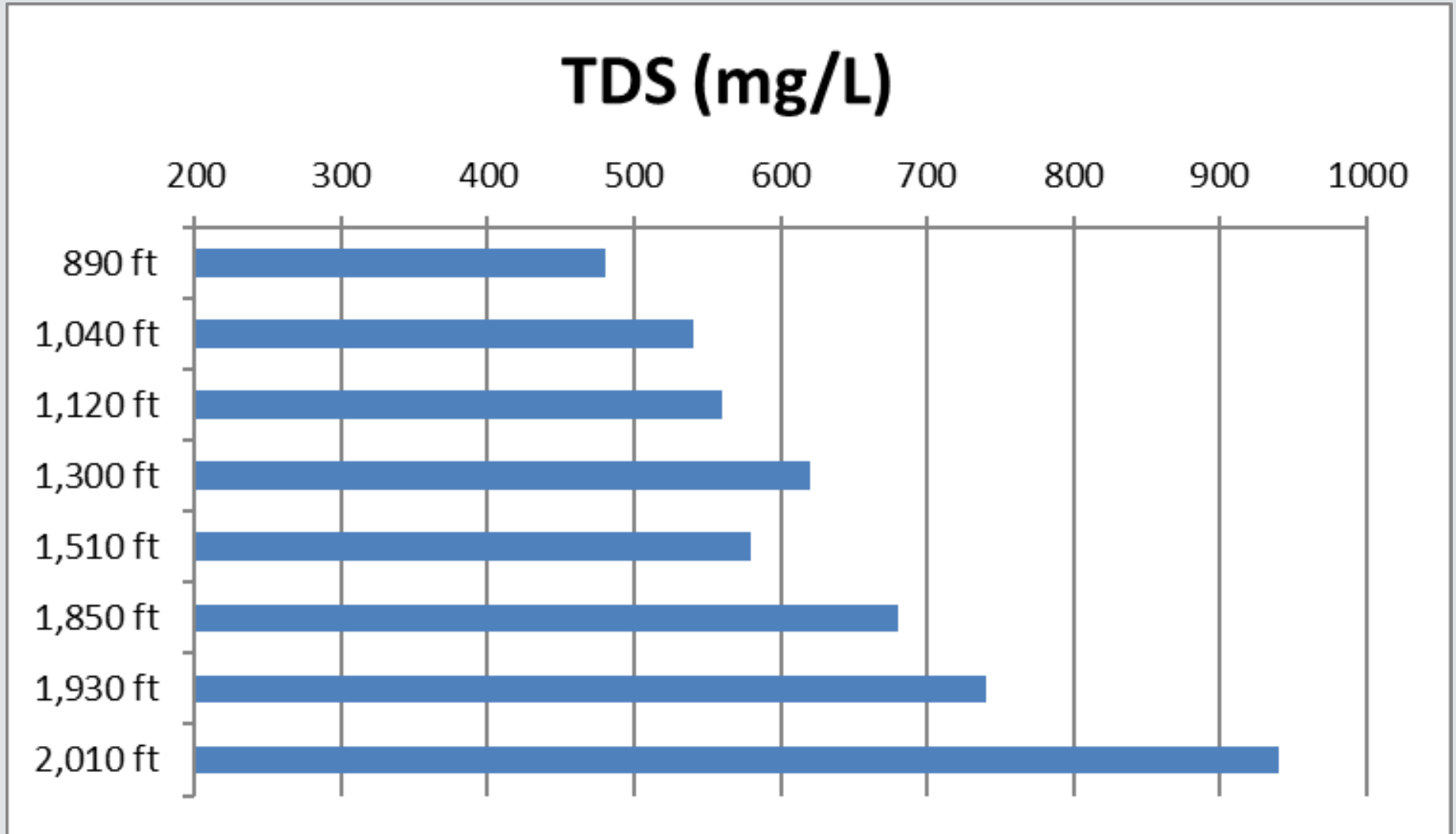
Well Zone Testing (Tulare Lake Basin)



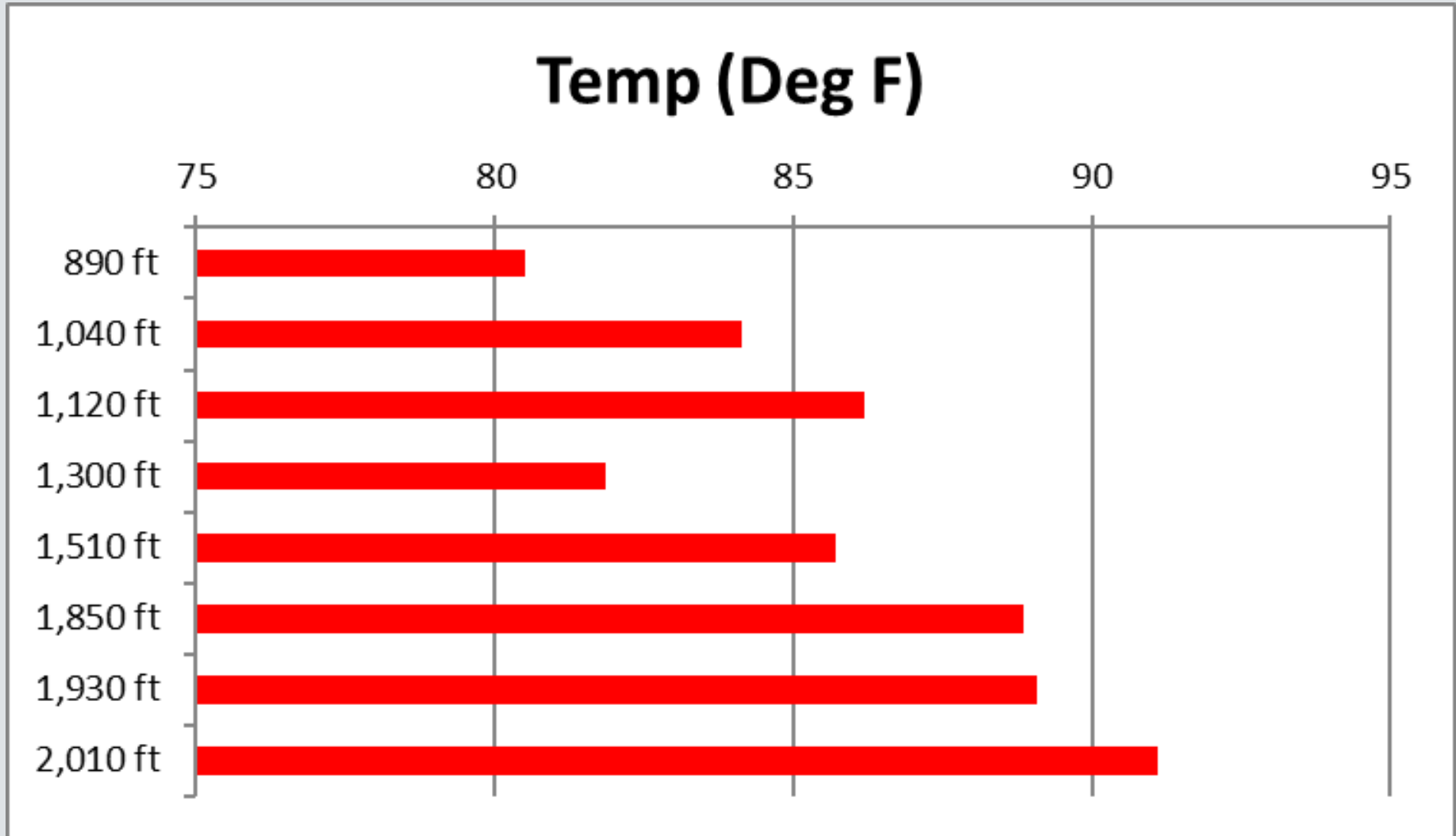
Well Zone Testing (Tulare Lake Basin)

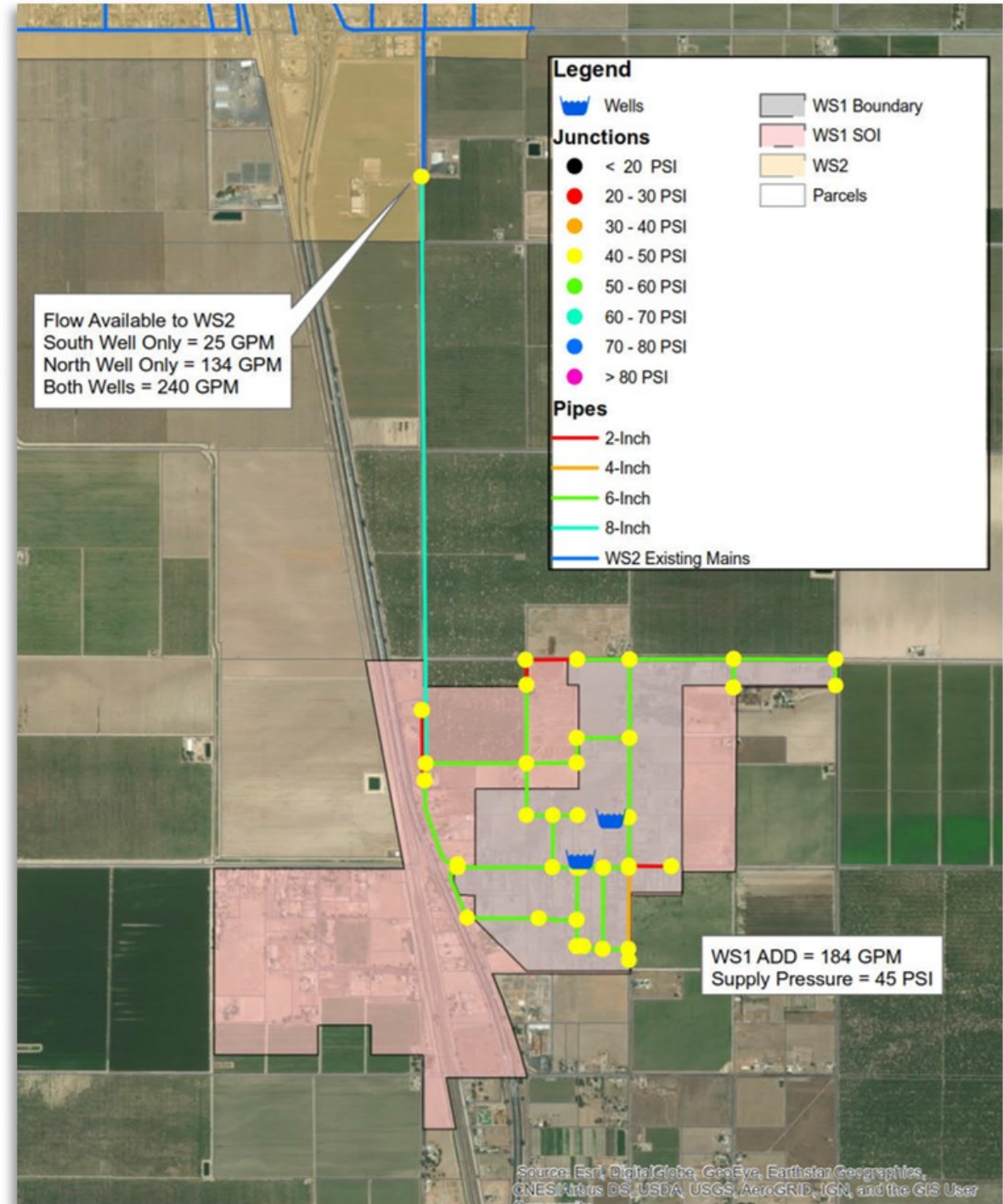


Well Zone Testing (Tulare Lake Basin)



Well Zone Testing (Tulare Lake Basin)



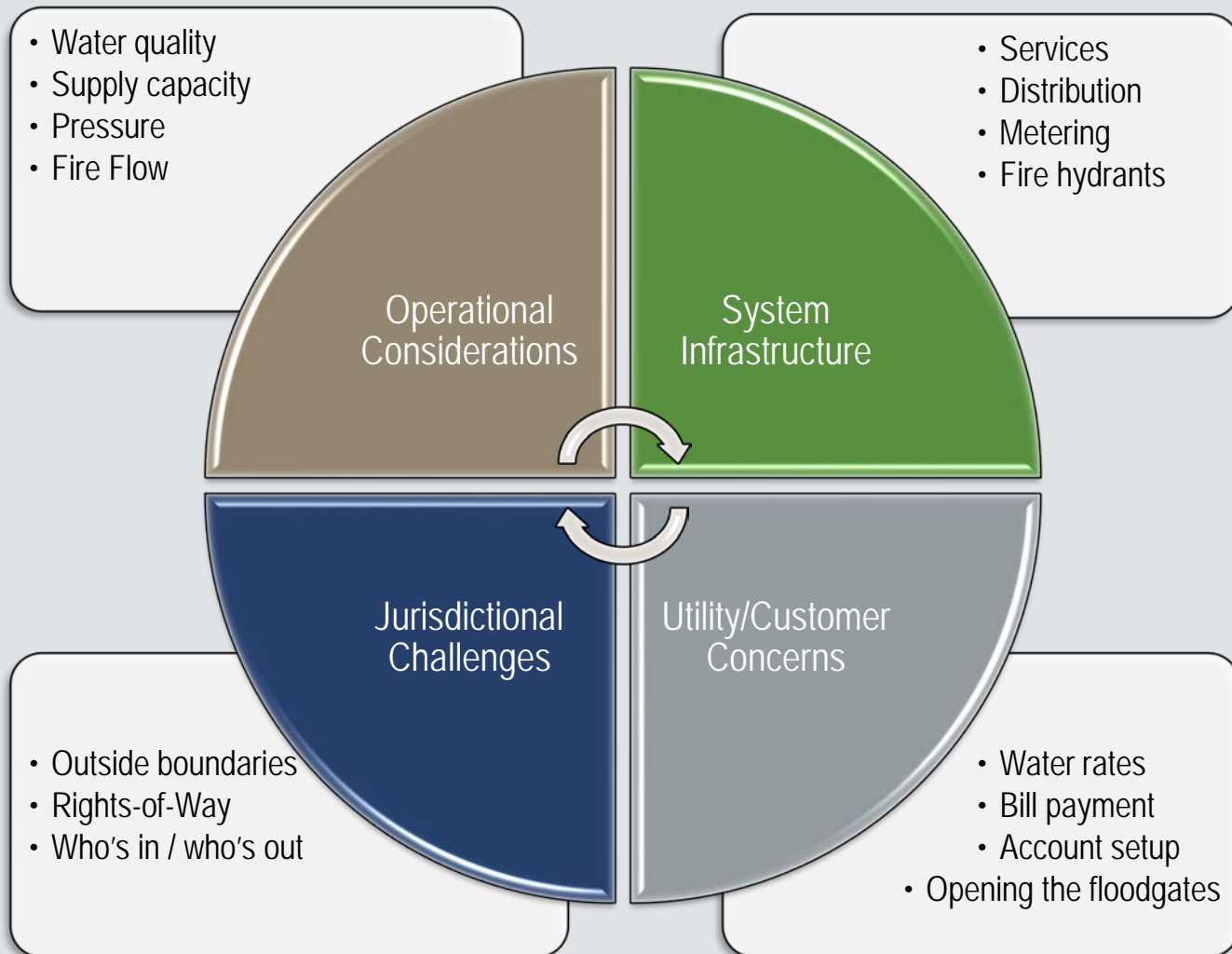


Consolidation

System Consolidation

- Preferred alternative when small systems are TMF deficient
- Cost of physical consolidation is often not the issue
 - One mile of pipe is less than \$0.5 million
 - Constructing centralized treatment is typically several million
- Primary obstacles are:
 - Regional extent of water quality issues
 - System cooperation
 - Technical (e.g. fire flow, water age)

Obstacles to Consolidation





POU/POE

Point-of-Use Technology



Reverse Osmosis

- Metals (As, Cr, Pb)
- Nitrate
- Uranium
- Salts
- Limited at full scale by waste

Granular Activated Carbon

- Volatile organics
- Synthetic organics
- Pesticides
- Tastes and odors

POU

- Combination of RO and GAC
- Manageable RO waste quantities
- Highly versatile
- Inexpensive

Point-of-Use Effectiveness

Contaminant	Under-Sink Effectiveness
Arsenic (pentavalent)	✓
Arsenic (trivalent)	?
Chromium (hexavalent)	✓
1,4-Dioxane	✗
Lead	✓
Nitrate	✓
PFCs (long-chain)	✓
PFCs (short-chain)	✓
1,2,3-Trichloropropane	✓
Uranium	✓

Point-of-Use Device Selection

- California Water Treatment Device Registration
- Practical Considerations
 - Built-in flow and TDS monitoring
 - Capital cost
 - Cost of replacement cartridges
 - Availability
 - Quality
 - Technical support
- Low cost, big-box store devices appear to be as effective as those from specialized suppliers.

Point-of-Use Device Limitations

- Not allowed for residential applications with volatile contaminants (including TCP)
- NSF testing
 - Performed using essentially perfect water
 - Chloroform used as a surrogate for VOCs
- Nitrate removal effectiveness is limited (60 – 75%)
- Supply pressure is important for reverse osmosis

Point-of-Entry

- Point-of-entry treats all water entering a building
 - Relatively common in commercial/industrial facilities
 - Difficult to implement in residential settings
- Issues:
 - Device availability is more limited than for POU
 - Waste generation from reverse osmosis becomes substantial
 - Building plumbing corrosion becomes a concern
 - Solid waste disposal may become an issue
- Activated carbon most viable POE technology

Example Costs – Nitrate Treatment at 34 Homes

	Centralized Treatment ¹	POE	POU
Capital Cost	\$775,000	-	\$15,000
Annual O&M	\$35,300	-	\$10,000
Treatment Capacity	75 gpm	5-7 gpm	6.5 gpd
Daily Volume Treated	97,200 gallons (for 34 homes)	300 gallons (per home)	6.5 gallons (per home)
Waste Volume	5,000 gallons (brine)	1,000+ gallons (per home)	32 gallons (per home)

- 1) Assumes system consolidated and re-plumbed to isolate domestic water use

POU/POE: Working With the Enemy

“Fluoridated water linked to ADHD in alarming study
...the new EPA regulation isn’t low enough to protect you!”

The Most Dangerous Types of Water You Can Drink

Including one that is just as unhealthy as soda... another which has 36 harmful pollutants... and this "healthy water" which invites devastating health consequences as it condenses the toxic byproducts into your drinking supply and sucks the good minerals out of your body. Read this before you consume another drop...

“...water from your tap may not be pure, despite passing through a water treatment facility. It is because it is easy for water to pick up contaminants after it has left the water treatment facility.”

POU/POE: Working With the Customers

- 100% compliance means 100% compliance
- Every home has to be treated
- Every device has to be inspected once per year
- Issues
 - Access agreement
 - Room under sink
 - Liability
 - Operator safety
 - Scheduling
 - Cats and other beasts

POU/POE Summary

- **Great choice for**

- Commercial facilities
- Contaminated private wells

- **Challenging for**

- Residential homes under common ownership

- **May be problematic for**

- Residential community water systems



Centralized Treatment

Centralized Treatment

- Cost and operability vary widely among contaminants and even with the same contaminant
 - No good options (e.g. nitrate)
 - Highly variable performance (e.g. arsenic and hex chrome)
 - Disposal challenges (e.g. uranium)
 - Regionally challenging water (e.g. Tulare Lake Basin)
- Multiple contaminants greatly increase treatment challenge
- Waste disposal can be a major complicating factor

Closing Observations

- DDW collaborative model carried over from CDPH works well
- Public acceptance of projects is greatly influenced by aesthetic quality of water
- The current SWRCB financial assistance program fails to address larger disadvantaged communities and Mutual water companies exposed to scorched earth regulations
- Greater coordination between DDW and RWQCB would lead to more economical solutions

Questions

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