



Water Management Cost Savings Achieved through Service Integration and Automation Technologies

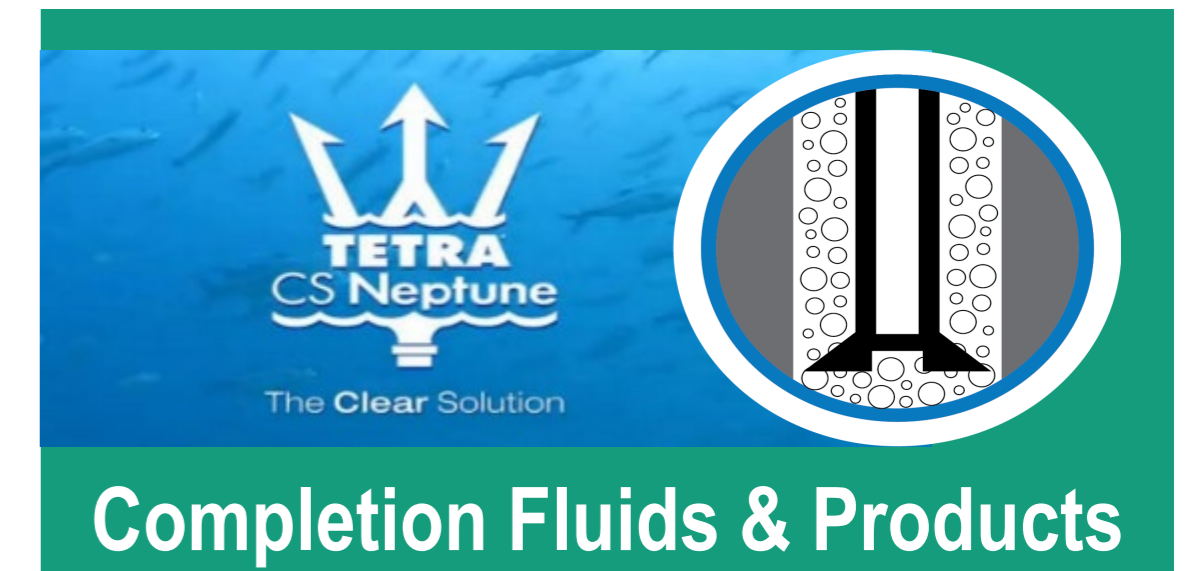
October 7, 2019

26th International Petroleum Environmental Conference
October 7-9, 2019
San Antonio, Texas, USA



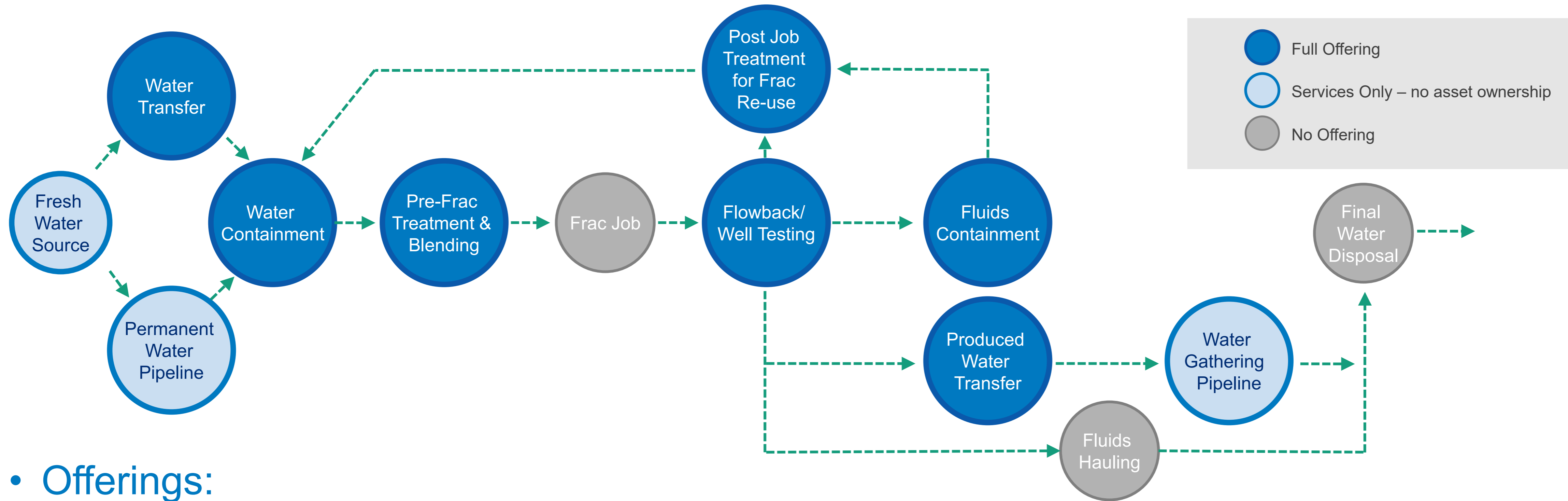
- Overview of TETRA Technologies Inc.
- Water Management Systems for Unconventional Well Applications
- Historical View of Water Management Costs
- Service Integration through Automation for Movement, Handling, Recycling / Treating Produced Water
- Cost Savings
- Success Stories

- **Clear Brine Fluids and Completion Fluid Services**
 - » The only vertically integrated provider → R&D / manufacture/ deliver
 - » We service both the industrial and oilfield markets
 - » Innovative technologies for reservoir drill-in, workover and completions applications
- **Water & Flowback Services**
 - » Fresh & Produced Water Transfer
 - » Water Treatment
 - » Storage and Containment
 - » Pipeline Construction
 - » Water Blending
 - » Pond Lining
 - » Flowback and Sand Management
 - » Automation and Remote Monitoring
- **Compression**
 - » Largest vertically integrated compression company
 - » Wide range of HP to address customer gas lift and gathering solutions





TETRA Integrated Water Solutions

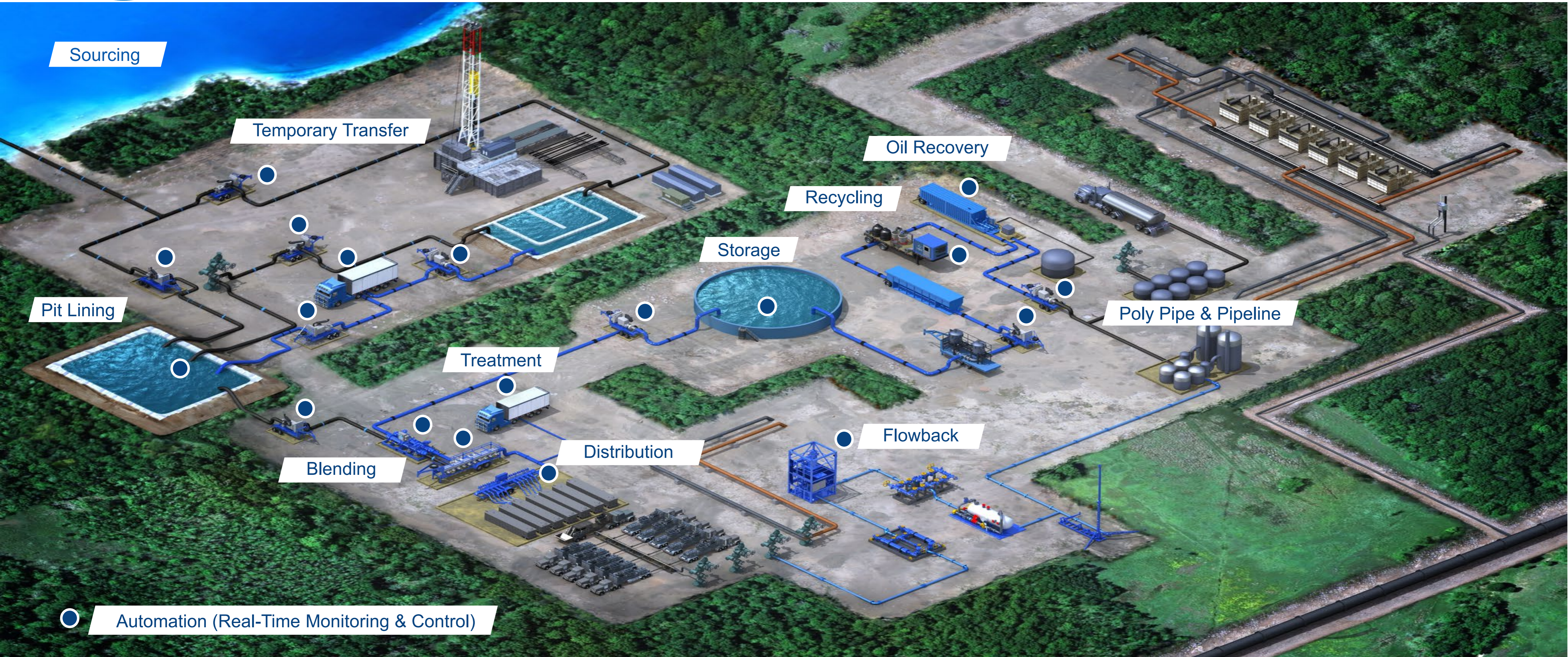


• Offerings:

- Fresh Water Transfer
- Produced Water Transfer
- Pipeline Construction
- Treatment and Recycling
- Pit Lining
- Containment
- Flowback and Testing
- Automation and Monitoring



Water Management – Full Cycle Drilling / Hydraulic Fracturing / Flowback / Production





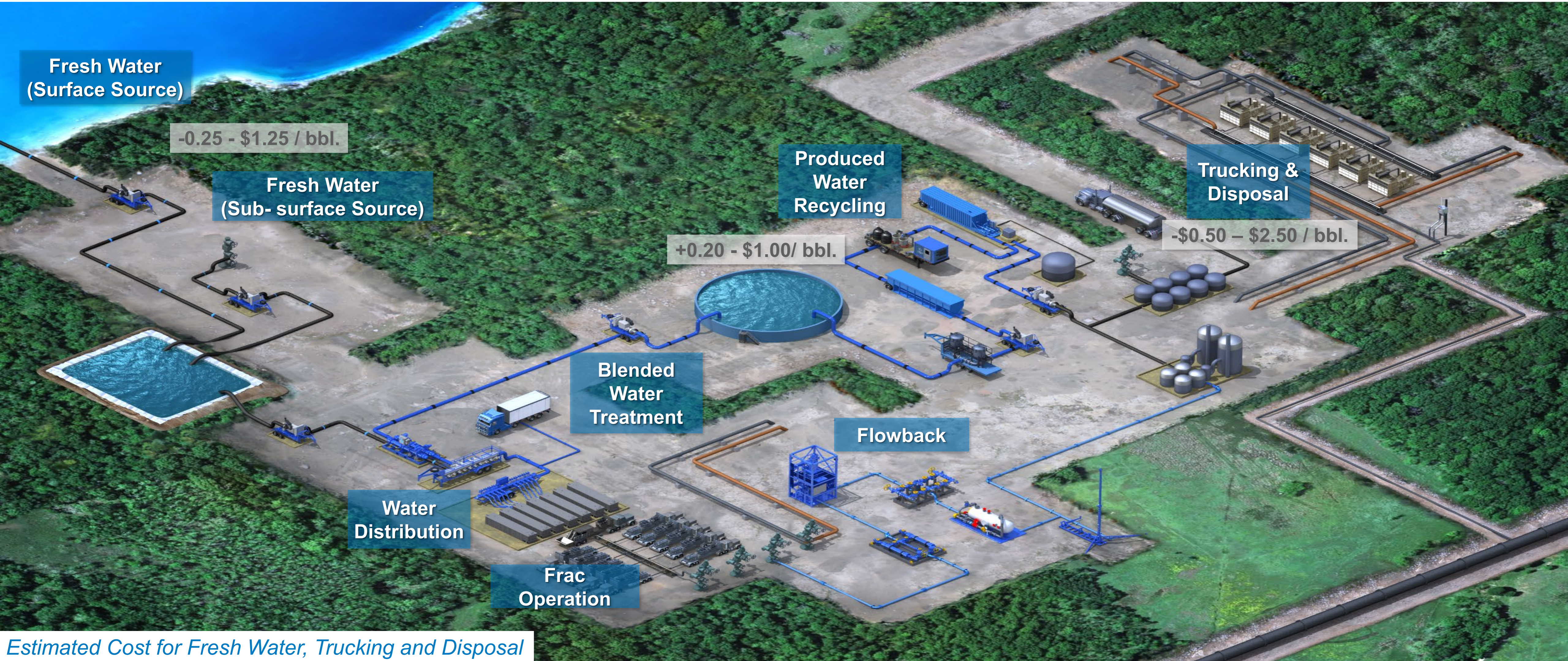
Water Management Without Recycling Produced Water



Estimated Cost for Fresh Water, Trucking and Disposal



Water Management With Recycling Produced Water



Estimated Cost for Fresh Water, Trucking and Disposal



Water Management With Produced Water Recycling + Automation



Estimated Cost for Fresh Water, Trucking and Disposal



Lowest Cost per Barrel Fluid Solutions



LEADERSHIP IN WATER TRANSFER

- **First mover in deployment of lay flat hose**
- **Single Jacket hose water transfer system**
 - Economical for fresh water transfer
- **TETRA Steel™ water transfer system**
 - Only double-jacketed lay flat hose, UV-resistant hose on the market
- **Reduced customer risk**
 - Highest flowrates and operating pressure
- **Market leader for produced water transfers**
 - Recently approved by the Alberta Energy Regulators (“AER”) to transfer produced water





Lowest Cost per Barrel Fluid Solutions

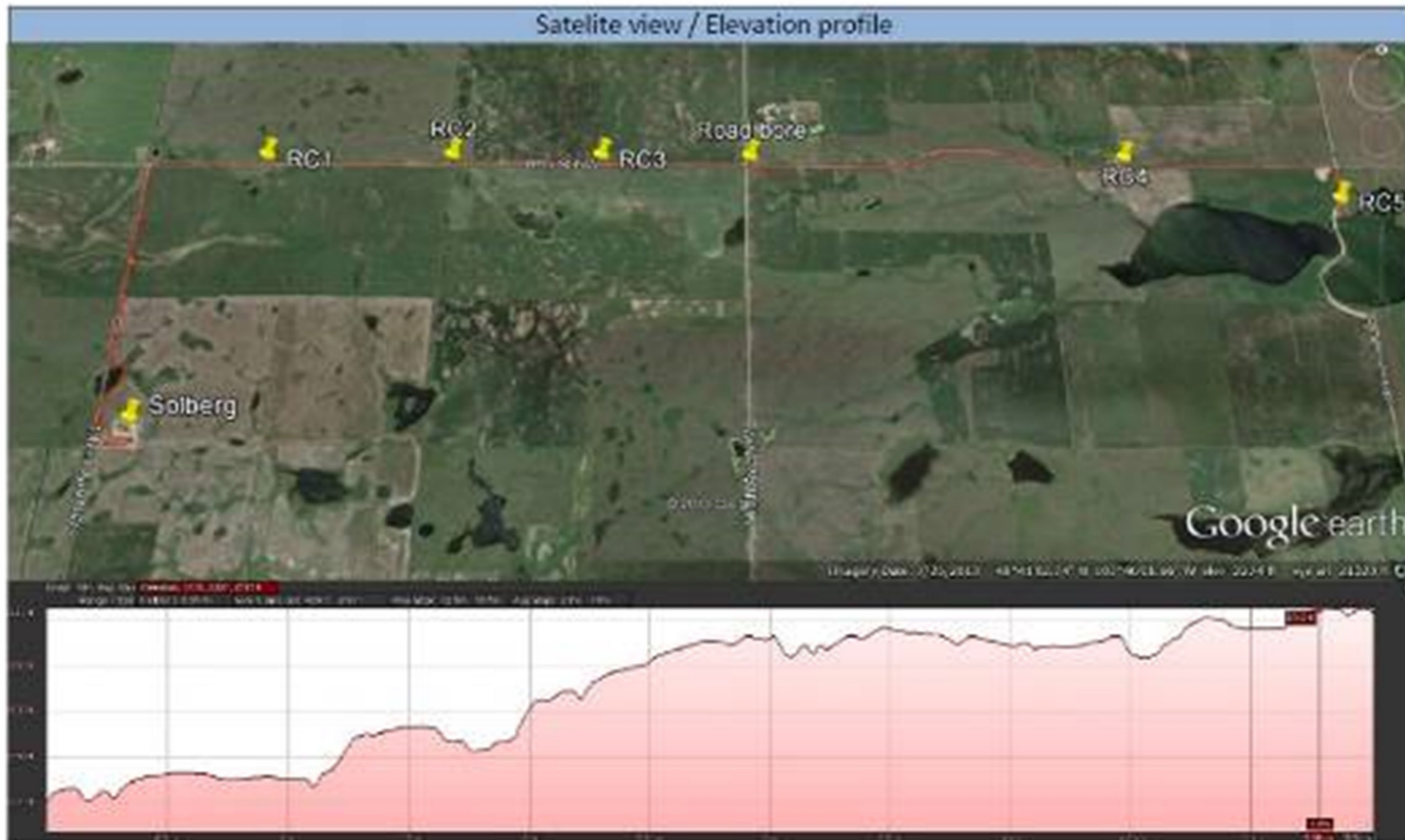


LEADERSHIP IN WATER TRANSFER

Engineering and Optimization of the Route

Hydraulics Calculator

- Transfer Distance
- Water Volume and Rates
- Elevation Changes



TETRA Technologies - PFD Calculator

Job name	Halcon - STATE Moline frac	Date	October 27, 2015
Located	Williston, ND	PFD #	
Start	48 24'04.40 N	By	YH
End	108 57'08.82 W		4.6

Comments: Halcon fresh water frac. Transfer from TETRA STEELWATERC impoundment on Hqs pad to STATE Moline frac.

Rate: 70 BBL 2940 GPM System: TETRA 2x4 1200

Distance Abs.(ft)	Elevation Abs.(ft)	Point ID / Description	Flow (GPM)	Hydroz Loss (psi)	Friction Loss (psi)	Coupling Loss (psi)	Filter pod (units)	Road crossing (units)	Total Loss (psi)	Pressure @ Inlet (psi)	Pump Input (psi)	Pump ID	Pressure @ Outlet (psi)	Line Volume (BBL)	Total Volume (BBL)	VO Hydro (psi)
0.0	1955.0	Hqs impoundment		0.0	0.0				0.0	0.0	70.0	5	70.0	0.0	51.8	5.5
246.0	1927.0			0.9	1.5				2.3	67.7			67.7	59.9	51.9	2.6
3066.0	1927.0		7.0	0.0	5.0	0.1			5.1	62.6			62.6	172.4	12.4	2.6
1499.0	1943.0			2.6	2.7				5.3	57.3			57.3	241.3	32.5	0.0
1977.0	1943.0		1.0	-0.5	6.0	0.0			7.2	50.2			50.2	136.4	47.8	0.0
2485.0	1932.0		1.0	-0.5	5.1	0.0			-0.7	55.9			55.9	194.2	35.0	4.0
2550.0	1932.0	Exit of bridge	2.0	0.0	6.5	0.1			6.6	50.4			51.1	205.8	33.0	6.0
4014.0	1962.0	inlet	7.0	0.0	5.5	0.1			5.6	45.8			45.8	455.5	55.4	4.5
4257.0	1951.0	West of bridge	1.0	-0.4	5.8	0.0			5.2	40.6			40.6	789.9	33.8	5.2
6706.0	1923.0	Location	0.0	0.0	12.6	0.2			12.6	27.0			27.0	3062.5	18.6	6.3

Pumps	%
Pump type (A,B,C...)	A
Elevation (ft)	1923.00
Line Pressure (psi)	43.87
Friction Loss (psi)	0.00
Hydroz Loss (psi)	-0.00
Vel. (ft/min)	22.78
Total Dynamic Head (ft)	235.23
Line from curve	1500.00
Head from curve	12.00
Head from curve	7.77

Pump types
A 1270 200 1200
B 1270 200 1200
C 1270 200 1200
D 1270 200 1200
E 1270 200 1200
F 1270 200 1200

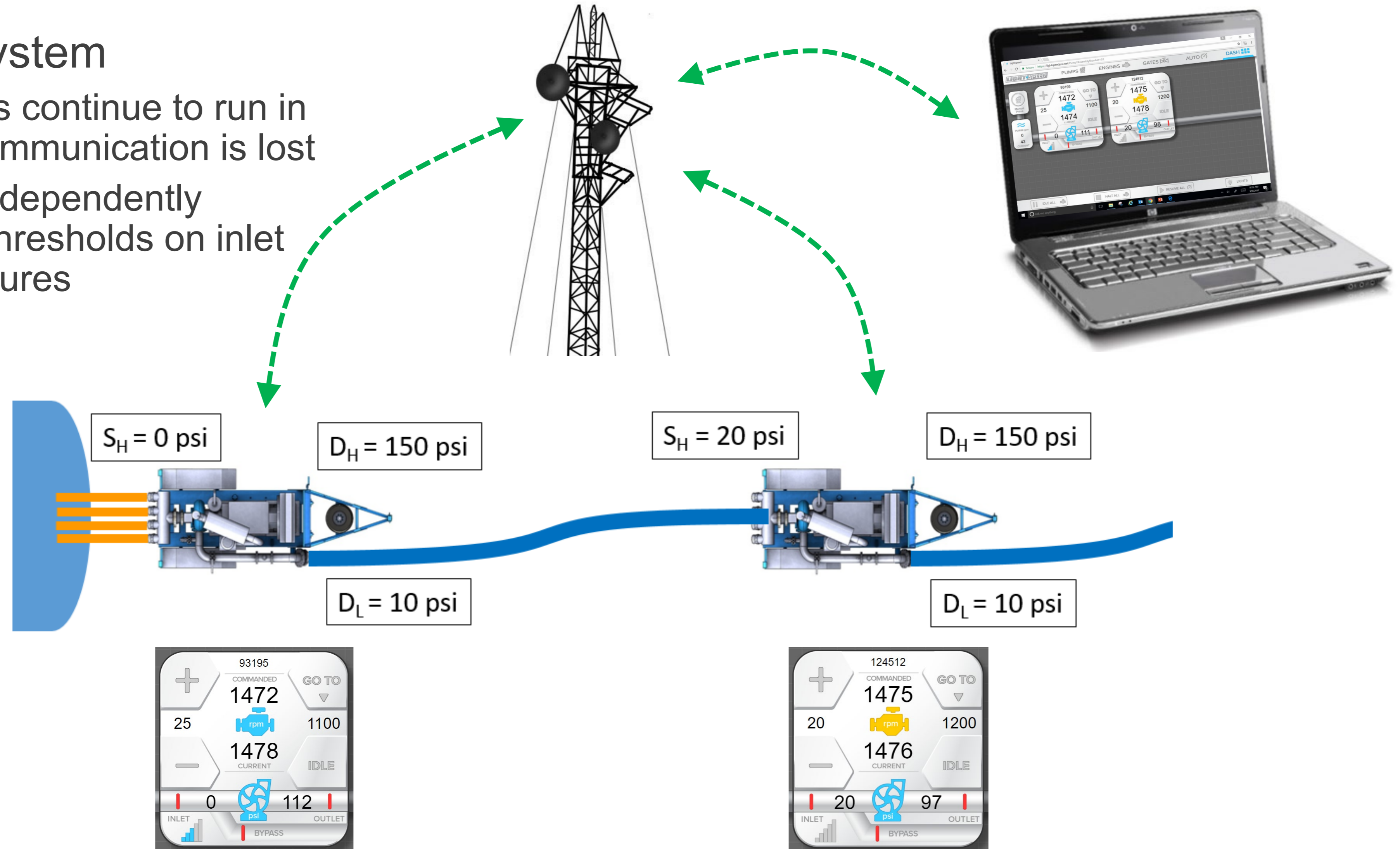
TETRA
Focused on Energy. Dedicated to Service & Safety

Lowest Cost per Barrel Fluid Solutions



Cellular based system

- » However, pumps continue to run in unison, if cell communication is lost
- » Each pump is independently calibrated with thresholds on inlet and outlet pressures





LEADERSHIP IN TREATMENT & RECYCLING

➤ Blending Controller

- Conserves fresh water by blending reclaimed produced water “on the fly”
- Optimal fracturing fluid that meets customer water specifications

➤ Blending Manifold

- Homogenous blend of fresh and produced water at all discharge ports

➤ Distribution Manifold

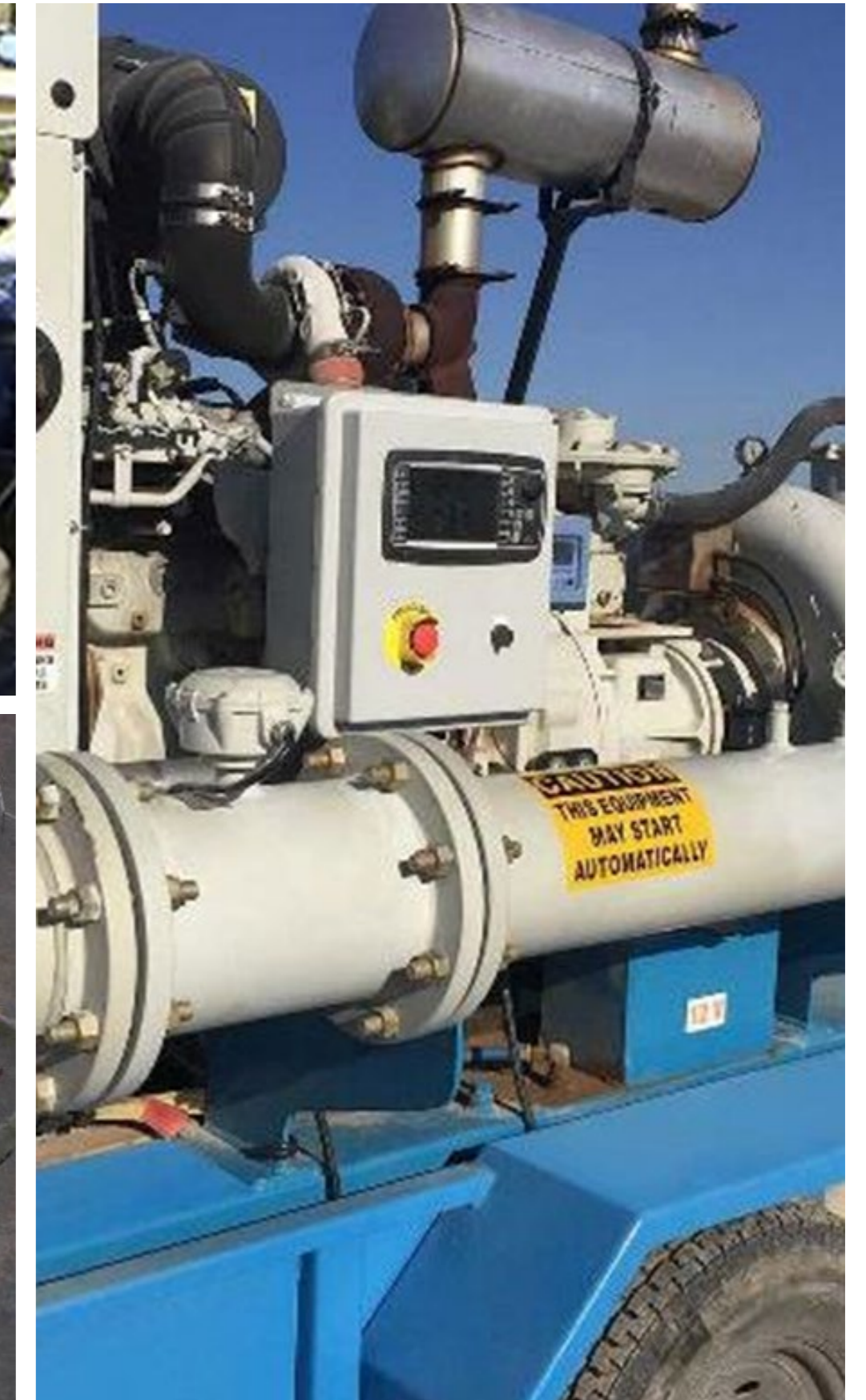
- Ensures frac tanks are optimally supplied with water
- Minimizes environmental and personnel risks

➤ CLO2 and SwiftWater Advanced Treatment System

- Provides continuous and accurate chemical dosage volume

➤ Oil Recovery After Production Technology (“ORAPT™ separation units”)

- Separate oil from produced water up to 35,000 bpd





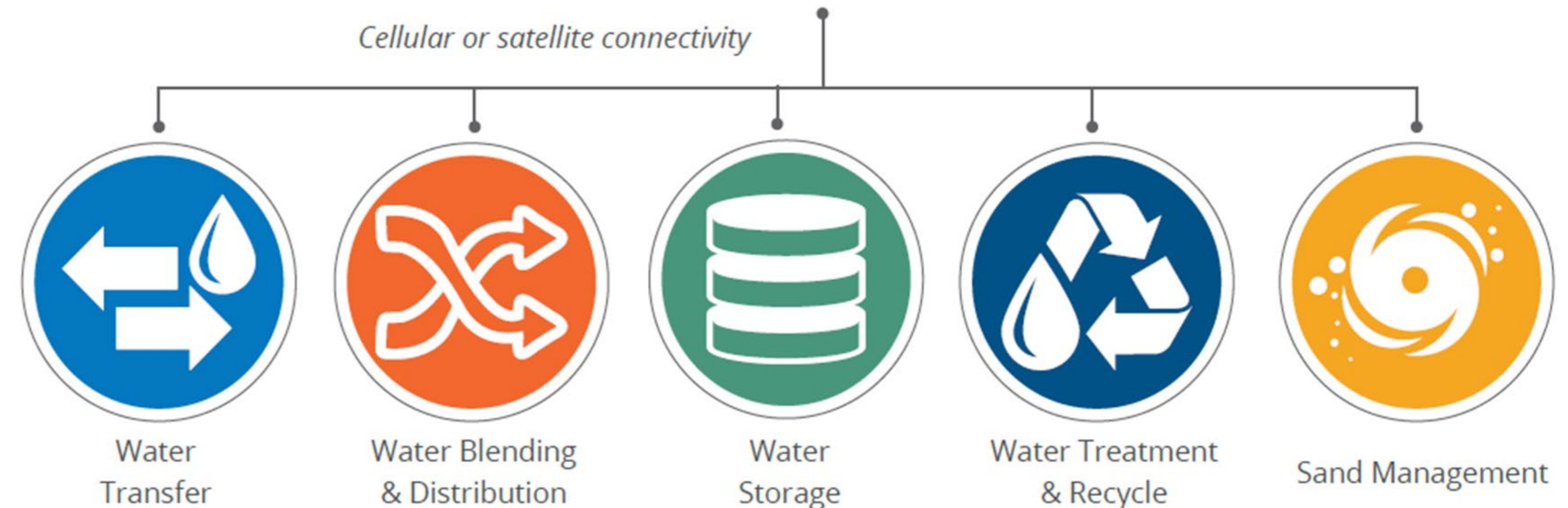
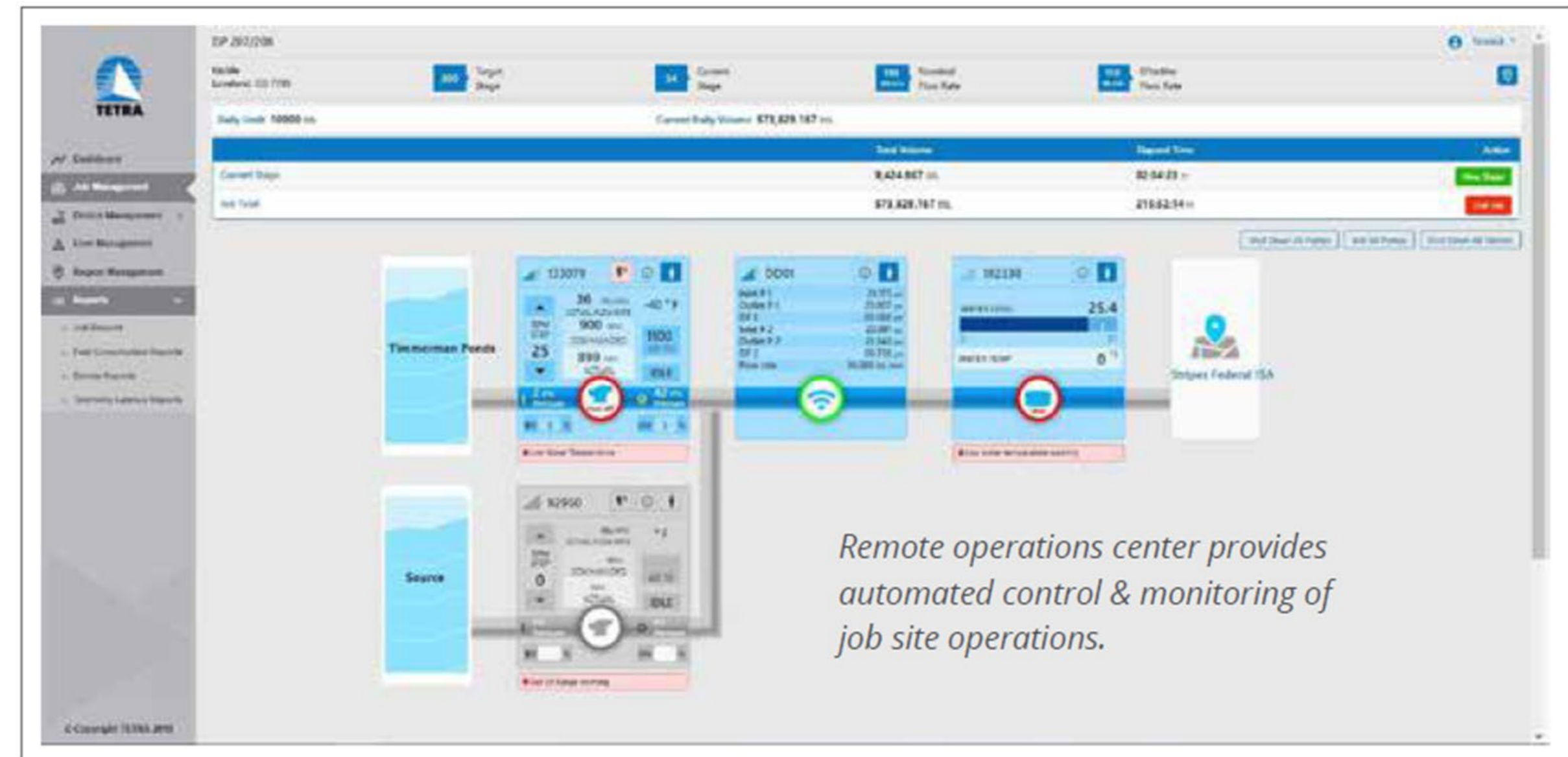
TETRA's Lowest Cost per Barrel Integrated Solution



Water Management Transparency



- Water Volume
- Pumping Rate
- Water Quality
- Chemical Use Solids
- Recovery (recycling & flowback)
- Fuel Usage
- Personnel Usage
- NPT



Produced Water Recycling Project 4 Well Zipper Frac

- Total produced water treated for reuse:
1,300,000 bbls
- Client cost savings of ~\$500,000
- Less fresh water sourced and used
- Less produced water trucked and disposed



Produced Water Recycling Project Multi-Well / Multi-Year

The 1st of multiple new recycling facilities started in July 2018

50K bbls. per day capacity

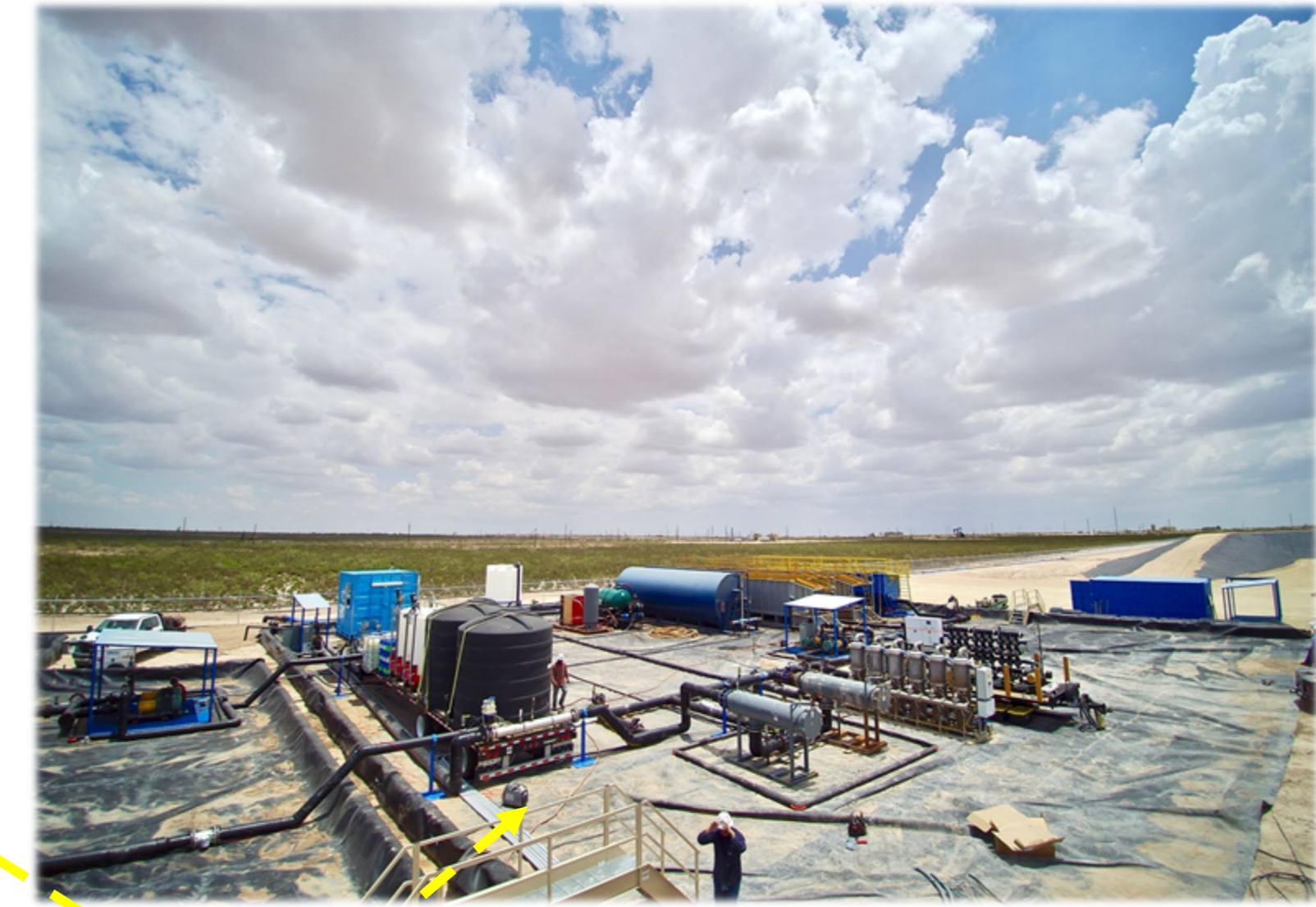
Expanding to 100k bbls per day

Volume contingent on availability of raw produced water

NORM is kept in a concentrated solution, acidized and disposed

Blending produced and fresh water at the frac site

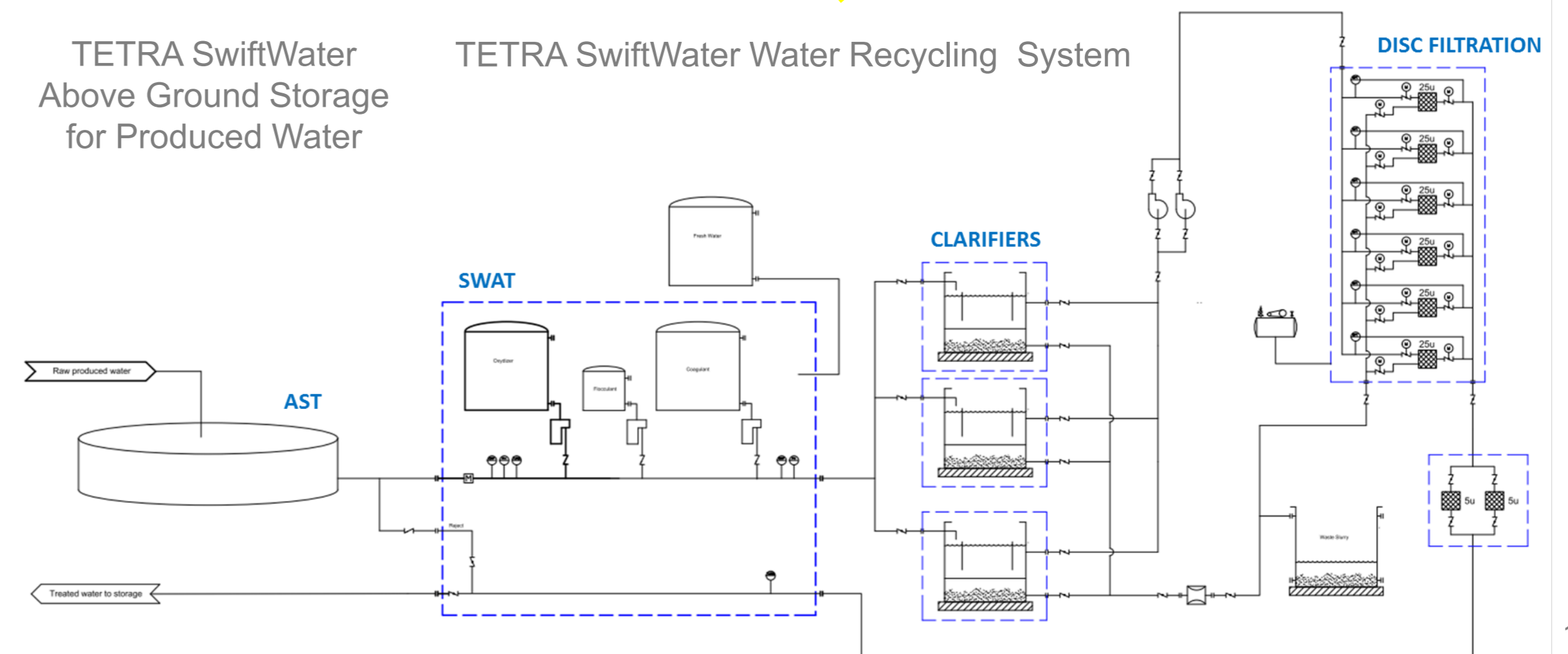
CLO₂ treatment for bacteria
“on the fly”



TETRA Steel transfers the produced water

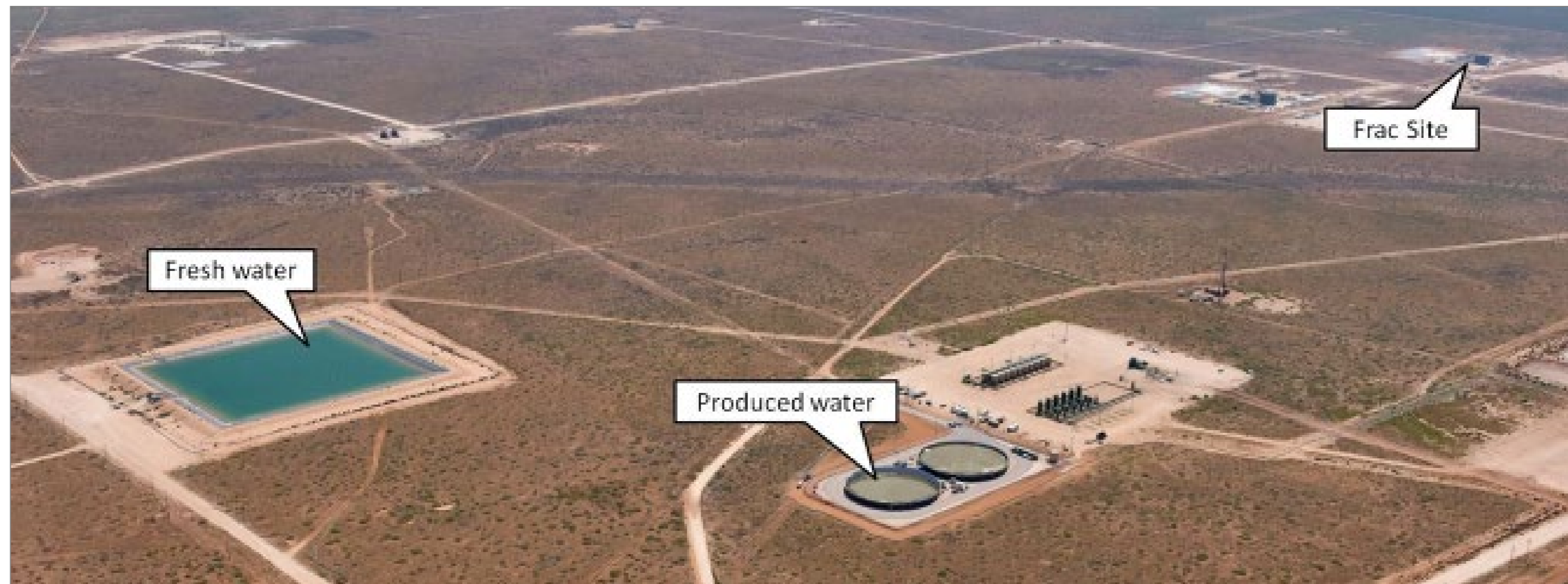
TETRA SwiftWater Above Ground Storage for Produced Water

TETRA SwiftWater Water Recycling System



Produced Water Recycling Project Multi-Year / Multi-Well

- Produced Water Usage up to 55% depending on availability
- No Impact on Stimulation 35 wells
- Decreased Fresh water used by 4,781,000 BBL (2 projects)
- Total water blended and sent to frac: 13,660,000 BBL (35% avg)
- Estimated savings of \$3,500,000* in water sourcing and disposal cost
- 8,500 BBL sellable oil extracted from water (approx. \$320,000)
- Assurance of supply has greater value than financial implications



* (2016,Spears)



Q & A