

# HYDROZONIX

Providing environmentally responsible water treatment solutions to the oil and gas industry

## Innovative Water Management Technologies

*Fear No Water*



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# Produced Water Reuse Standards

## Slickwater Fracs – 5 different Operators

Constituent	A	B	C	D	E
Chlorides (ppm)	140,000	100,000	N/A	85,000	N/A
Total Hardness (ppm)	50,000	NA	N/A	20,000	Calcium 2000 Magnesium 2000
Sulfides (ppm)	0	0	0	0	0
Iron (ppm)	25	10	10	10	10
Oil (ppm)	100	50	40	10	N/A
TSS (ppm)	100	100 micron	50	5 micron	N/A
pH	6.5-7.5	6-8	6.5-7.5	6-7	6-8
Bacteria (cfu/ml)	100	0	0	1000 GHB 100 SRB 100 APB	10,000

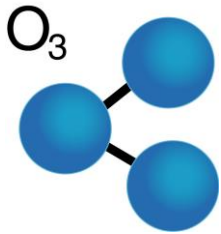
# Produced Water Reuse Standards

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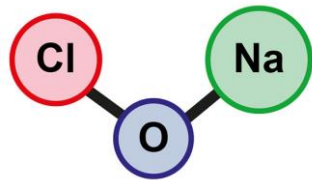
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# Conventional Produced Water Recycling

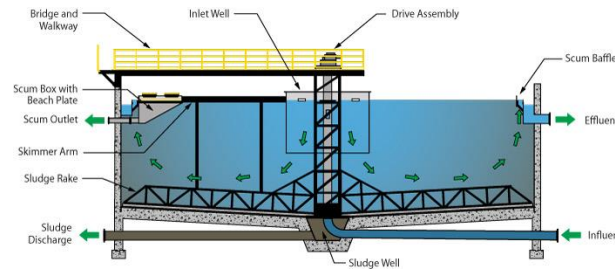
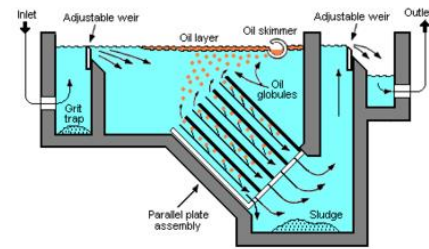
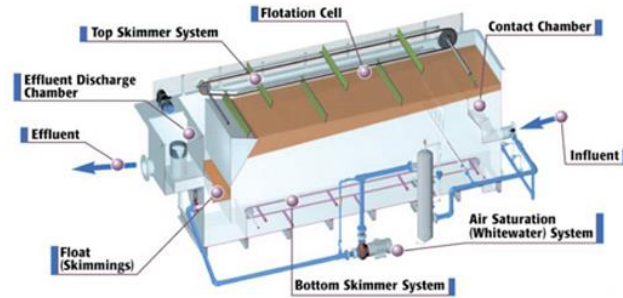
## Step 1 - Oxidation



chlorine dioxide



## Step 2 - Oil/Solids Control



## Step 3 - Solids Polishing



# Produced Water Reuse Standards

Slickwater Fracs – 5 different Operators

**What  
About  
Oil and  
Solids ?**

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# Solids & Oil Control

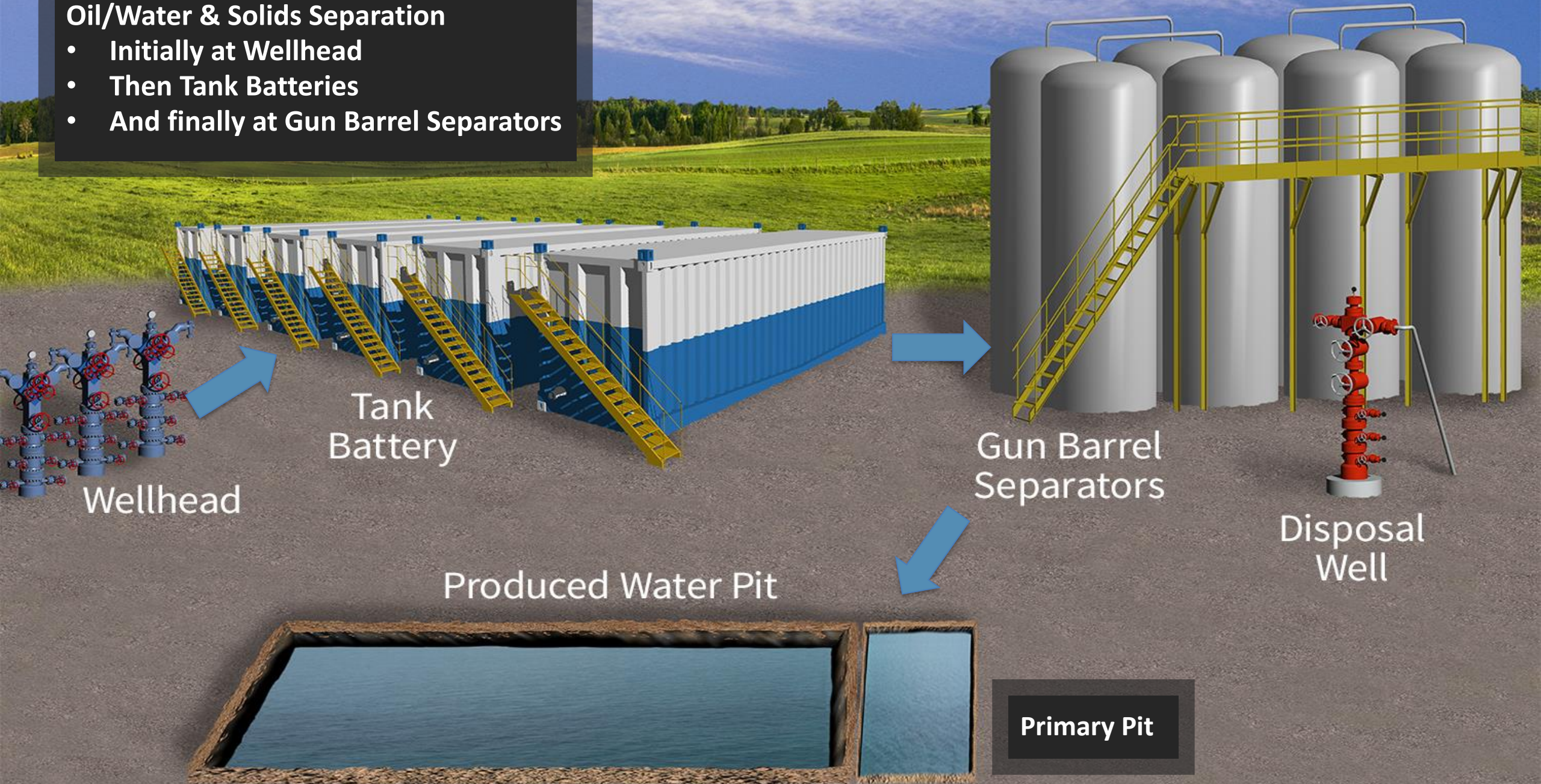
- Solids & Oil Control are located at Wellhead, Tank Batteries and SWD
- Desander or Centrifugal Separator is typically part of a Gun Barrel separator system
- Flowback systems include solids and oil control
- Some solids settle in Gun Barrel tanks while oil is removed
- Upstream Tank Batteries also settle solids and separate oil
- Secondary filtration is sometimes included downstream of Gun Barrel separators
- Not unusual to see < 30 ppm oil from Gun Barrels
- In some cases secondary systems are installed as part of recycling programs, which can include settling tanks, DAF, weir tanks for solids and additional oil removal
- Secondary systems are typically before produced water pits

You don't need Oil and Solids Control if you optimize existing systems



## Oil/Water & Solids Separation

- Initially at Wellhead
- Then Tank Batteries
- And finally at Gun Barrel Separators



# Solids & Oil Control

## Solids and Oil/Water Separation

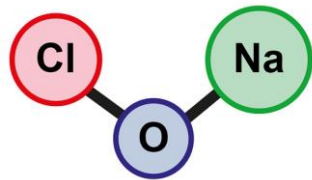
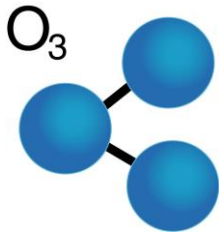
- Secondary Solids Control
  - Sometimes your storage is your secondary control
  - Smaller pit w/sump before a larger pit
  - Oil boom and skimmer can be added



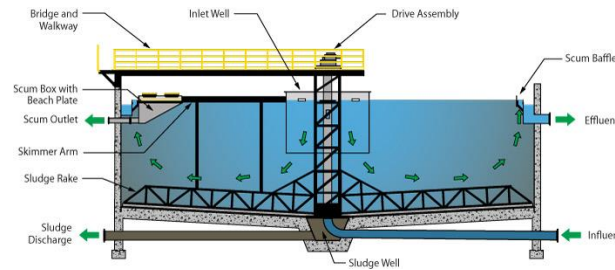
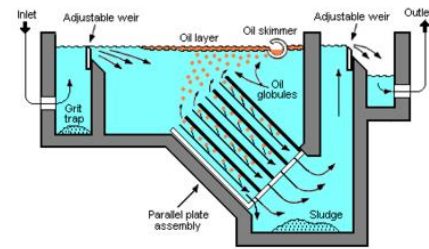
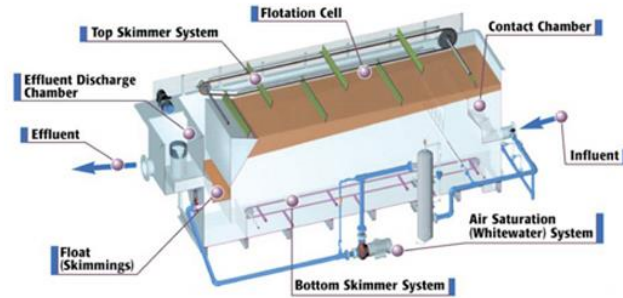


# Conventional Produced Water Recycling

## Step 1 - Oxidation



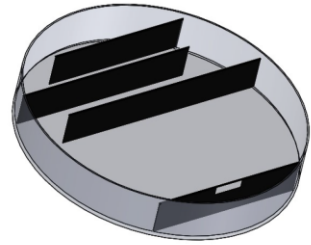
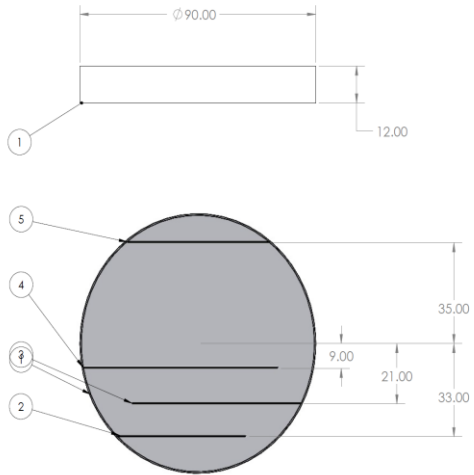
## Step 2 - Oil/Solids Control



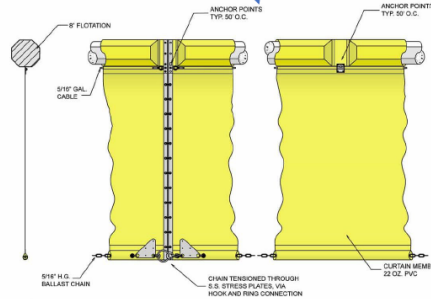
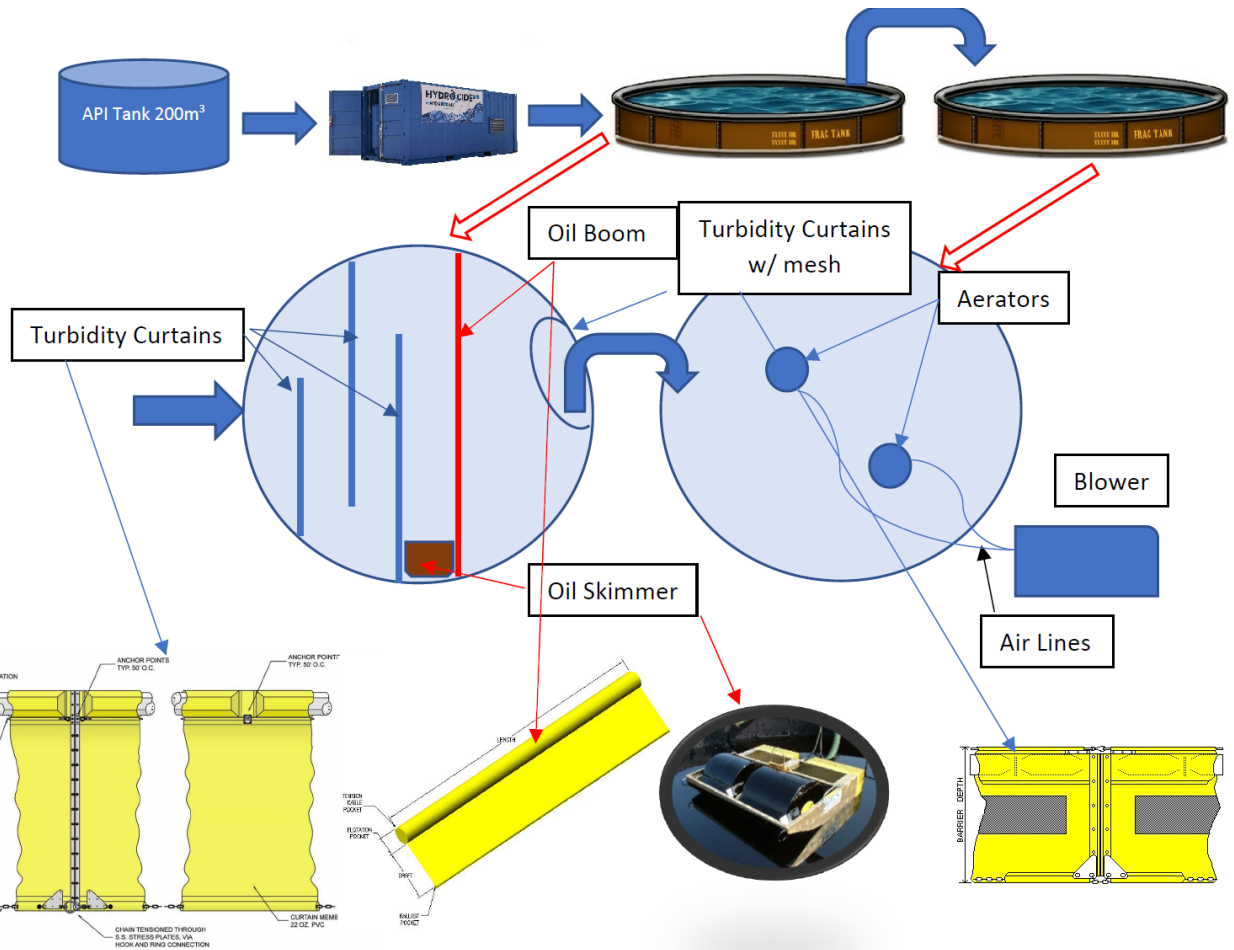
## Step 3 - Solids Polishing



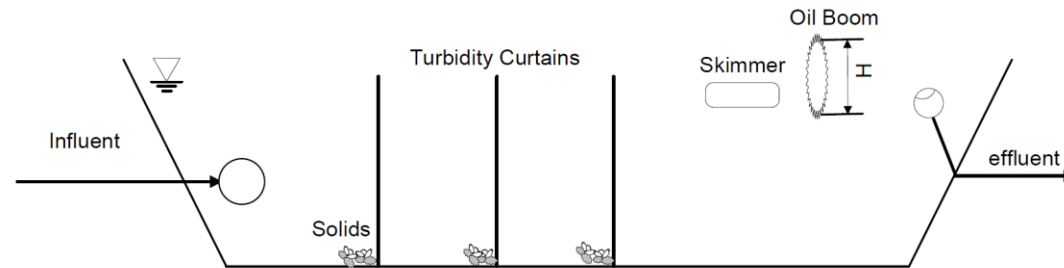
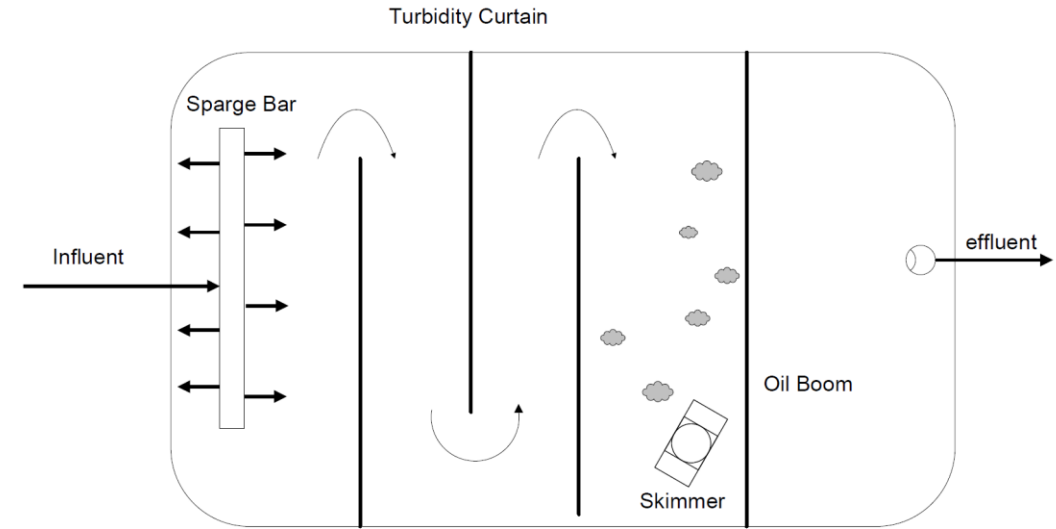
# Produced Water Reuse



ITEM NO.	PART NAME	DESCRIPTION (L x W)	QTY.
1	AST Tank	90' x 12'	1
2	Baffle 1	50' x 10'	1
3	Baffle 2	65' x 10'	1
4	Baffle 3	75' x 10'	1
5	Baffle w Mesh - 25'	25' x 10'	1

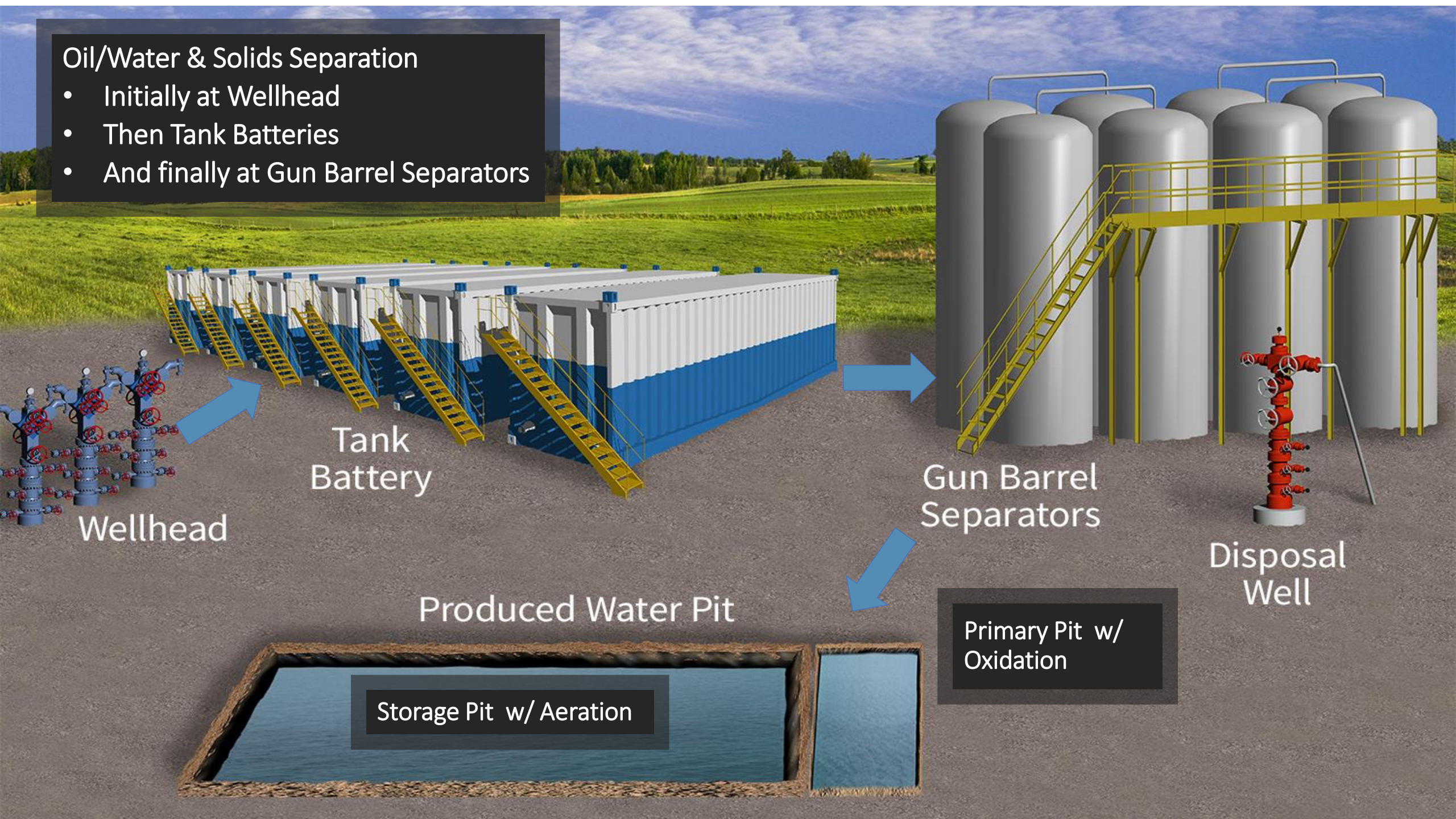


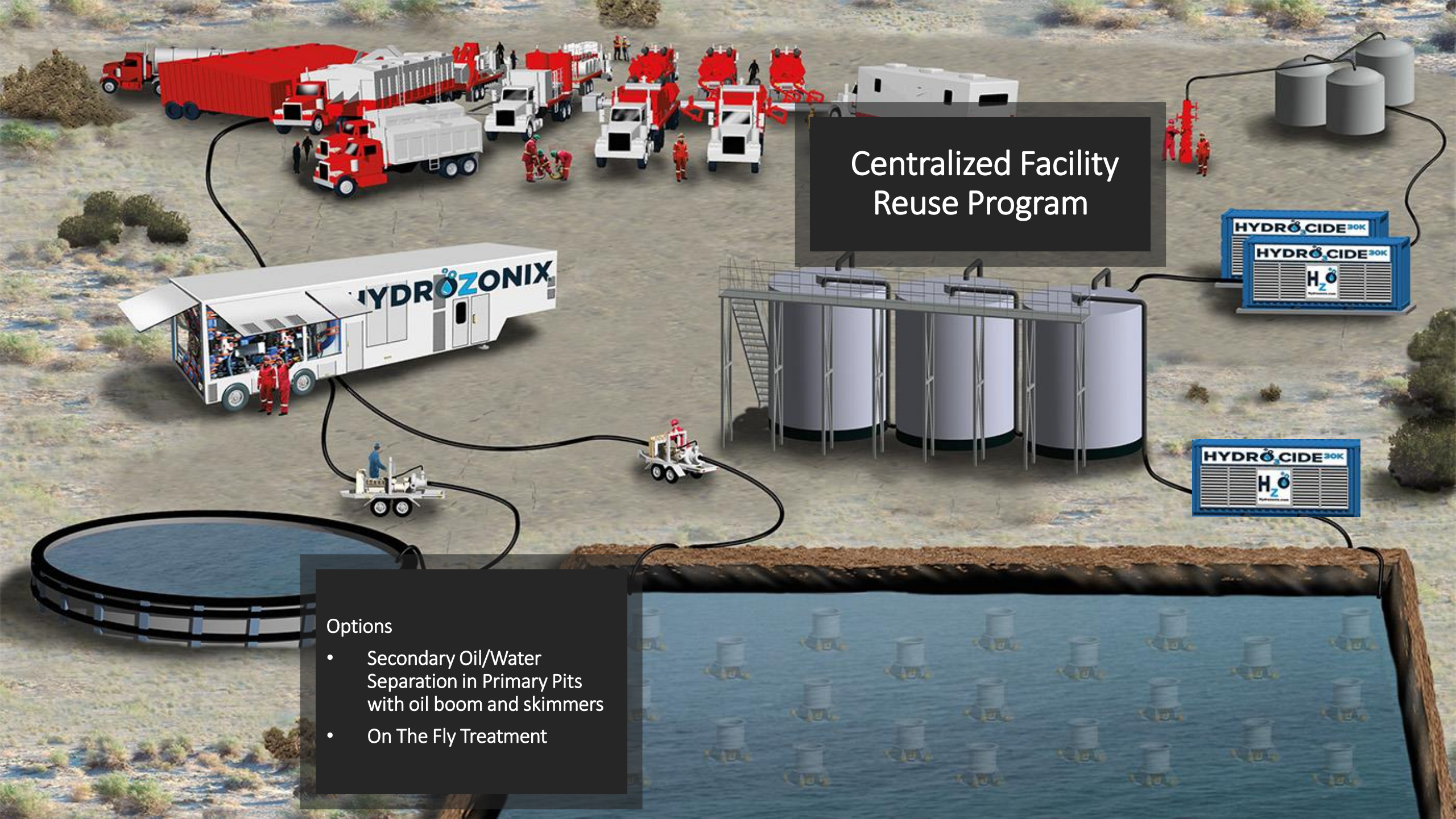
# Produced Water Reuse



## Oil/Water & Solids Separation

- Initially at Wellhead
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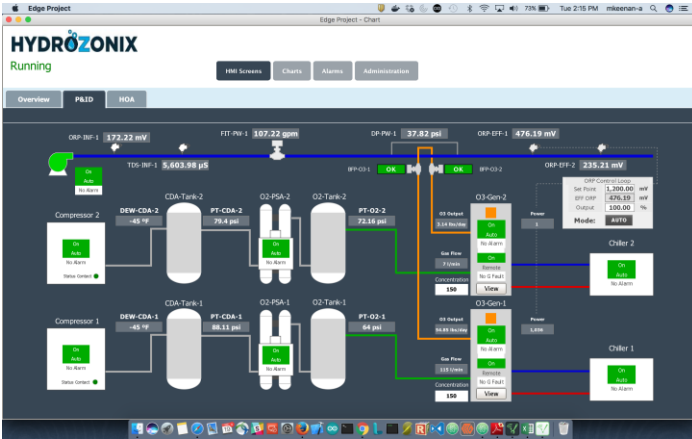


## Centralized Facility Reuse Program

### Options

- Secondary Oil/Water Separation in Primary Pits with oil boom and skimmers
- On The Fly Treatment

# HYDR<sub>3</sub>OZONIX

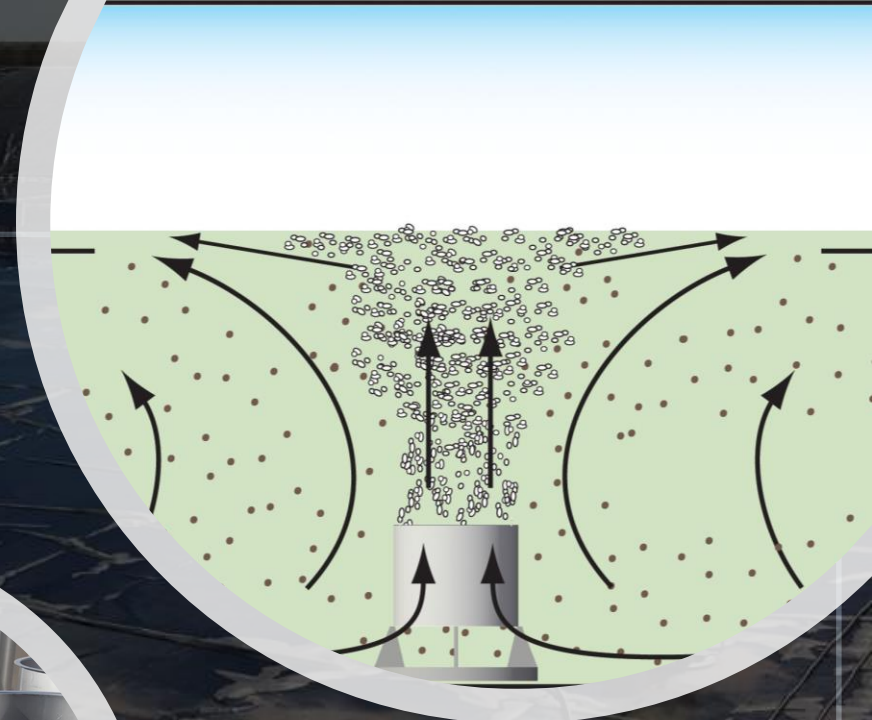
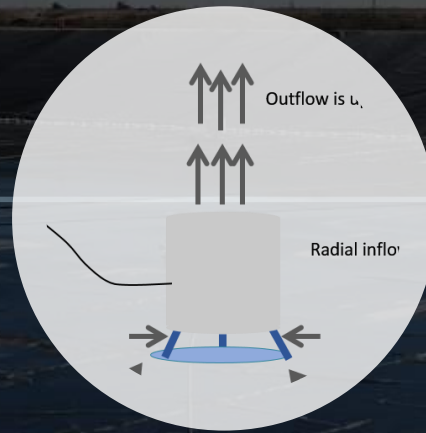


- Fully Automated Ozone System
- Provides Bacteria, Iron and Sulfide Control
- Rent from \$0.05 - \$0.10/bbl
- Purchase < \$0.03/bbl

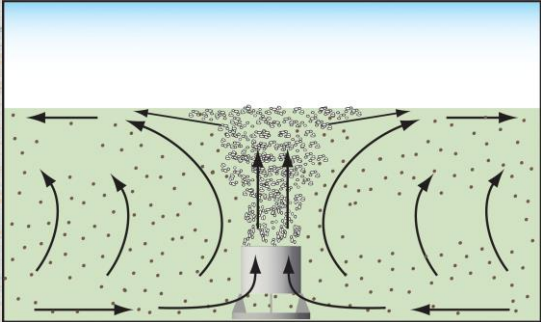
# Mixing Submersible Aerators

## Aeration Benefits

- Bacterial Control/Growth Inhibition
- Algae Control/Growth Inhibition
- Iron Control
- Sulfide Control
- Stratification Control
- Icing Inhibition
- Mixing / Homogenization
- Low Cost



# Aeration for Bacteria, Iron and Sulfide Control

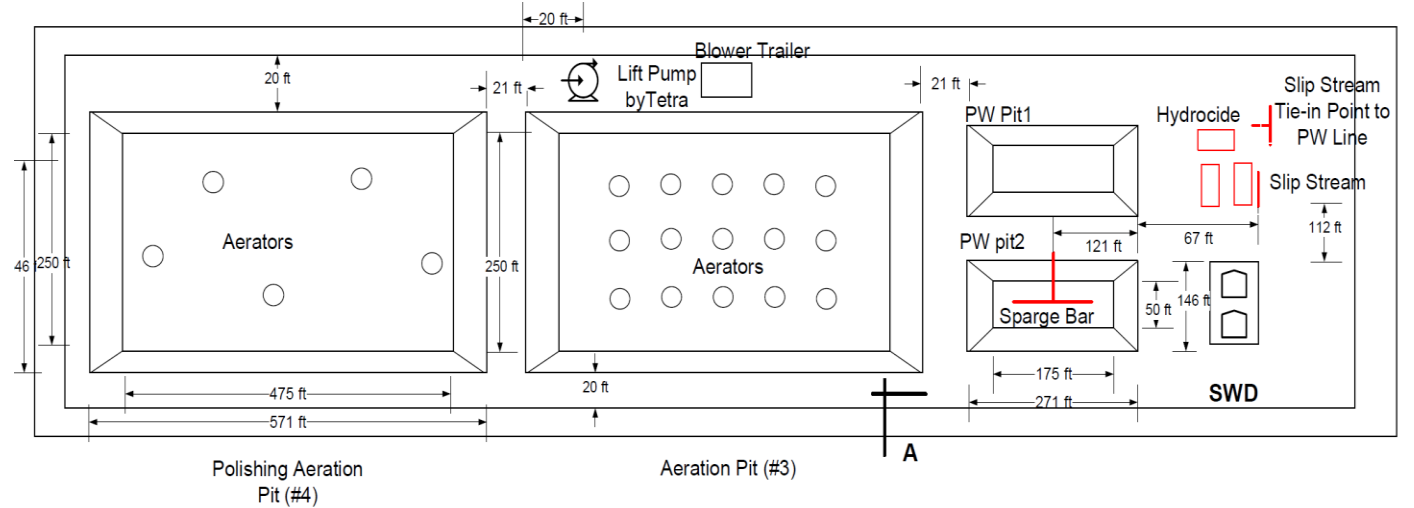




# HYDRO<sub>3</sub>CIDE

## Case Study

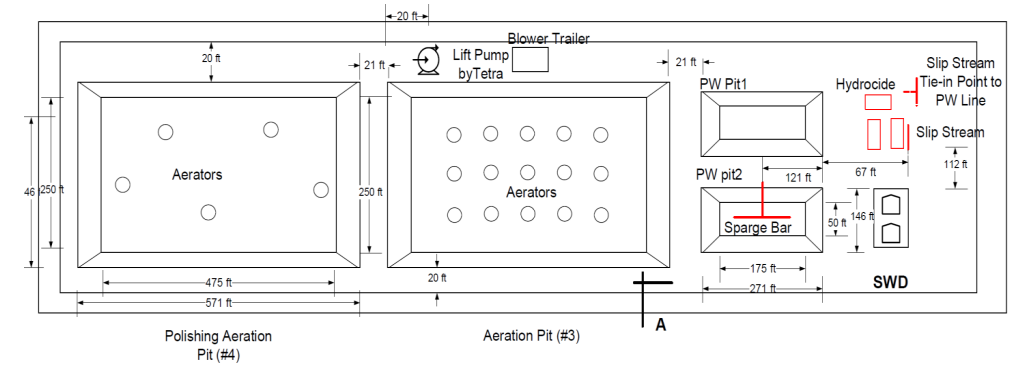
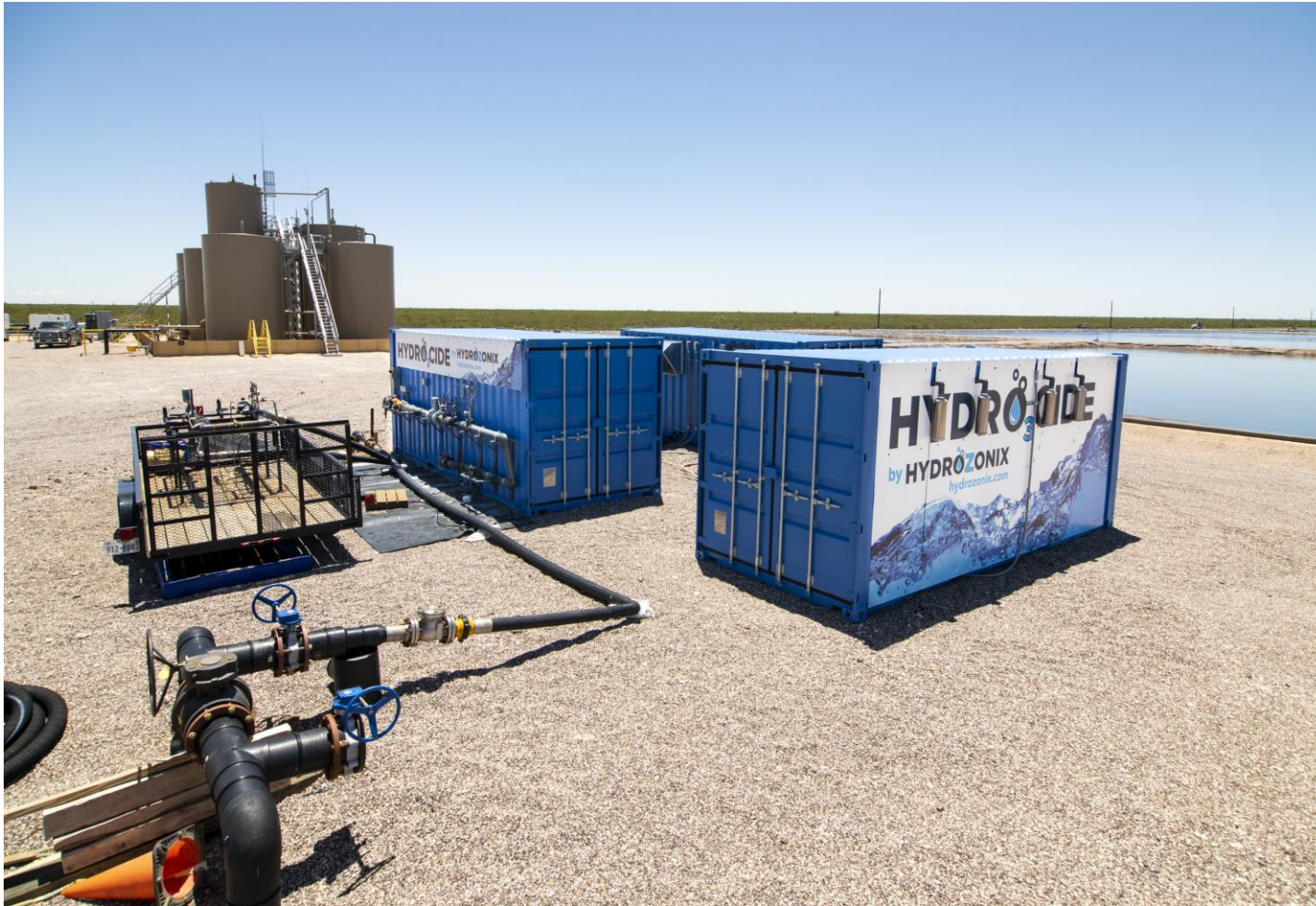
- Dual Use System
  - Pre-Treat Gun Barrels
  - Recirculate Primary Pit for Recycling
- Replaced Sodium Hypochlorite and aeration for \$0.26/bbl
- HYDRO<sub>3</sub>CIDE, automated ozone system with aeration under \$0.04/bbl



	ATP	Fe <sup>2+</sup>	Total Fe	Sulfide	TSS	ORP
Raw PW	32177	0.7	1.6	0.1	65	-112
Treated PW	96	0.3	1.4	0	47	336
Standard	<500	5		0	100	300-400

# HYDR<sub>3</sub>O<sub>3</sub>CIDE

## Case Study

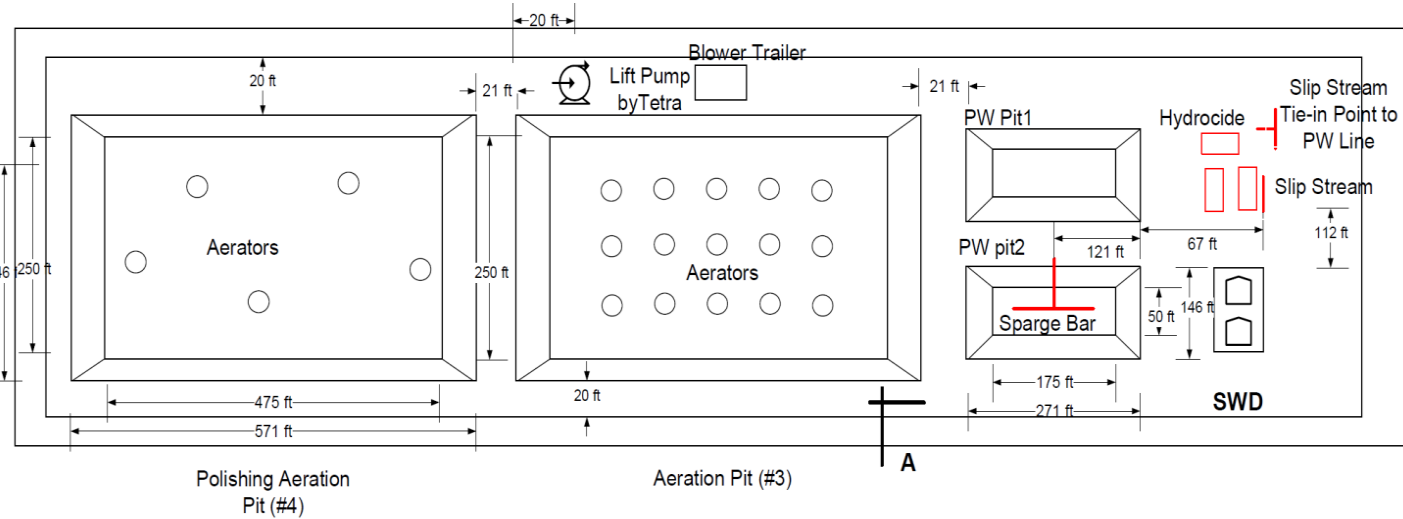


- Dual Use System provides better injectivity by oxidizing Fe to allow it to coagulate other solids and be removed by centrifugal separator

# HYDRO<sub>3</sub>CIDE Case Study

## Status

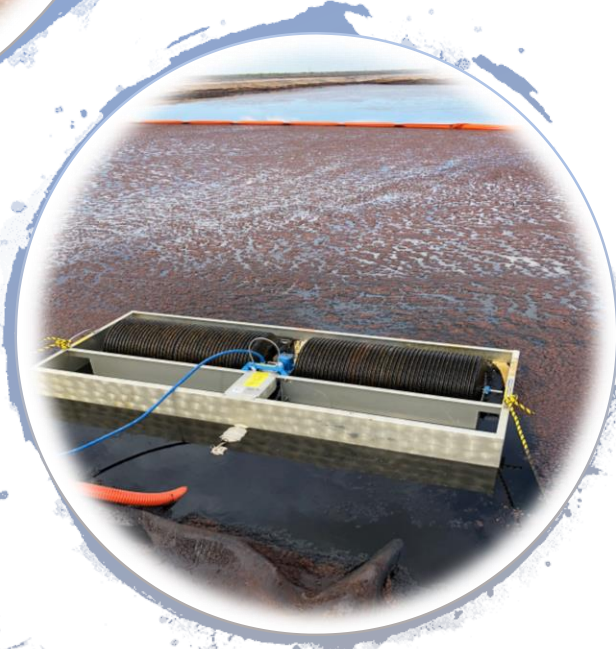
- (5) 40,000 BPD systems installed
- (5) Aeration Systems in 500,000 bbl pits at each location
- (2) additional locations scheduled for November



# HYDRO<sub>3</sub>CIDE Case Study

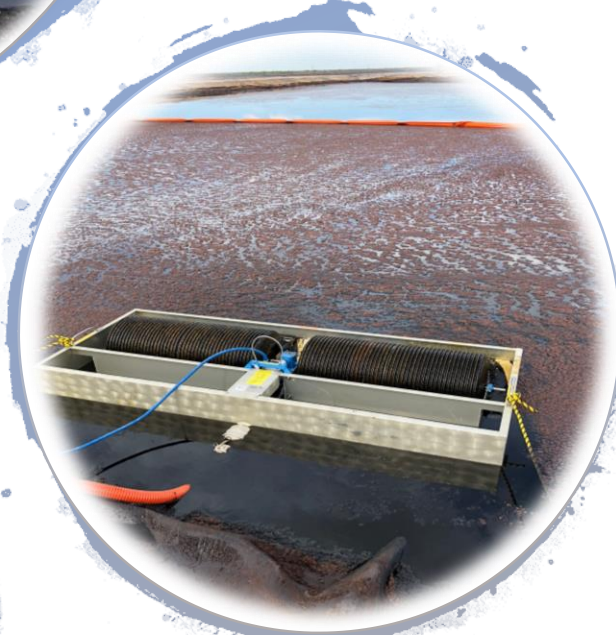
## Options

- Booms and oil skimmer added to primary pits
- Sparge Bar in primary pit for better mixing





# HYDRO<sub>3</sub>CIDE Case Study



40,000 BPD	Utilities	O&M	Total
\$800,000 Purchase			
\$13,333.33/ month 5yr dep.		\$10,000/ month	
\$0.011/bbl	\$0.005/bbl	0.008/bbl	<b>\$0.024</b>



Data Buoy



HYDRÖFLARE



HYDRÖ<sub>3</sub>CIDE OTF

*Fear No Water*





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