

# **The Use of Miniaturized Detection Technology with the Iphone or Android to Determine Water Composition and Bacterial Load of Agricultural and Industrial Water Sources**

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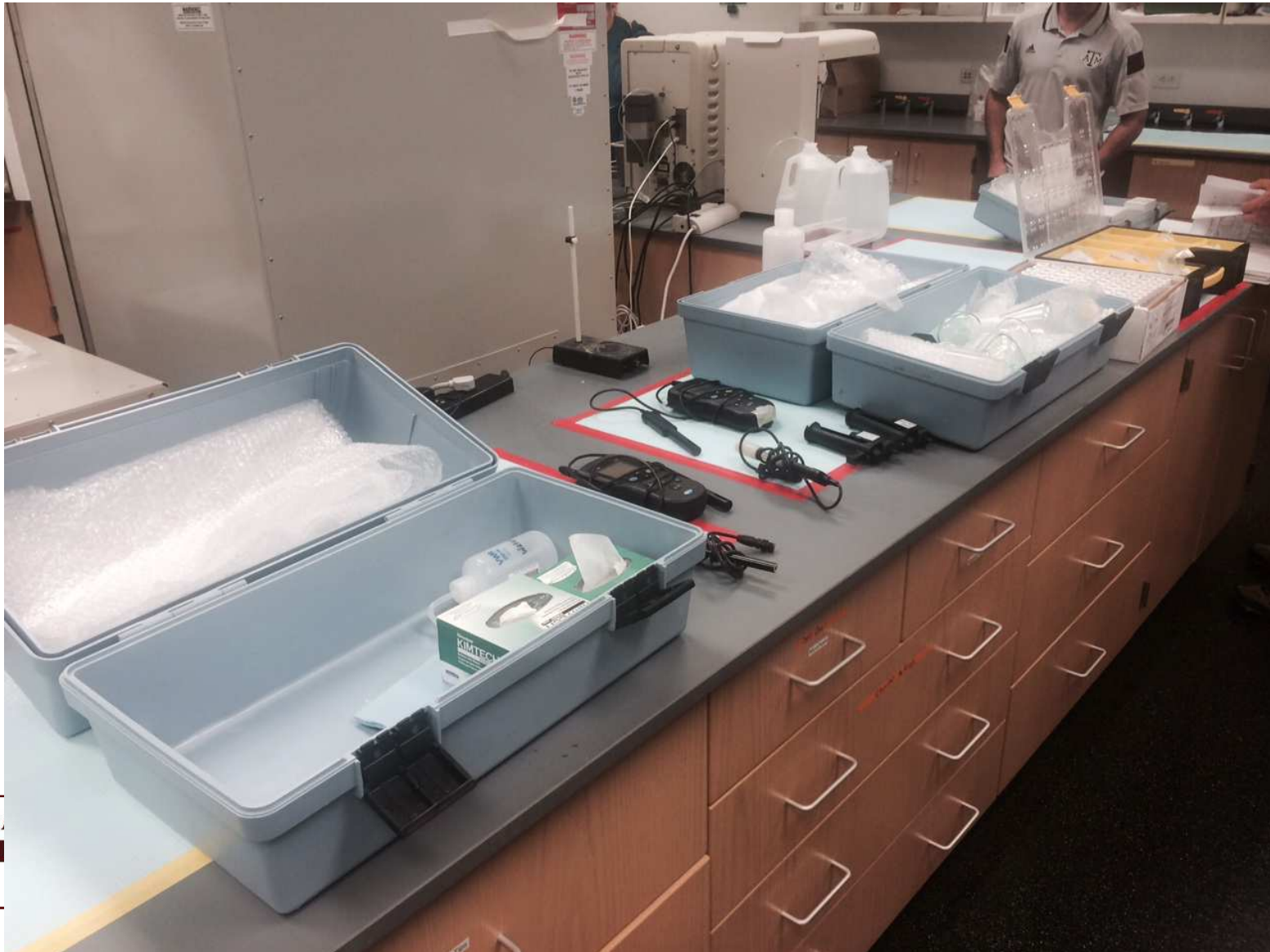
International Petroleum Environment  
Conference November 17-19 201

# ICP in a Working Laboratory



*Harold Vance Department of*  
**PETROLEUM ENGINEERING**  
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# Hach Basic Frac Kit



# Hach Reagent Pillows



# Hach Turbidity Meter



# Lamotte Frac Kit



# Site Testing; Microbial Influenced Corrosion (MIC)



# What We Would Love to Have in the Field





# Duck Pond (Fresh Water) in Webb County, TX

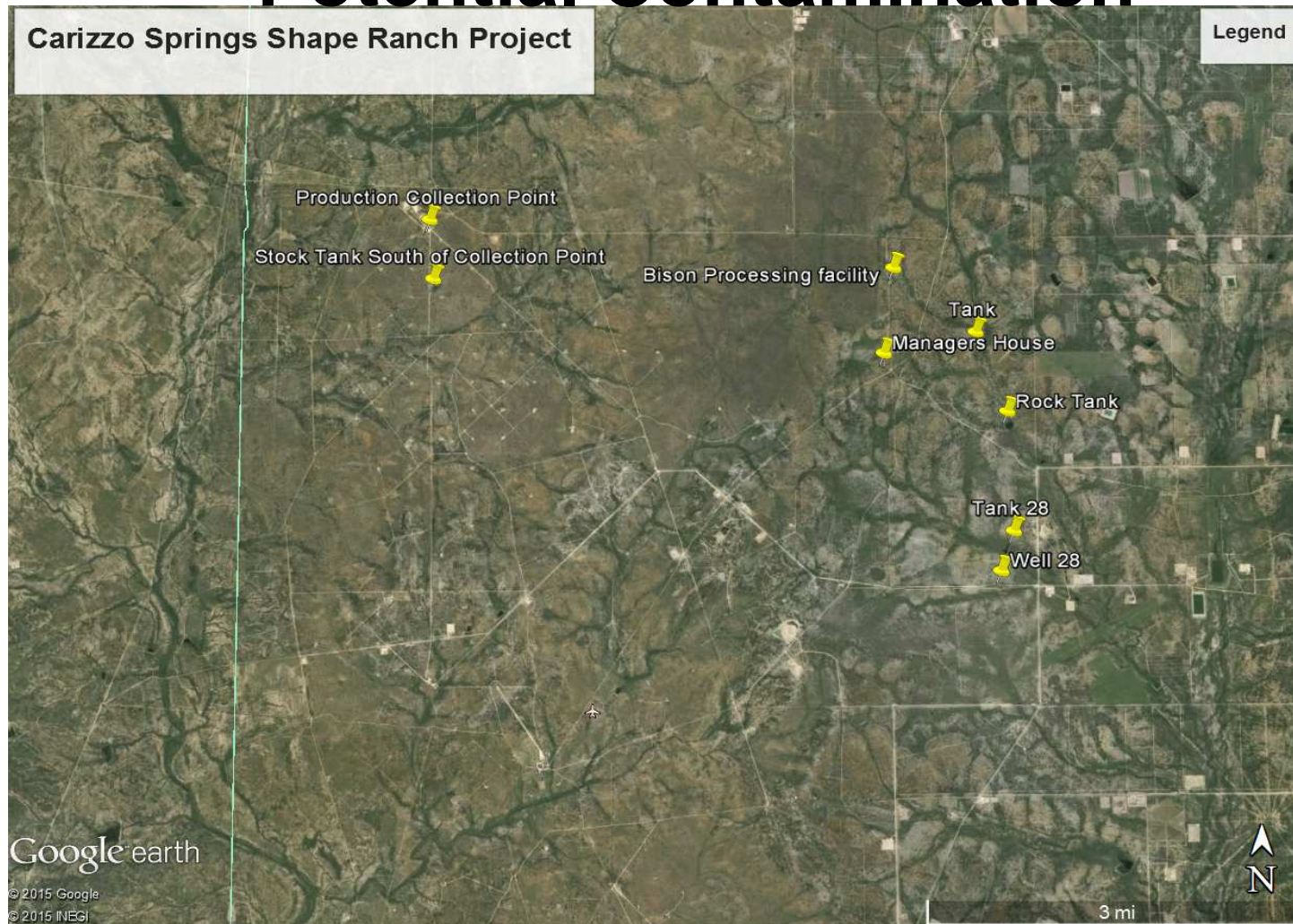


# Eagleford Frac Pond



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# Site in South Texas for Static Parameter Monitoring Potential Contamination



# Horiba U50



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# Horiba u50 non wifi

Turbidity (U-53G only)	Range: 0-1000 NTU Resolution: 0.01 NTU Accuracy: 0 to 10 NTU: $\pm 0.5$ NTU 10 to 1000 NTU: 3% (reading) or $\pm 1$ NTU whichever is greater
Sensor probe	Measurement temperature: -5 to 55° C Mass: Approx. 1800 g (Approx. 3.97 lbs)
Control Unit:	Mass: Approx. 800 g (Approx. 1.76 lbs) LCD: 320 x 240 liquid crystal display with backlight
pH	Measurement principle: Glass electrode method Range: pH0 to 14 Resolution: 0.01pH Repeatability: $\pm 0.05$ pH
Oxidation Reduction Potential (ORP)	Measurement principle: platinum electrode method Range: -2000 mV to +2000 mV Resolution: 1 mV Repeatability: $\pm 5$ mV
Dissolved Oxygen (DO)	Measurement principle: polarographic method Range: 0 to 50.0 mg/L Resolution: 0.01 mg/L Repeatability: $\pm 0.1$ mg/L
Conductivity	Auto range Automatic temperature conversion (25°)
Salinity	Range: 0 to 70 PPT Resolution: 0.1 PPT
Total Dissolved Solid (TDS)	Range: 0 to 100 g/L Resolution: 0.1% F.S.
Seawater specific gravity	Measurement principle: Conductivity conversion Range: 0 to 50 t
Temperature	Measurement principle: Thermistor method Range: -5 to 55°C



# smarTROLL Multiparameter (MP) Handheld



# smarTROLL Multiparameter (MP) Handheld

**Chemical parameters:** Dissolved oxygen, pH, ORP, conductivity (actual or specific), salinity, total dissolved solids, resistivity, and density

**Physical parameters:** Air and water temperature, barometric pressure, water level, and water pressure



# Hach SL1000





# SL1000 Test Parameters

Parameter	Reporting Range
ammonia	0.05-1.5 mg/l
ammonia, free	0.05-1.5 mg/l
Chlorine, Free	0.12-4.6 mg/l
Chlorine, Total	0.12-4.6 mg/l
Copper	0.06-5.75 mg/l
Monochloramine	0.12-4.6 mg/l
Nitrite	0.005-0.6 mg/l



# LaMotte Mobile WaterLink Spin



# LaMotte Test Disk



# LaMotte Test after Reaction with Water Tested



# Lamotte Components

Inject Water  
into the Disk



Insert Disk into  
the Reader



Tests results  
automatically



Chlorine Disk  
Code 4330-H [50/pk]

Biguanide Disk  
Code 4431-H [50/pk]

# LaMotte Spin Parameters

The screenshot displays the 'Web DataMATE' software interface. At the top, there is a navigation bar with 'Customer Search', 'Reports', and 'Add Customer' buttons. The user is logged in as 'Tom Smith'. The main content area is titled 'Test Water' and shows data for 'Tom Smith' at 'Site Pool 1'. A table lists various water parameters with their current values and historical data for three dates: 02/21, 01/30, and 01/30. A 'Spin' logo and a 'Report' button are visible. On the right, there is a 'Customer Information' section with an 'Edit' link, listing details such as Name, Address, City, State, Zip, and Phone numbers.

Test Parameter	Use	Value	Range	02/21	01/30	01/30	Actions
Temperature		0 F		0	0	0	 <a href="#">Report</a>
Free Chlorine	✓	<input type="text"/>	2-4 ppm	0	0.5	0	
Total Chlorine	✓	1.4	2-4 ppm	0	0.5	0	
pH	✓	7.1	7.2-7.8	6.3	8.1	6.7	
Alkalinity	✓	110	100-150 ppm	0	74	30	
Hardness	✓	201	124-325 ppm	0	232	20	
Cyanuric Acid	✓	9	30-150 ppm	1	2	0	
Copper	✓	<input type="text"/>	0-0.2 ppm	0	0.2		
Iron	✓	<input type="text"/>	0-0.2 ppm	0	0.3		
Manganese	✓	<input type="text"/>	0-0.2 ppm				
Phosphate	✓	<input type="text"/>	0-500 ppb				

**Customer Information** [Edit](#)

Name: Tom Smith  
Address: 1122 Quick Lane  
City: Cairn Village  
State: VA  
Zip: 21620  
Phone 1: 722-957-1234  
Phone 2:  
Email: ts@none.com



# Waterlens



# Waterlens Test Tray with implied Dilution Schedule





# Waterlens Results

Date	Time	Source		
10/7/2014	10:05AM	PERMEATE		
Analyte	Dilution Factor	Measured Concentration	Actual Concentration	
Turbidity (NTU)		0	838	838
Total Iron (mg/L)		0	0	0
Calcium (mg/L as Ca+2)	1000		2.11	2110
Boron (mg/L)	10		8.8	88
Date	Time	Source		
10/8/2014	1:50PM	FEED		
Analyte	Dilution Factor	Measured Concentration	Actual Concentration	
Turbidity (NTU)		0	2.5	2.5
Total Iron (mg/L)		0	0.9	0.9
Calcium (mg/L as Ca+2)	1000		1.97	1970
Boron (mg/L)	10		6.5	65



# Cost Parameters

Unit	Unit Cost	software	reagents expendable per test
LaMotte Spin	\$1,040	Included	\$3.00
Water Lens	<b>In development</b>		
Horibba U-50	\$3,225		
hach sl1000	\$2,950		
smarttroll	\$3,200		



# Site Testing; Microbial Influenced Corrosion (MIC)



Recent rapid test mobile technologies identify total bacterial numbers. QuickChek SRB is the only rapid test mobile technology that measures a specific type of bacteria.

## Current Mobile Monitoring Options

Molecular Technology	Ease of Use	Testing Time (min)	Portability	Accuracy	Microbial Activity Tested	Cost
ATP LuminUltra	Easy	5	Very Good	Good	All (viable & nonviable)	\$
Bactiquant	Moderate	11	Very Good	Good	All (viable only)	\$
QuickChek SRB	Moderate	10	Very Good	OK	SRB (viable & nonviable)	\$
Rapid-B Flow Cytometer	Easy	3	Benchtop Based	Very Good	All (viable only)	\$
Bug Bottles	Easy	5-7 days	Benchtop Based	OK	Specific to Media (viable only)	\$

<http://www.hach.com/quick.search-quick.search.jsa?keywords=ATP+LuminUltra>

<http://www.modernwater.com/monitoring/by-industry/oil-and-gas>

<http://www.mycometer.com/> <http://www.biotechnologysolutions.com/>

[gas.php](http://www.gas.php)

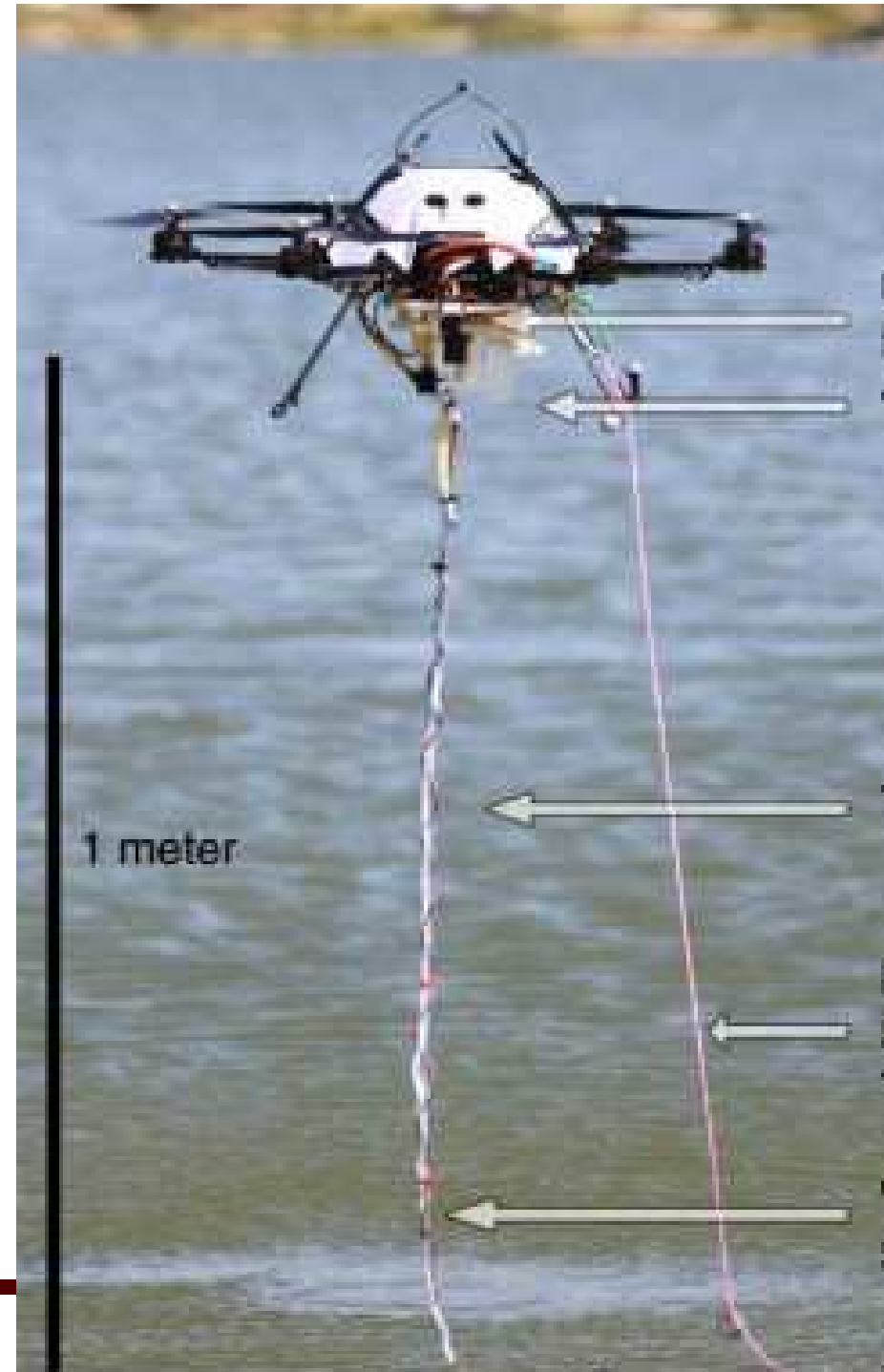
Slide No.

# Bactiquant Biological Unit

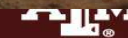


# Drone Sampling

Quick to site  
Properly setup multiple samples  
Get schedule  
Inaccessible area for man sampling  
Hazardous duty area (poisonous  
conditions) such as H<sub>2</sub>S



# Duck Pond (Fresh Water) in Webb County, TX

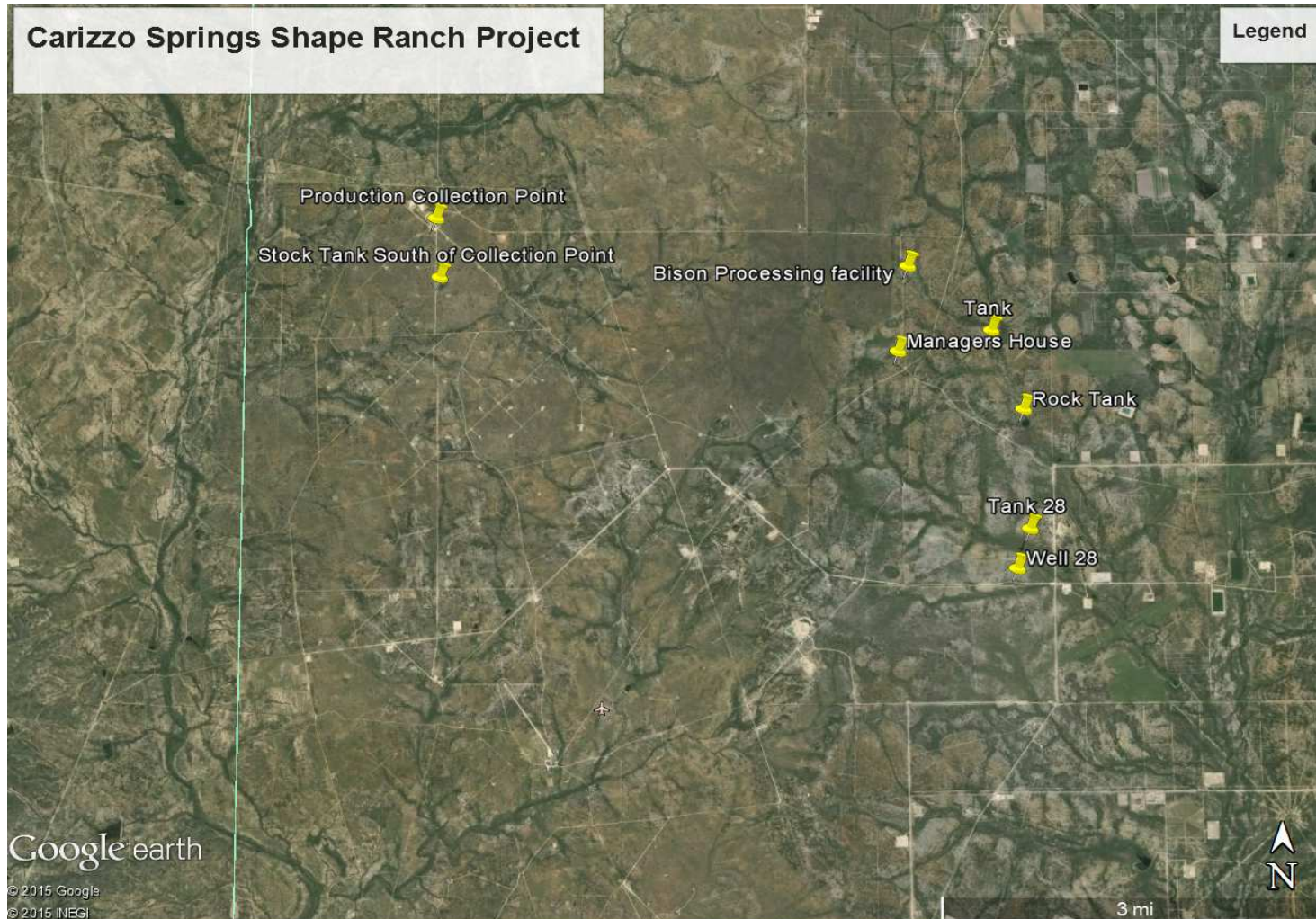


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# South Texas Ranch with Multiple Sample Points





**Questions?**

