Summary Slides

Our Own Debutante Party for a Special Young Lady – "ROZ"

A Recap of the 2010 Field Trip to Hess Corporation's Seminole San Andres Unit CO_2 Flood and Facilities

And Legado Resource's Goldsmith Landreth CO_2 Flood (Ector Co, Tx)

December 8, 2010

A Very Special Thanks Goes to the Conference Sponsors

Advanced Resources International
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Legado Resources
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Trinity CO_2, LLC
The University of Texas of the Permian Basin
Whiting Petroleum Corporation

2010 CO_2 Flooding Conference
Wednesday, Dec 8th

CO_2 Conference Field Trip to Seminole and Goldsmith

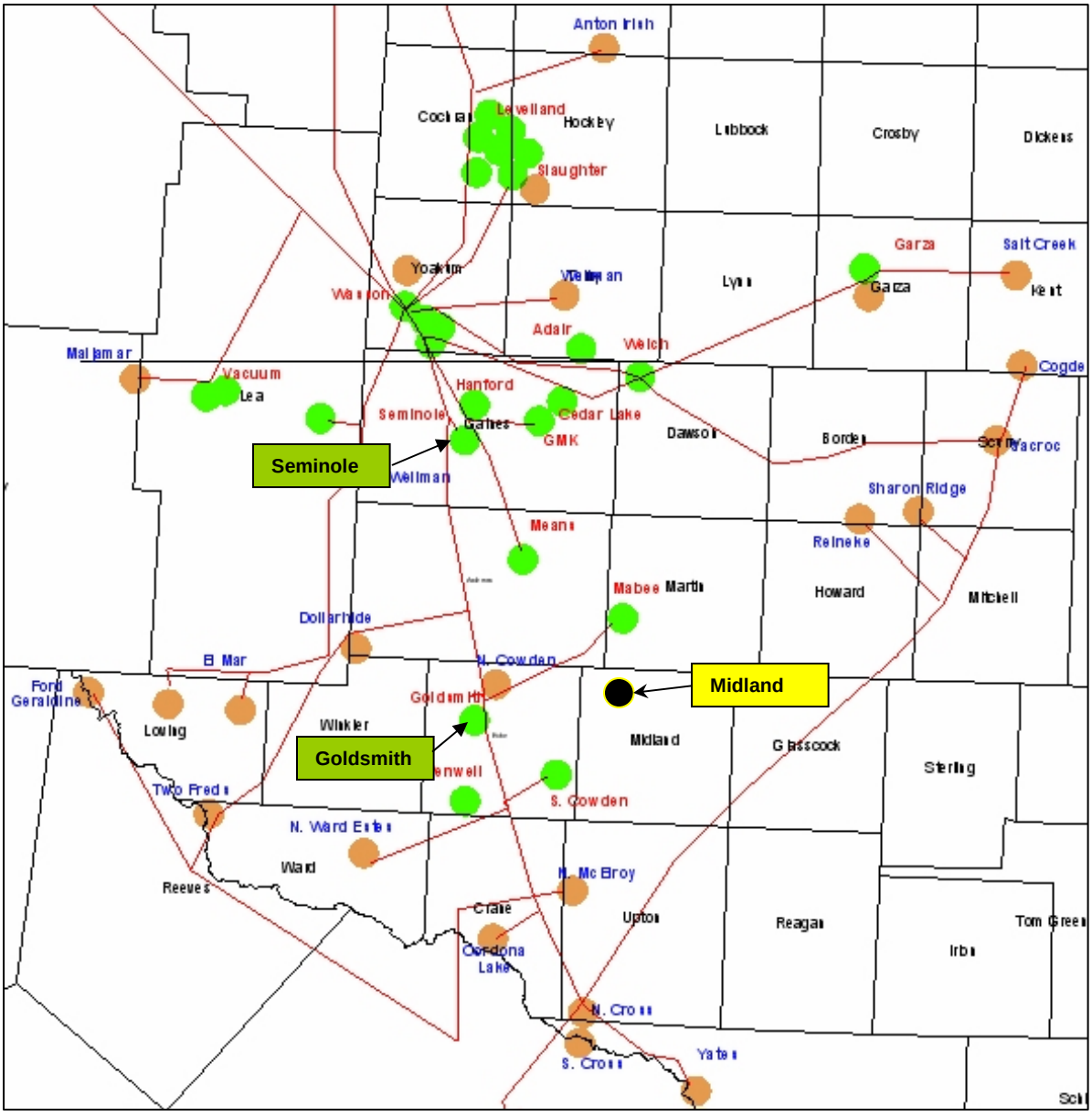
Clothing Requirements: If you have fire-retardant clothing, please wear; if not, wear long sleeve cotton shirt and cotton pants. You need to also wear sturdy, closed –toe shoes. Hard hats and safety glasses will be provided for the portion of the trip where needed.

Host Sponsors: Hess Corporation and Legado Resources
Trip Coordinator: Bob Kiker – APTA

(8:00 am to 5:00 pm)

8:00	*Check-in at Midland Center*
8:30	*Buses Depart Midland Center Promptly*
9:45	*Arrive at Hess Offices in Seminole, Tx*
9:45-10:15	*Rest Stop, Briefing*
10:30-11:45	*Tour of Field Facilities*
12:00	*Return to Hess Offices for Buffet lunch*
12:00-1:00	*Lunch*
1:00	*Depart for Tour of Plant Facilities*
2:30	*Depart for Goldsmith*
3:30	*Goldsmith Landreth CO_2 Flood and Facilities*
4:00-4:15	*Goldsmith Rest Stop*
4:15-5:00	*Return Trip to Midland Center*

CO_2 Floods in the Permian Basin



Seminole

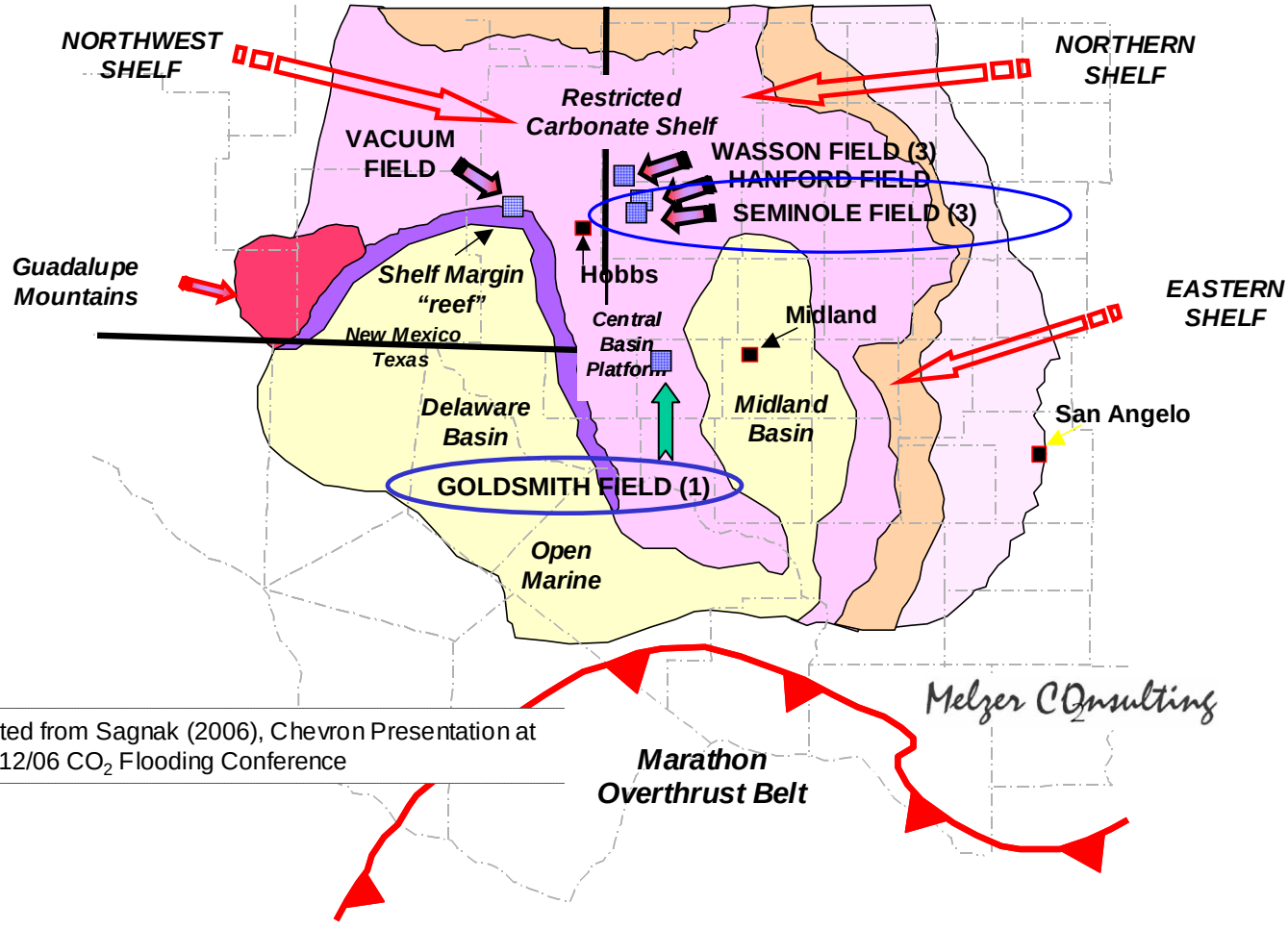
Midland

Goldsmith

ACTIVE RESIDUAL OIL ZONE CO_2 EOR PROJECTS IN THE PERMIAN BASIN

MIDDLE SAN ANDRES PALEOGEOGRAPHY

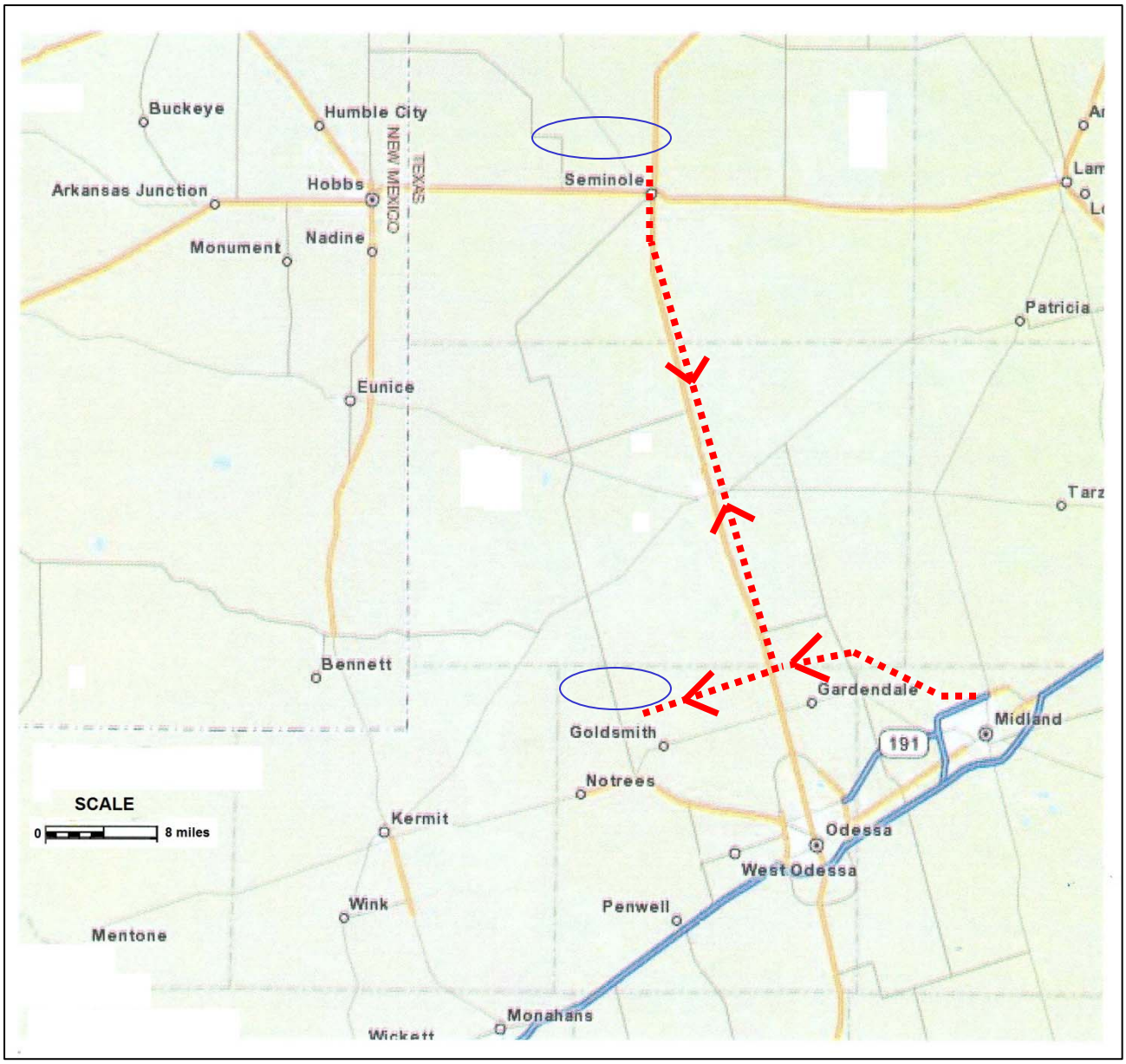
with Location of Industry Documented ROZ Zones/Fields*



Melzer CO_2nsulting

* Adapted from Sagnak (2006), Chevron Presentation at the 12/06 CO_2 Flooding Conference

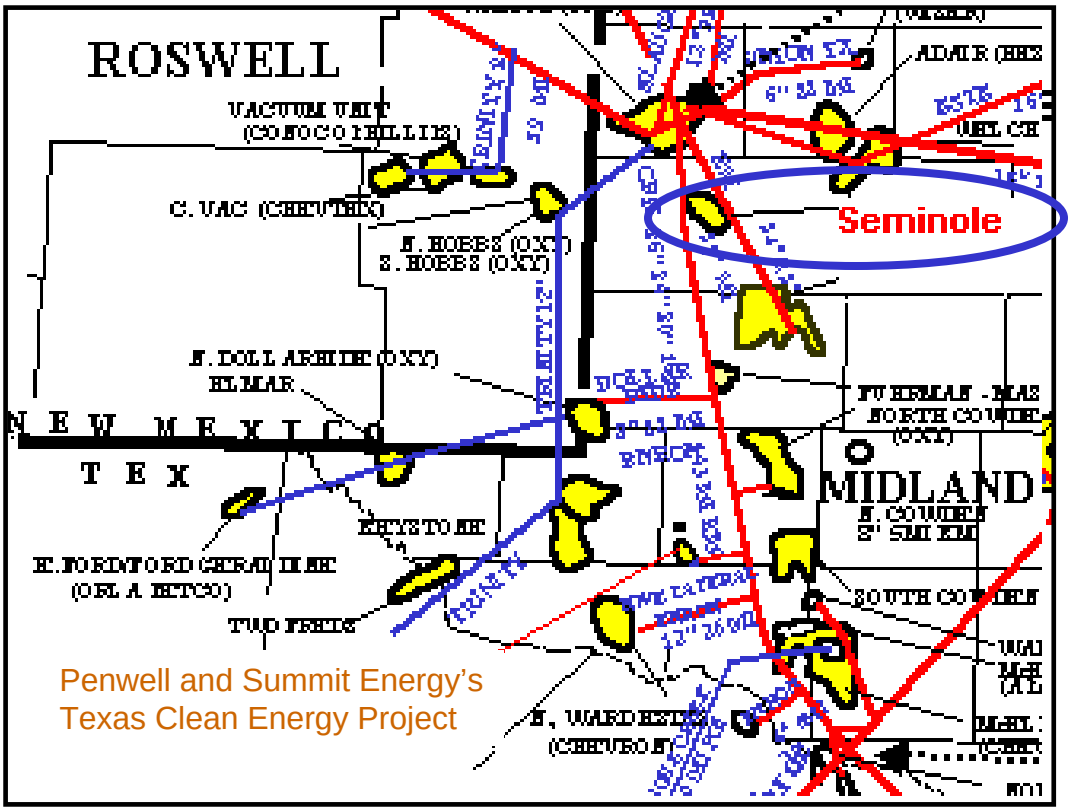
MAP OF FIELD TRIP ROUTE



STOP NUMBER 1

THE SEMINOLE FIELD

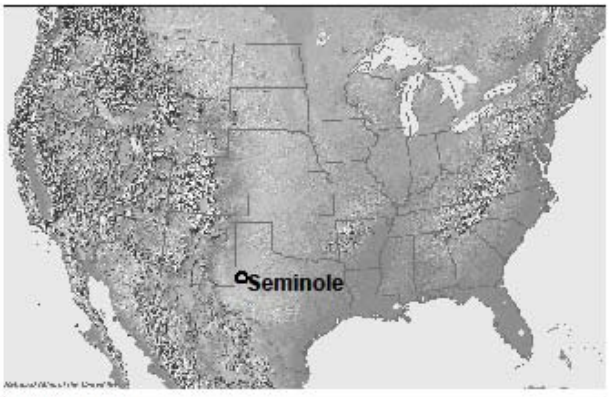
Seminole San Andres Unit (SSAU)



SSAU BACKGROUND

Seminole San Andres Unit

SSAU Background



Ownership

Hess	**34.3% (operator)**
OXY	**28.0%**
ExxonMobil	**19.2 %**
Marathon	**13.5 %**
Chevron	**2.5 %**
Others	**2.5 %**

Location: **Permian Basin, TX**

Wells: **368 prod 196 inj**

Facilities: **SSGP Unit CO2 Recovery Plant**

Reservoir Description	**Limestone and dolomite deposited in a shallow carbonate ramp environment**
Fluid Type	**Saturated black oil**
Drive Mechanism	**Gas in solution and gas cap during primary. External energy from water and CO2 injection during secondary and tertiary recovery.**
Develop. History	**1936 Discovery** **1936 First Production** **1969 Unitized/Waterflood** **1983 MPZ CO2 Flood Begins** **1996 ROZ Phase 1** **2004 ROZ Phase 2** **2007 ROZ Stage 1**
Cumulative Production	**674 MMBO, 41 MMBOE NGL, 685 BCF HC Gas**
Current Rate	**19.7 MBOPD, 242 MMCFD CO2+HC** **28,113 MBOEPD (Oil+NGL+Gas)**

May 18, 2010

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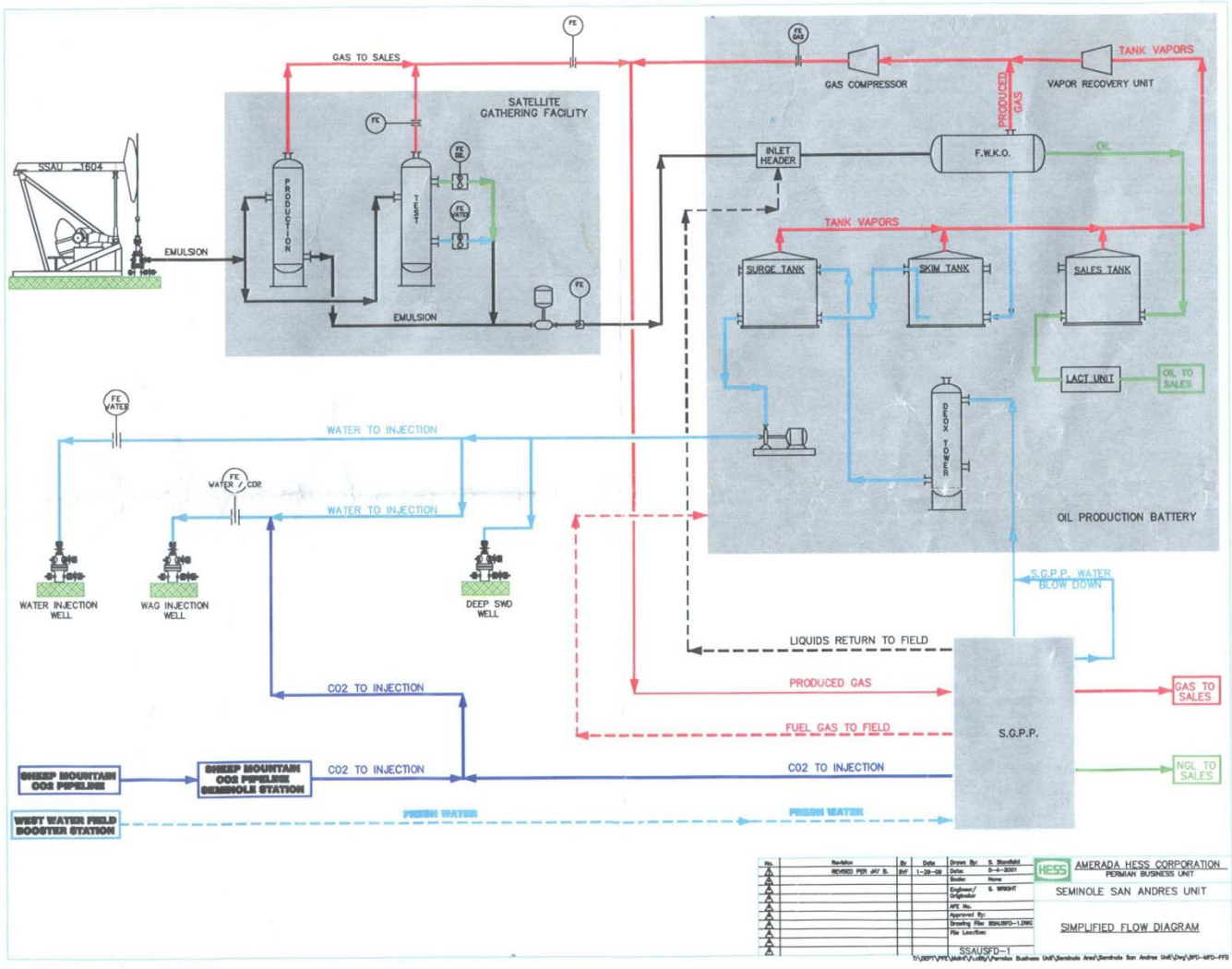
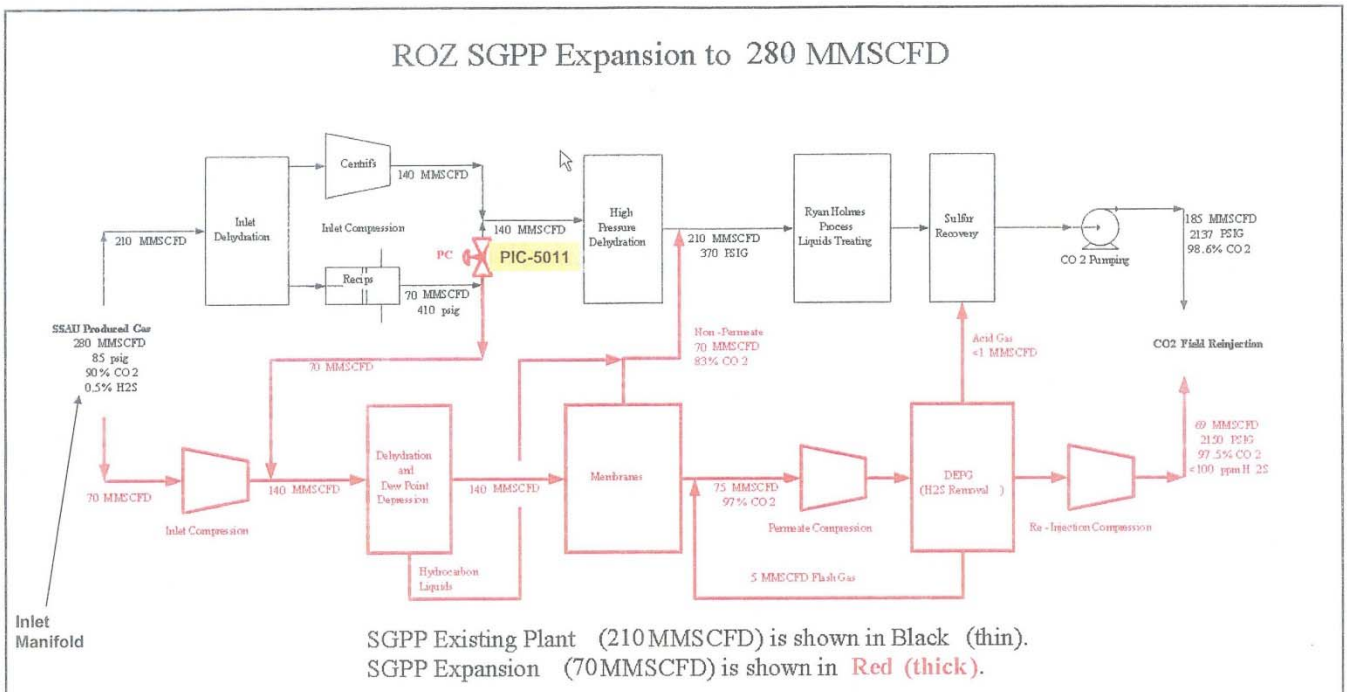
Reference: Biagiotti, S. (2010), Houston Section of the SPE Reservoir Study Group, May 2010

SSAU Field Flow Schematic



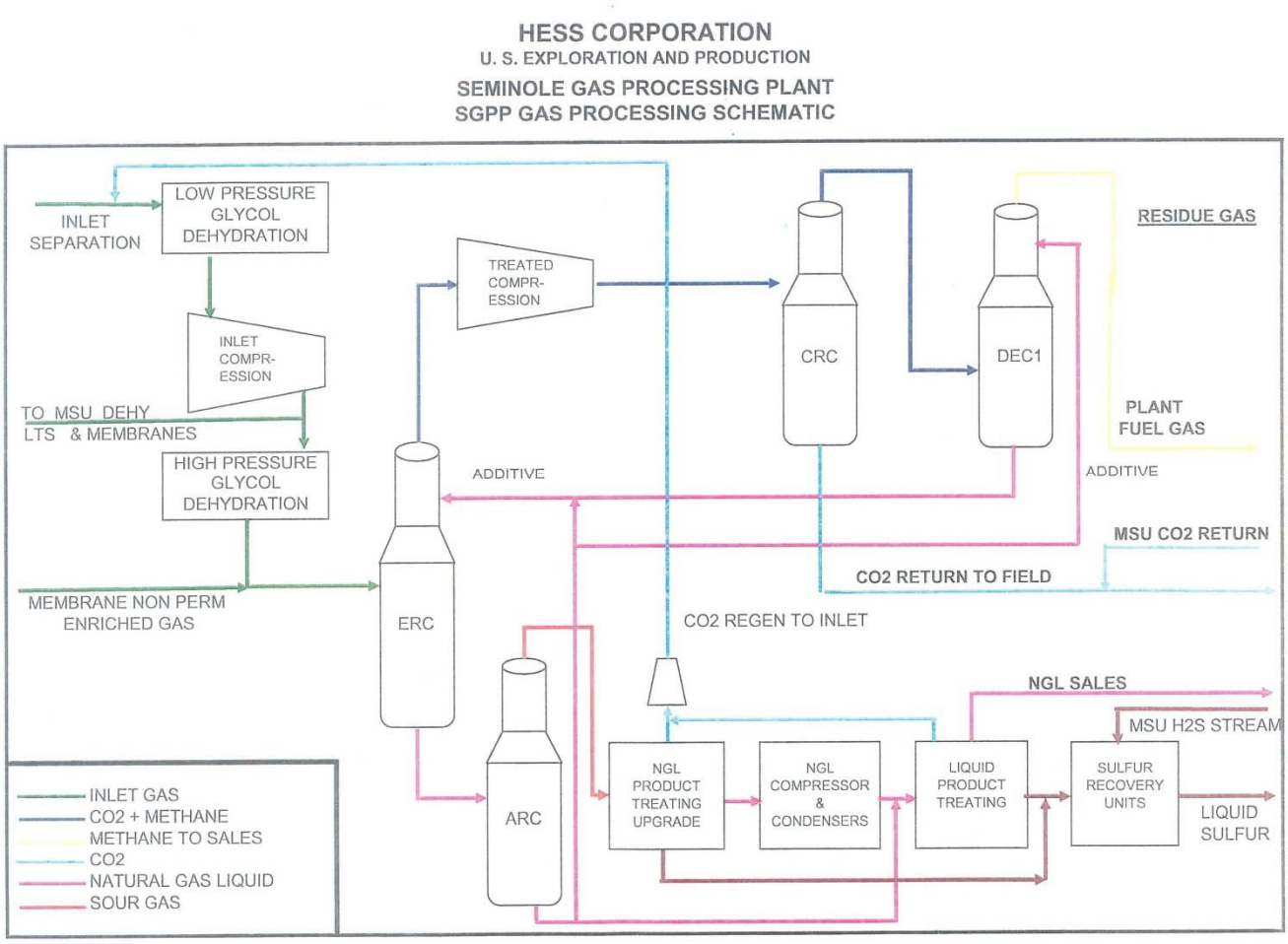
Overall Seminole Plant Schematic



The nominal capacity of the ROZ expansion is 70 MMSCFD inlet gas, though design allowances and equipment margins should result in a throughput capacity of 75 to 80 MMSCFD (Dehydration through Membrane Separation is ~2 times to incorporate the SGPP gas). ROZ is designed to run on the common SGPP inlet system, analogous to trains 1-3. A new 30" inlet header around the NW corner of SGPP connects the new ROZ inlet to the existing inlet laterals and manifold. The three fixed-speed ROZ centrifugal compressors work in series, and are designed to run in complement with each other. Inlet Gas fluctuations will be absorbed by the existing SGPP I/T compressors and pressure control valves (PV-9301 and PV-5547).

The throughput of ROZ is controlled primarily by the flow-control valves on the inlets to the membrane skids (FV-03141A/B). During normal operation, it is expected that these valves will have local set-points higher than attainable, in order to maximize throughput. Variations between the ROZ Inlet and Permeate Compressors are controlled by the pressure control valves on the SGPP inlet compression discharge header (PV-5011-1/2), allowing excess inlet gas from the Reciprocating compressors to revert to the High Pressure TEG Dehydration.

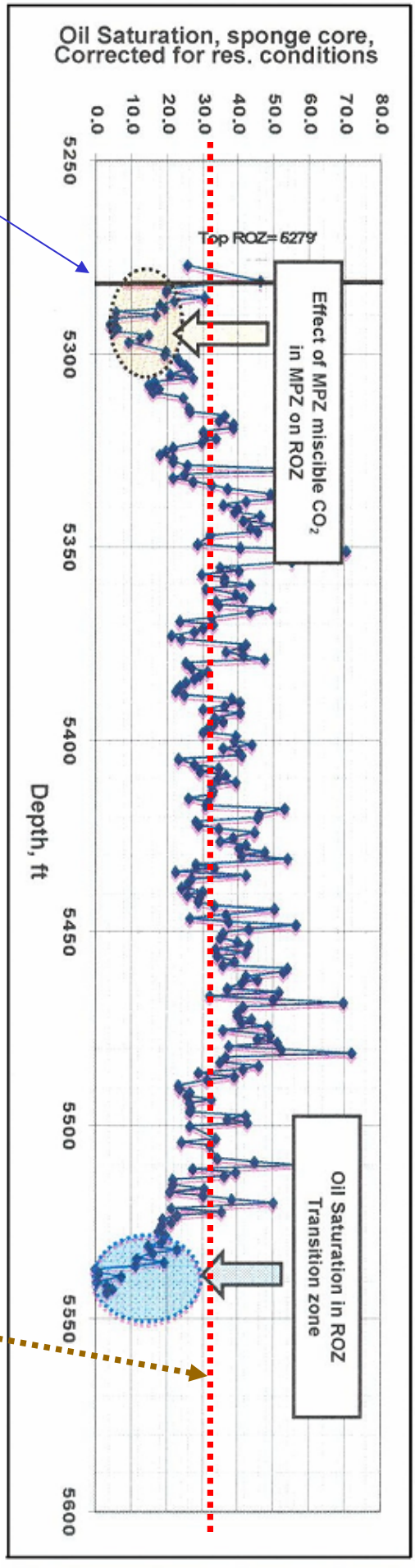
Recent Seminole Plant Expansion



PROPERTIES OF THE ROZ

SSAU Sponge Core Data

Ref: SPE 133089



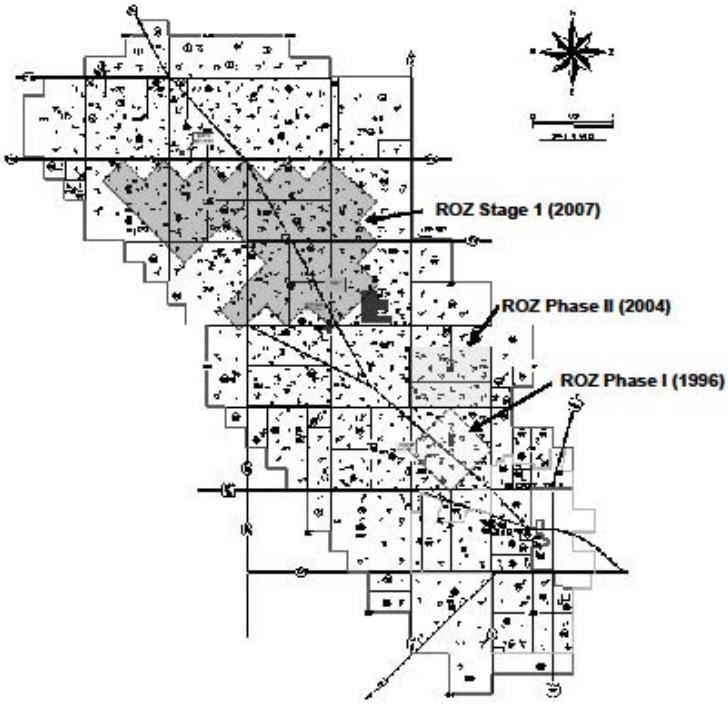
Oil/Water Contact

Selected Interval "Average" Oil Saturation for ROZ

HISTORY OF ROZ DEVELOPMENT

Seminole San Andres Unit

ROZ Development



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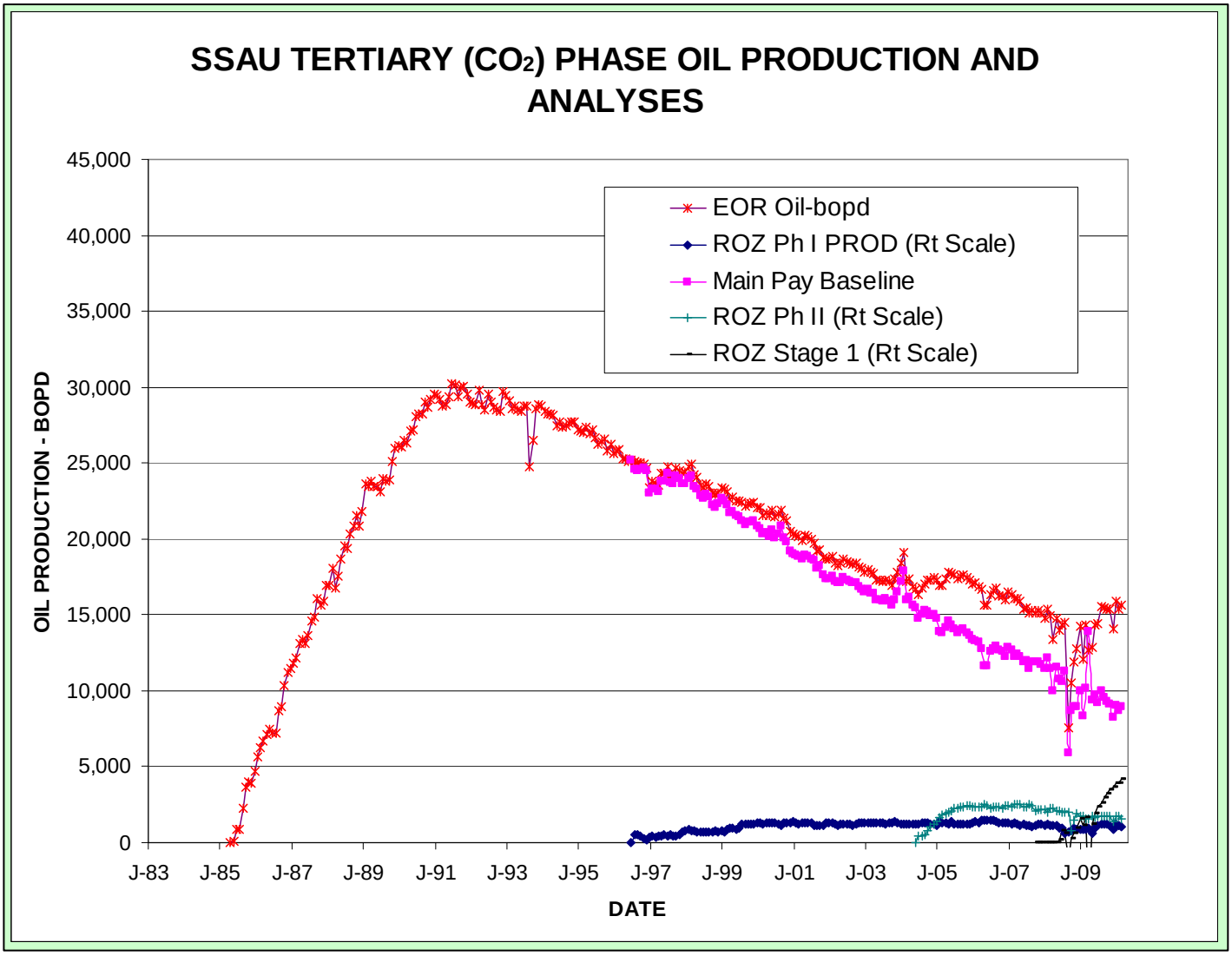
SSAU OIL RESPONSE* TO CO_2



* Interpretations as per Melzer Consulting

STOP NUMBER 2

THE GOLDSMITH FIELD

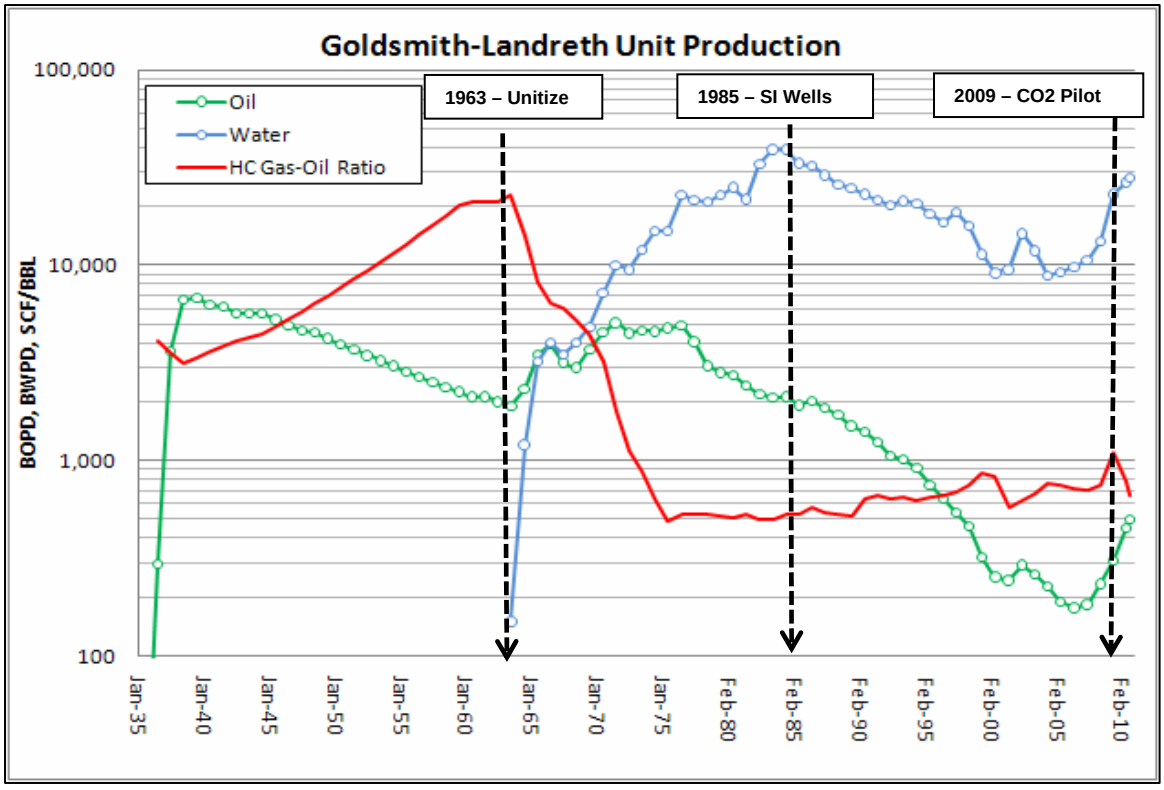
Goldsmith Landreth
San Andres Unit (GLSAU)

Goldsmith Landreth San Andres Unit

(GLSAU)

- 6,200 Acre San Andres Unit
- CO_2 ROZ Pilot in Place (as of 6/10, 4 Wells on CO_2 Injection 6 of 9 Producers Responding)
- Pilot Designed to Prove up ROZ Potential (More than Double CO_2 Reserves)
- Phase I Co-development of Main Pay and ROZ just underway (Nov ’10)

Detailed GLSAU Background (1)



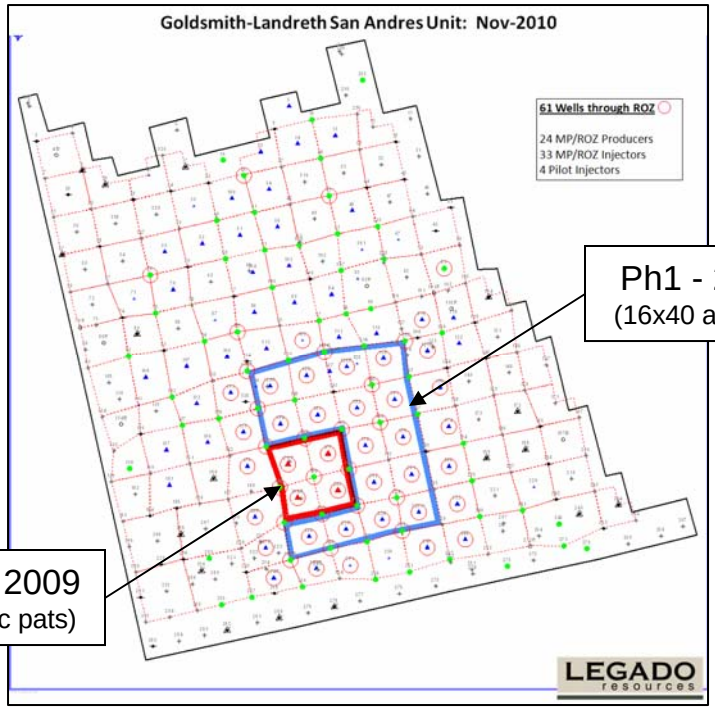
SAN ANDRES RESERVOIR DATA		
Unit Area	(ac)	6166
Well Spacing	(ac)	20
Depth	(ft)	4200
Pinit	(psi)	1712
Temp	(F)	95
API	(gravity)	34
MMP	(psi)	1150
Rsi	(scf/bbl)	757
Swc	(%)	15-20
Sorw	(%)	38%
Porosity	(frac)	0.11
Permeability	(md)	8

TIMELINE

Discovered in 1934 with 250 wells drilled by 1945
Gas cap reinjection occurred from 1948 to 1969
Unitized in 1963 with Amoco operating until 1996
Initially a peripheral flood injecting below main pay
Expanded to 40ac 5-spot patterns over ~20 yr span
Water curtain ceased & oil migrated into gas cap
Well abandonments in mid 80's accelerates decline
Field pressure in 2008 varied from 1000 – 2000 psi
Legado acquired in '08, Avg well 4 BOPD at 1% oil cut

Reactivated, deepened through ROZ, and cut core
Convert from rod pump to ESP when ROZ added
Installed CO2 pilot in 2009 at 5 MMCFD injection
Expanded pilot to 4 pats 1Q-2010 at 16 MMCFD
Install Ph 1 CO_2 by YE-2010 & ramp to 55 MMCFD

Detailed GLSAU Background (2)



Ph1 - 2010
(16x40 ac pats)

Pilot - 2009
(4x40 ac pats)

<u>CO_2 FLOOD (2009-2010)</u>

Well Utility ($16.9 MM)

20 CO_2 injectors, 30 prods, 22 containment injectors

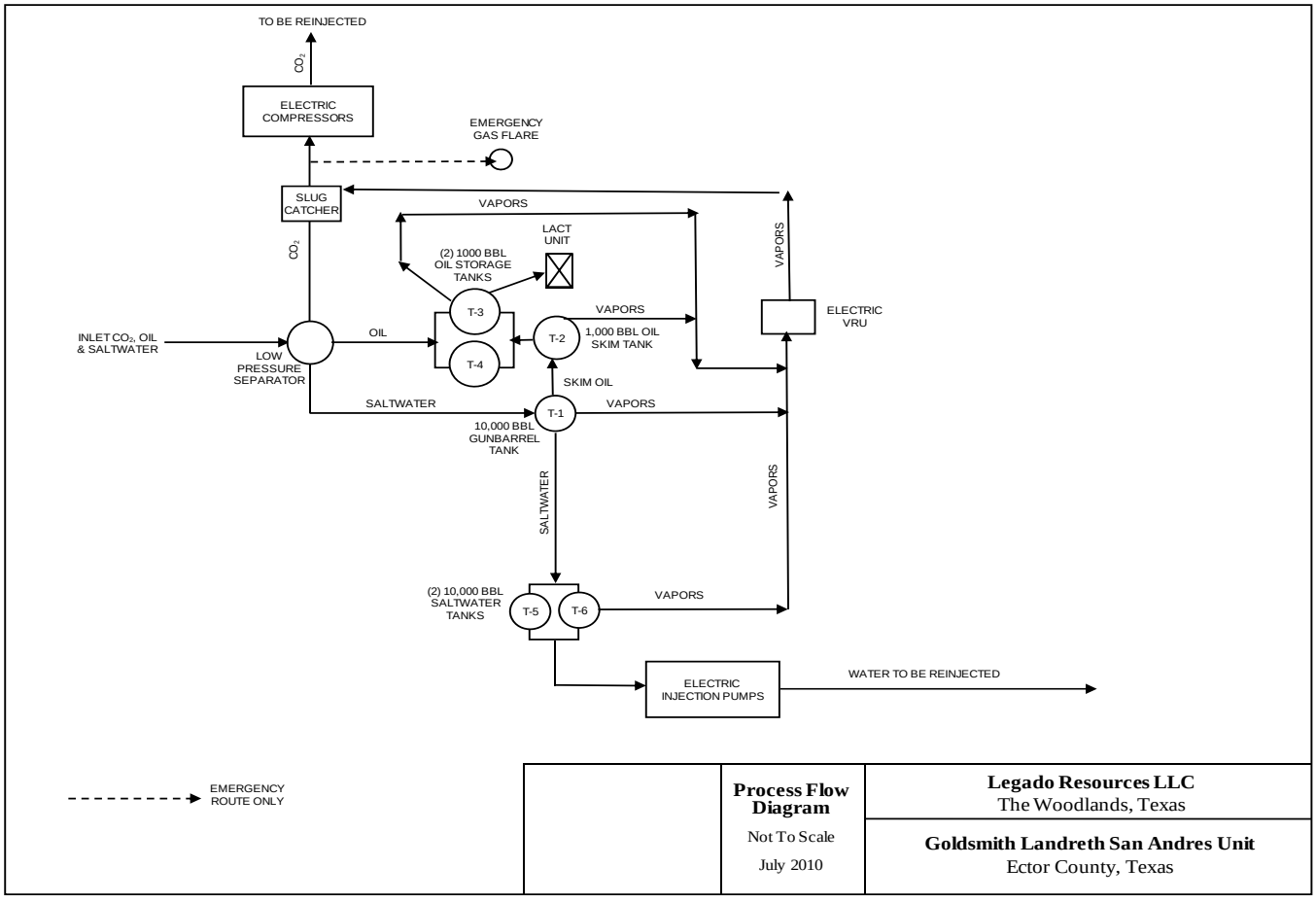
Facilities ($23.6 MM, excluding NGL plant)

3.5 mile 8” pipeline (200 mmcfd)
14 miles of injection line (3” laterals, 6”-8” trunk)
11 miles of flow line (3” flow line, 16” trunk)
3650 HP of compression (16 mmcfd, 3 units)
Central Processing Facility (60,000 BFPD)
2 Test Satellites (16 prod/16 inj wells each)
NGL Processing Facility

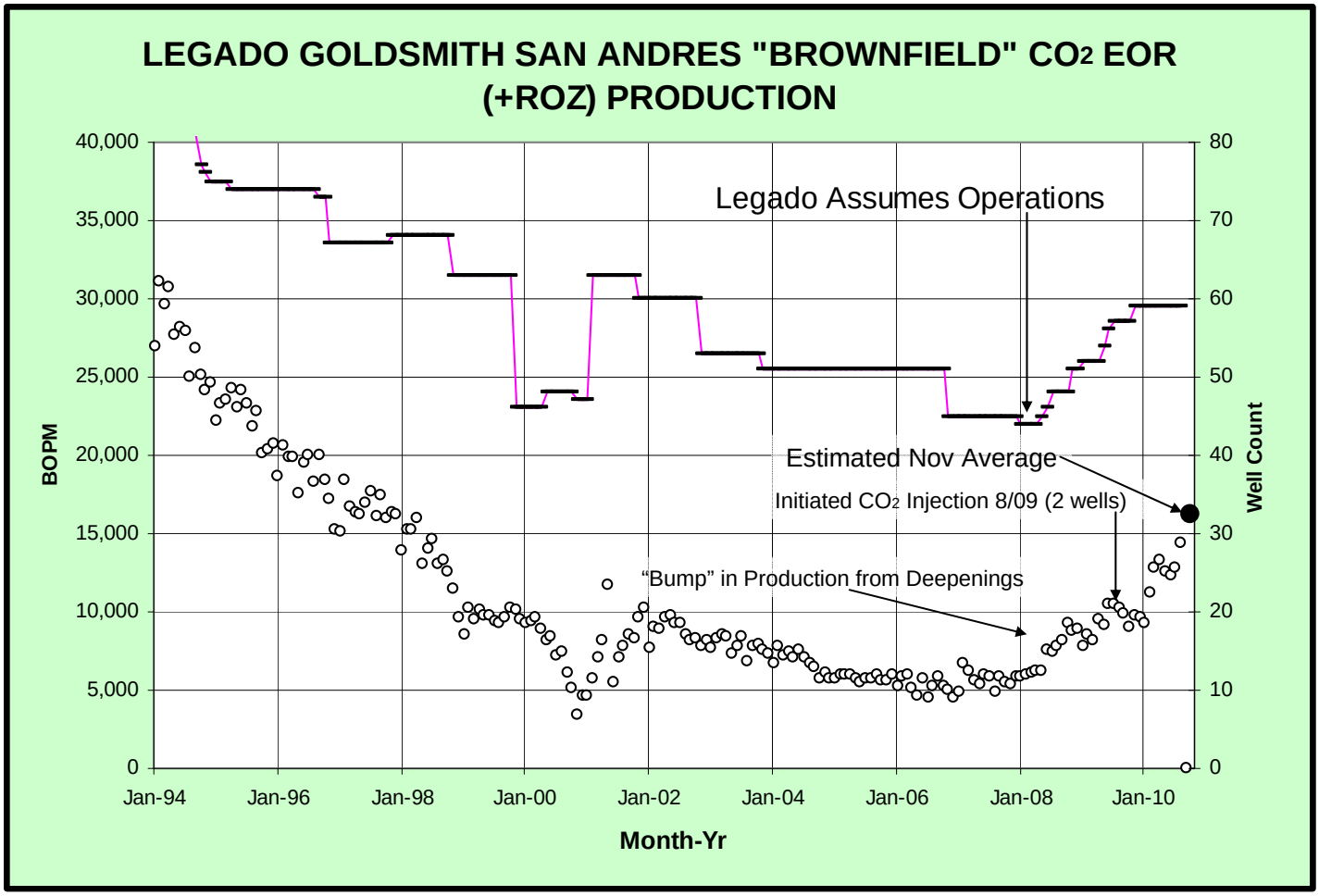
Background

All CO_2 flood wells deepened through ROZ
Avg CO_2 injection 4.5 MMCFD/well
Pilot prod 300+ BOPD incremental to date

CO_2 Project
Phase I Central Processing Facility Process Flow



CO_2 EOR RESPONSE AT THE GLSAU



Thank You