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PF&C: The Development of Cascade and Chinook Fields in Ultra Deep Waters in the Gulf of Mexico

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Walker Ridge Asset Manager
Petrobras**

**Society of Petroleum Engineers – Gulf Cost Section
Houston, Texas
January 20th, 2009**



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Agenda

1 - Introduction

2 - Cascade and Chinook Framework

- Ownership and Well History
- GoM Environment and Regulation

3 - Cascade and Chinook – Phase 1

- Overview and Timeline
- Reservoir and Wells
- Subsea, FPSO and Export System

4 - Path Forward



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Petrobras Summary

- Proven Reserves (SPE): 15 bi boe
- Employees: 69,000
- O&G Production: 2.3 million boe/day
- Refining Throughput: 2.2 million boe/day



● HEAD OFFICE
■ DOWNSTREAM

■ TRADING
■ E&P

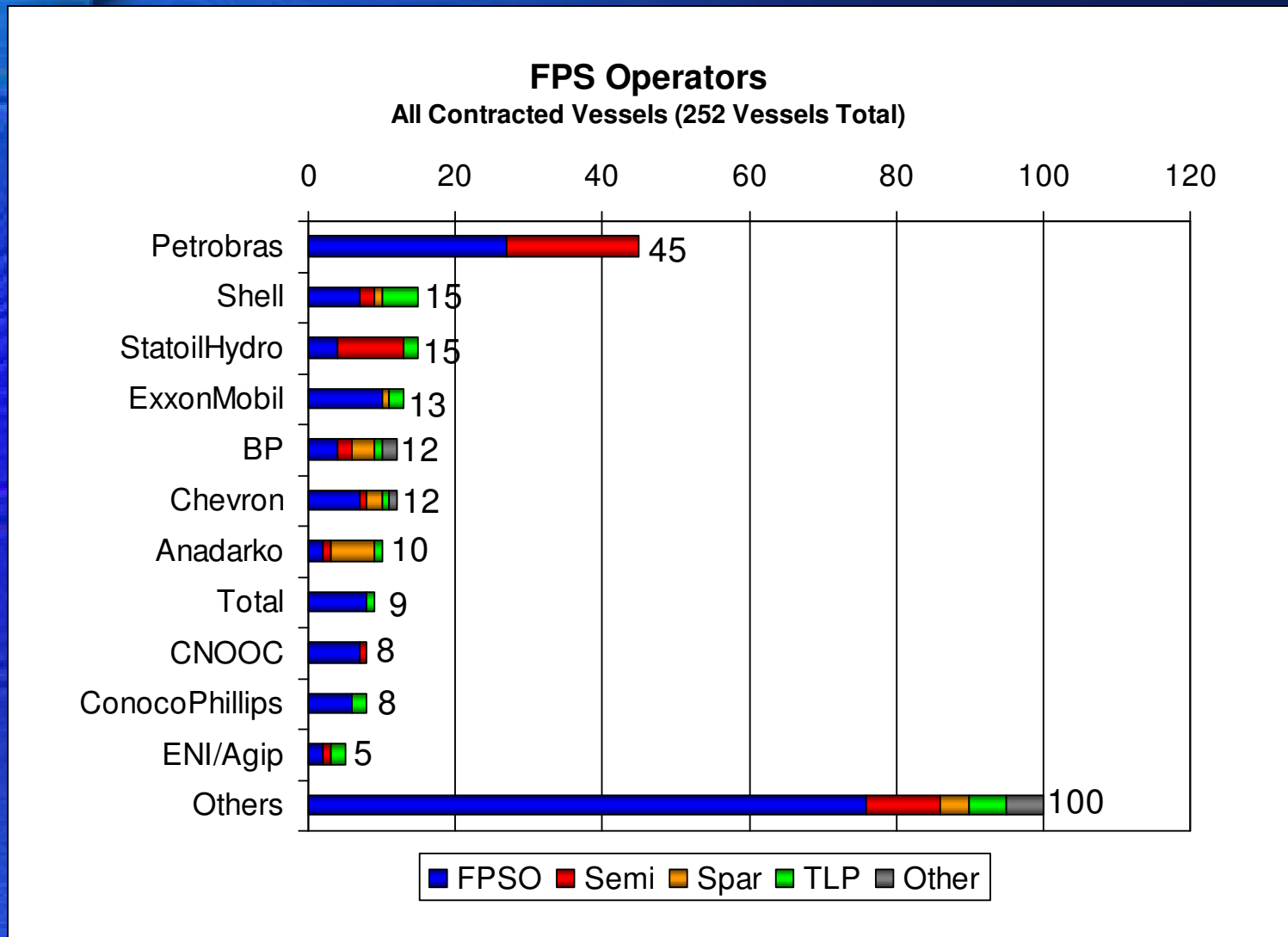
■ GAS & POWER
■ REPRESENTATIVE OFFICE

SOURCE: PETROBRAS



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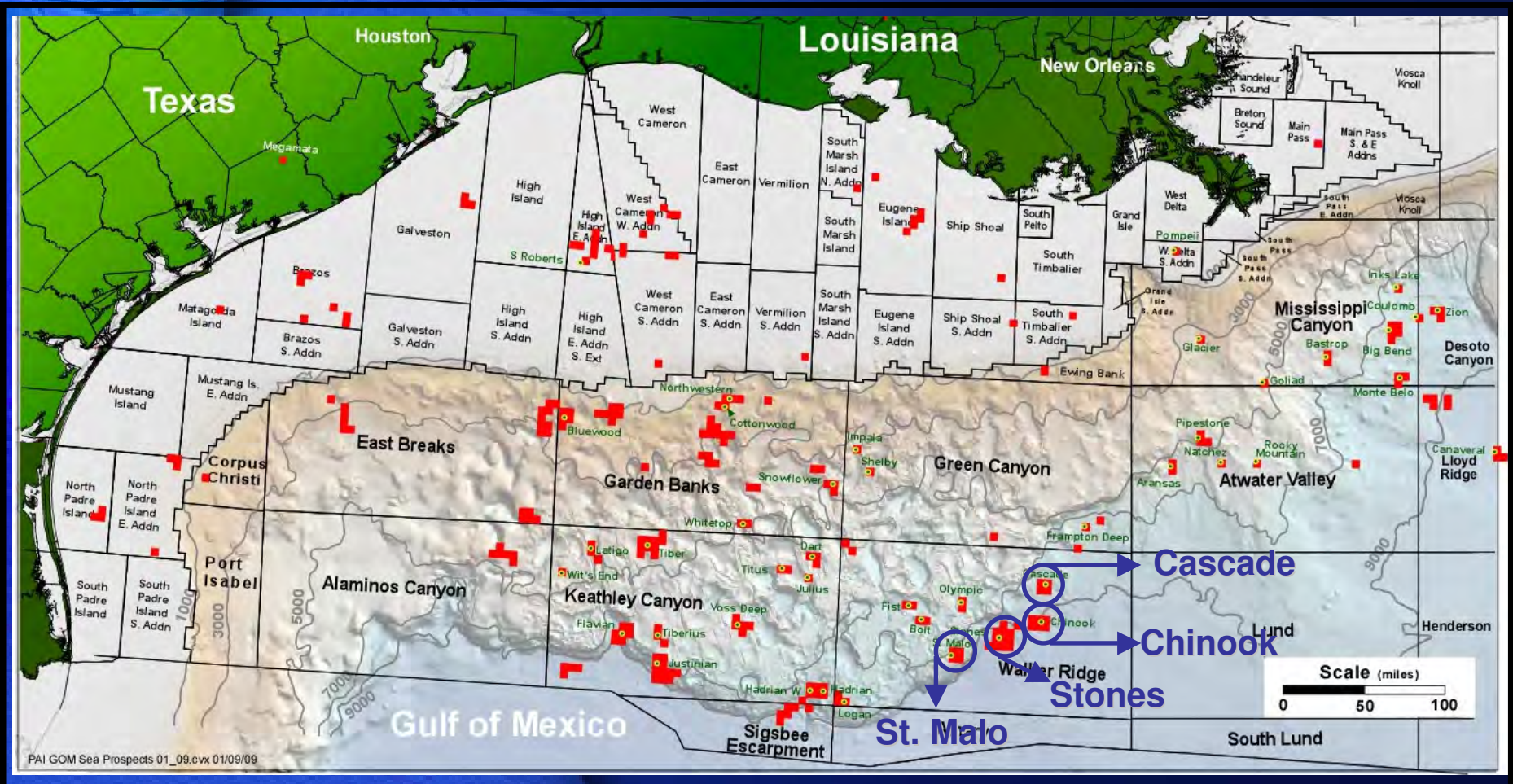
Petrobras as an Operator of Floating Production Systems





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Petrobras E&P Portfolio in Gulf of Mexico (259 Blocks)





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Cascade and Chinook Lease Holders

The Cascade Field

Lease Holders

- Petrobras – 50%
- Devon – 50%

(Blocks WR205, 206,249 &250)

The Chinook Field

Lease Holders

- Petrobras – 66.67%
- Total – 33.33%

(Blocks WR 425,426,469&470)



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Cascade and Chinook Field History

Year	Cascade	Chinook
2002	Discovery Well	
2003		Discovery Well
2004		
2005	2 Appraisal Wells	
2006		
2007		
2008	Spud Develop. Well	



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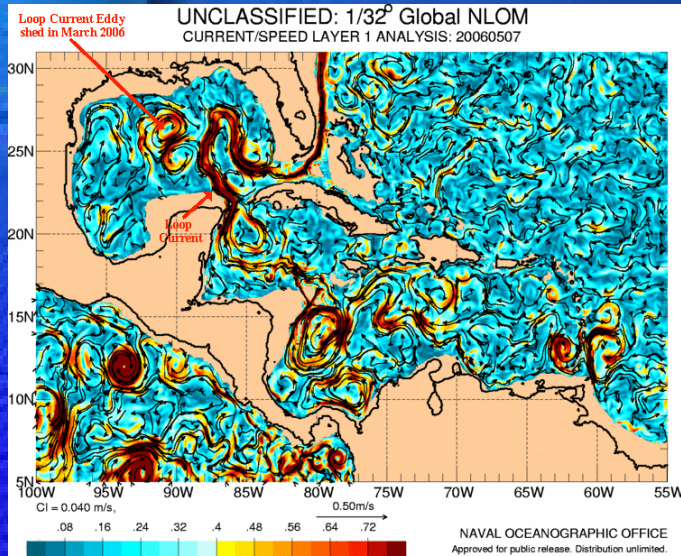
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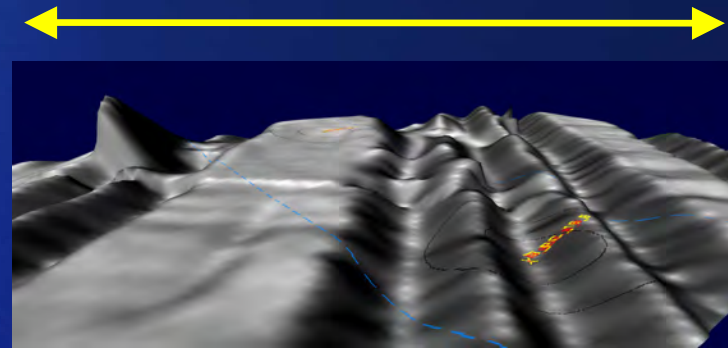
Currents, Furrows and Hurricanes in Gulf of Mexico



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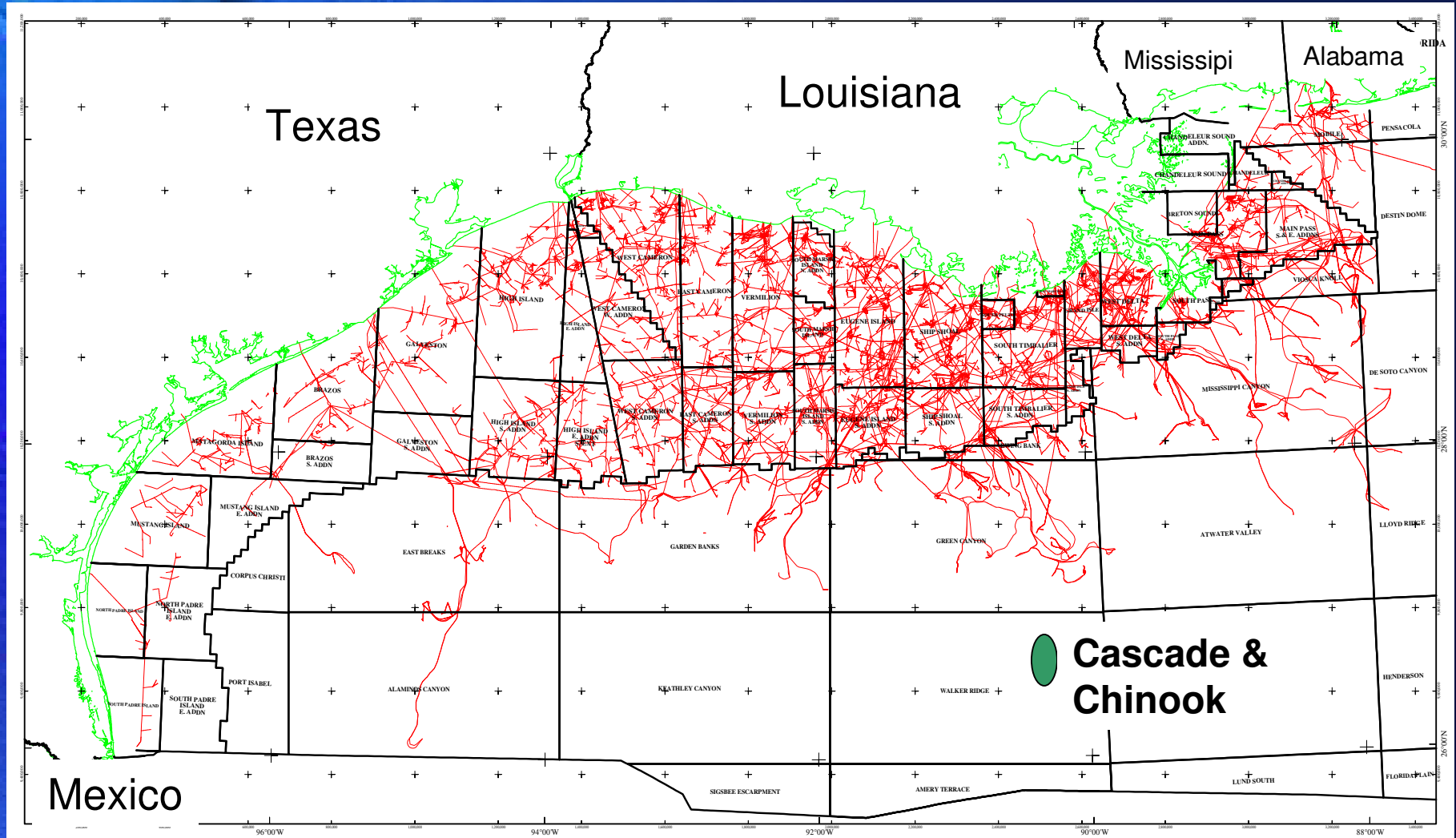
~1 Football Field





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Oil and Gas Pipelines in Gulf of Mexico





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Regulatory Compliance

MMS

Exploration Plan
Application for permit to Drill
Conservation Information Document
Downhole Commingling
D.W.O.P.
D.O.C.D.
Pipeline Application / ROW & LT
Riser Verification (CVA – Risers)
Structural verification (Structural CVA)
Production Safety System
Surface Commingling & Measurement
Well Control & Production Training
In-Service Inspection Plans
Oil Spill Response
NPDES
Departure Requests
MMS Inspections incl. Pre-Production Inspection

USCG

Certificate of Compliance (COC)
Foreign Flag Issues & Equivalencies
Design Document & Plan Review
Manning & Licensing
Security / Safety Zone
Lightering Procedure
Oil Spill Management
Emergency Evacuation Plan / Vessel Response Plan
In-Service inspection plan
USCG Inspections During Construction & Installation
Pre-COI / COC Inspection



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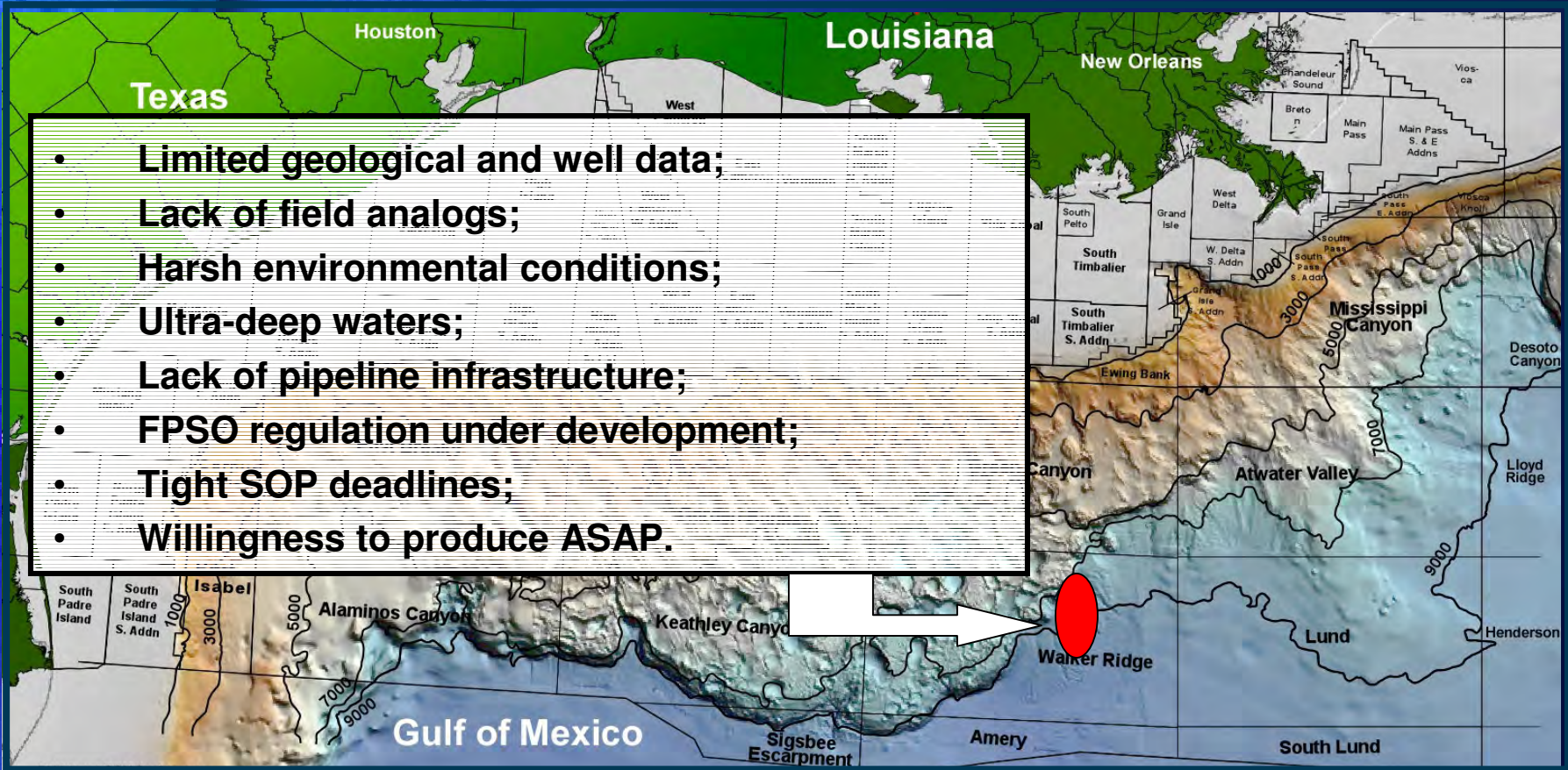
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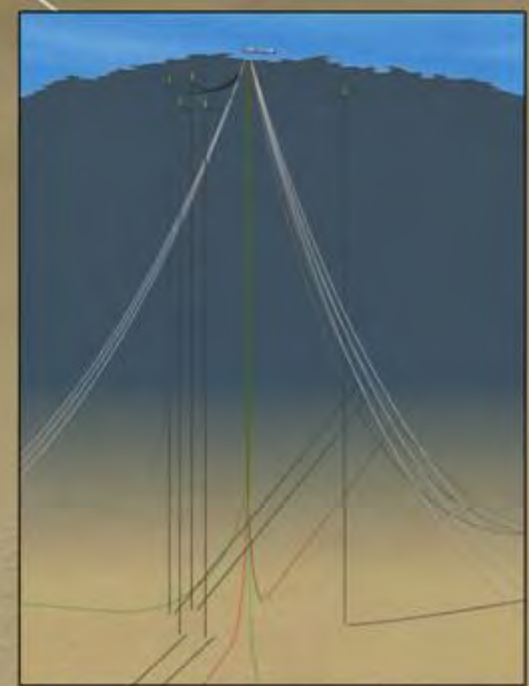
Cascade and Chinook We Were Here in Aug2006



Cascade and Chinook Phase I
Walker Ridge
Gulf of Mexico



Chinook



Cascade





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Phase 1 - Objectives

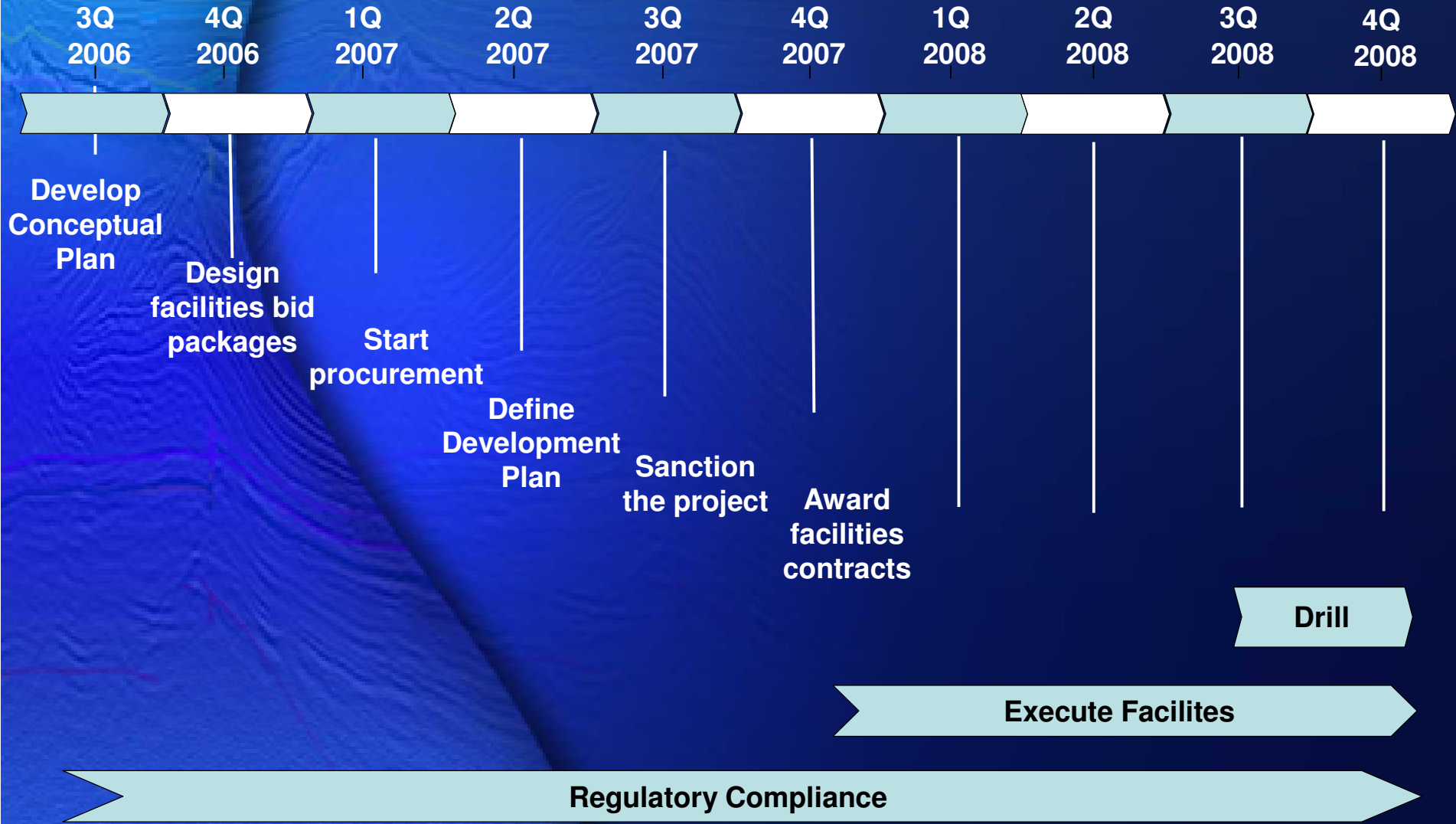
The Objective of Cascade and Chinook Phase 1 is to obtain data and information about the reservoirs and the well productivity in order to optimize the future phases focusing on the following aspects:

- Number and type of wells;
- Completion design;
- Production System Type and Capacity;
- Subsea Layout and Boosting System;
- Secondary Recovery Potential.



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First Oil in Jun 2010 – As Planned





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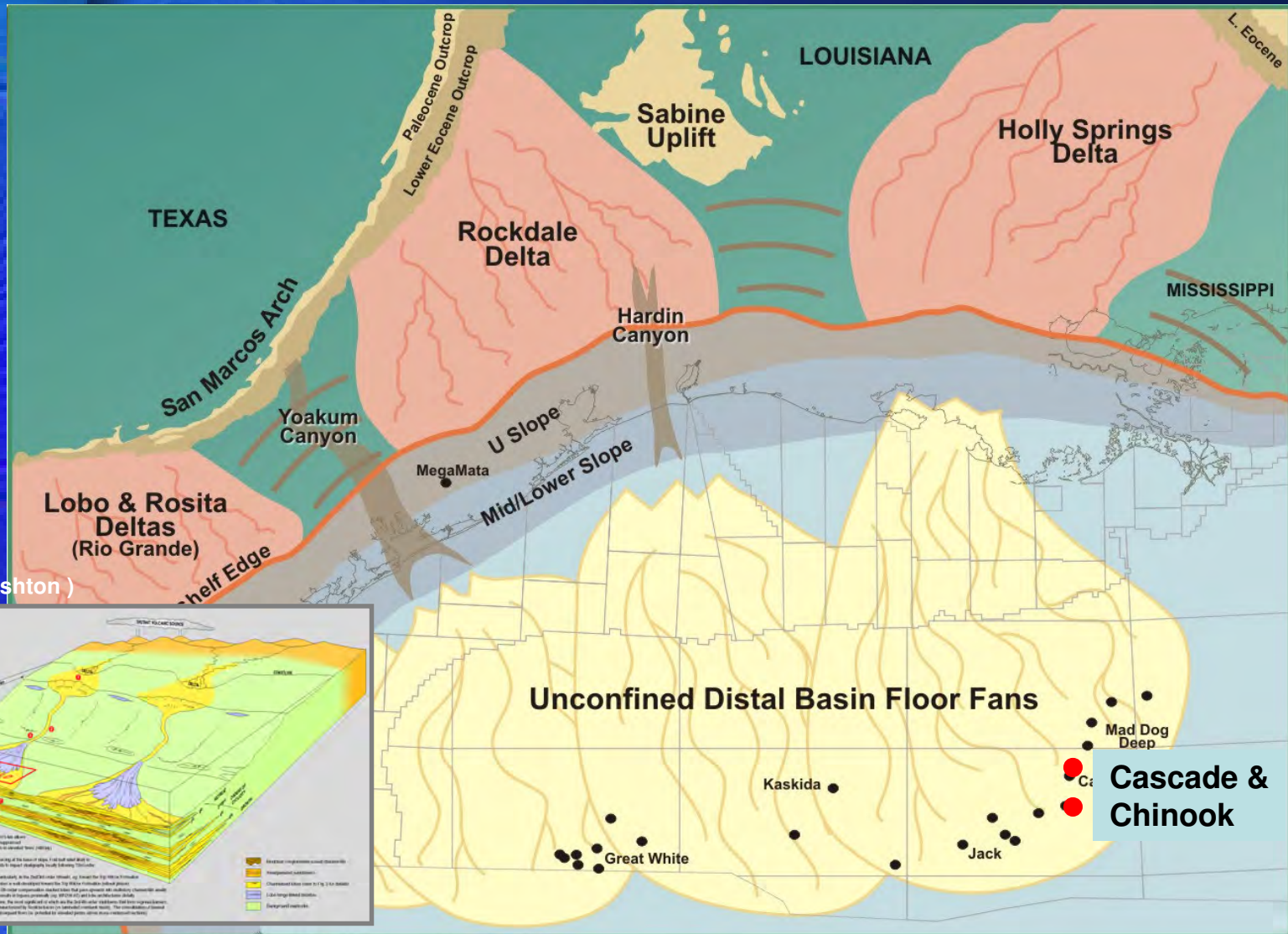
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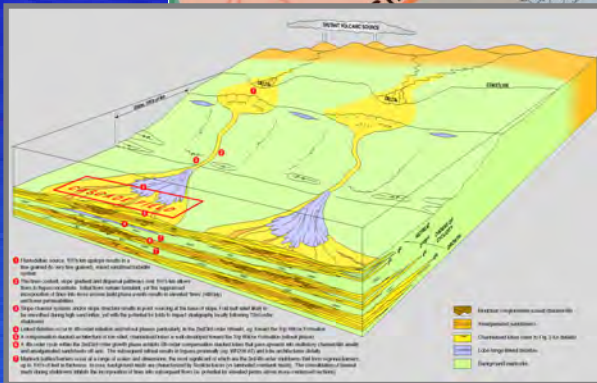


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Lower Tertiary in GoM Depositional Environment



(Badley Ashton)



Modified 5/8/07 from Galloway, et al 2000



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Lower Tertiary (Wilcox) Section Walker Ridge Quadrant in Gulf of Mexico

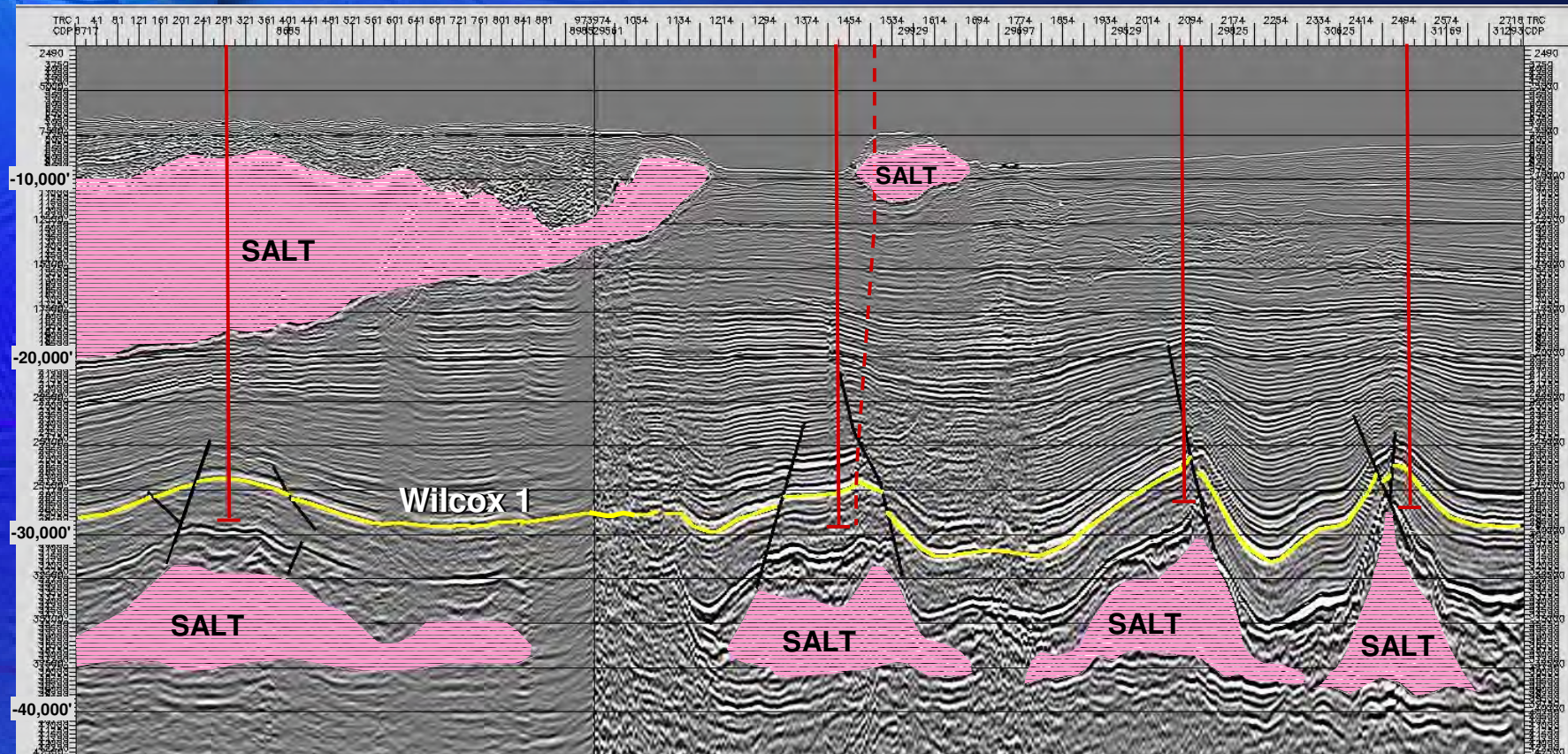
SW

St Malo

Stones

Chinook

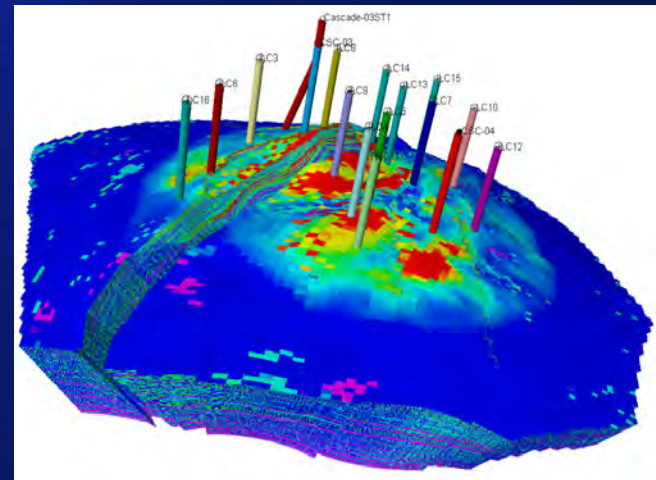
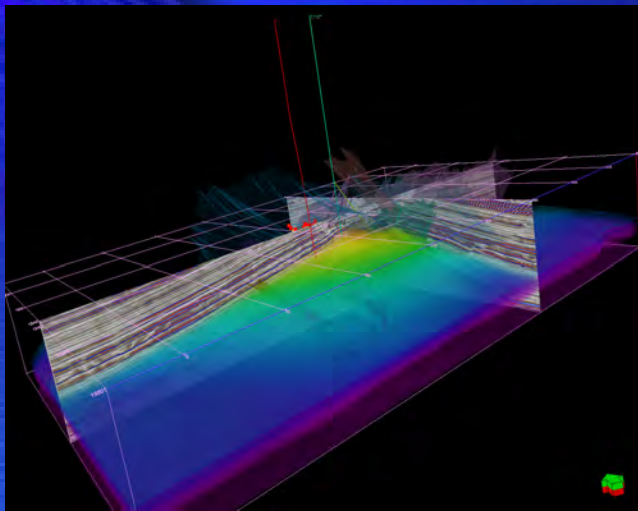
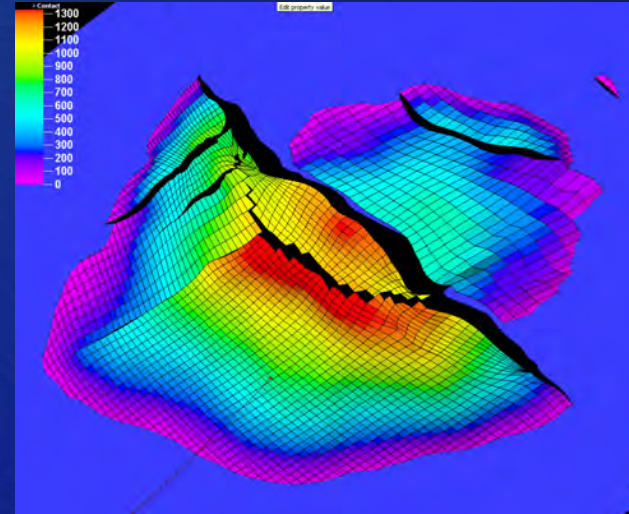
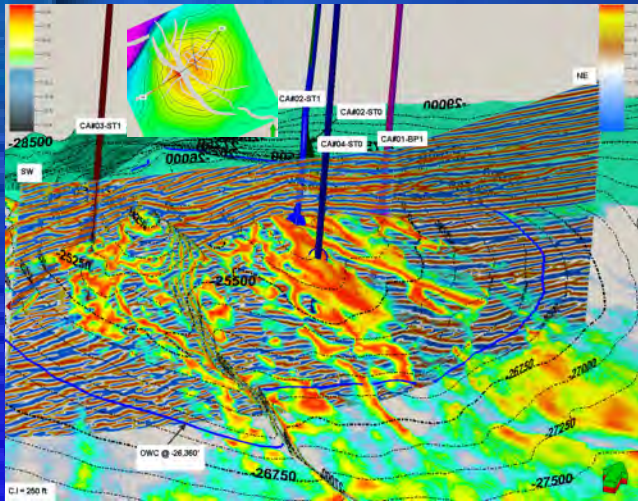
Cascade NE





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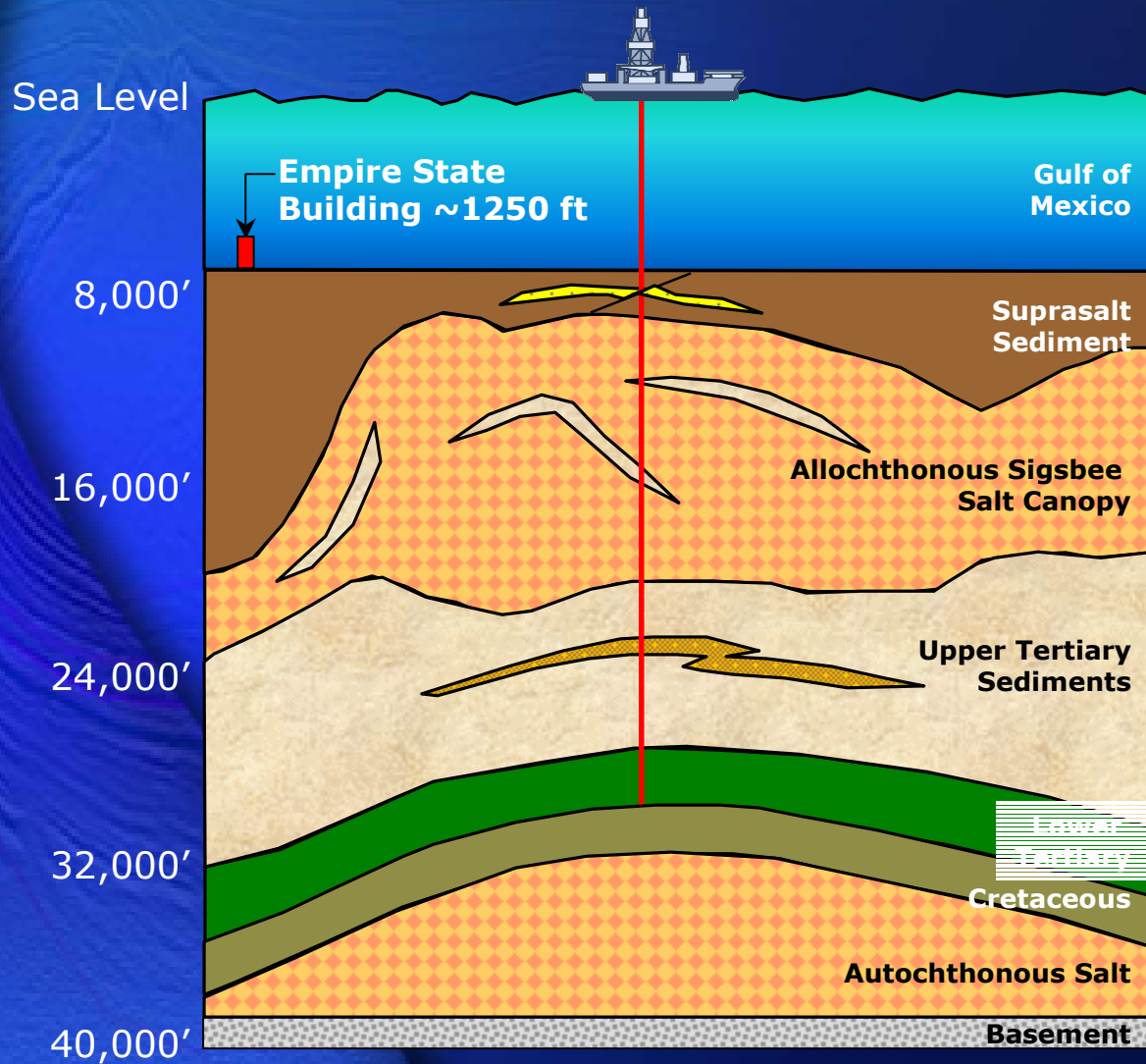
Reservoir Challenges





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Well Drilling Challenges



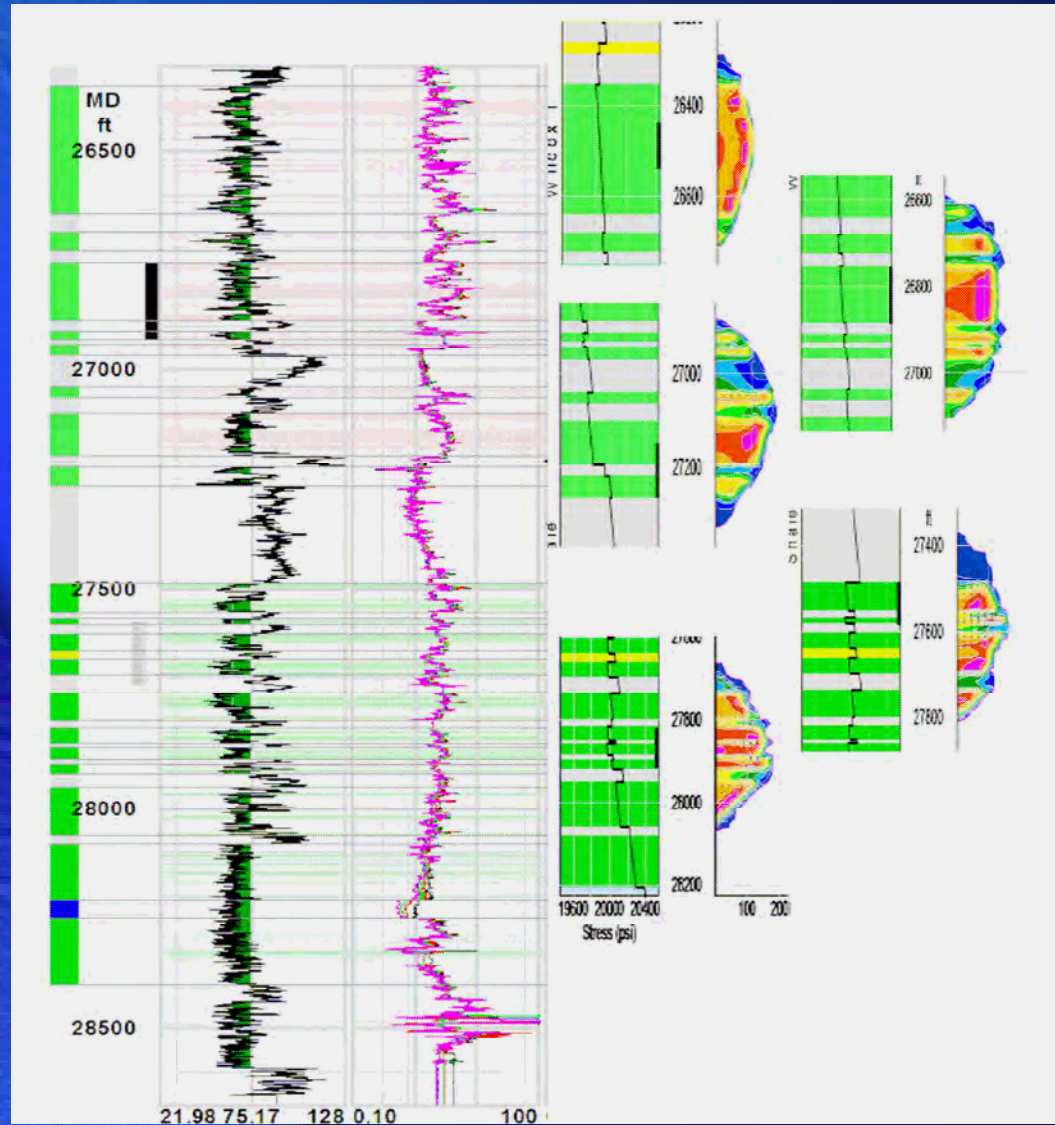
Modified from Keith Couvillion, Chevron, 2008



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Well Completion Challenges

STMZ –
Single Trip
Multi-Zone
Frack Pack





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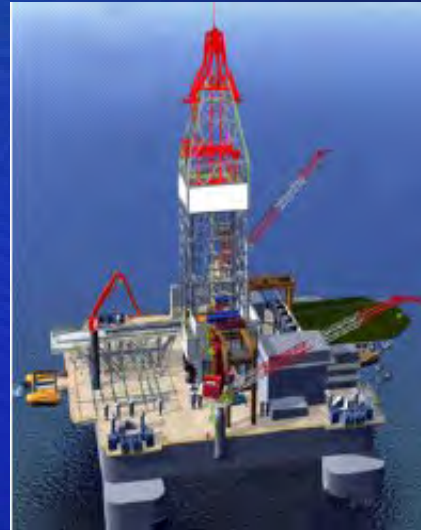
Cascade and Chinook Rigs

2008



Ocean Endeavor - 10,000 ft WD
(Under Contract to
Devon Energy)
Diamond Offshore Drilling

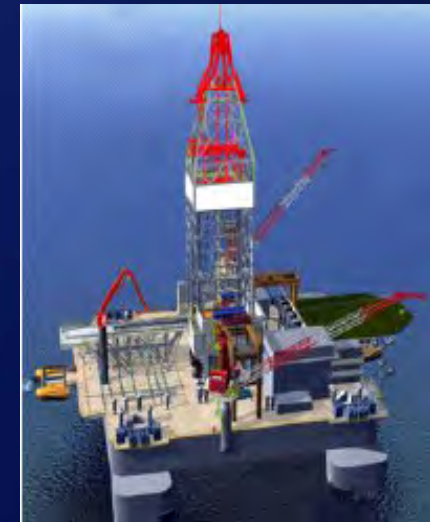
2008



West Sirius - 10,000 ft WD

(Under Contract to
Devon Energy)
Seadrill Limited

2009



PetroRig 1 - 10,000 ft WD
(Under Construction – Singapore)
Larsen Oil & Gas



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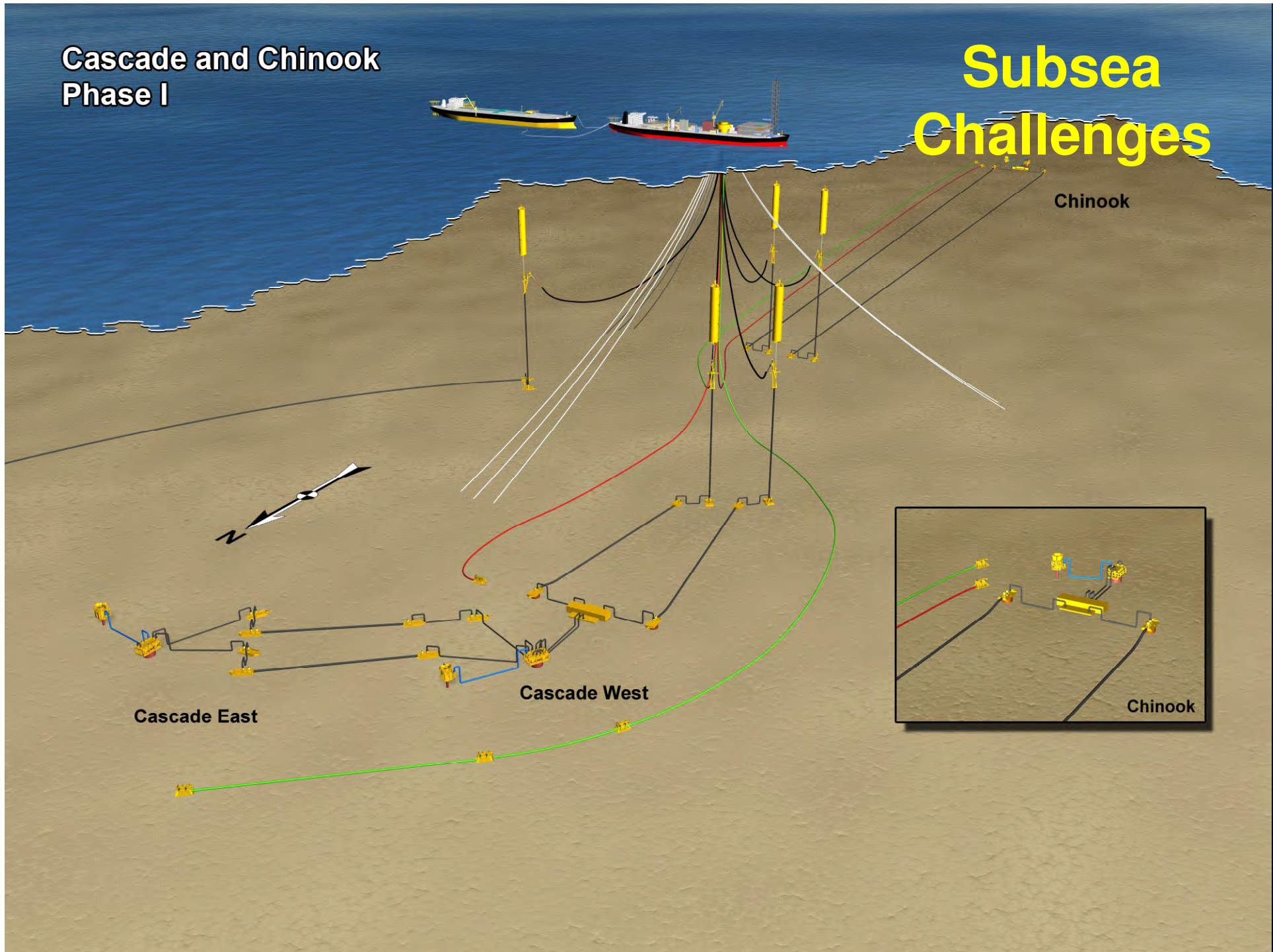
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Cascade and Chinook Phase I

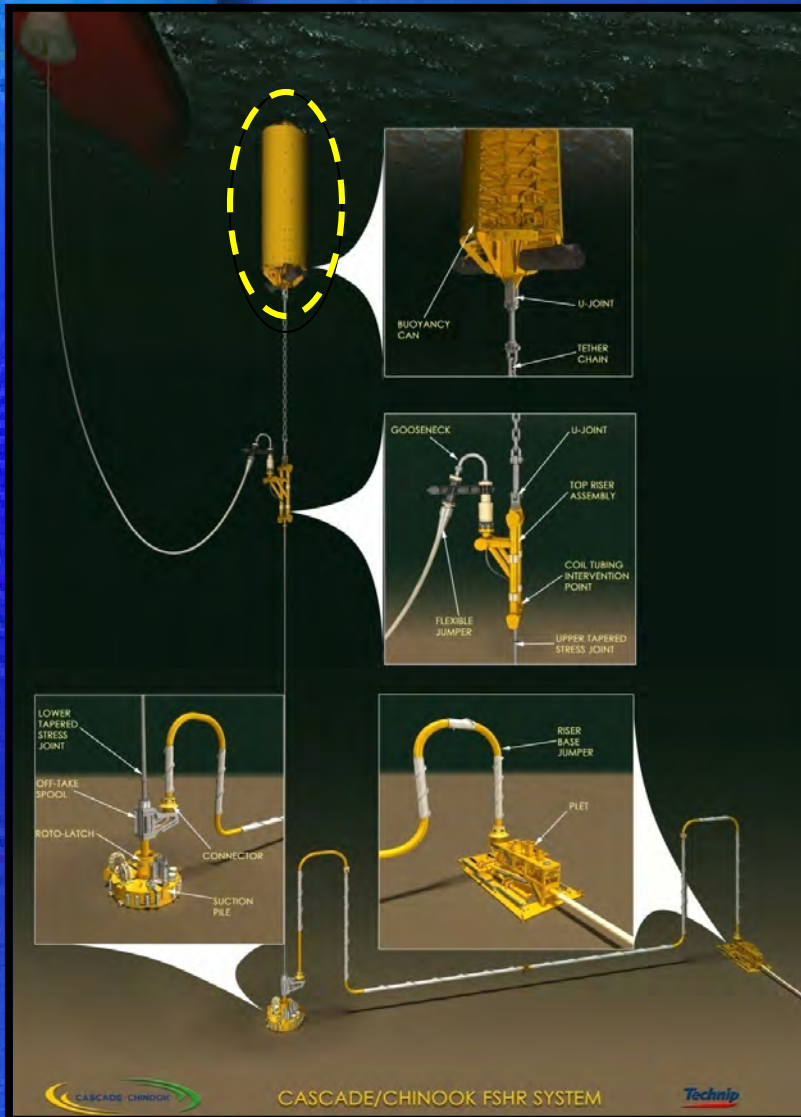
Subsea Challenges





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Free Standing Hybrid Risers





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Instalation Vessels

Technip Deep Blue



Heerema Balder



Subsea 7 Seven Seas





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FPSO Challenges





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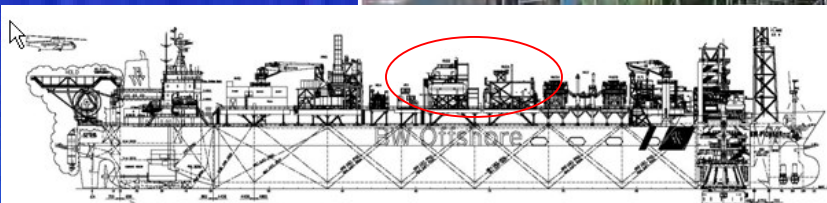
FPSO BW Pioneer Main Particulars

Oil Storage	500,000 bbl
Liquid Production	80,000 bpd
Gas Production	16 MMcf/d
Water Production	16,000 bpd
Test Separator	10,000 bpd
Oil Gravity	18 to 26 API
Gas Export Pressure	172 barg



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FPSO Conversion in Singapore





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Oil Export from FPSO to Shore Thru Veteran Class Shuttle Tankers

Overseas Houston



Overseas Los Angeles



Overseas Long Beach



Overseas New York



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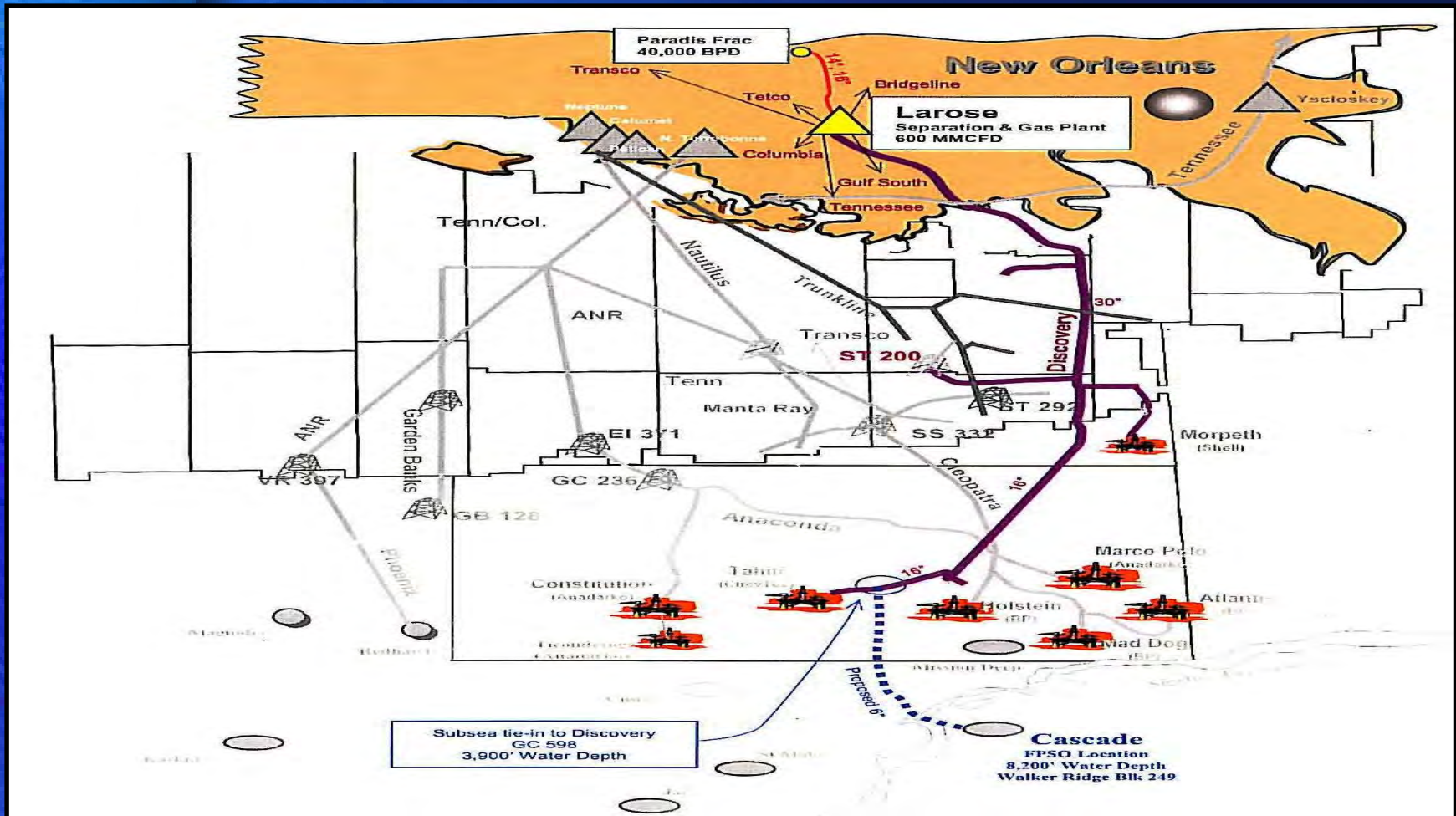
OSG's Shuttle Tanker Main Particulars

- Tank Capacity: 330,000bbl
- Classed by ABS
- Jones Act Compliant – Flag USA
- BLS (Bow Loading System)
- Retrievable Hose & Hawser
- Bow Thrusters
- Speed: 14.6 knots



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Gas Export Discovery Pipeline System





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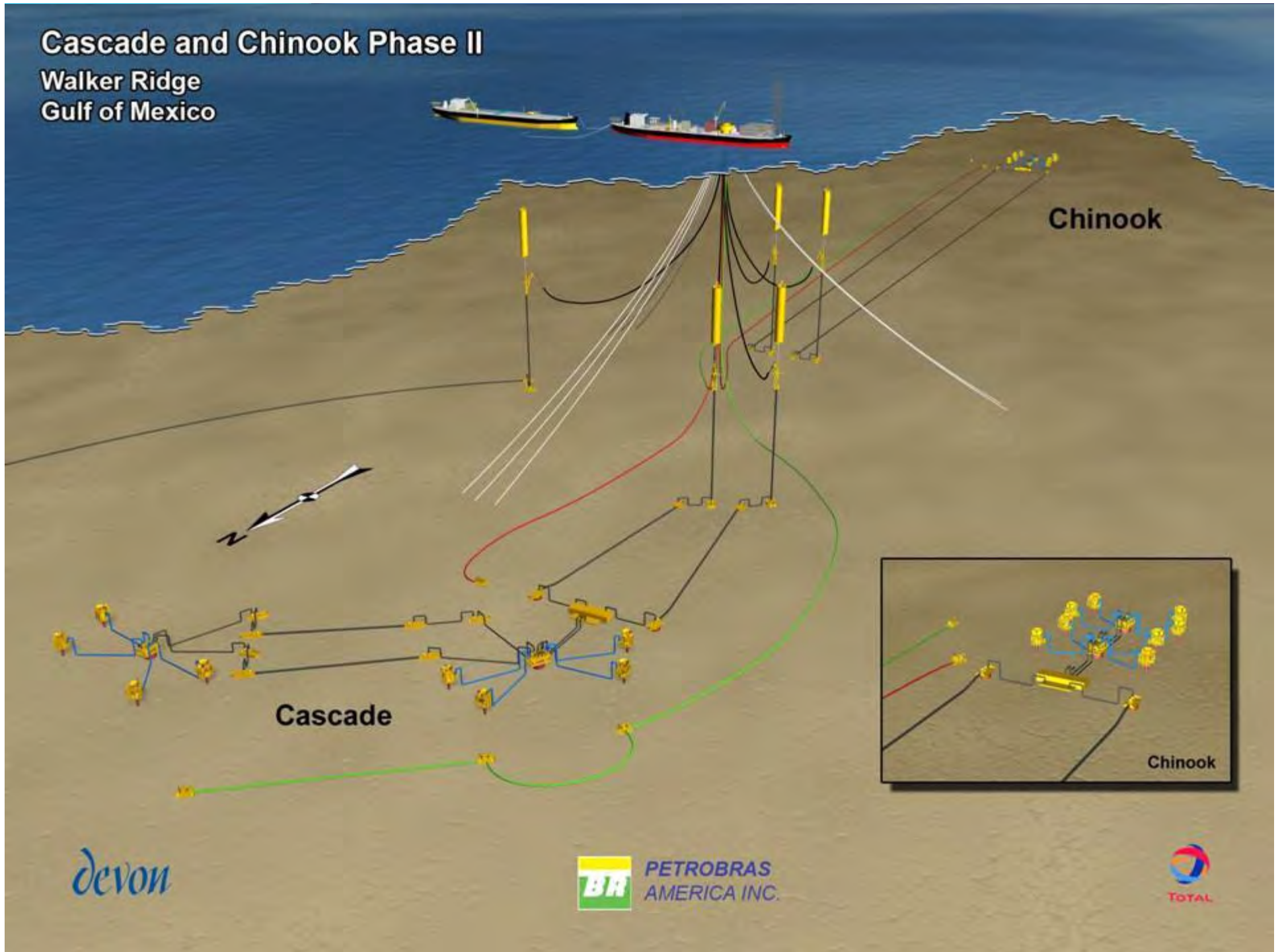
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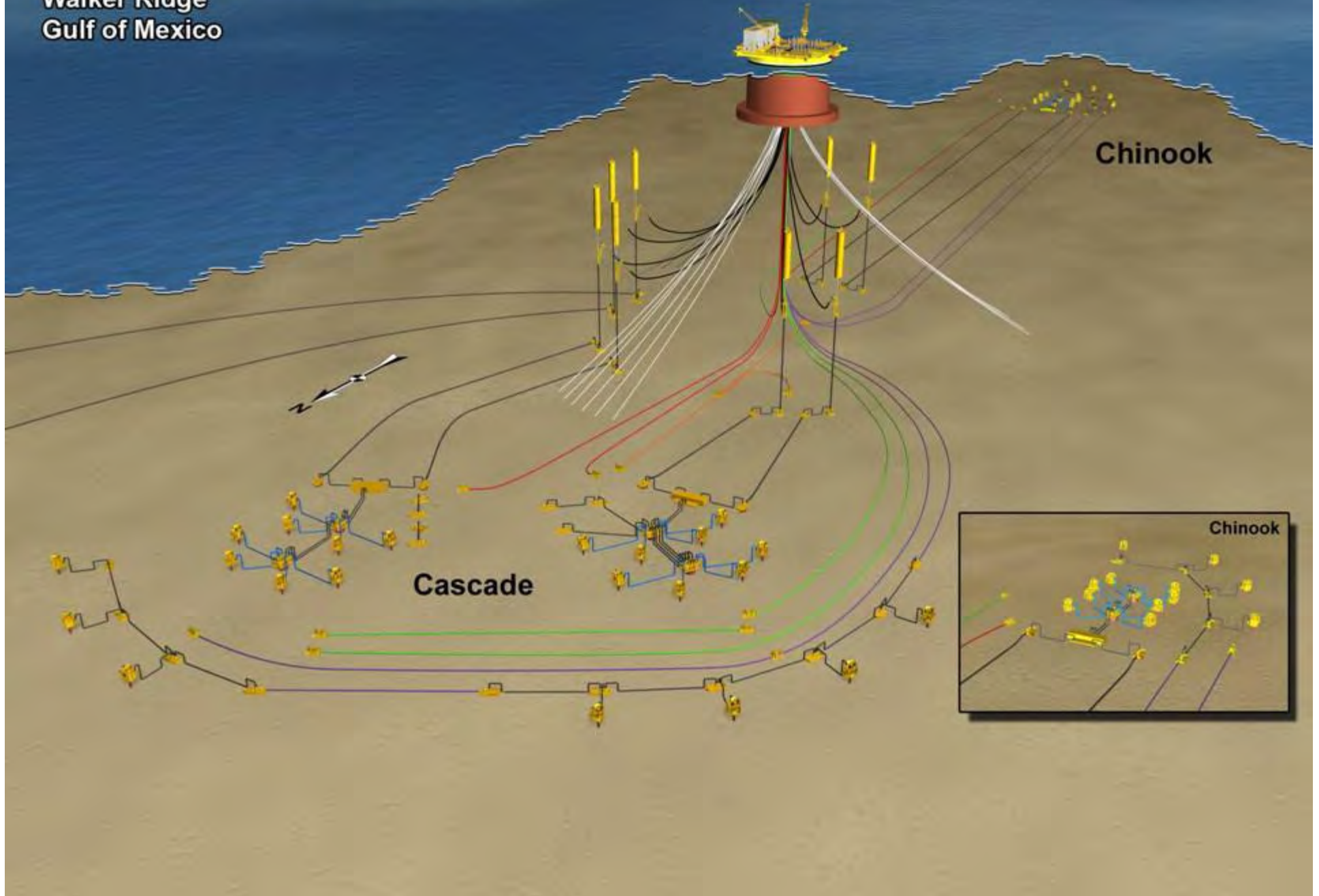
Cascade and Chinook Phase II

Walker Ridge
Gulf of Mexico



Cascade and Chinook Phase III

Walker Ridge
Gulf of Mexico





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Final Message

- The Cascade and Chinook project will pave the way for future ultra-deep water Lower Tertiary fields in the US GoM.



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Path Forward !!





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Thank You !

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