



Schlumberger Land Rigs—Contribution to NT Community

September 2017

Schlumberger Land Rigs in the NT



Charter flights in and out Daly Waters and Elliott ex Darwin

Weekly crew changes, ad hoc drive in/out ex Darwin

Buses

Rigs activity 50 person project, with services (frac and other) an additional 70 persons

Zero HSE or ENV incidents

Schlumberger Land Rigs in the NT

Local Input to the Economy

Local Supplier Spends in 2015 was \$243,450 & in 2016 was \$ 496,740

Key suppliers for rig based activities:

- Crowhurst Engineering - Katherine
- NT Recycling Services – Katherine
- Larrimah Hotel “the Pink Panther”
- Hi Way Inn Daly Waters and Daly Waters hotel
- Indigenous Beverages Australia
- Northern Territory Government
- Veolia Environmental Services – Katherine

Schlumberger Land Rigs in the NT



Rig 185 on Amungee
drilling fluids ponds
For conventional and
underbalanced drilling

Compact Footprint
200x100M, exploration
size

Schlumberger Land Rigs in the NT

Welcome to Country Ceremony



Reconciliation action plan conditional endorsement April 2017

Working with Clontarf Aboriginal College University in WA

Interns, Base visits for students, defensive driving, and interview practice

Roma Technical college QLD

Aboriginal interns in Roma base, QLD

Apprenticeships, cultural awareness sessions

14% of local spend on indigenous supplier, initiative started in 2016 Q2
assistance with onboarding and vetting process

CEBAC executive conference on traditional lands

Schlumberger Land Rigs Land Rigs | Technology | Reliability | Efficiency | Integration

Schlumberger

Schlumberger Land Rigs in the NT - Amungee



Rig team

Frac Lease, during drilling phase with rig onsite

Schlumberger Land Rigs in the NT – working towards



**NORTHERN
TERRITORY
GOVERNMENT**

Mr Roy Parhusip
Operations Manager
Saxon Energy Services
E: RParhusip@slb.com

Dear Mr Parhusip

Re: Saxons assistance to promote the oil and gas industry in the Northern Territory

The Northern Territory Department of Mines and Energy (DME) would like to thank Saxon staff for their help in producing a well model that will significantly assist the Department in explaining the techniques behind drilling for petroleum.

This positive outcome was achieved through the good relationship built between DME, Saxon and Origin while a DME engineer was on secondment to Origin with Rig185. The creative well design model will greatly assist the department in explaining to the public the mechanism of drilling wells and how risks can be safely managed to protect aquifers and drinking water. As a tool for visualisation it is a model that gives a very clear picture of well security and design. The well model was recently on display at the departments stand at the Fred's Pass Show and received significant attention and queries.

In particular the department would like to thank Craig Adamski, Paul Beswick and Graham Hartwig for their continued positive attitude to develop relationships amongst the industry and their excellent work in the design, construction and transportation of the well model and in your assistance in promoting the oil and gas industry in the Northern Territory.

Jop van Hattum
Senior Director of Petroleum Technology and Operations

2 June 2016



**DEPARTMENT OF
MINES AND ENERGY**

Paspalis Centrepoint Building
48-50 Smith Street Mall
DARWIN NT 0800

Postal Address
GPO Box 4550
DARWIN NT 0801

T 08 8999 6521
F 08 8999 5191
E petroleum.operations@nt.gov.au

File Ref: C16.066.cd



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www.nt.gov.au

Schlumberger Frac operations in the NT – Local Input to the Economy

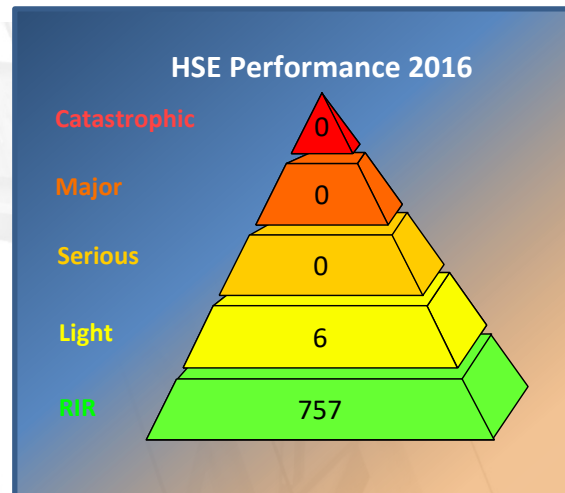
Local Supplier Spends in 2016 was \$345,000

- NTRS Waste and Recycling- Darwin
- Cleanaway- Darwin
- Hi Way Inn Daly Waters
- Indigenous Beverages Australia



Schlumberger Frac in the NT

- Origin's first fracturing operations in remote Northern Territory
- 1 Horizontal exploration well
- Drilled in 2015, re-entered in 2016 Q2, stimulated in September 2016
- 11 frac stages completed
- Shale target, high pressure treatments
- Objective of 2 stages per day achieved
- Zero safety incidents



- ✓ Total Man hour 18616
- ✓ Total Km Driven 382,000
- ✓ No vehicle incidents
- ✓ No LTI

Schlumberger Frac in the NT – TOLL Subcontracting

TOLL engaged NT team based in Darwin for the project

- Indigenous site coordinators worked with the water and sludge haulage teams



Biography - Justin Shooter



- Justin Shooter age 41
- Oil & Gas Professional
- Sole Trader & Land Owner in the Finnis Valley, NT
- Adelaide Based with Schlumberger Land Rigs Land Rigs
- Career spanning Venezuela, Bolivia and Colombia before returning to Australia for last 7 years
- Darwin is home

Personal Note; raised on the land in a family owned and operated water well drilling company with great exposure to international/remote oil & gas projects during my career. I currently have a select opportunity with Schlumberger Land Rigs Land Rigs to support the professional development and lead the oil & gas industry here in Australia. I appreciate my work/life balance enabling me to support the education of our children and as a family we enjoy everything mother nature can offer

J.Shooter

Unconventional Reservoir Development



Global Footprint — Understanding the Impact Points



100,000⁽¹⁾ women and men
140 nationalities



0.8 million operating hours/month
1.8 million meters drilled/month



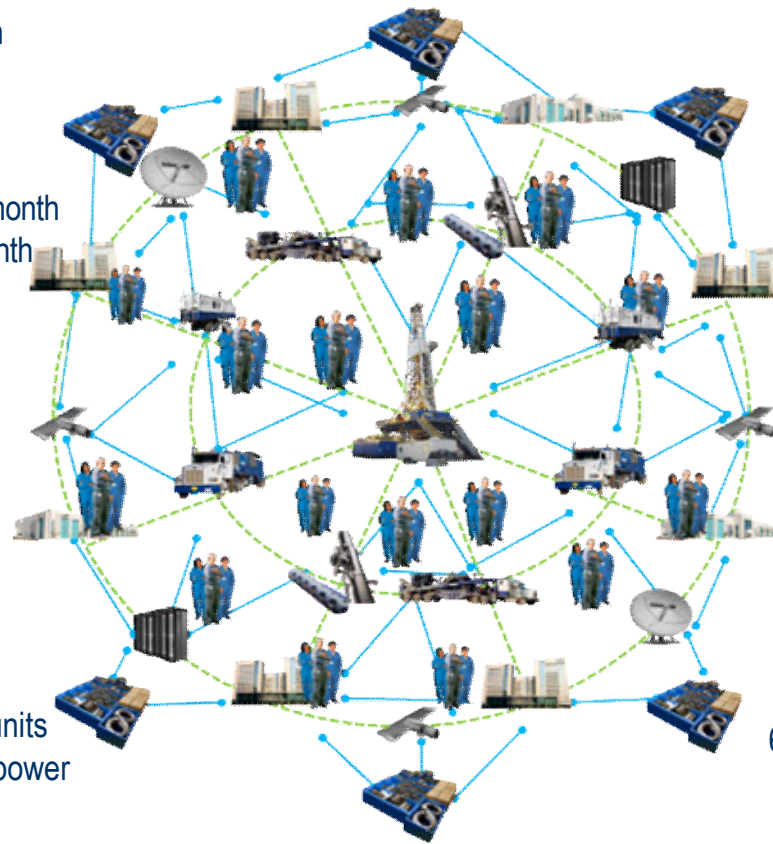
150,000 mobile assets



2,300 facilities
95 REM⁽²⁾ centers



700 IT connected wellsite units
30 petaflops of computing power



6,500 customers



85 countries



Active on 3,200 drilling rigs
925 workover rigs



58,000 suppliers
500,000 transactions/month



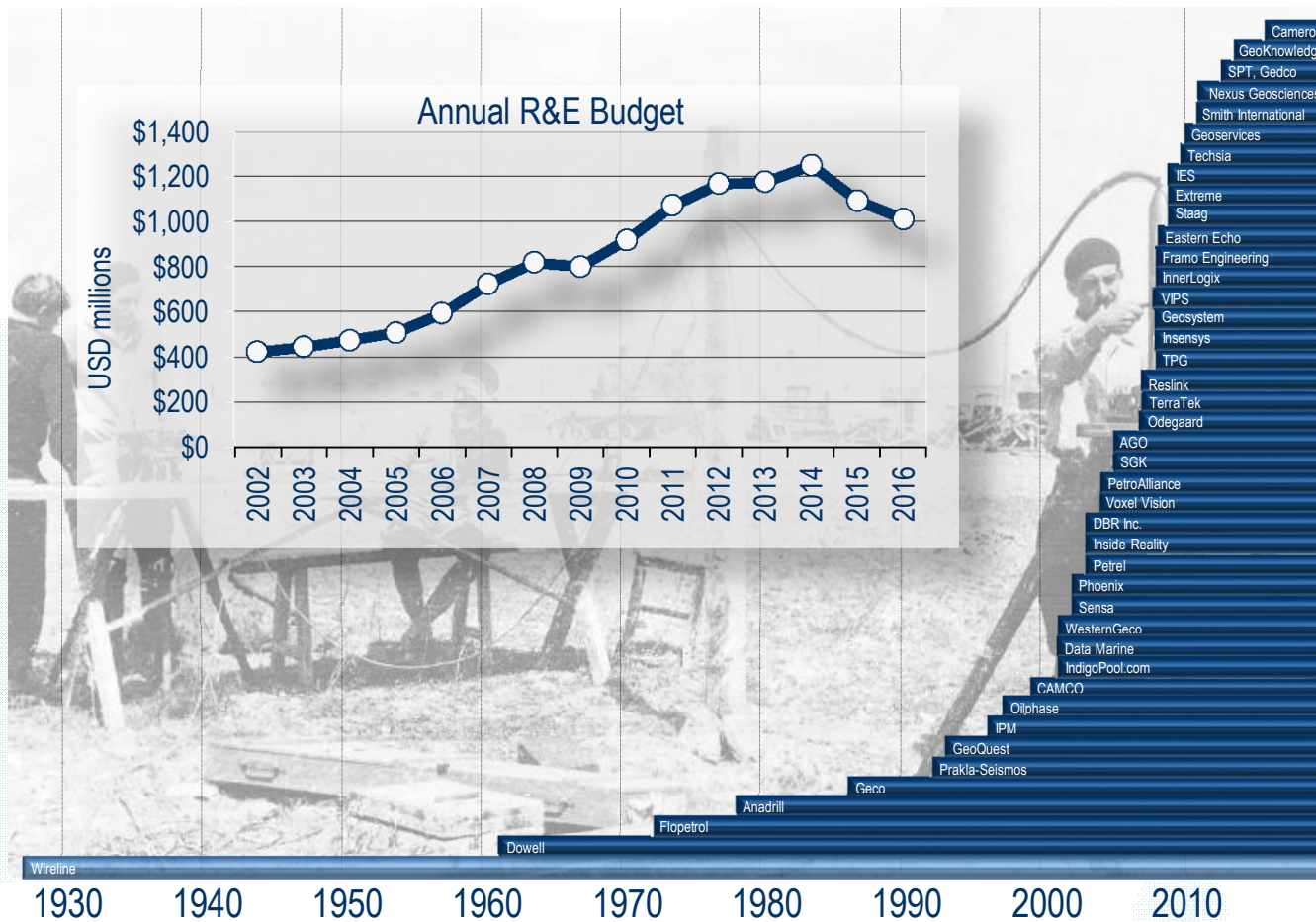
65,000 shipments per month



1) Total employee headcount, Jan 2017

2) Research, Engineering and Manufacturing

Schlumberger History of Internal & External Investments



The Resource Triangle

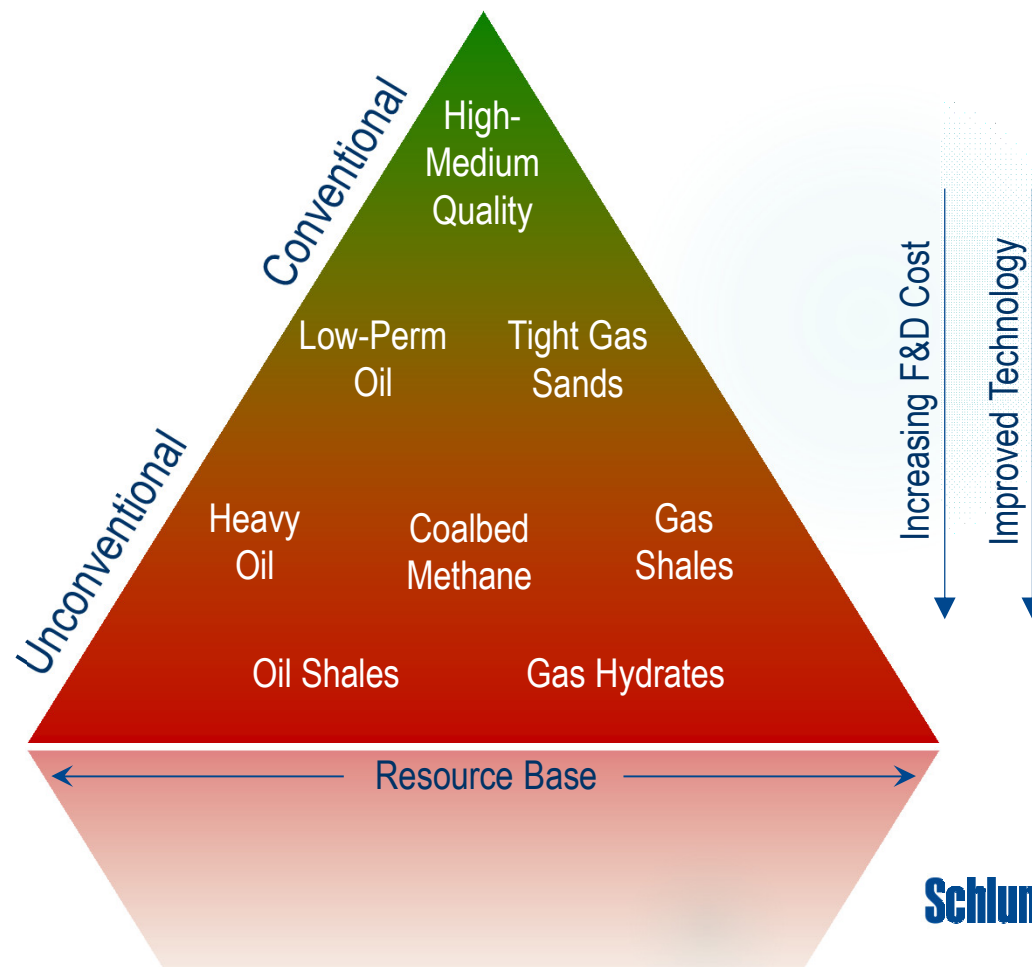
Conventional Resources:

Small Volumes... Easy to Develop

Unconventional Resources:

Large Volumes... Difficult to Develop

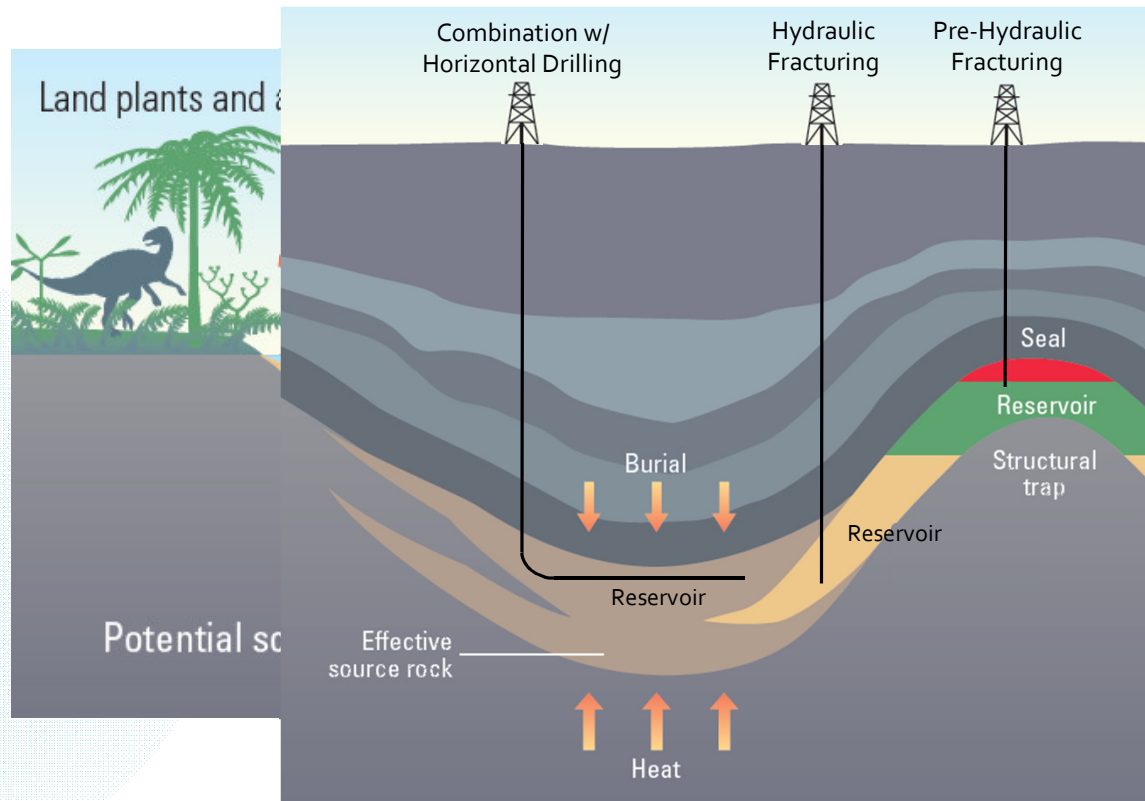
- Multiple Wells
- Hydraulic Fracturing



Source: 2007 NPC Global Oil & Gas Study, Unconventional Gas Topic Paper #29

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Evolution of Reservoir Rock



Why is Hydraulic Fracturing Effective

Vertical, Perforated Well



30 m²

Vertical, Perforated Well with Single Hydraulic Fracture

15,000 m²

60m High x 0.15m Wellbore

60m High x (1) 60m Frac

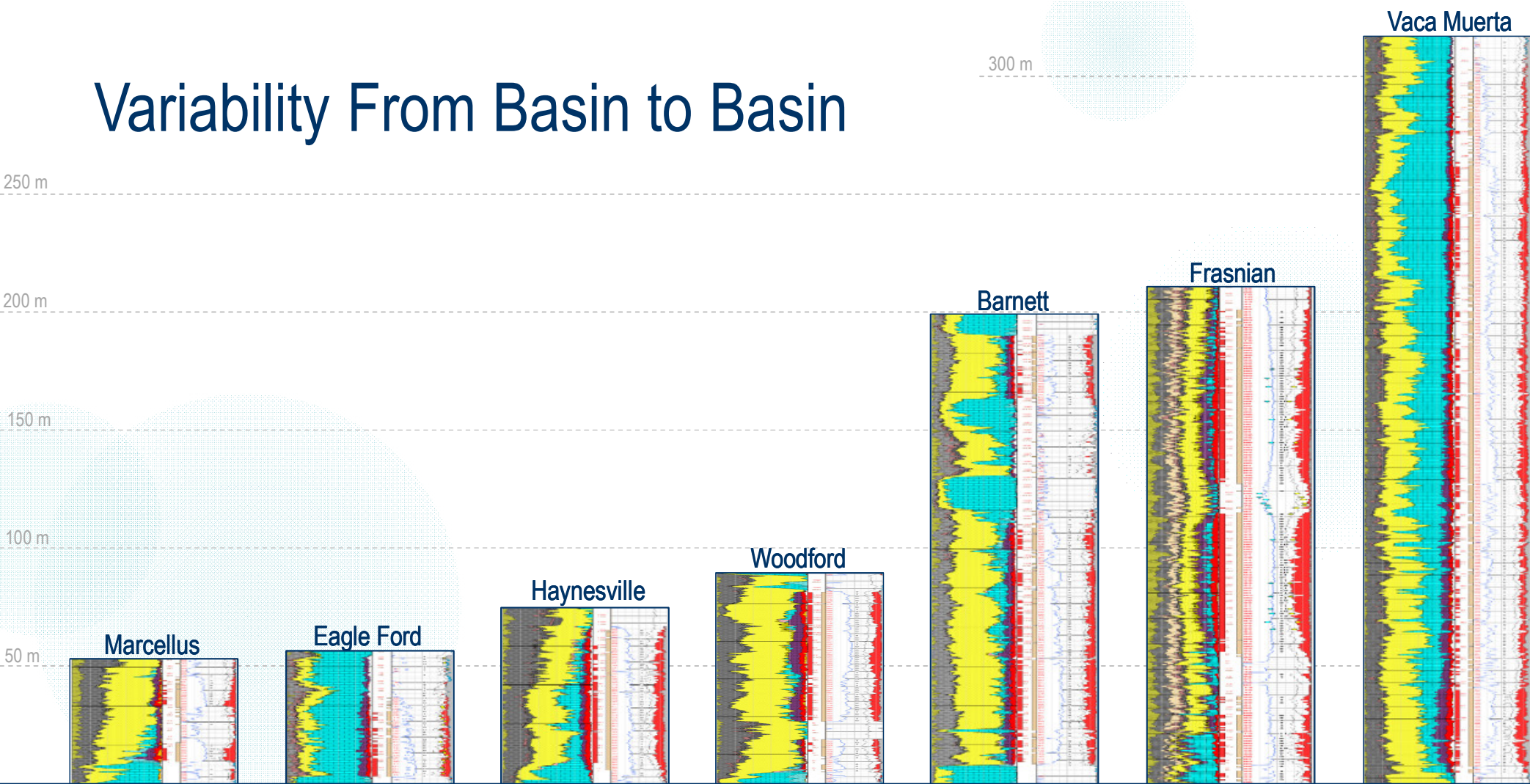
Horizontal, Perforated Well with 15 Hydraulic Fractures



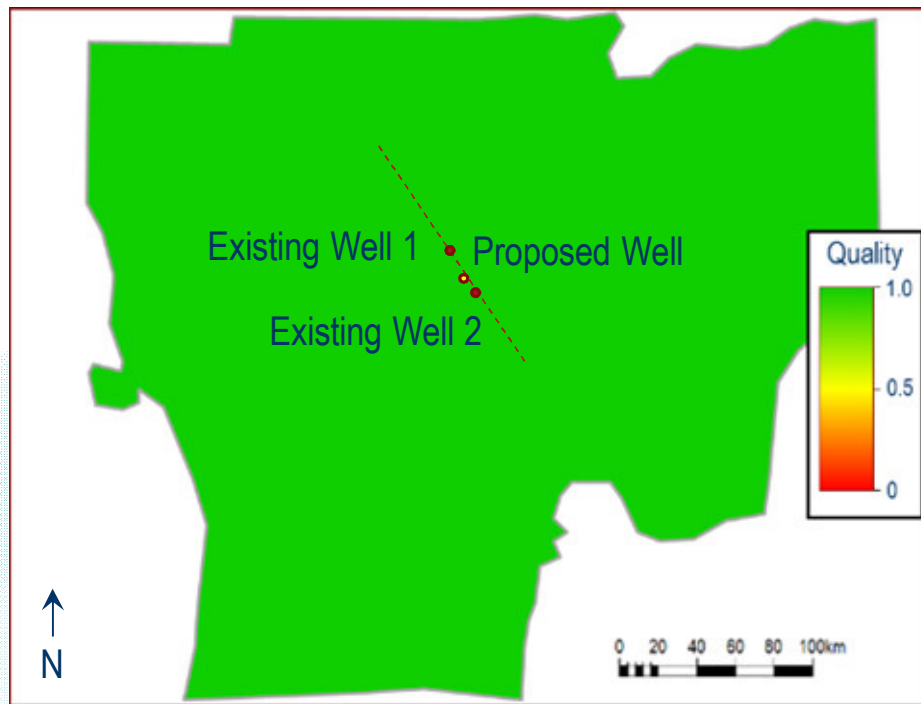
220,000 Sq Ft

60m High x 0.15m Wellbore x (15) 60m Fracs

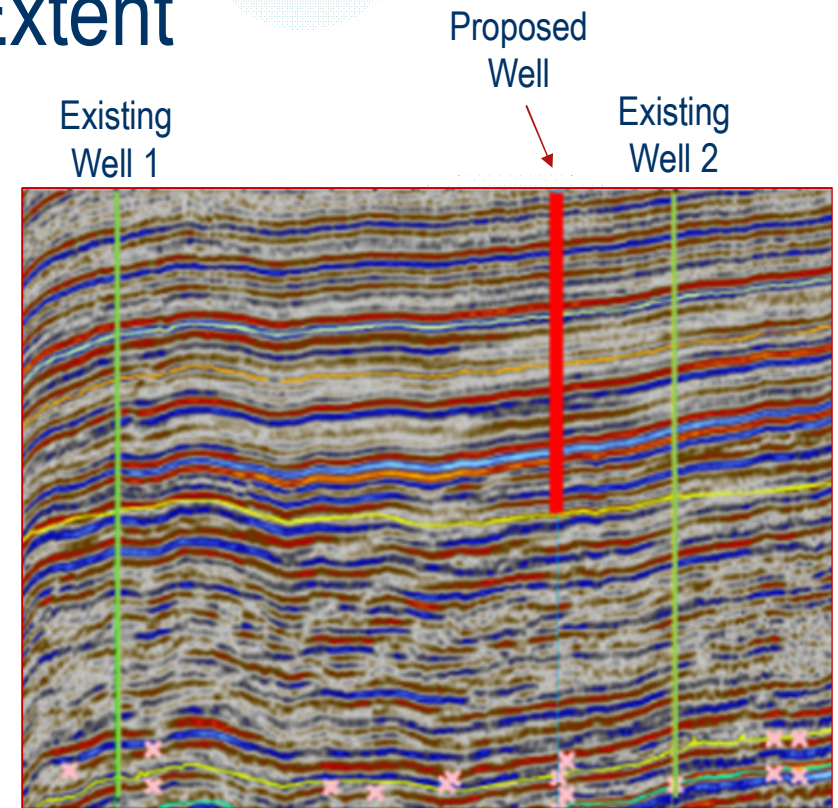
Variability From Basin to Basin



Building a Field Model... Aerial Extent

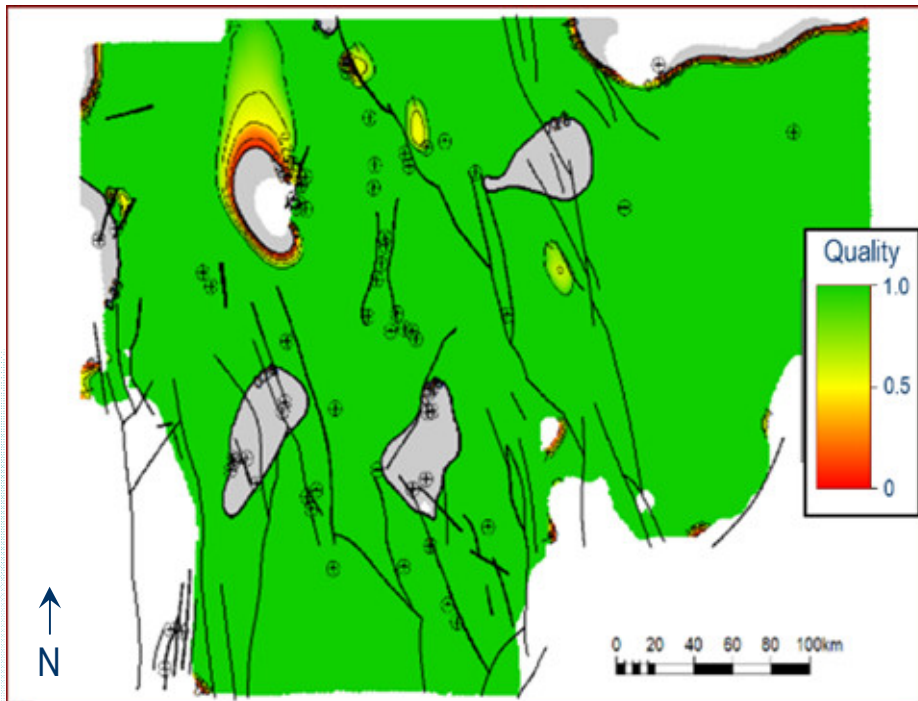


Map View



Processed Seismic Survey

Building a Field Model... Reservoir Quality

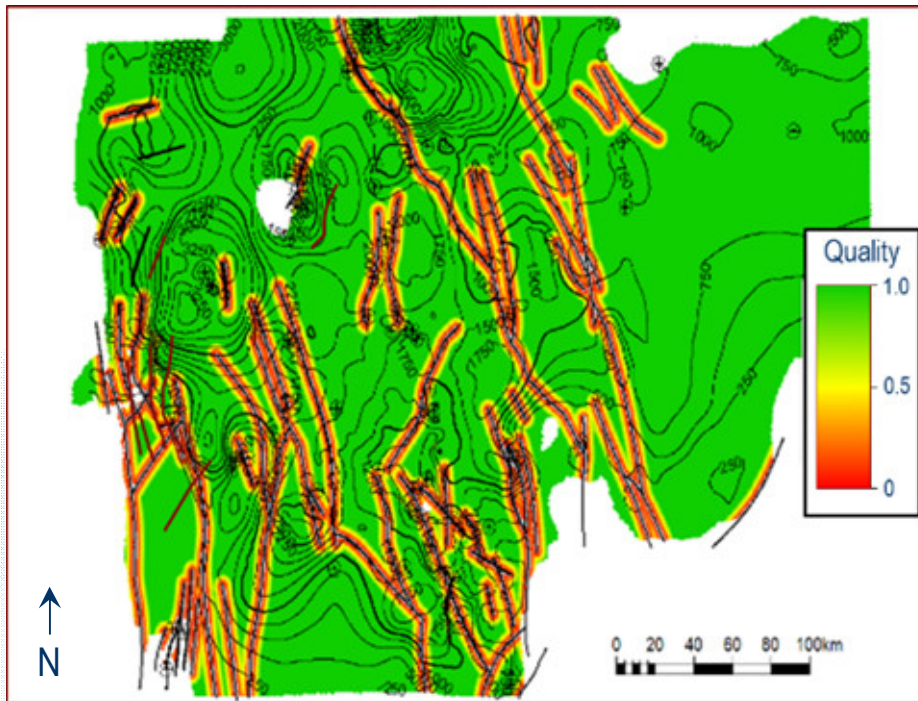


Map View

Reservoir Performance Drivers...
Including:

- Total Organic Content
- Porosity
- Permeability
- Water Saturation

Building a Field Model... Completion Quality

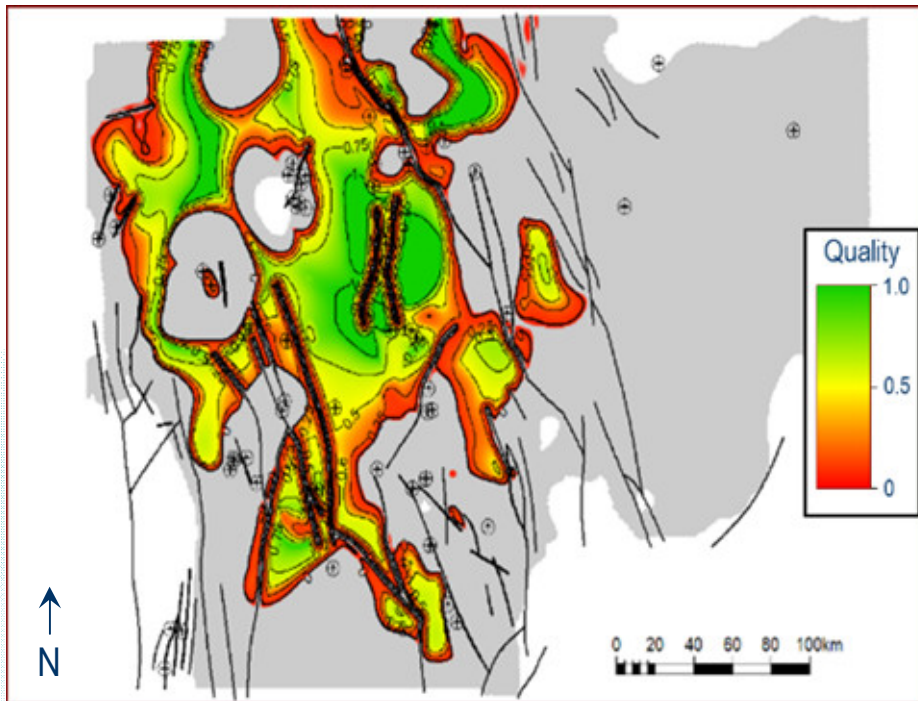


Map View

Fracturing Placement Drivers...
Including:

- Clay Volume
- Pore Pressure
- Min. Horizontal Stress
- Young's Modulus
- Poisson's Ratio
- Natural Fractures

Building a Field Model... “Sweet Spots”

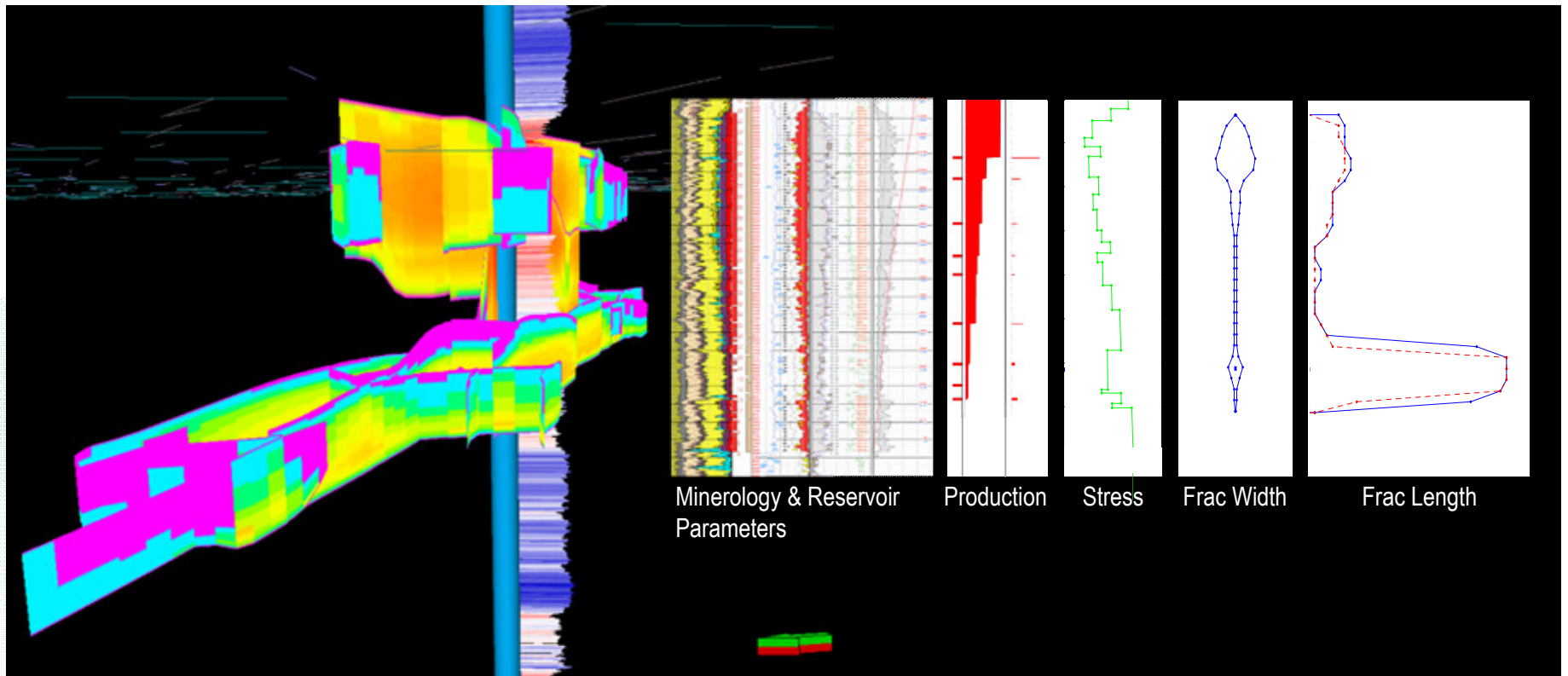


Map View

Combination of Results from Reservoir Quality plus Completion Quality

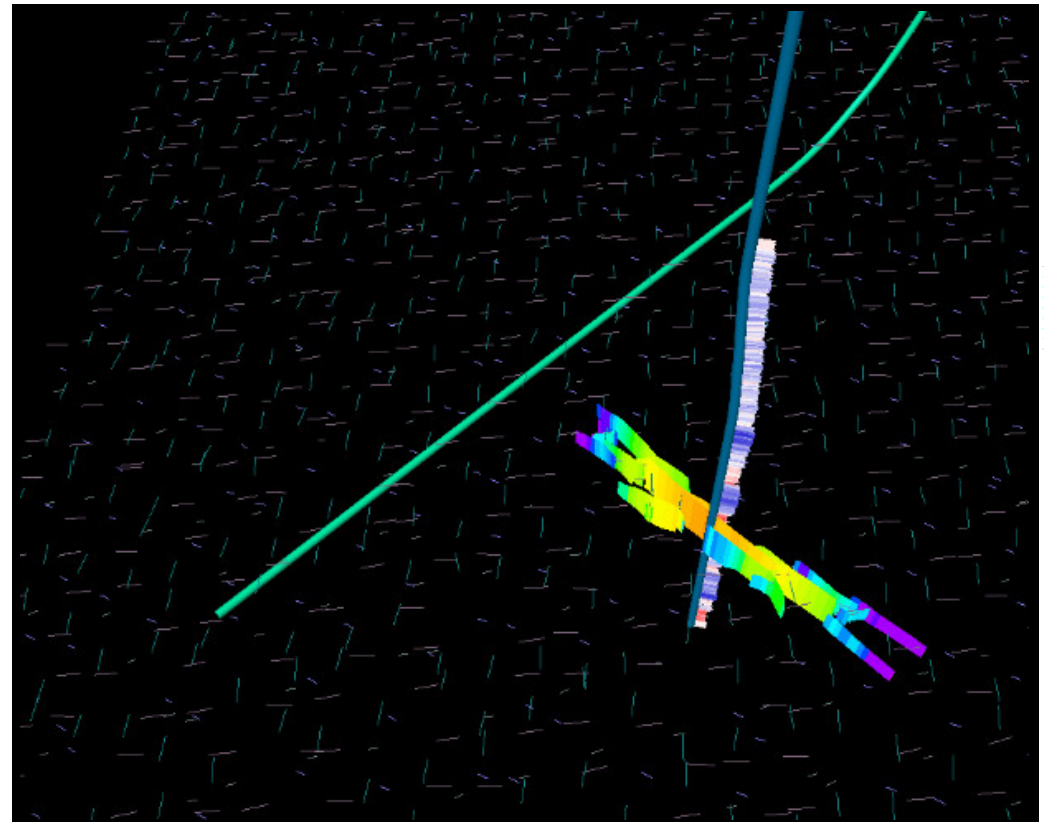
- Identifies and Prioritizes Bottomhole Locations
- Eliminate Non-Economic Wells
- Develop a Development Strategy

Developing a Completions Model



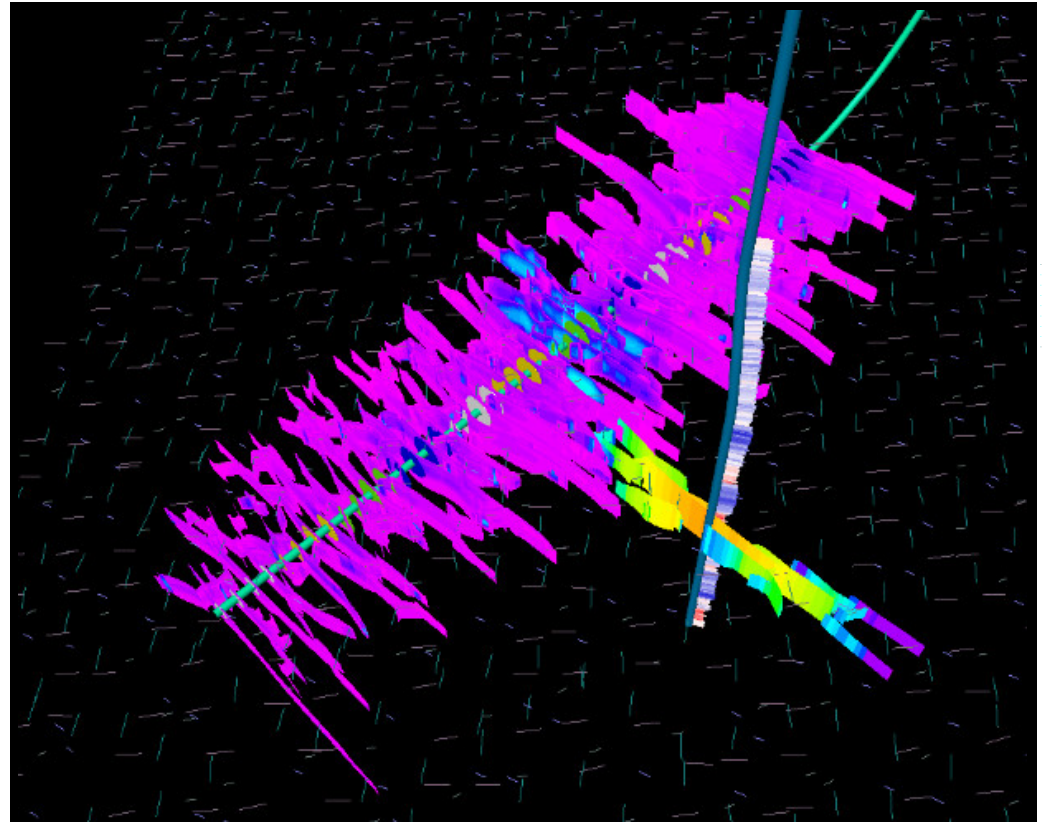
Converting from the Vertical to the Horizontal

- Data from Vertical Well Provides Basis for Modeling
 - Drilling Models
 - Hydraulic Fracturing Models
- Identifies Horizontal Well Landing Point

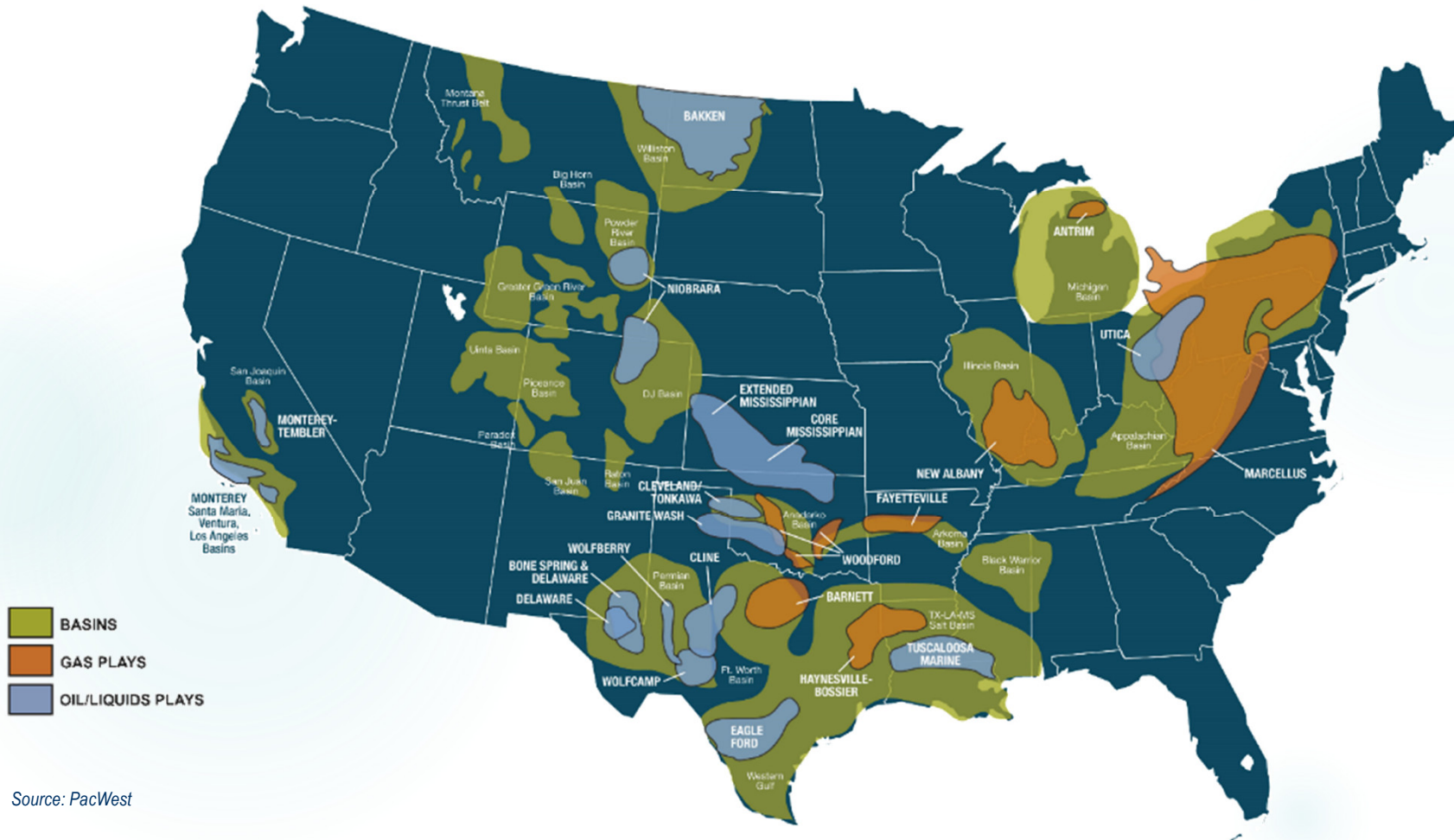


Converting from the Vertical to the Horizontal

- Fracturing Modeling
Calibrated for Horizontal
- Combined with Microseismic
Data for Large Scale
Development Planning



The US (Lower 48) Unconventional Resources



Source: PacWest

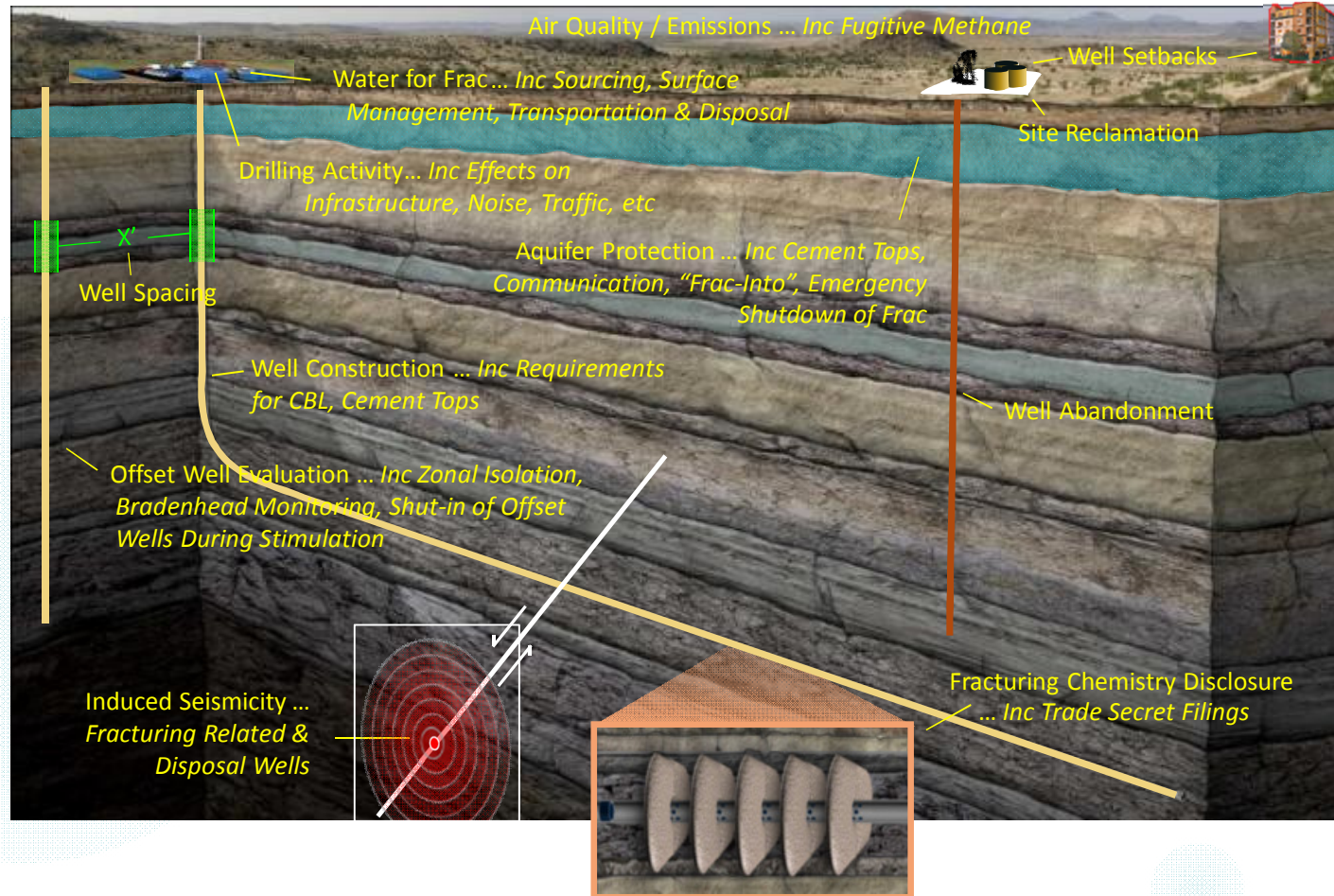
The Global Unconventional Resources



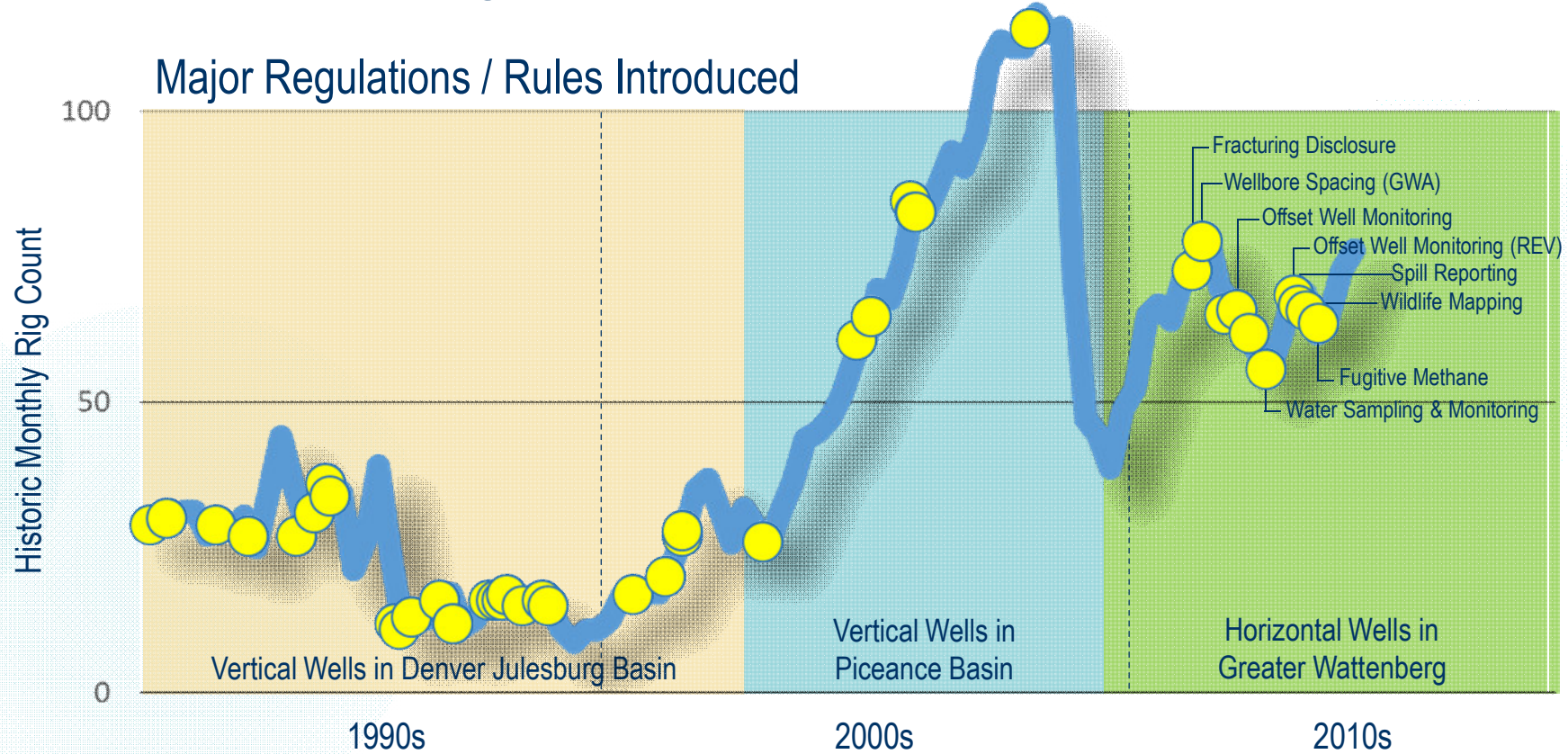
Global Stakeholders



The Resulting Regulatory Environment

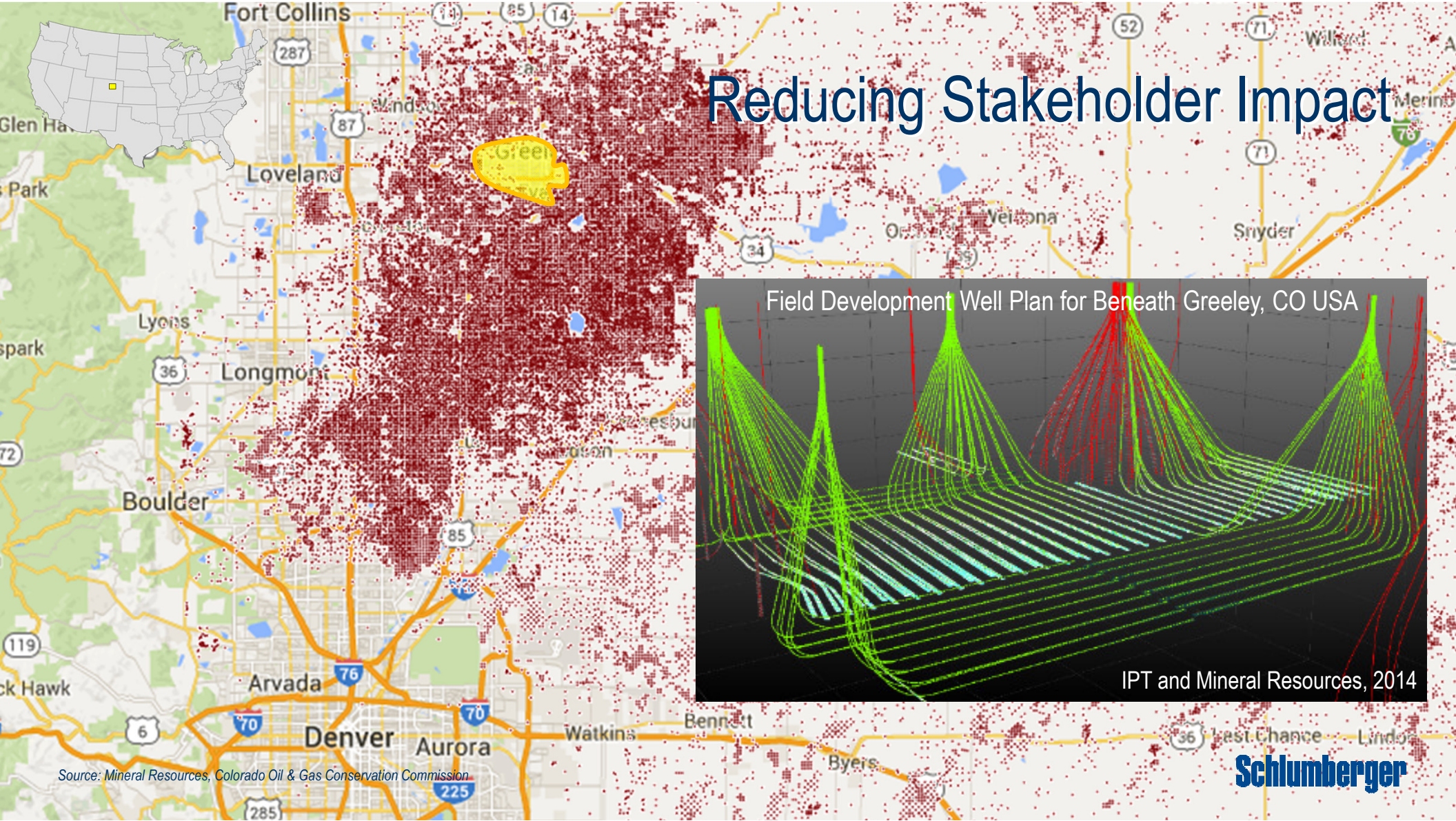


Basin Based Regulation... Colorado, USA Example



Source: Colorado Oil & Gas Conservation Commission

Reducing Stakeholder Impact



Field Development Well Plan for Beneath Greeley, CO USA

IPT and Mineral Resources, 2014

Source: Mineral Resources, Colorado Oil & Gas Conservation Commission



Piceance Basin, Colorado USA



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Surface Management with Directional Drilling

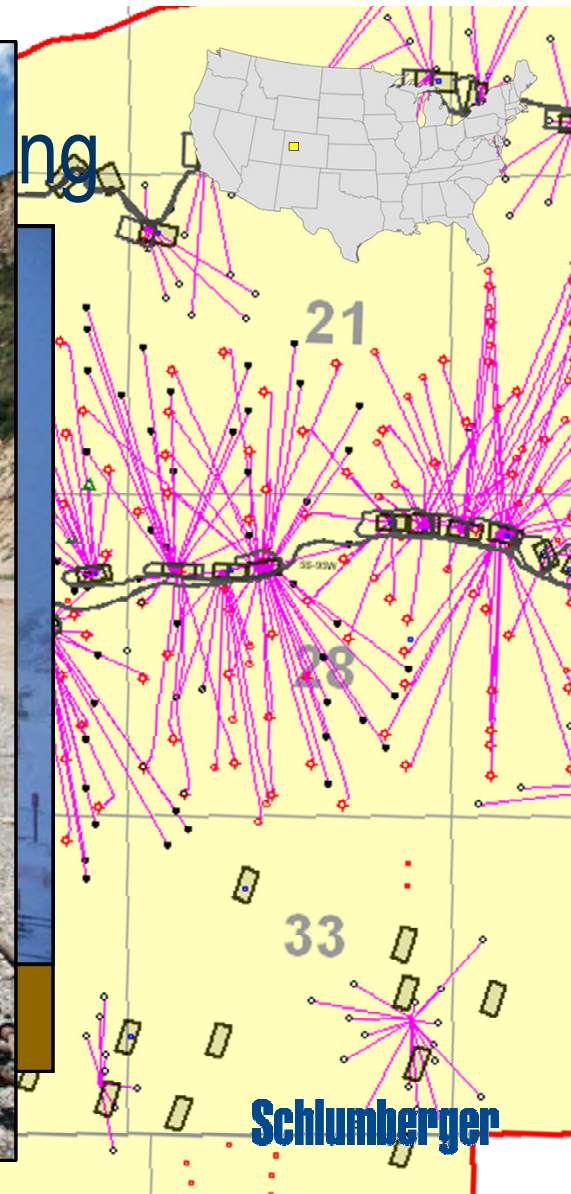
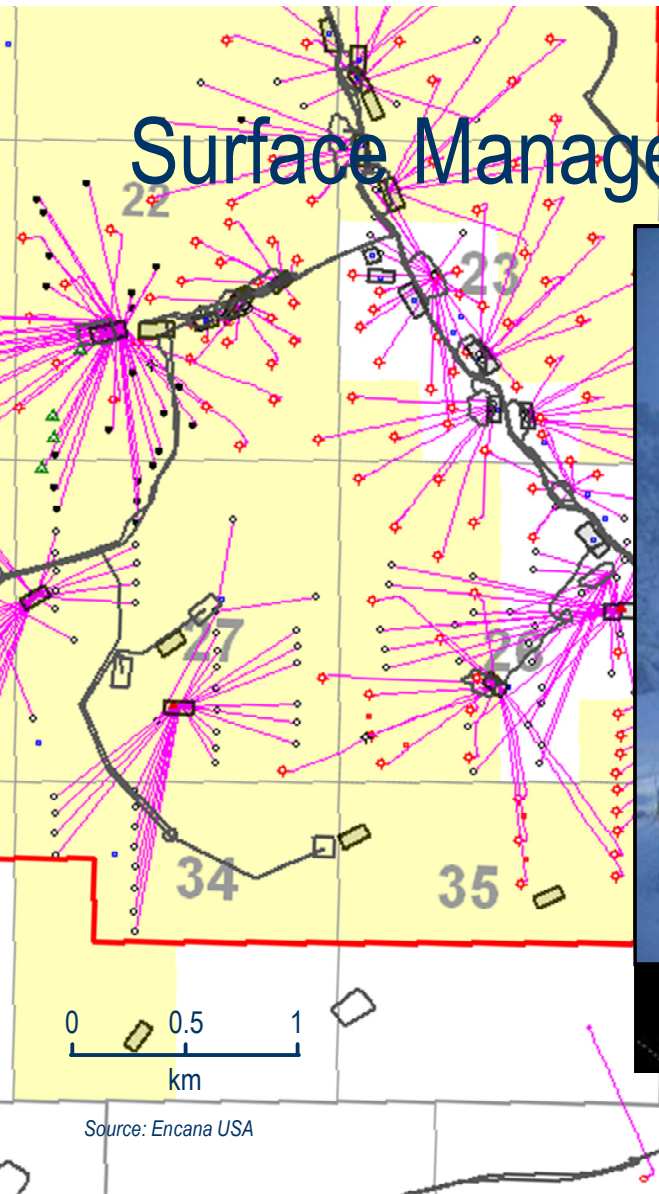


0 0.5 1
km

Source: Google Earth

Schlumberger

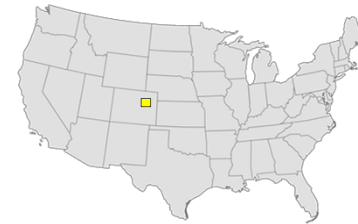
Surface Management



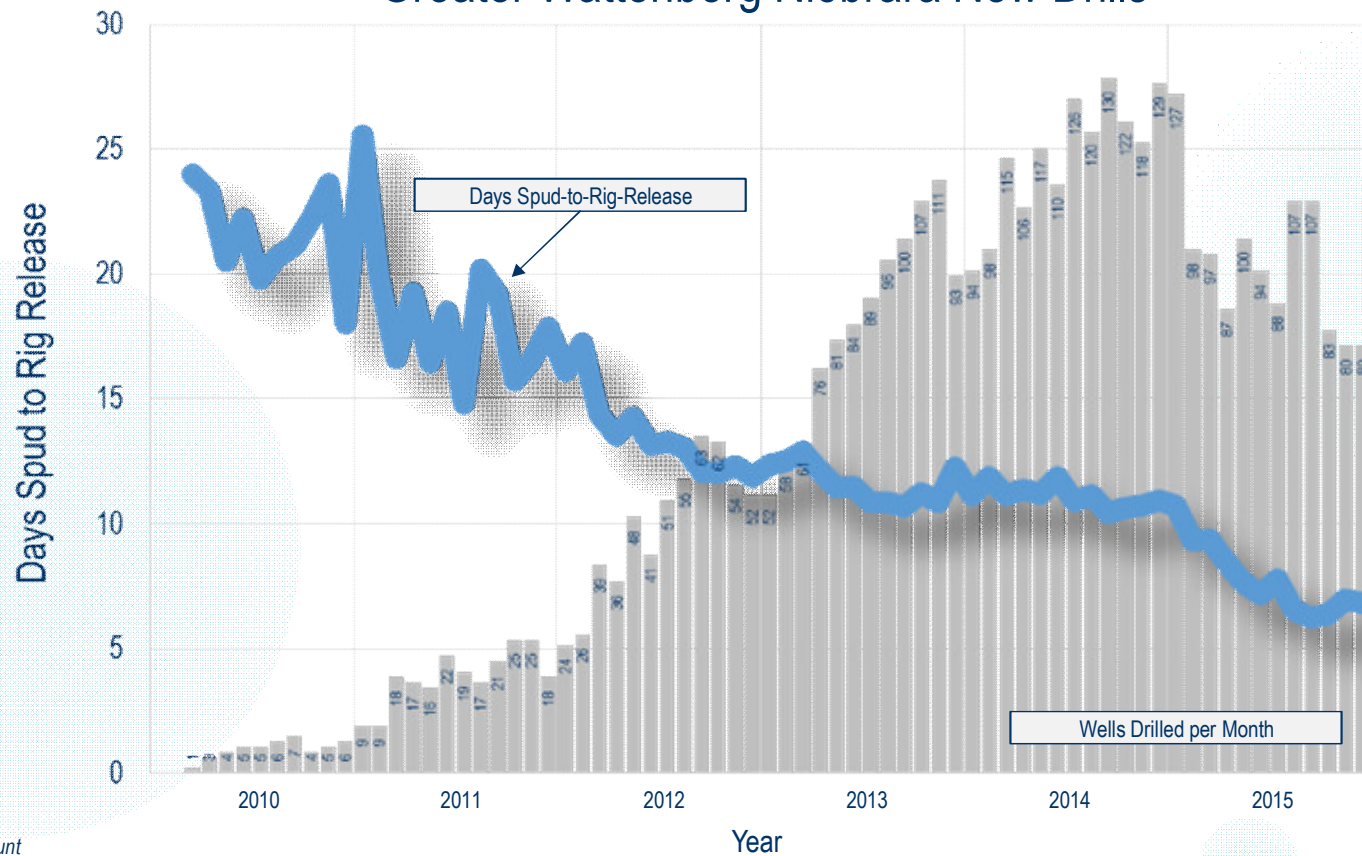
Source: Encana USA

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Climbing the Drilling Curve



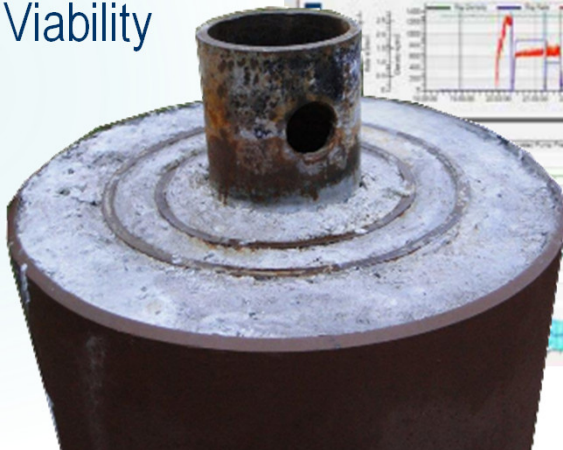
Greater Wattenberg Niobrara New Drills



Source: Schlumberger Rig Count

Well Integrity

- Low Reservoir Pressures / Loss Circulation
- Stresses on Wellbore
 - Completion Phase
 - Production Phase
- Gas on Annulus
- Corrosive Fluids
- Long Term Viability



Typical Water Requirements for US Unconventionals

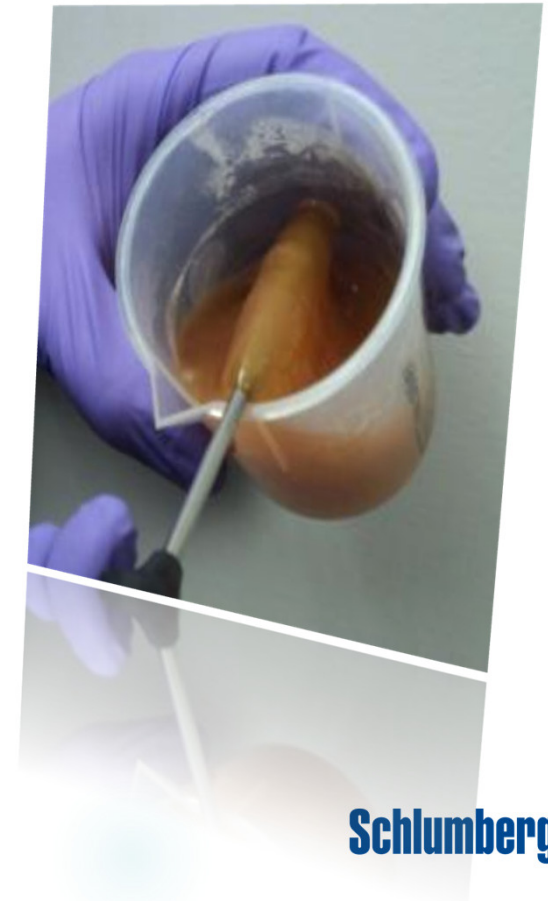
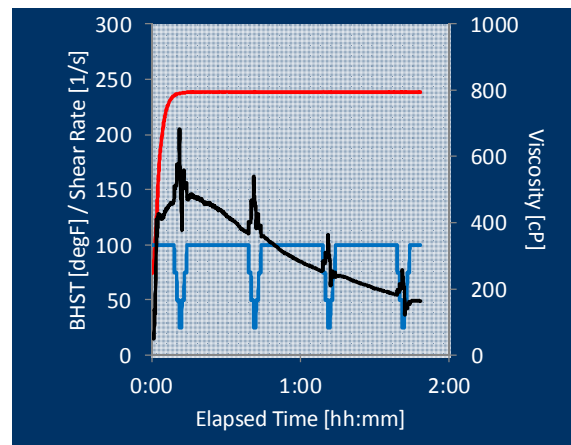
Basin	Frac Water per Well (m3)	Recycle Water per Well (m3)	% Recycle
Bakken	454	0	0.0%
Barnett	382	0	0.0%
DJ Basin	547	38	6.9%
Eagle Ford	717	0	0.0%
Haynesville	1,183	76	6.4%
Marcellus	867	681	78.6%
Mid-Continent Region	969	303	31.3%
Permian	980	76	7.7%
Utica	1,090	606	55.6%
Other US Onshore	467	38	8.1%
Average	780	151	19.4%

Source: IHS Markit / WaterIQ 17

Water Sourcing for Hydraulic Fracturing



Cation	Sample 1
Sodium	80,423
Calcium	18,938
Potassium	6,800
Magnesium	889
Iron	82.29
Boron	364
pH	5.68
SG	1.187
TDS	275,000



Reducing the Carbon Footprint of Hydraulic Fracturing

Traditional Approach

Proppant to Wellsite (55 Trucks)

Fresh Water to Wellsite (416 Trucks)

Recycled Water to Wellsite (104 Trucks)

Produced Water from Field to Disposal (416 Trucks)

Technology Application

Proppant to Wellsite (33 Trucks)

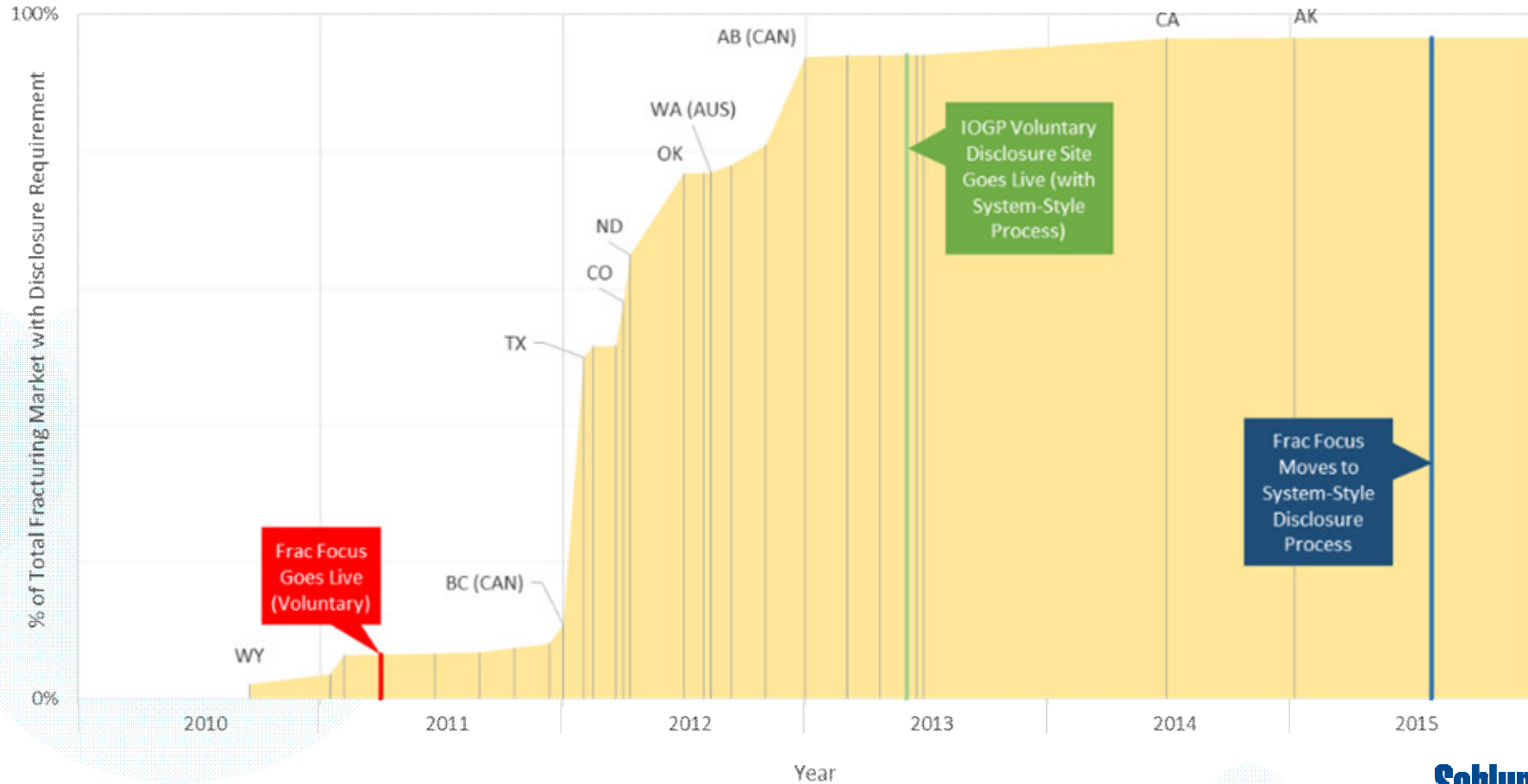
Recycled Water to Wellsite (78 Trucks)

Produced Water from Field to Wellsite (312 Trucks)



- 57% Reduction in Truck Traffic
- 82% Reduction in Transportation Related CO₂ Emissions (17 t v 93 t)
- 28% Reduction in Treatment Related CO₂ Emissions (101 t v 139 t)
- Reduced Field Produced Water Disposal Volumes (5675 m³ per Well)

Fracturing Chemical Disclosures





Client: Petrofrontier
 Well: Example Well
 Basin / Field: Northern Territories
 State: Northern Territories
 Country: Australia
 Case: Hybrid Prop Frac
 Disclosure: Prejob
 Date Prepared: 5/26/2011

Fluid Name & Volume	Additive	Additive Description	Concentration	Volume
Slickwater 400,000 Gal	F103	Surfactant	2.0 Gal / 1000 Gal	800 Gal
	M275	Microbiocide	0.5 lb / 1000 Gal	200 Lb
	I064	Clay Stabilizer	2.0 Gal / 1000 Gal	800 Gal

Fluid Name & Volume	Additive	Additive Description	Concentration	Volume
YF120LG 525,000 Gal	F103	Surfactant	2.0 Gal / 1000 Gal	800 Gal
	J134	Breaker	6.0 lb / 1000 Gal	2,400 Lb
	J218	Breaker	6.0 lb / 1000 Gal	2,400 Lb
	J479	Breaker	6.0 lb / 1000 Gal	2,400 Lb
	J494	pH Control	12.0 lb / 1000 Gal	4,800 Lb
	J580	Gelling Agent	20.0 lb / 1000 Gal	8,000 Lb
	I010	Crosslinker	2.0 lb / 1000 Gal	800 Lb
	M003	Soda Ash	5.0 lb / 1000 Gal	2,000 Lb
	I064	Clay Stabilizer	2.0 Gal / 1000 Gal	800 Gal
	M275	Microbiocide	0.5 lb / 1000 Gal	200 Lb
	S020	20/40 Mesh Sand	0.25 to 6.0 PPA	1,000,000 Lbs

The total volume listed in the tables above represents the summation of water and additives. Water is supplied by client.

CAS Number	Chemical Name	Mass Fraction
-	Water (Including Mix Water Supplied by Client)*	87.46737%
14808-60-7	Crystalline silica	11.97160%
9000-30-0	Guar gum	0.11533%
75-57-0	Tetramethylammonium chloride	0.09242%
533-96-0	Carbonic acid, sodium salt (2:3)	0.07542%
7727-54-0	Diammonium peroxodisulphate	0.07165%
9012-54-8	Hemicellulase enzyme	0.03771%
67-63-0	Propan-2-ol	0.03327%
111-76-2	2-butoxyethanol	0.03327%
497-19-8	Sodium carbonate	0.03143%
68131-39-5	Alcohols, C12-15 linear, ethoxylated	0.01664%
34398-01-1(3EO)	Linear C11 alcohol ethoxylate (3eo)	0.01664%
34398-01-1(7EO)	Linear C11 alcohol ethoxylate (7eo)	0.01664%
10043-35-3	Boric acid	0.01257%
25088-72-6	Vinylidene chloride/methylacrylate copolymer	0.00362%
91053-39-3	Diatomaceous earth, calcined	0.00277%
10377-60-3	Magnesium nitrate	0.00055%
7631-86-9	Non-crystalline silica	0.00031%
26172-55-4	5-chloro-2-methyl-2h-isothiazolol-3-one	0.00030%
7786-30-3	Magnesium chloride	0.00028%
14807-96-6	Magnesium silicate hydrate (talc)	0.00015%
2682-20-4	2-methyl-2h-isothiazol-3-one	0.00009%
14464-46-1	Cristobalite	0.00006%
Total		100%

* Mix water is supplied by the client. Schlumberger has performed no analysis of the water and cannot provide a breakdown of components that may have been added to the water by third parties.

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Northern Territory Fracturing Disclosure

- System-Style Minimizes Proprietary Designation
- Supported by Frac Focus
- Implemented in 2010
- Use in NT Identical to North America Process
- Voluntary to Allow Operators to Plan Completion

