Southwest Regional Partnership on Carbon Sequestration

New Mexico Sequestration Tests

Project Overview

October 4, 2006

Pittsburgh, Pennsylvania

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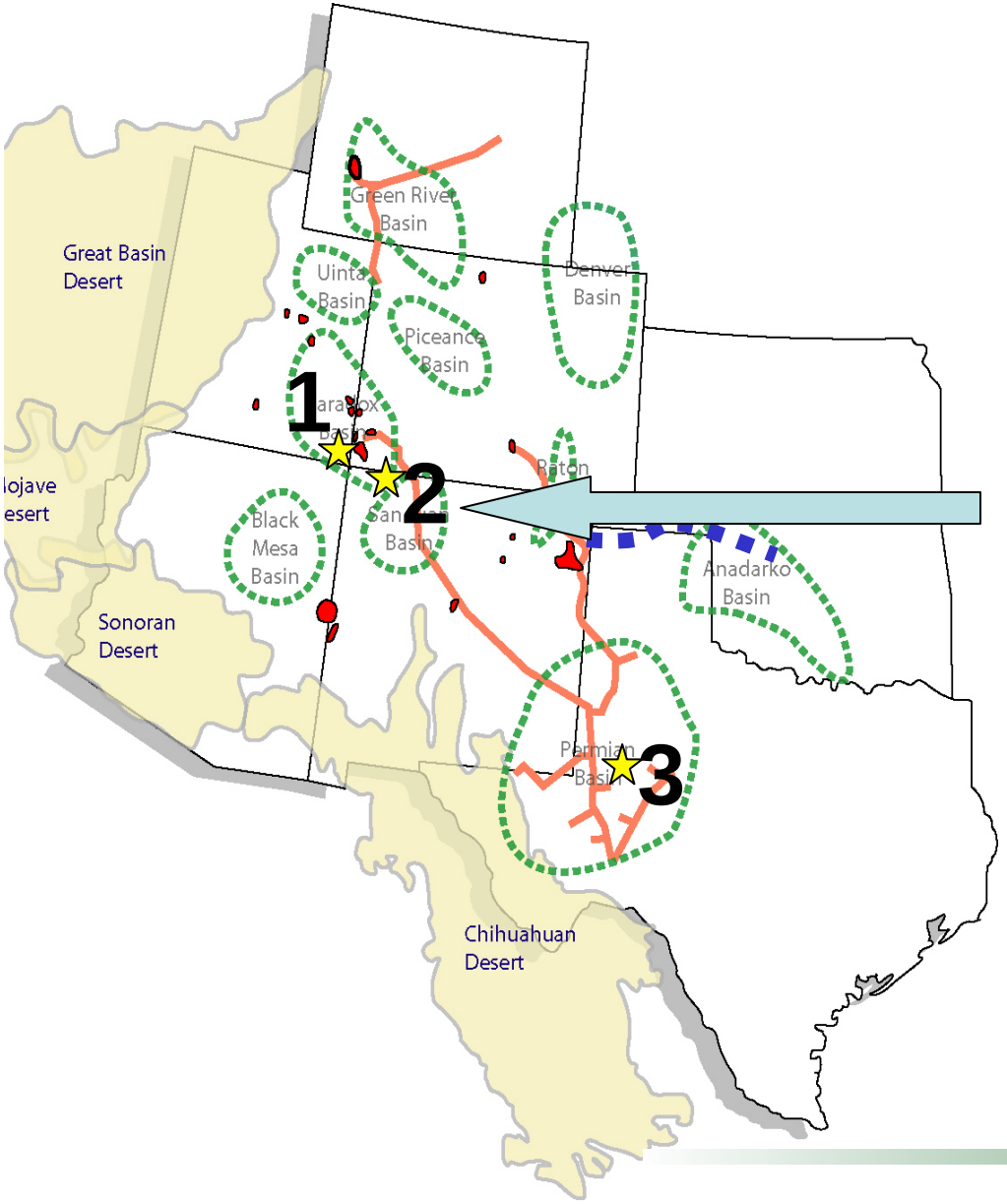
New Mexico Tech

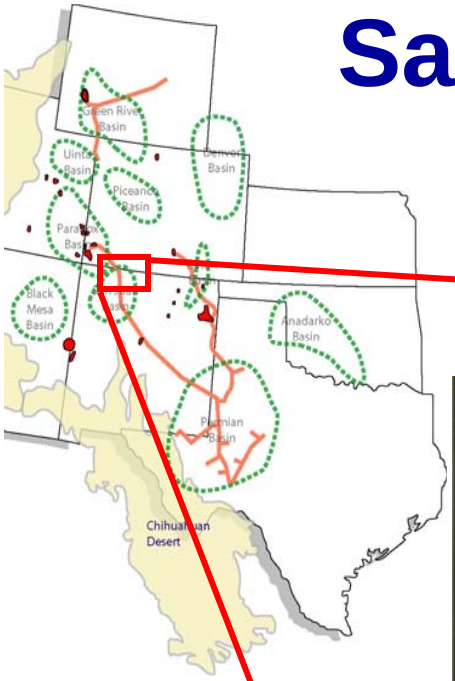
Best Demonstration Options

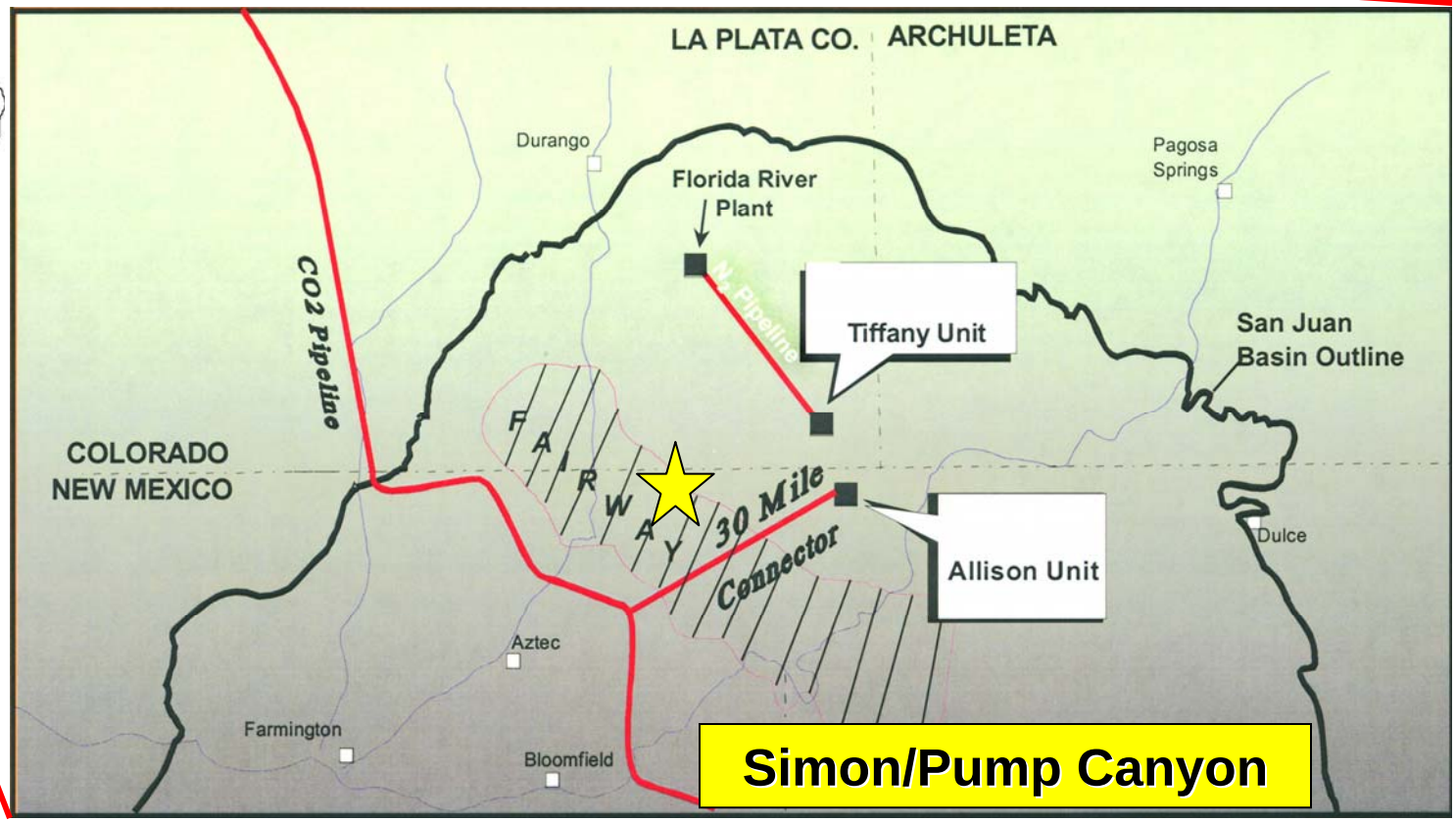


Three of these geologic options were selected as the most promising opportunities for evaluation in Phase II:

- combined ECBM and sequestration testing, San Juan Basin, NM

San Juan Basin, New Mexico: ECBM Demonstration





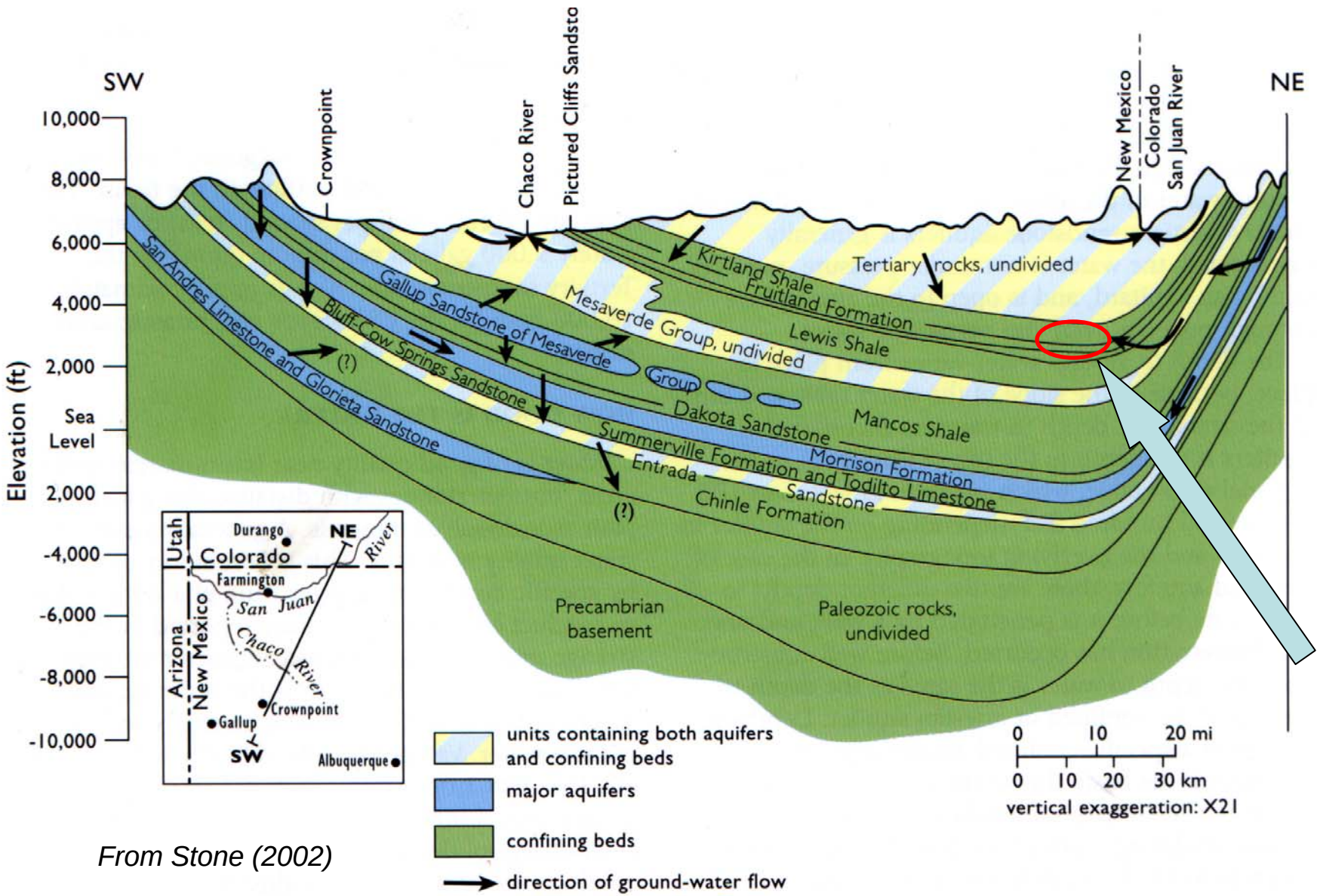
San Juan ECBM: A Unique Opportunity

- **ECBM/CO_2 test in San Juan CBM "Fairway"**
- **Assessed by ARI in DOE-sponsored Coal-Seq project as one of top US coal basins for sequestration:**
  - Potential storage capacity (12 Gt CO_2, 12% of US total)
  - ECBM potential (16 TCF, 10% of U.S. total)
  - Potential value-added storage (predicted net profit of $4-8/ton of CO_2)
- **Scalability: results of demo directly scalable to much of San Juan and other coal-rich basins**

Scalability

- **Infrastructure for large-scale sequestration already in place**
- **Fairway coals characterized by exceptionally high permeability (~100 mD)**
- **Mitigating factor: coal swelling and injectivity loss** (maintaining high injectivity critical for large-scale, low-cost sequestration in coals)

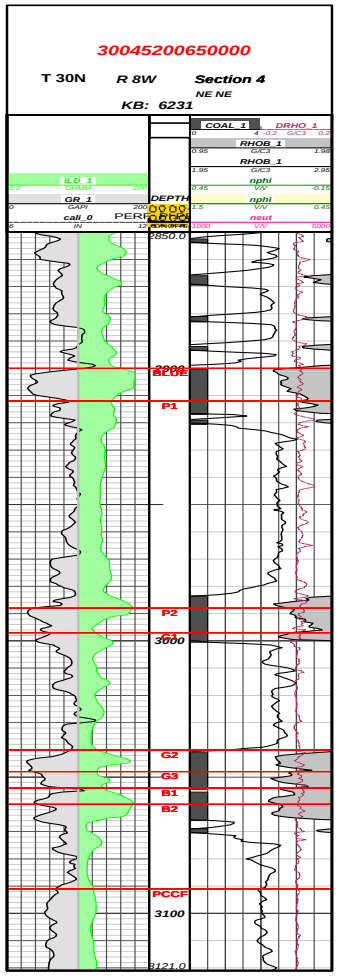
Site Description: San Juan Geology



From Stone (2002)

Site Description: Fruitland Type Logs

SW



Upper Coals

Middle Coals

Basal Fruitland

Pictured Cliffs

?

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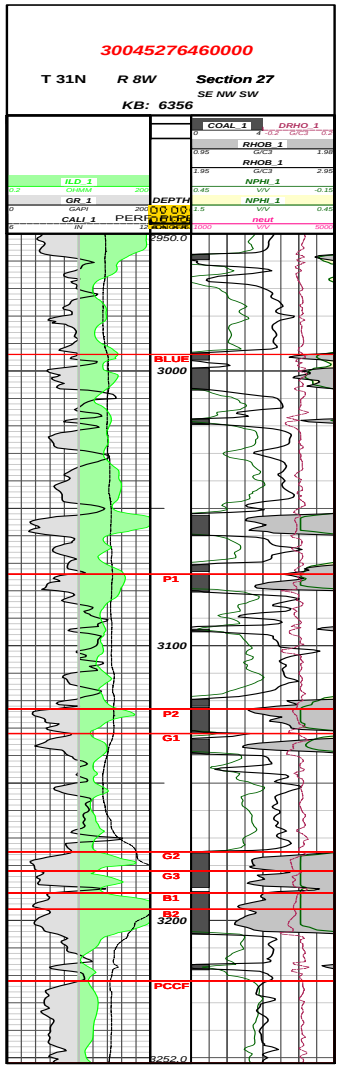
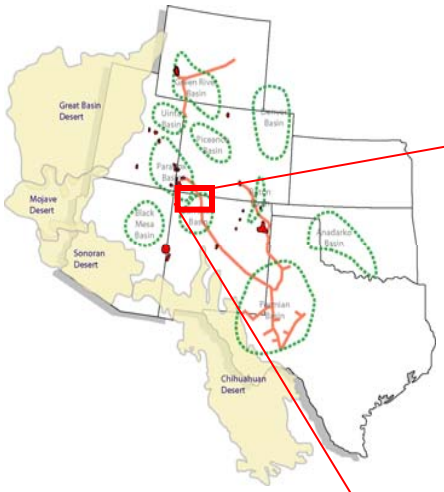
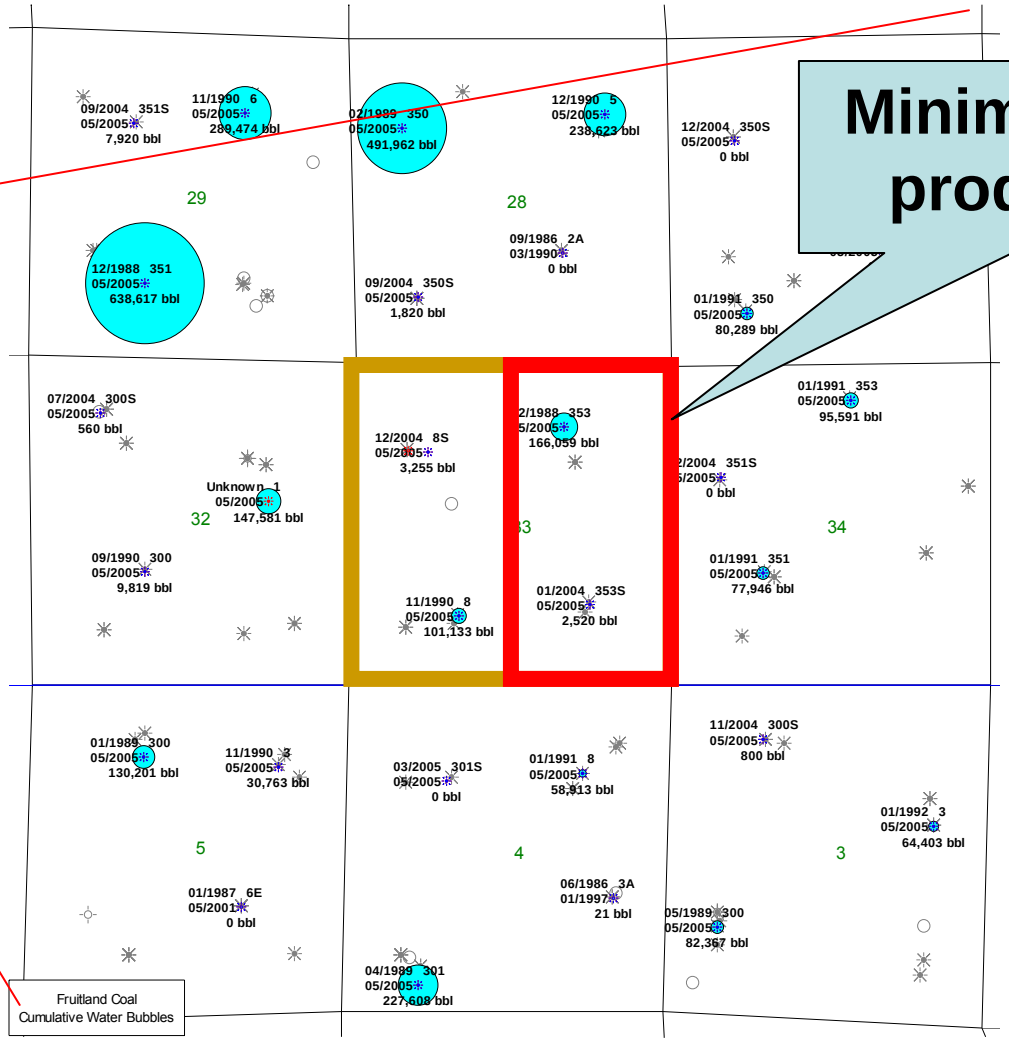


NE

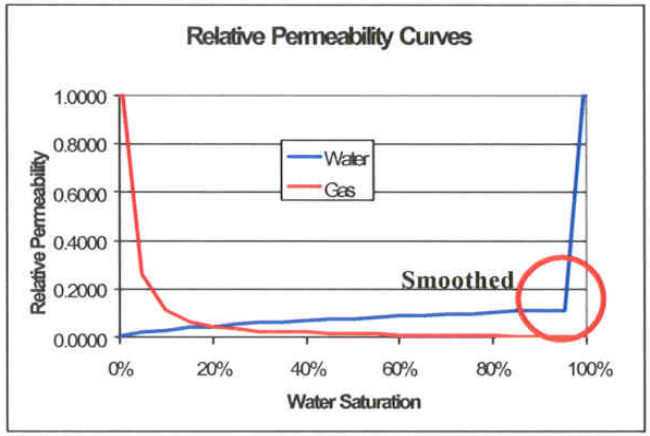
Site Description: Nearly Single Phase Flow



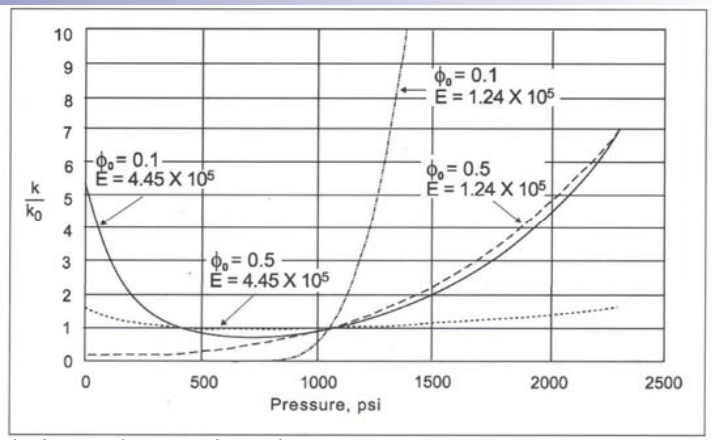


Minimal water production

Comparison to Other CBM Areas



(Reeves et al., 2003)



(Palmer and Mansoori, 1996)

- **Comparatively higher methane content than typical Powder River Basin (Wyoming) coals**
- **Significantly higher permeability characterize Simon/Pump Canyon (50-100 md) compared to <10 md at nearby Allison**
- **Permeability reduction due to two phase flow is negligible at Simon/Pump Canyon compared to Allison**
- **Near abandonment pressure at Simon/Pump Canyon (50-100 psi -- very low compared to many other basins) may minimize injectivity loss due to matrix swelling from CO_2**

Major ECBM Project Tasks

1. Site/reservoir characterization and model development
2. Implement regulatory permitting requirements and risk mitigation
3. Construction, safety and site preparation, baseline MMV
4. Injection operations, MMV and capacity analysis
5. Post-injection monitoring and analysis

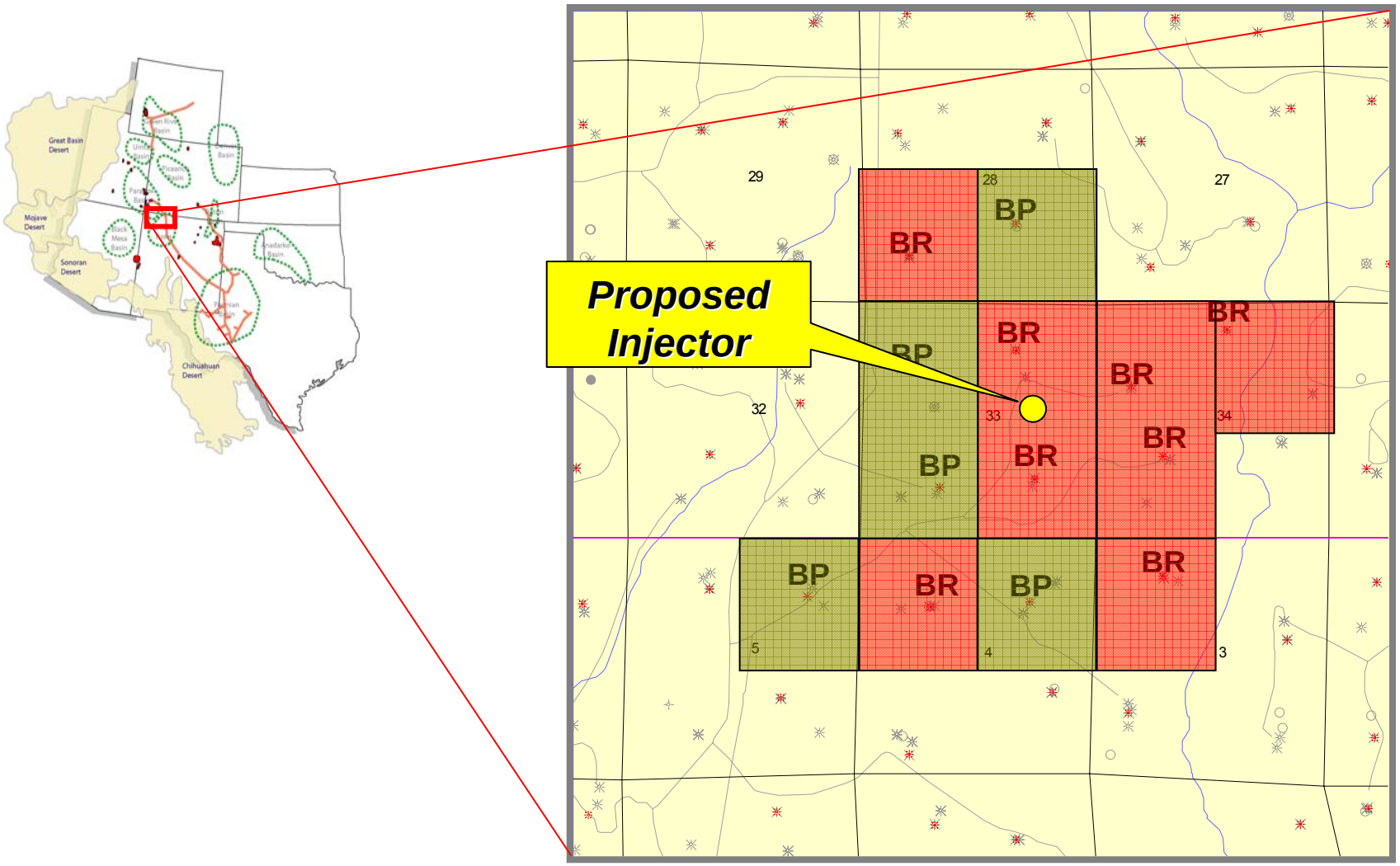
Construction and Site Preparation

- Drill CO_2 injection well in Summer 2007; vertical well to ~3,200 ft.
- Open-hole vs. cased & perforated – suitability in very low reservoir pressure environments; hydra-jetting instead of cavitation
- Collect coal cuttings for lab analysis
- Downhole pressure/temperature sensors for continuous monitoring of injection conditions; CO_2 heater
- A 2-in pipeline will transport CO_2 from Burlington's 4-in connector to KM's Cortez pipeline

Initial Engineering Aspects

- **Inject for 12 mos.; monitor for 24 mos.; start between Oct 2007 and Jan 2008**
- **CO_2 injection 75,000 tons; volume estimates of 1.2 BCF or about 3.5 MMCFD**
- **Injection will be controlled using a constant surface injection pressure allowing rate to vary**
- **CO_2 will be heated to *in situ* reservoir temperature to reduce swelling effects**
- **Experimentation with unheated CO_2**

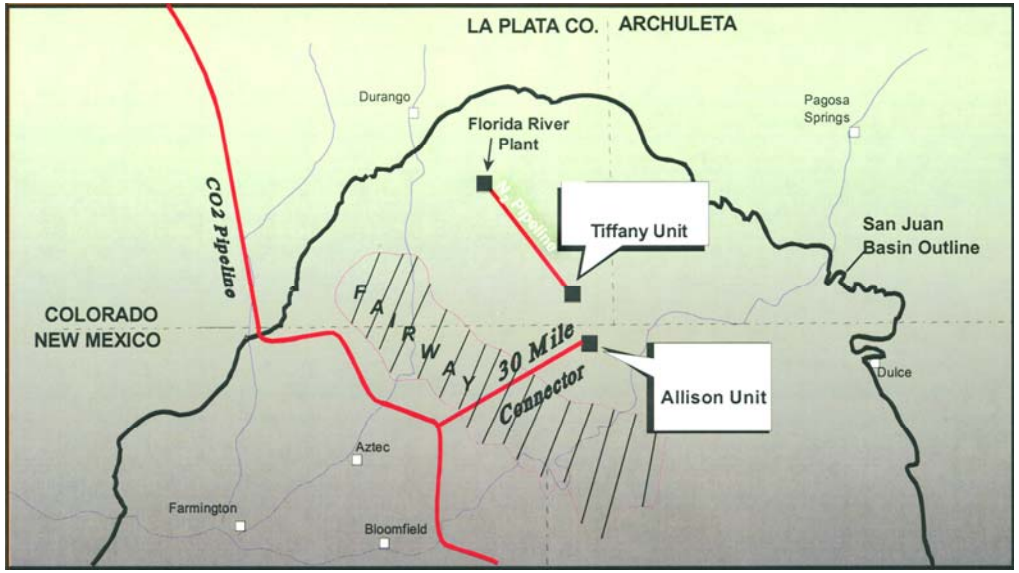
Offset Operators: Industry Partners Critical



Combined ECBM - Terrestrial Sequestration

- **Two-pronged strategy: enhance existing woody plant species along riparian areas and re-establish native grasses and shrubs in upland areas**
- **Limiting factor: water, both quality and quantity**
- **Desalinate CBM/ECBM produced water using zeolite RO membrane (or other technology) for application to rangeland riparian ecosystems**
- **SWP collaborating with Big Sky Partnership on economic modeling and analysis**

General MMV Plan: New Mexico Site



Unique Test:
Combined ECBM - Terrestrial

Unique technology:
Tiltmeter arrays

San Juan, NM: 2007 to 2009

Baseline Background:

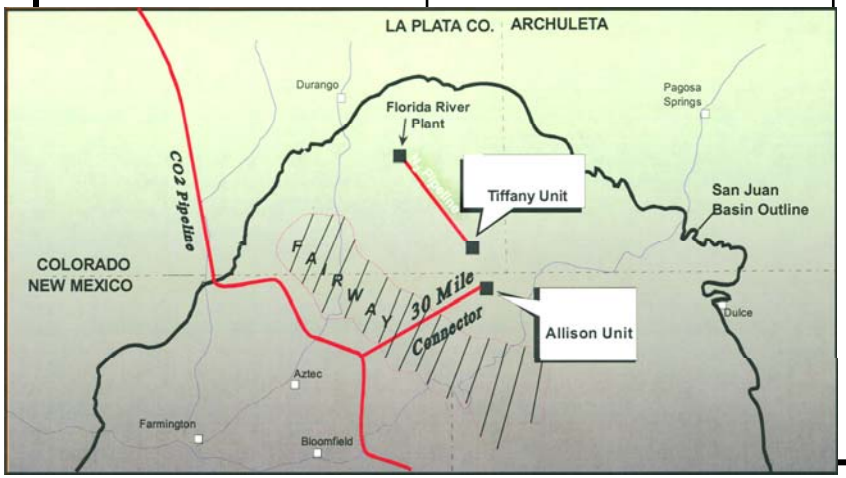
- Jun 07: 2D seismic, passive, VSP, active doublet
- May 07: water chem, gas fluxes
- Monthly before injection: water chem, gas fluxes, remote sens
- Riparian measurements
- Characterize and measure all wells (plugged or not) in area
- LIBS, eddy flux, other terrestrial

During Injection (starts Oct 07)

- Bi-monthly: Water chem, gas fluxes, remote sensing, passive seismic
- Every 4-6 months: other seismic
- Tiltmeter arrays
- Riparian irrigation and evaluation
- LIBS, eddy flux, other terrestrial
- Constant P-T-bicarb

New Mexico Demonstration Summary

Location	Type of Test	Test Details	Estimated Capacity & Value Added Benefit
San Juan basin Coal Fairway, near Navajo City, NM	Combined ECBM testing and terrestrial sequestration evaluation	**Geologic:** Est. 75,000 (?) tons per year for 1 year **Terrestrial:** Desalinate water from ECBM test and use for riparian restoration	- An estimate of minimum capacity of test unit: 100,000,000 tons - Value added Benefit: enhanced methane recovery - Value added Benefit: wetland restoration



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