



ANADARKO PETROLEUM CORPORATION

ACTS: Anadarko Completion Transport System

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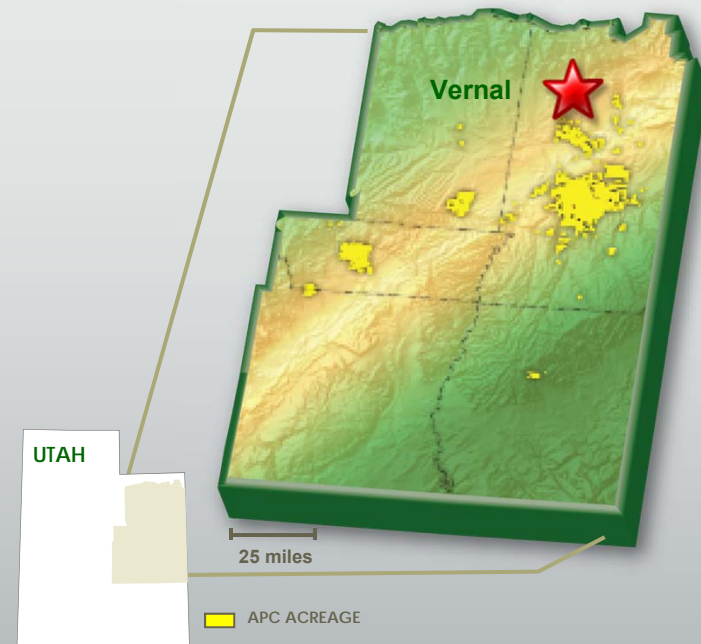
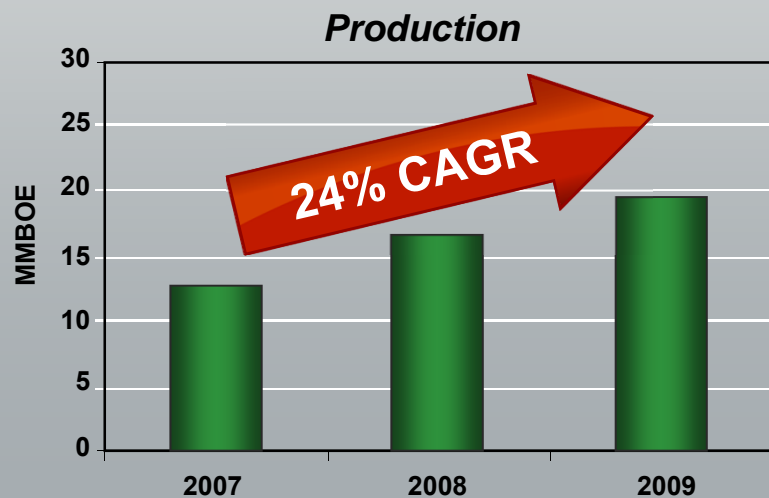
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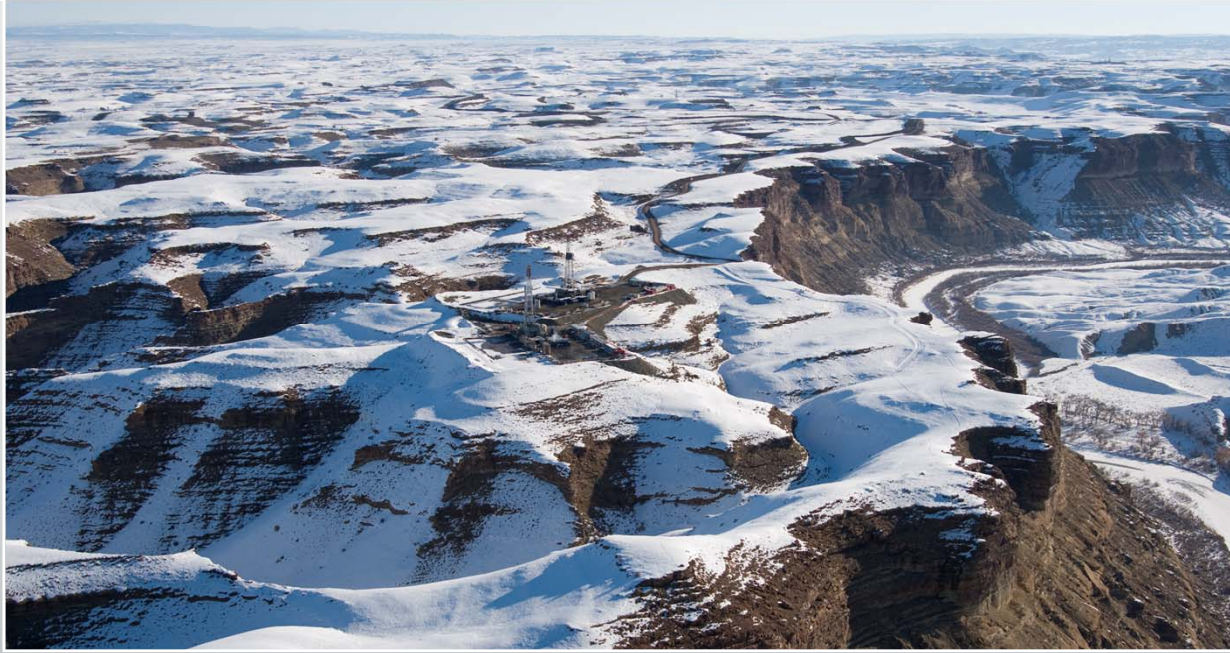
Greater Natural Buttes

Field Statistics

- 163,000 Acres Available for Development
- Current Production of 400 MMcfd
- Peak Production in Excess of 1 Bcfd
- 9.2 TCF of Resource Potential
- 6000+ Locations in Inventory
- 180 APC Employees & 600+ Contractors



Background

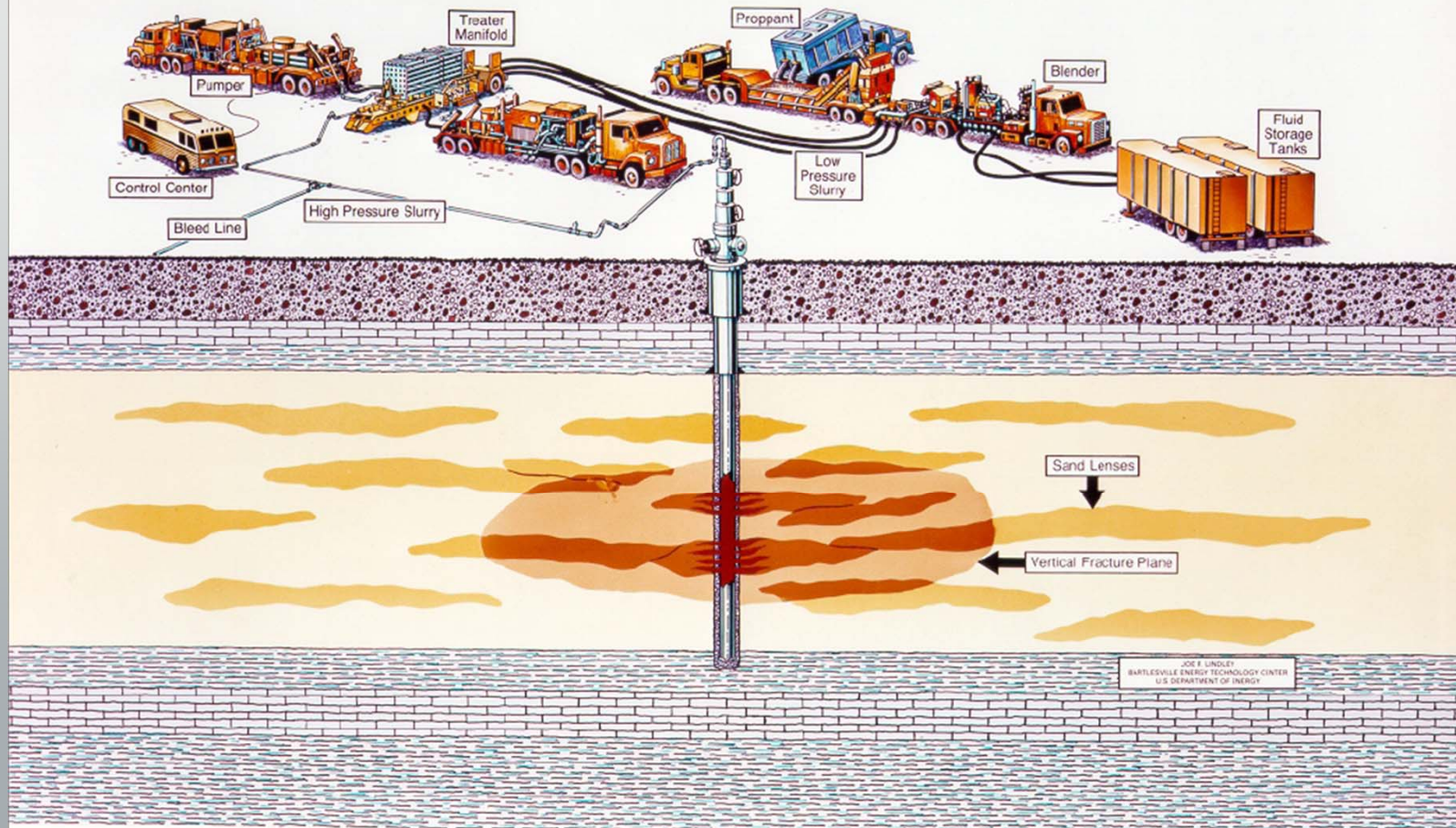


- **APC strives to find creative ways of developing energy resources while reducing environmental impacts**
- **Received the 2008 Earth Day Award from the Utah Division of Oil, Gas and Mining for “pad drilling”**
- **Drilling efficiencies → Completions innovations**

Tight Gas Completions = "Fracing"

HYDRAULIC FRACTURING

Hydraulic fracturing is a means of creating fractures emanating from the well bore in a producing formation to provide increased flow channels for production. A viscous fluid containing a proppant such as sand is injected under high pressure until the desired fracturing is achieved. The pressure is then released allowing the fluid to return to the well. The proppant, however, remains in the fractures preventing them from closing.



What is ACTS?

- **Anadarko Completion Transport System**
- **A highly efficient method of moving large volumes of water without trucking**
- **Recycled flowback fluids are transferred between pads, significantly reducing fresh water usage**
- **Reduces truck traffic, air emissions, fresh water utilization, and cost**

2008 Challenges – Prior to ACTS

- **Typical 4-well pad completion required:**

- ~50,000 bbls of water >>> 770 truck loads
 - *385 loads hauled in for completion fluid, 385 hauled out*
- ~100 completion fluid tanks on location
- ~80% of all trucks in the field hauling water

- **Resulting in:**

- Logistical challenges due to crowded locations
- Potential need for larger locations and increased surface usage to accommodate completion fluid tanks and associated equipment

2008 Challenges – Prior to ACTS

Example of a crowded multi-well pad during completion operations.



2009 ACTS Concept

Pilot Goal: To create temporary staging sites on existing locations to treat completion/flowback fluids and move filtered completion fluids by temporary pipelines directly to offset locations

- **Limit new disturbance by utilizing existing locations and/or right-of-ways**
- **Reduce truck traffic**
- **Achieve operational improvements and time savings**
 - *Move fluid once*
 - *Reduce the number of completion tanks needed*

ACTS Requirements

A refurbished pit becomes a staging site for completion fluids

- *Drilling fluid is evaporated or hauled to disposal after conclusion of drilling operations*
- *Fill dirt is mixed with remaining drilling mud solids and cuttings from the large end of the pit and moved to the small end of the pit*
- *Pit is re-lined with impermeable barrier to prevent infiltration*
- *Refurbished pits are used for completion fluids and are managed throughout the process in accordance with applicable Conditions of Approval and/or Best Management Practices*

Refurbishing the Pit

Pit ready for protective liner installation.



ACTS Requirements

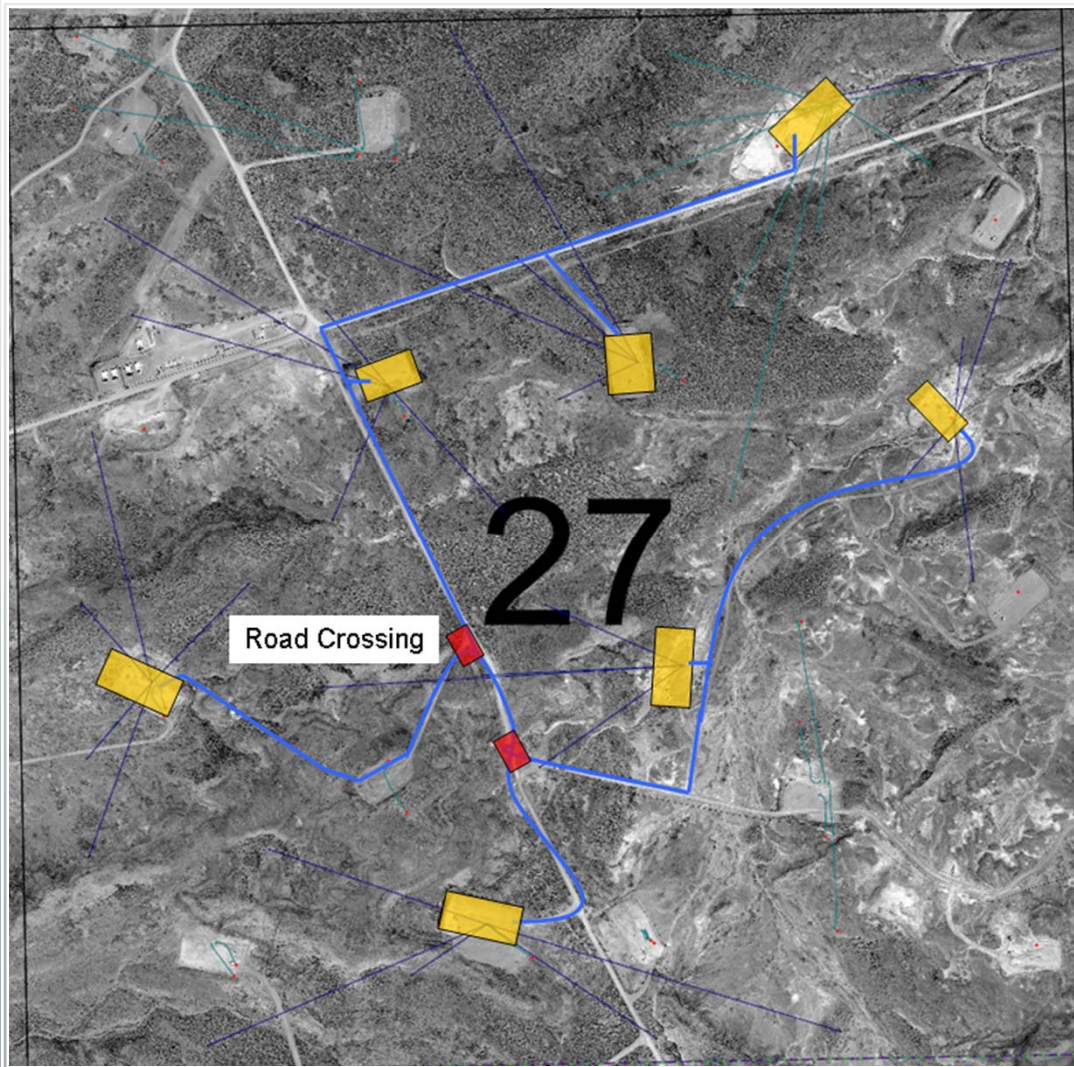
Temporary surface lines move completion fluids from one staging site to another

- *Lines are hand-placed along existing roads and/or rights-of-way*
- *Lines are pressure tested to 100 psi by filling lines with fresh water and compressed air and held for 15-30 minutes*
 - Lines are walked for visual inspection during the test
- *While transferring completion fluid, temporary lines and pits are frequently walked, inspected and documented daily*
- *Temporary surface lines are flushed with fresh water and then purged with compressed air into a truck or to the reserve pits before they are removed*

Temporary Surface Lines



Sample Section of ACTS Implementation



Key

- Existing Pads
- Road Crossing
- Temporary Surface Lines

Results

Innovative Program Results in Positive Outcomes:

- Reduces number of tanks on a 4-well pad from ~100 to ~20
- Decreased the need for fresh water by approximately 1.6 million bbls in 2009, by recycling ~70% of completion fluids
- Truck traffic reduced by approximately 30,000 miles per 4-well pad
 - Less Road dust and emissions
 - Will reduce truck traffic in excess of 1.5 million miles in 2010
- Accelerates reclamation by expediting pit closures
- Uses existing rights-of-way thus limiting the use of cross- country lines
- Preserves county and lease roads, improves driving conditions and safety
- Water costs savings estimated at \$50,000 per 4 - well pad (~ \$1.00 per bbl)

Results

2010 Earth Day Award from Utah's Division of Oil, Gas and Mining



Conclusions

- **Through ACTS Anadarko demonstrates the commitment to continually improve development processes in order to:**
 - Reduce surface usage
 - Decrease impacts on air quality
 - Decrease the need for fresh water
 - Save money
- **ACTS implementation on a section-by-section scale is believed to be the most effective means of planning and operations**
- **Future ACTS optimization has the potential to further reduce truck traffic and fresh water consumption due to the proximity of wells and pads within a single section**

