SRC Energy Inc.

FIELD DEVELOPMENT AND DARWIN –
A Brief History of Time in the Wattenberg

R. Bram

NYSE: SRCI
A (Very) Brief History of the Wattenberg

• History and Evolution

• A Few Land and Geology Matters

• The Horizontal Revolution

• Disclaimer: This is a **brief** overview by example of one field. All fields have their own quirks brought on by rock character, location, ‘creativity,’ reserves-in-place, politics, human foibles and poor grammar.
WHAT’S FOR DINNER, MA?
An Evolutionary Process

- Adaptation to trends
- Internal and external factors
  - Technology, Humanity
- Reproducing results through price fluctuations.
- The Politics of Perception

Adapt, reproduce or disappear!
Adapting to Change

“Necessity is the mother of invention”
- Plato, The Republic

“Speed of change is the driving force. Leading change competently is the only answer.”
- John P. Kotter, Harvard Business Review

“It’s a silly question.”
- Governor Jared Polis when asked if it was possible to drill for oil in a ‘blue’ state
The Denver-Julesburg Basin
Where Are We? Greater What-enburg?

- Covers parts of Adams, Boulder, Broomfield, Larimer and Weld Counties.
- Greater Wattenberg Area (Rule 318A) T2S-T7N, R 61W-R69W
- Area of rapidly expanding municipalities including Greeley, Longmont, Erie, Broomfield, Frederick, Firestone and metro Denver.
- Cheap drilling, repeatable performance, long life wells.

2,916 sq/mi
1,866,000 acres

Approx. 50,000 wells in GWA
Cretaceous Era: 65-140 mm years ago.

Key Production from J-Sand, Codell, Niobrara.


Codell developed late ‘70’s-early ‘80’s, some Niobrara.

Sussex/Shannon blankets, D Sand and Dakota intermittent.
A Gopher’s-eye View
How did we get here?
PACIFIC RAILROAD ACT OF 1862

- July 1- Union Pacific RR given charter to build transcontinental railway west from Omaha; to join Central Pacific Railway building east from California.

- Grants up to $48,000 & 6400 acres of land for each mile built.

- “…five alternate sections per mile on each side of said railroad, on the line thereof, and within the limits of ten miles on each side…”
Railroad Grant – the Gift that Keeps on Giving

• 200-foot public lands each side of RR bed. Led to U. S. mineral ownership on non-RR lands.

• Contiguous easement for RR bed.

➢ Side note: School lands (Sec’s 16 & 36) were granted July 2nd, after the railroads received grants.

➢ Second side note: Unintended Consequences – Severed Minerals, etc.

The entire Railroad Act of 1862
Some Room to Roam in Weld
ISAAC CANFIELD 1839 – 1924

- *Florence Field, First commercial field West of Mississippi (1881)-Pierre Shale.*
- *Boulder Field, Second *commercial* field West of Mississippi (1901)-Pierre, Niobrara*
- *Rob Roy coal mine near Coal Creek Canyon*

*Wikipedia*
Boulder Oil Field – 1901

McKenzie #1-21
T1N, R70W, Sec. 21: NW/4NW/4
Niobrara, Pierre
Drilled 1901, P&A’d 2007.
Isaac Canfield used dowsing rod.
Boulder County? Really?
1970 – A Perspective

**SONGS**
- Bridge Over Troubled Water - Simon & Garfunkel
- Let it Be – Beatles
- Layla – Derek and the Dominos
- Raindrops Keep Fallin’ on My Head – B. J. Thomas

**MOVIES**
- Love Story
- Patton
- Woodstock
- Little Big Man

*Lookin’ Groovy!*
1970 – Natural Gas Arrives!

- Pan American Petroleum Corporation (Amoco) gets farmin from UPRC, huge leases with NE/4 generally reserved.
- Large company – exploration and development, looking for BIG fields.
- Amoco walks away in early ‘80’s (HS Resources sale).

Non-Railroad lands

- Vessels’ Grenemyer #1- T 1 N, R 67 W, Sec. 26: SW/4 (Jss, not Cd or Nio) sets off lease play by many parties. Amoco (nee Pan American) et al start leasing fee lands.

- **ECON 101**: Low risk, low reward discoveries lead to many small players entering the basin; inexpensive drilling. Leads to promoters, ‘creative’ financiers and the Mom and Pop Shop.
  - Tight Sand Gas Tax Credits-political response works.
# 1970 J-Sand Wildcat Completion Report

**Fracking in 1970?**

![1970 J-Sand Wildcat Completion Report Image]

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**WELL COMPLETION OR RECOMPLETION REPORT AND LOG**

**TYPE OF WELL**

**SUMMARY**

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<th>WRAP</th>
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**DATE OF COMPLETION**

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**BUREAU OF MINERALS**

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**FRACKING FOR OIL AND GAS**

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<th>QUANTITY</th>
<th>RESULTS</th>
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See spec for additional data on reverse side.
What’s the Big Deal about Railroads?

BIG FARMINS, BIG LEASES (4000 ac’s +)

• Some Pugh clauses – consult lease, vesting document, title opinions. Earned rights to depth drilled initially. NOTE: USX generally earned in NE/4 only.

• Railroad acreage formed backbone of Vessels, Gerrity, Snyder, USX, Patina and HS/Kerr-McGee acreage. Terms of UPRC/ Champlin/ Anadarko leases are unique, detailed and demanding. 20-25% LOR.
Initial J-Sand Spacing and Well Location – “One Straw”

- 1970 J-Sand spaced 320’s with one well permitted.
  - Original Well

- 1979 amended to allow one infill.
  - Infill Well
    - Minimum 920’ setback from quarter section line.
    - Operations areas within 800’ window.
1980’s: Codell/Niobrara – uphole, smaller operators

Generally spaced 80’s either laydown or standup.

One well per 80 with optional infill on offset 40.

Well location: center of q/q with 200’ tolerance.

Sussex/Shannon – oily, often different operators. Hambert, Space City fields.

Created operations area drilling windows:
  • Codell/Niobrara and Sussex/Shannon drilled from same windows
    • 150’ setback between wells (twinning rule)

D-Sand (eastern) and Dakota formations - generally spaced 40/320.

Finance – Many IPO’s, LP’s.
Segregated Vertical and Horizontal Ownership by Formation
Twinning Rule – COGCC Hearings
Window Boundaries are where?

- 460 Feet??  920 Feet??
- $5280 \div 2 = 1320$
- 800’ square around center of quarter section;
- $1320-400 = 920$ ft.
- $1320\div2 = 660$
- 400’ square around center of quarter/quarter;
- $660’-200’ = 460$ ft.
Rule 318A – Spacing, Surface Location Rule

- Development of zones, surety of surface access.
- Established four 400’ x 400’ and one 800’ x 800’ drilling window per quarter section.
- Produce any Cretaceous formation within window.
- Twinned well - 150’ from existing well.
- Commingle all formations, allocate revenue.
- Established 32-acre down hole well density.
- Kept existing spacing orders.
- Center Sx/Sheet, C/N wells spaced 160 to safeguard correlative rights.
• 2004: Test premise that J-Sand, Codell, Niobrara reserves being left in ground under Rule 318A ‘5-spot’ drainage pattern.

• COGCC: 50 well pilot program across field. DIRECTIONAL DRILLING.

• Completed 50 center 320’s plus over 150 5th spot wells.
  • Noble/KMG: Codell/Niobrara tests
  • EnCana: J-Sand tests

• Results: Proved large reserves left in ground.
• Noble, EnCana, KMG filed amendment to Rule 318A - three additional bottomhole locations per 160 – political concessions.

• Application includes:
  • Directional drilling from existing surface sites.
  • J-Sand, Codell, Niobrara formations only.
  • Twinning rule cut to 50 feet.
  • Smaller area than GWA

• Address future operations in J-Sand, Codell & Niobrara.

• *SPACING!* Roving 160’s?

• Recover and book *new reserves.*
Application Rule 318A.e Rule Revisions - Boundary Line Wellbore Spacing Units for Wells

- PROTECT CORRELATIVE RIGHTS!
  - Roving 160 Spacing Unit: four closest 40-acre q/q’s to bottomhole.
  - Bottomhole 50’ inside of 40-acre tract (wellbore drift).
  - 20-day notices to offset operators, WI owners.
  - Sharing title opinions/information
  - Wellbore equalization since replaced by WEA.
  - 318Ae Boundary Line JOA.
  - No change to spacing for existing wells
Suburbia Encroaches – Adapt!
So many to choose from -

• Gerrity v Magness (1996)
  • Doctrine of “Reasonable Accommodation/Due Regard” – excess surface use, lack of accommodation to surface user. Mineral Estate still dominant but...

• Amoco v Thunderhead (2002)
  • Operator has right to drill in designated ‘windows’ despite inconvenience. Absence of offset owner waivers forces operator into designated areas.
  • Inconvenience and speculative uses are not reasons to deny permit or access to drilling windows.

• Rogers v Westerman (2001)
  • Post-Production royalty deductions. What is “at the well” and “marketable” is for jury to decide absent specific language.
Horizontal Wells – the “Niobrara” play

• The “Little Bakken”
  ➢ 2009: EOG’s Jake well near Wyoming border sets off land rush. First horizontal well in Niobrara, produces huge oil amounts.
  ➢ Noble drills Gemini well in between existing vertical wells. Indicates limitations of vertical well drainage. Still a great well.
  ➢ State Land Sale August 2010 - $4000/acre in Weld County. Marathon, Chesapeake, Carrizo, Rubicon et al join the hunt. Lease prices explode.
  ➢ Understanding – Evolving, some sweet spots and some ram pasture. Check back tomorrow. Codell hz wells added.
  ➢ Surface Sites – evolving, new legal issues. 2-mile horizontal legs, rigs on site for 6 months instead of 6 days.
  ➢ Spacing – roving spacing units, tangential 40’s (460’ from well) in GWA. Outside GWA, COGCC spacing order or statewide spacing (600’ from quarter-section line). VERIFY!
  ➢ Codell – Took a little while but now commonly drilled.
Horizontal Wells – Nio/Cd

- **GWA**-Spacing unit will include any 40’s within 460’ of wellbore. **Outside GWA** - Statewide spacing unless order obtained from COGCC, e.g. DSU’s.
• Senate Bill-181: Passed April 3rd, signed April 16.
• “Local control” of oil & gas development, a reasonable and necessary standard.
• COGCC’s mission changed from “fostering” production to “regulating” public health and safety.
• COGCC board appointed by Governor and approved by the state Senate, 2 of 9 positions are industry pros.
• Pooling requires 45% of mineral interest owners.
• Passage of SB-181 ‘reduces uncertainty’ for operators; municipalities set individual rules.
• Weld County Oil and Gas Energy Department; shots from COGCC fired across bow. Stay tuned.
Show Us the Money!

- Early years – Bank financing (home mortgages?!?), small IPO’s in penny exchange, American Exchange.
  - AFE’s - $275-300K; J-sand only.
  - “Explore and develop” – can operator repeat?
  - Failures through loan overextension/price fluctuations, incompetent hubris.

- Modern era
  - “Resource Play” – Basin Centered model.
  - Private Equity, Hedge Funds
  - IPO’s based on development model (XOG).
2019 - Still adapting – Survival?
What’s next?