

Fruitland Coal Infill De Novo Hearing

Geologic Exhibits

ChevronTexaco

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Introduction to Coal Gas

- **Combination source and reservoir rock**
 - Coal rank
 - Gas storage
 - Gas content measurement technologies
- **Naturally fractured, low pressure systems**
 - Gas in place calculations
 - Gas content vs. bulk density
 - Production profile
 - Sorption isotherm effects on recovery

Coal Rank

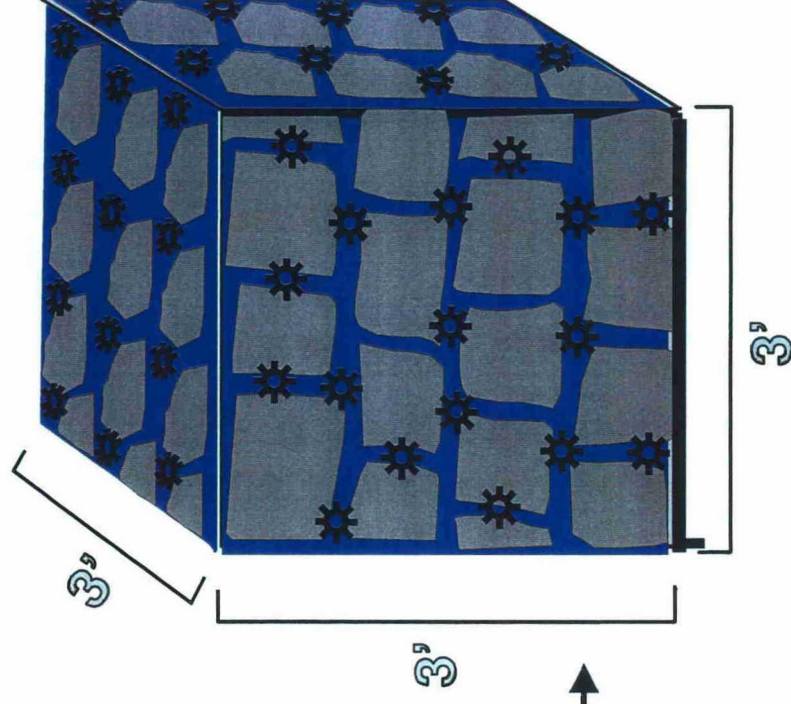
- **Thermal Maturity**
 - Time and temperature
 - Rank series in increasing order:
 - Lignite
 - Subbituminous
 - Bituminous (High Volatile C-B-A, Medium, Low Volatile)
 - Semi-Anthracite
 - Anthracite
 - Graphite

Coal Gas Storage

Perspective...

1 Ton of coal contains
1 billion square feet
of internal surface area.

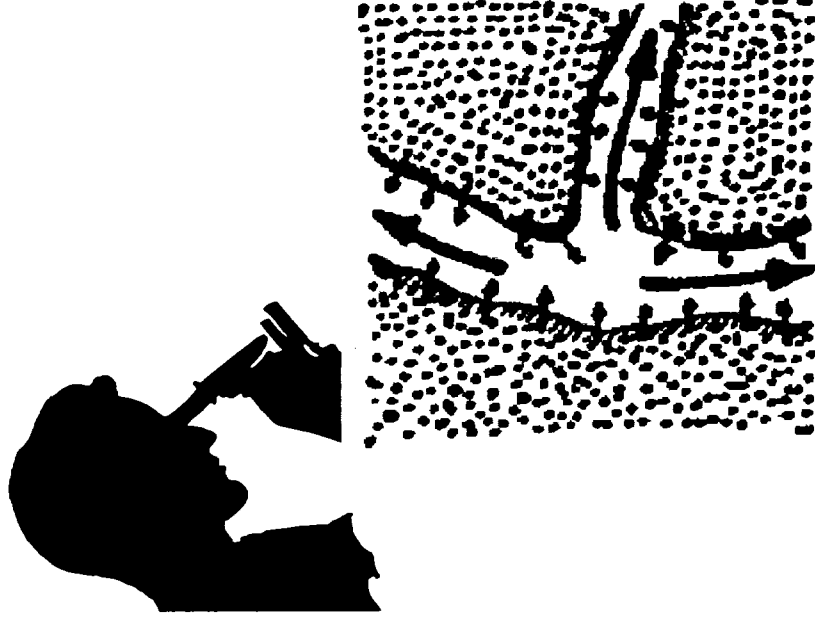
1 Ton of coal →



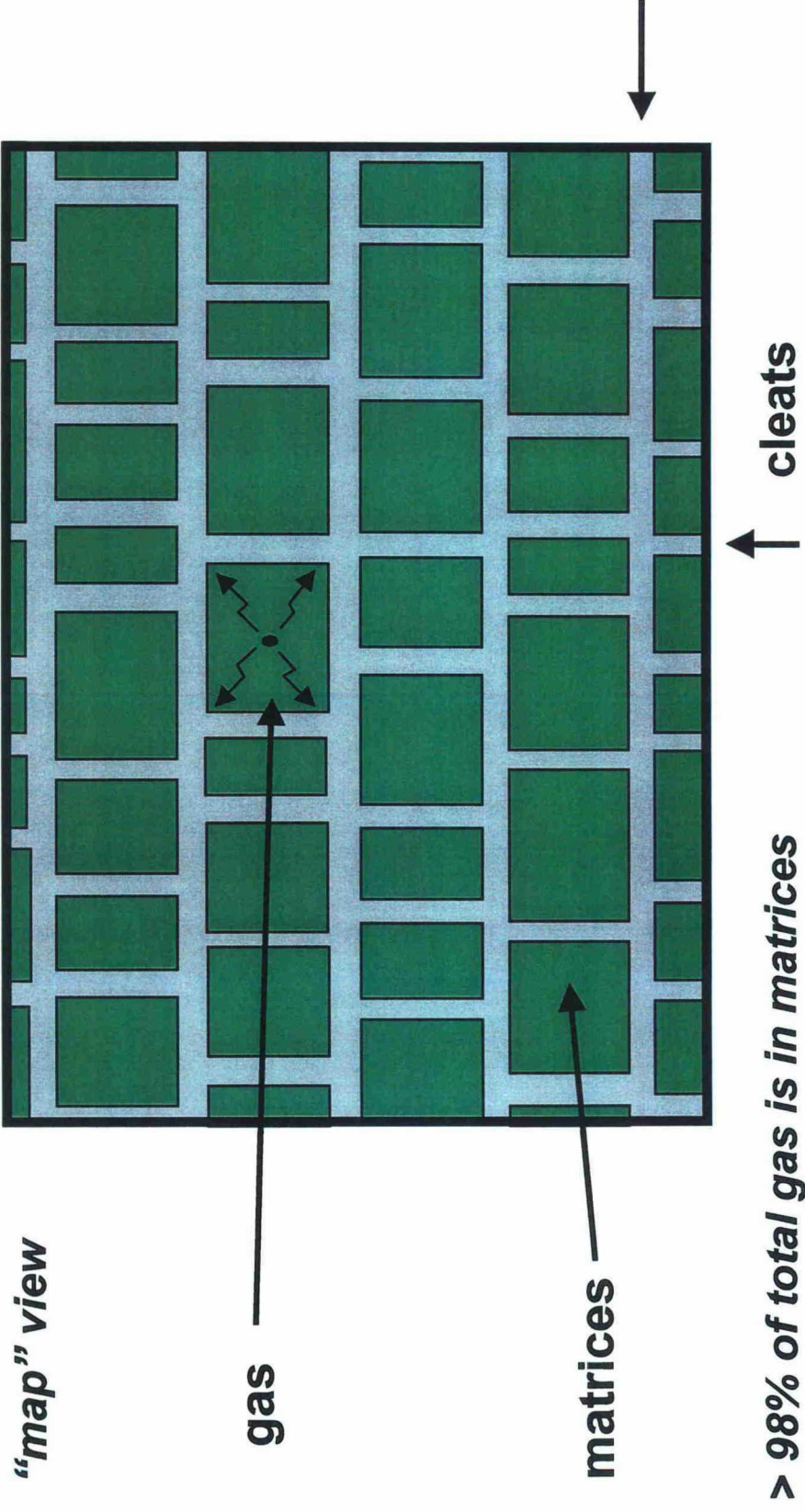
Coal Gas Storage

Looking inside...

Coal contains 2-3 times
as much gas as sandstone
at low pressures.

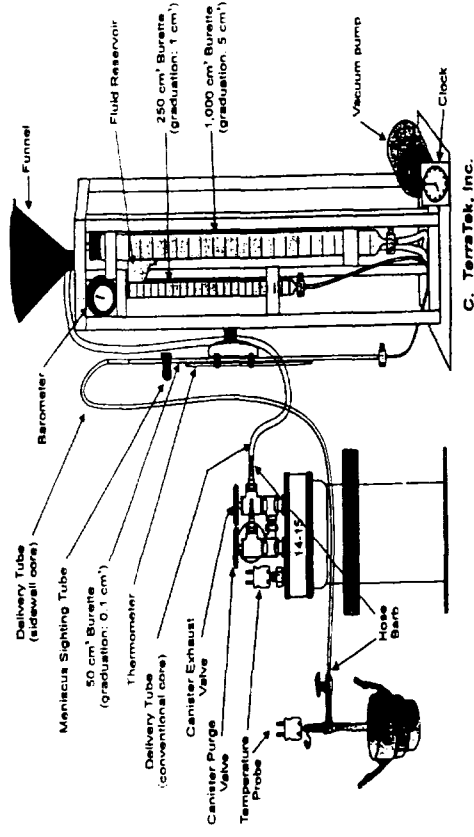
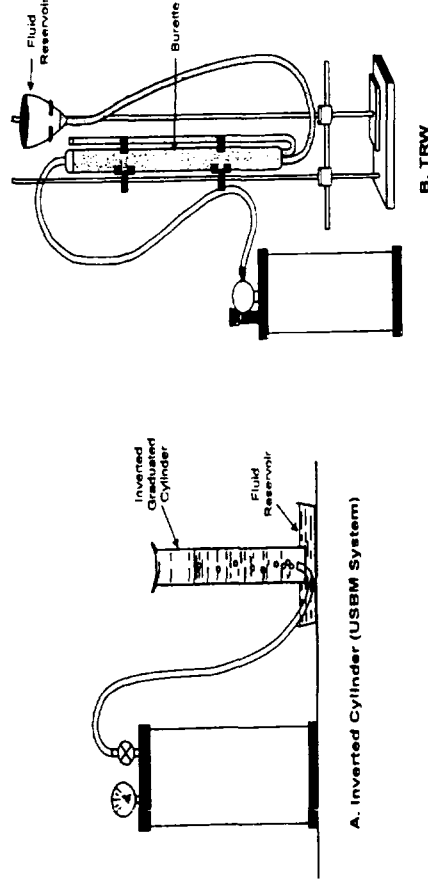


Matrix Gas Storage



Gas Desorption Equipment

Progressive Development of Volumetric Displacement Apparatus



Coal Gas Storage

Gas in Place Calculations

$$G = 1359.7 A h \bar{\rho}_c \bar{G}_c$$

G = gas in place (scf)

A = acres

h = net thickness (ft)

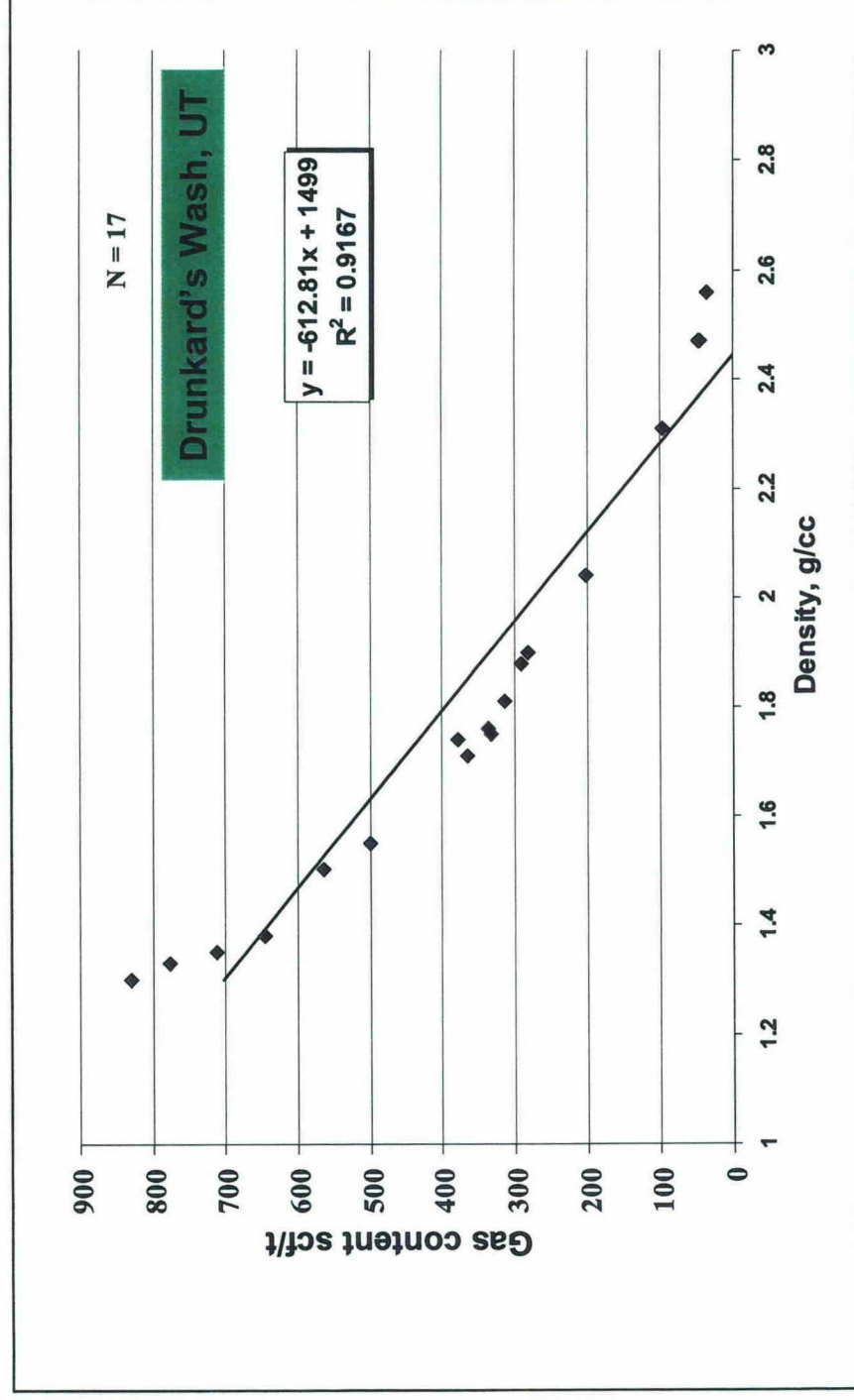
$\bar{\rho}_c$ = density (g/cc)

$\bar{G}_c$ = gas content (scf/ton)

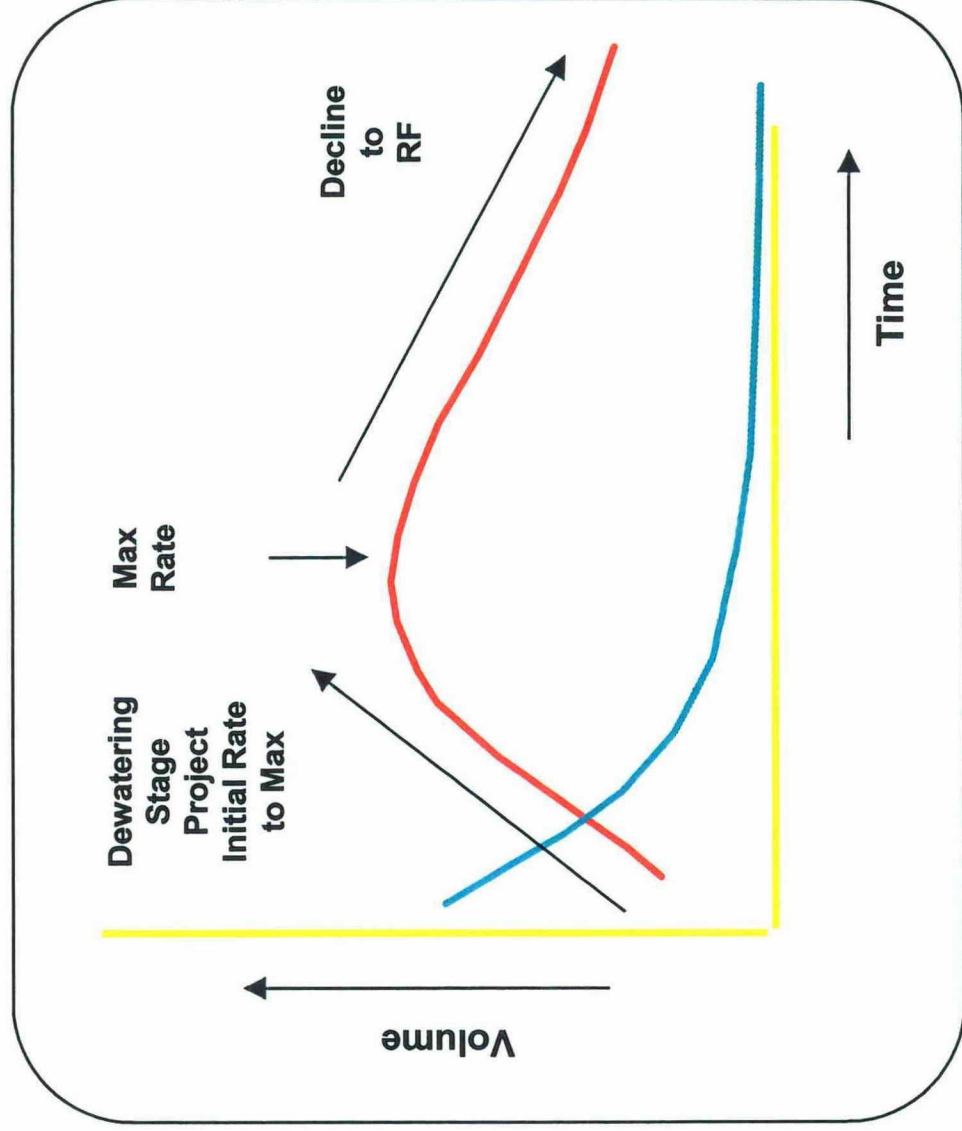
Coal Gas Storage

Gas in Place Calculations

Gas content vs. density cross plot from core analysis



Coal Gas Recovery Production Profile



Coal Gas Storage

Langmuir Isotherm

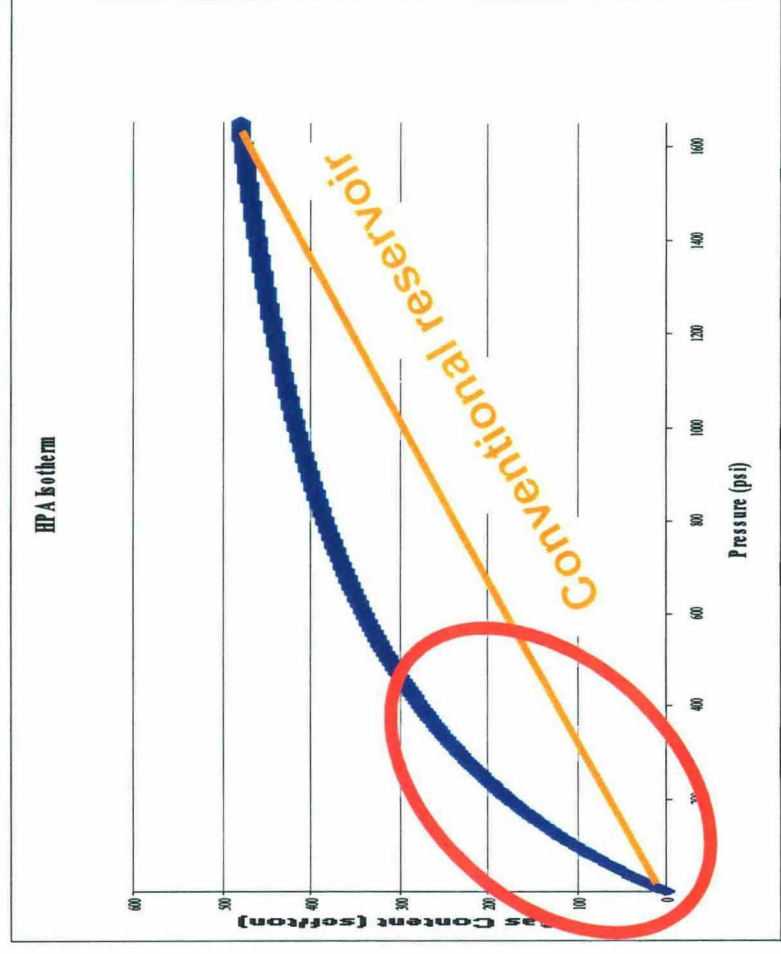
$$G_s = G_{sL} \left(\frac{p}{p_L + p} \right)$$

G_s = gas content @ equilibrium pressure (scf/ton)

G_{sL} = gas content @ p ∞ (scf/ton)

p_L = pressure @ 0.5 G_{sL} (psi)

P = equilibrium pressure (psi)



Supplemental Geological Exhibits