



02359189

Appendix IV

Sudduth Coal Coalmont Formation North Park Basin

Core Photographs
(TICORA)

059-06444



Core Photography

Nielson & Associates, Inc.: CBM CH# 1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation



Sudduth

TICORA 349-1

707.8-708.8 feet

057-06444



Core Photography

Nielson & Associates, Inc.: CBM CH# 1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation



Sudduth	TICORA 349-5	725.3-726.3 feet
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057-06444



Core Photography

Nielson & Associates, Inc.: CBM CH# 1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation



Sudduth **TICORA 349-9** **740.4-741.4 feet**



Core Photography

Nielson & Associates, Inc.: CBM CH# 1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation

057-06444



Sudduth	TICORA 349-11	744.4-745.4 feet
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057-06449



Core Photography

Nielson & Associates, Inc.: CBM CH# 1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation

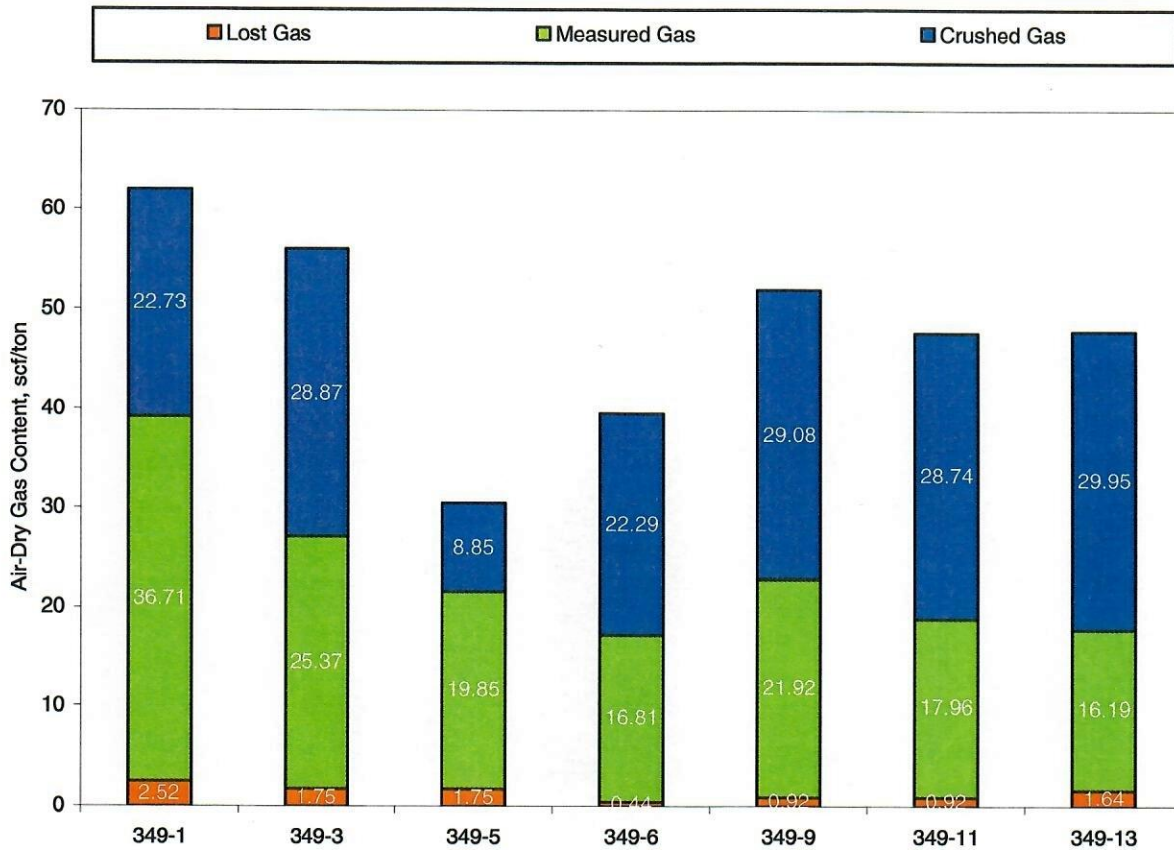


Sudduth **TICORA 349-13** **751.0-752.0 feet**

estimates (air-dry and dry, ash-free bases) for the **RapidGas**SM samples and presents an average and standard deviation of these data. Desorption graphs presented in Appendix II illustrate the magnitude of lost (labeled red), measured (labeled green), and crushed gas (labeled blue) components for each sample. The reported air-dry gas contents may be an over or underestimation of in-situ gas contents (Refer to Section 1.0). Figure 2-1 illustrates a histogram of the lost, measured, and crushed or residual gas content (air-dry basis).



Figure 2-2. Gas Content Data Histogram



2.4. GAS DIFFUSIVITY AND SORPTION TIME

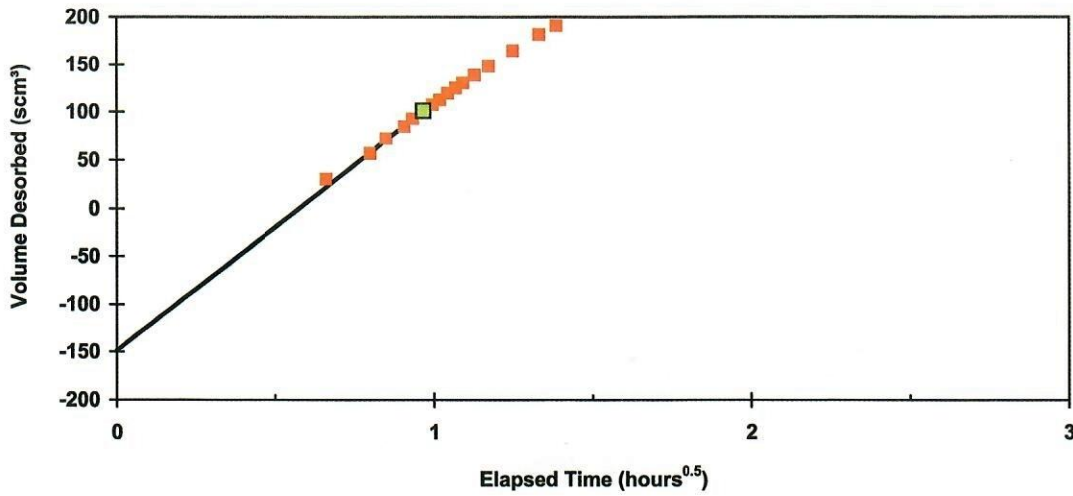
Gas storage and flow through coal seams and shale are generally modeled with dual porosity reservoir models. Gas is stored by sorption within the primary porosity system within the organic component of coal or shale matrix. The primary porosity consists of micro- (<2 nanometers) and meso-porosity (2 to 50 nanometers). Gas flows to the well bore through the secondary porosity system, which consists of macropores (>50 nanometers) and natural fractures. Gas flow through the primary porosity is dominated by diffusion and quantified with Fick's Law while that through the secondary porosity is quantified with Darcy's Law.⁷

Diffusivity is the diffusion coefficient (D) divided by the square of an average diffusion distance (r²). Diffusivity can be estimated from the method used for determining lost gas volume using the relationship listed in Equation 2.1.

057-06444

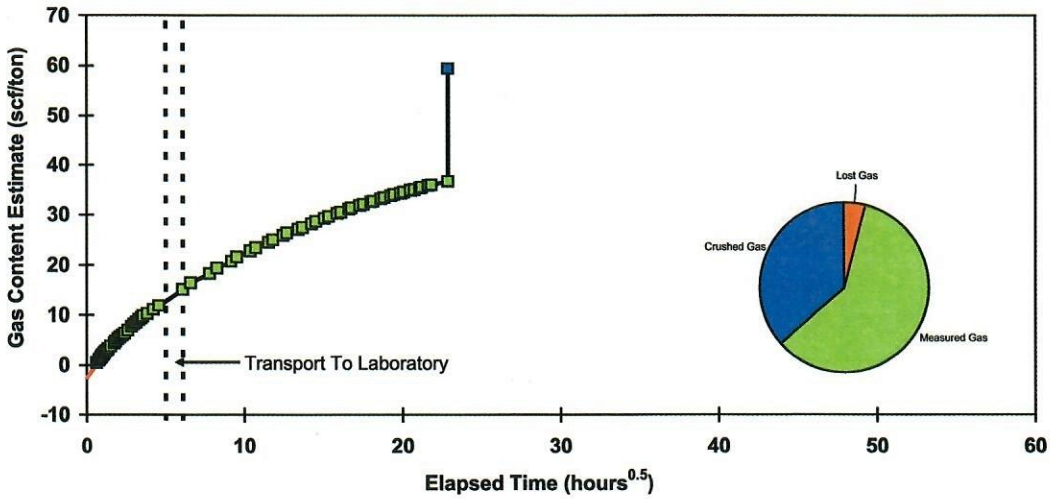


Lost Gas Extrapolation & Desorption Graphs
Nielson & Associates: CBM CH#1-28
TICORA Sample No.: 349-1 - Sudduth



Drill Depth: 707.8-708.8 feet

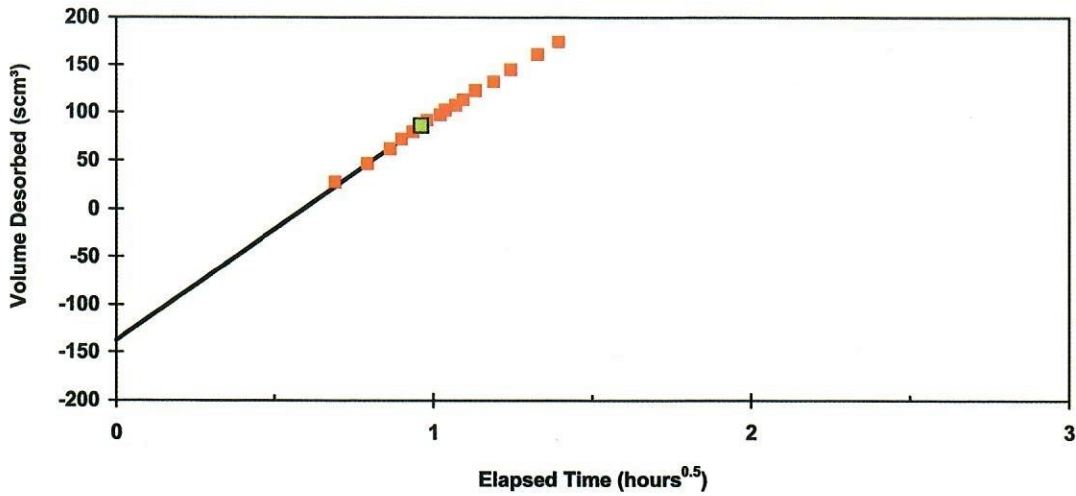
60 °F Desorption Temperature



057-06444

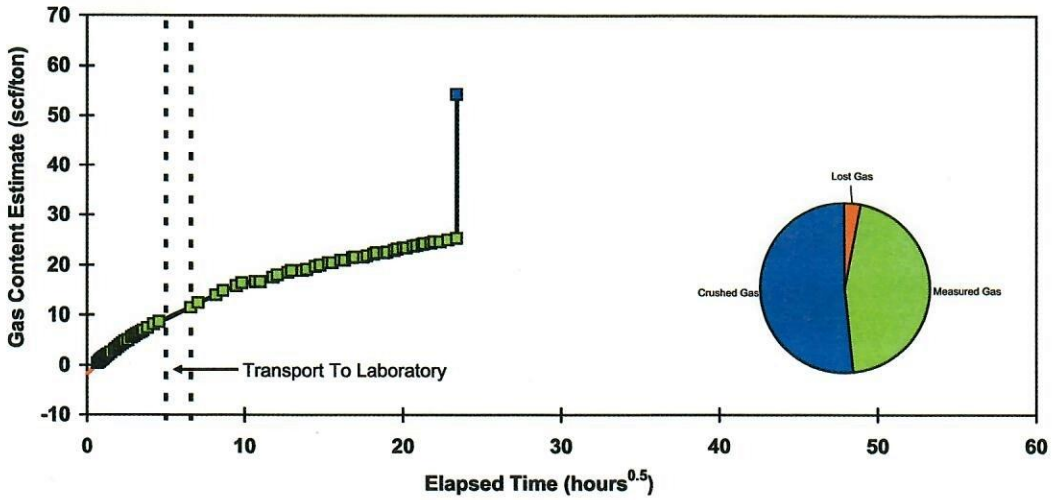


Lost Gas Extrapolation & Desorption Graphs
Nelson & Associates: CBM CH#1-28
TICORA Sample No.: 349-3 - Sudduth



Drill Depth: 715.9-716.9 feet

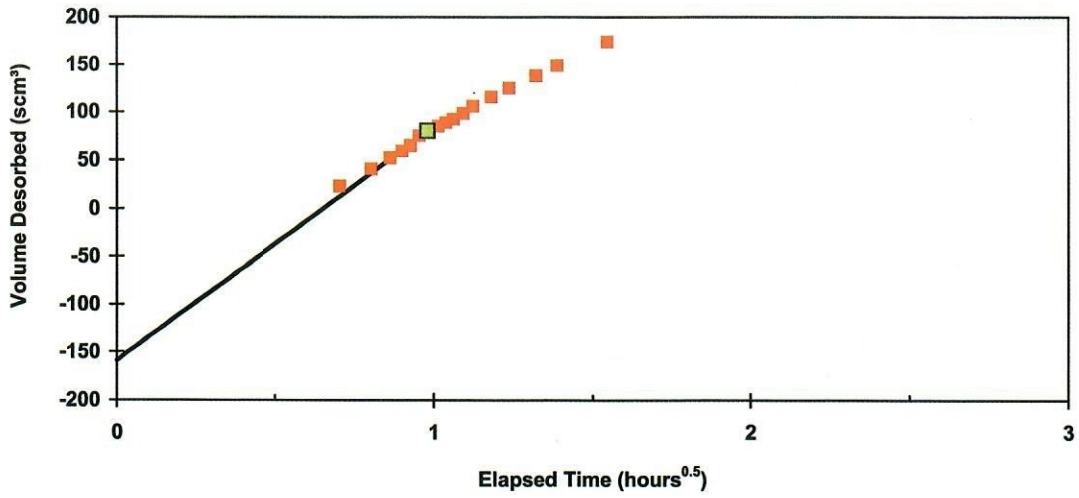
60 °F Desorption Temperature



057-06444

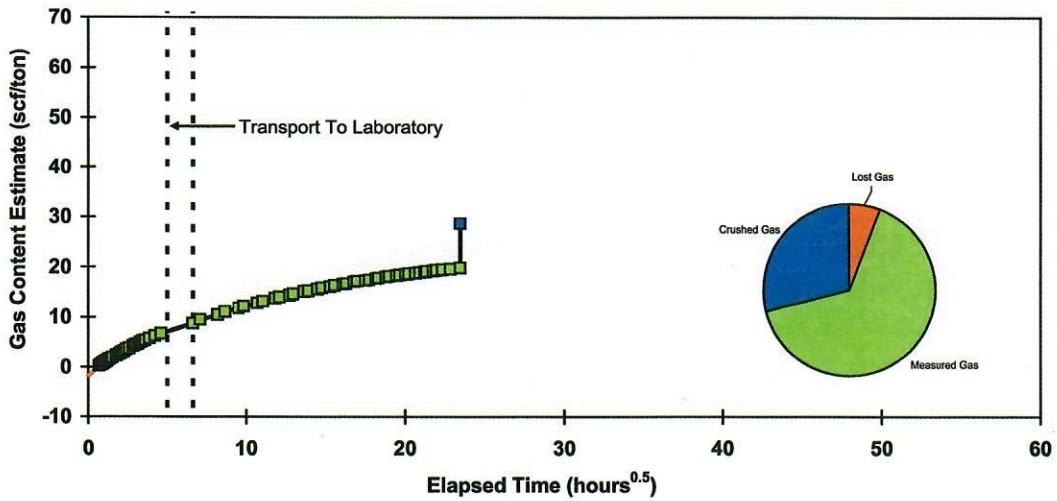


Lost Gas Extrapolation & Desorption Graphs
Nelson & Associates: CBM CH#1-28
TICORA Sample No.: 349-5 - Sudduth



Drill Depth: 725.3-726.3 feet

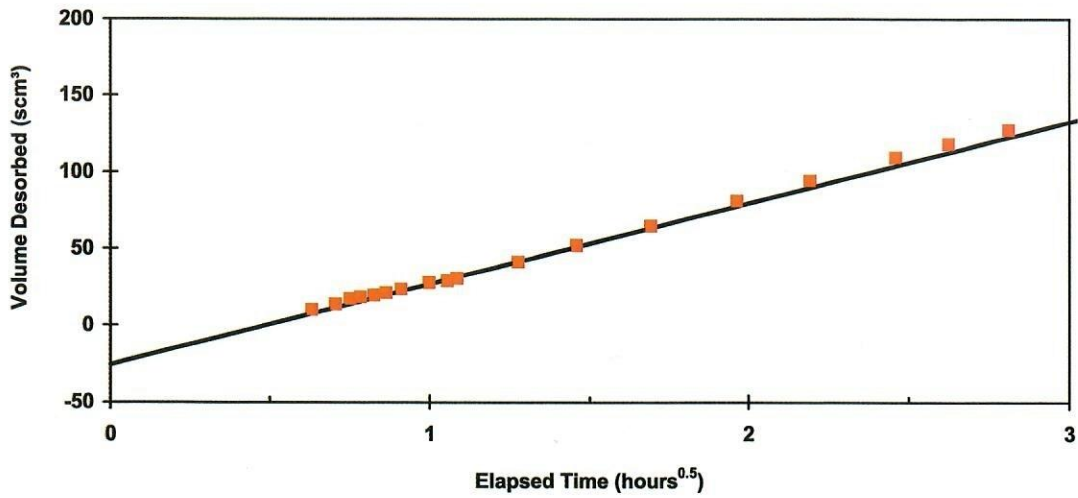
60 °F Desorption Temperature



057-06444

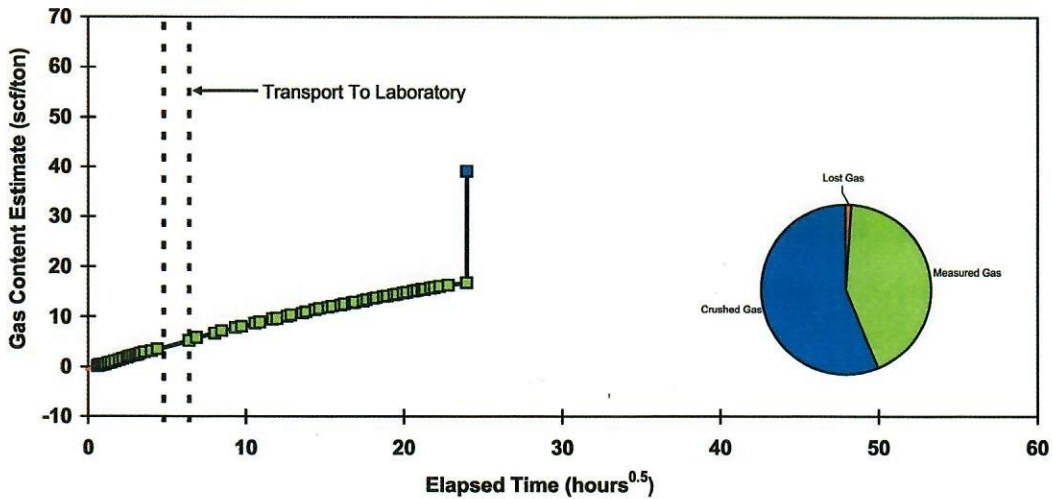


Lost Gas Extrapolation & Desorption Graphs
Nielson & Associates: CBM CH#1-28
TICORA Sample No.: 349-6 - Sudduth



Drill Depth: 729.0-730.0 feet

60 °F Desorption Temperature



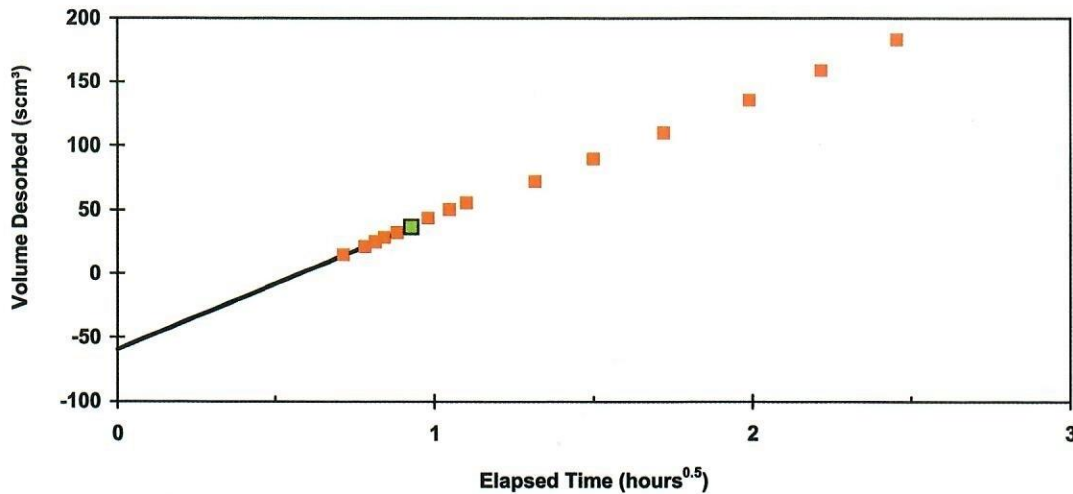
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Lost Gas Extrapolation & Desorption Graphs

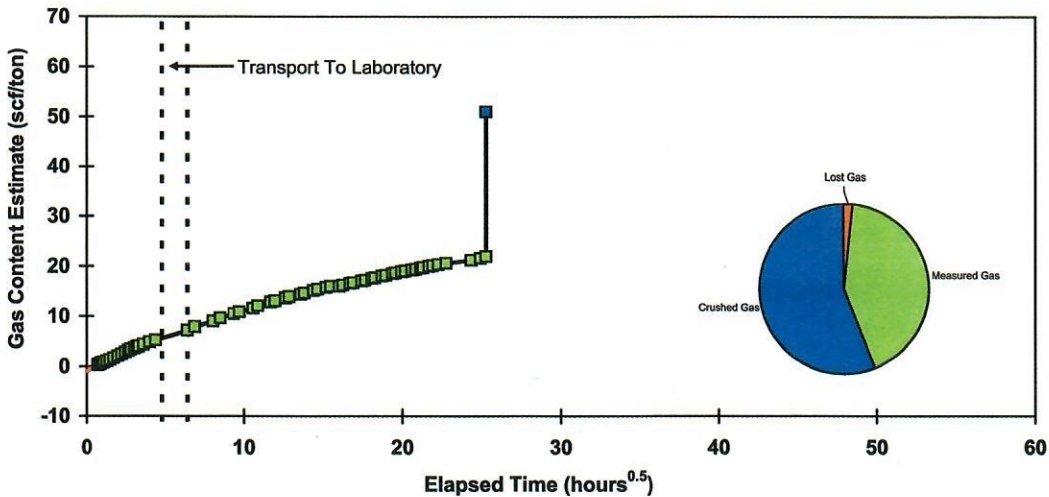
Nielson & Associates: CBM CH#1-28

TICORA Sample No.: 349-9 - Sudduth



Drill Depth: 740.4-741.4 feet

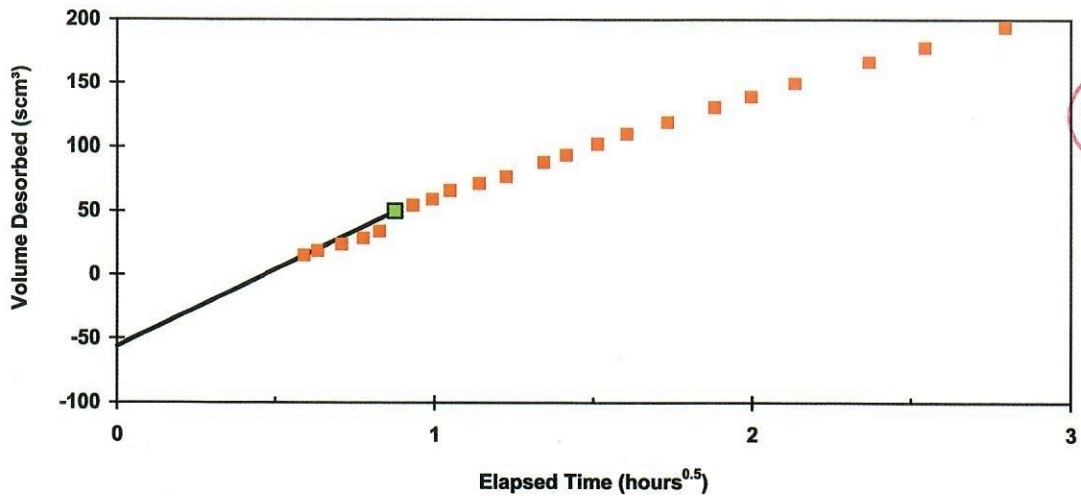
60 °F Desorption Temperature



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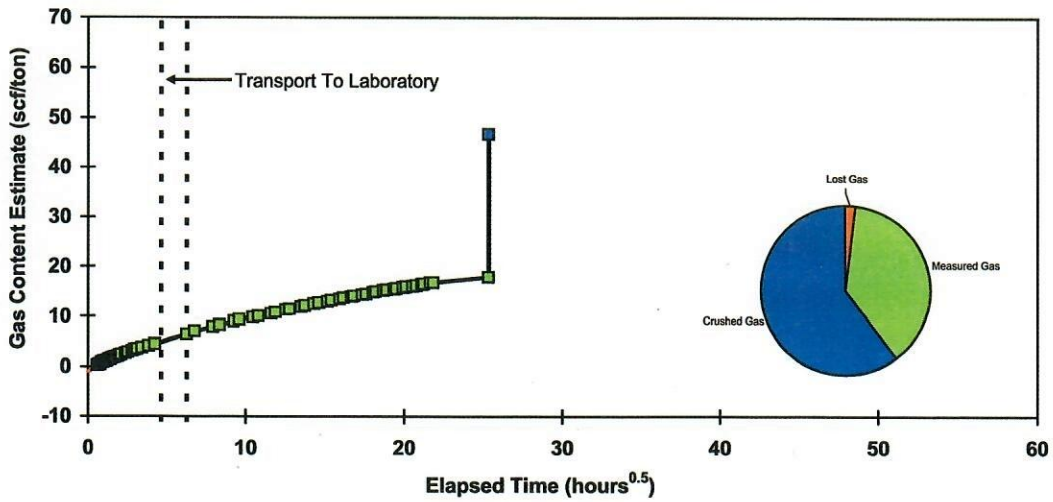


Lost Gas Extrapolation & Desorption Graphs
Nielson & Associates: CBM CH#1-28
TICORA Sample No.: 349-11 - Sudduth



Drill Depth: 744.4-745.4 feet

60 °F Desorption Temperature



057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park

TICORA 349-1

707.8-708.8 feet



057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park TICORA 349-2 711.9-712.9 feet

057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park	TICORA 349-3	715.9-716.9 feet
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057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park TICORA 349-4 721.2-722.2 feet

057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park	TICORA 349-5	725.3-726.3 feet
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057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park **TICORA 349-6** **729.0-730.0 feet**

057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park TICORA 349-7 733.3-734.3 feet

057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park **TICORA 349-8** **737.8-738.8 feet**

057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park TICORA 349-9 740.4-741.4 feet

057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park	TICORA 349-10	741.4-742.4 feet
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Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park

TICORA 349-11

744.4-745.4 feet

057-D6444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park **TICORA 349-12** **748.0-749.0 feet**

Note: GT-325 Canister was replaced by T-47 Canister in the field.

057-06444



Core Photography

Nielson & Associates, Inc.; CBM CH#1-28

Wireline Core (3.5-inch Diameter), Runs #1-4 (13 Canisters), Coalmont Formation.



Sudduth-Coalmont-North Park	TICORA 349-13	751.0-752.0 feet
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