The Second White Specks
Unconventional Oil Play

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Life Cycle of a Resource Play

**Definition Mode**
- Early Entrant
- Low Land Cost
- Innovator

**De-Risk Mode**
- Increased Competition
- Higher Land Cost
- Technology Implementation

**Manufacture Mode**
- Entry through Corporate Acquisition
- Low Cost Operator
- Continuous Improvement

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**Capital Requirements**
- Second White Specks
- Duvernay
- Montney
- Pembina
- Cardium

**Un-named Horizons**
- Second White Specks Play
- 2011
- 2012
- 2013

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**Development Stage**
- Immature
- Mature

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**ROI**
- $
Characteristics of a Resource Play

- Aerial Extent
- Thickness
- Geochemistry
  - Total Organic Content
  - Thermal Maturity
  - Generating vs. Migration
- Over-pressure
- Fracture Development
- Fluid Distribution (no water)
The Late Cretaceous

After R. Blakey (1994)
Second White Specks Extent

Second White Specks to Base of Fish Scales Isopach with Hydrocarbon Thermal maturity Window

Generalized thickness contours - Second White Speckled Shale to Base of Fish Scales
Contour interval = 20 metres
Scale: 1:5,000,000

Second White Specks
Bioenetic Gas

Hydrocarbon Thermal Maturity Window

250 km

1,100 km

Second White Specks Extent

OOIP ~ 460 billion bbls

Second White Specks
Petroleum System (Colorado Group)

OOIP ~ 1.6 trillion barrel

Ozadetz and Chen, 2010

Modified from Mossop et al. 1993
Geochemical Results from Core

Nu Tech Log analysis from Second White Specks Lochend well
Characteristics of a Resource Play

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• Thickness
• Geochemistry
  – Total Organic Content
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• Over-pressure
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Second White Specks Production
Tectonic Domains for the Basement of the Western Canadian Sedimentary basin

Aeromagnetic Data

Ross et al., 1994
Pressure Gradient
Second White Specks

Pressure gradient of one equivalent to hydrostatic pressure
Characteristics of a Resource Play

- Aerial Extent
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- Geochemistry
  - Total Organic Content
  - Thermal Maturity
  - Generating vs. Migration
- Over-pressure
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Second White Specks – Highwood River

Mega-fractures

Micro-fractures
\[ \vec{Q} = \frac{-kA}{\mu} \left( \frac{P_b - P_a}{L} \right) \]
Highwood River
Southern Alberta
Foothills
Second White Specks
Inter-bedded Shale, Siltstone, and fine-grained Sandstone
Characteristics of a Resource Play

- Aerial Extent
- Thickness
- Geochemistry
  - Total Organic Content
  - Thermal Maturity
  - Generating vs. Migration
- Over-pressure
- Fracture Development
- Fluid Distribution (no water)

Second White Specks Production
Second White Specks (Upper Cretaceous)
Fluid Migration

In

Second White Specks

$P_{\text{res}} > P_{\text{hyd}}$

Preferred Fracture Direction

Calliper

fractures

Bit Size

Barrons Sandstone

Base of Fish Scales

Mannville

90° calliper

washout

Low Pressure Gas

50 ohms

20 ohms

50 ohms
Washout for 2WS System
13-16-33-4W5M

Bit Size

Washout

SSPK
SSPK_A
SSPK_B
SSPK_C
SSPK_D
SSPK_E
BFS
VKNG
Washout for 2WS Upper

Increasing Washout

In Gauge

Duplex Structures

Aeromagnetic Trends

Basement Structure
Second White Specks – South-Central Alberta

- Fractures enhanced by drape into Basement Structures
- Fractures form during deformation related to mountains and oil generation
- 2WS Oil generating horizon increases fluid pressure
- Thrust Faults follow high pressure horizon

- Oil Source for Cardium Fm.
- Structurally enhanced
- Seismically Identifiable
- Fractured Reservoir
- Oil Saturated
- No Water
Claresholm/Longview (Southern Alberta)

- 15-21, IP +5,000 bopd, 1.3 mmbbls, 1.9 BCF
- 6-6, 39,000 bbls

Basement

Second White Specks

Surface
**Clareholm/Longview (Southern Alberta)**

**Play Overview**
- Stacked Oil Play: 2WS, Cardium, Exshaw/Big Valley
- Oil generating window (high TOC)
- No water production
Graphic removed for confidentiality reasons
Cardium Time Structure
State of the Play

• A few operators are actively pursuing the second white specs and a number of operators with significant land positions in the play fairways
• Evolved over past year from science and data from existing wells (well studies etc.) to new exploration and play definition
• First horizontal wells have been drilled with mixed results as people are trying to gain understanding of science
• New exploration and success with modern technology has allowed insight into petroleum system and importance of natural fractures
• Shale exploration has significant land position in the 2WS and over next year will be drilling exploration wells with our JV partner in our central Alberta holding and in our 100% southern Alberta land holdings based on understanding of the 2ws