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## **Eagle Plain Hydrocarbon Exploration: Operational Plans and Objectives of Northern Cross (Yukon) Limited**

Don Stachiw, VP Exploration Northern Cross (Yukon) Ltd.

Yukon GeoScience Forum November 19<sup>th</sup> to 21<sup>st</sup>, 2012



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Certain of the information provided in this presentation of Northern Cross (Yukon) Limited (the "Company") may constitute forward-looking statements and forward-looking information (collectively, "forward-looking statements") within the meaning of applicable securities legislation. The reader is cautioned that assumptions used in the preparation of such information, although considered to be reasonable at the time of preparation of such information, may prove to be incorrect. Forward-looking statements in this presentation include, but are not limited to, statements regarding the Company's resource potential, the Company's work program and the Company's ability to acquire future properties and projects.

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## **Our mission**

**“Create value by exploration and development of  
oil and natural gas resources”**

**Our activities will benefit the communities  
that we operate in as well as our shareholders**



## **Eagle Plain has the largest oil and gas potential of any onshore Yukon sedimentary basin**

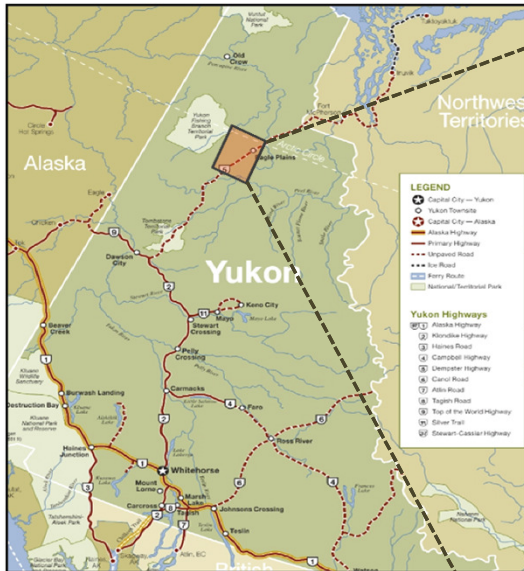
**The Geologic Survey of Canada's median estimates of resource potential are:**

- **6,000 Bcf of conventional natural gas; does not include unconventional**
- **450 mmbbls of conventional crude oil**

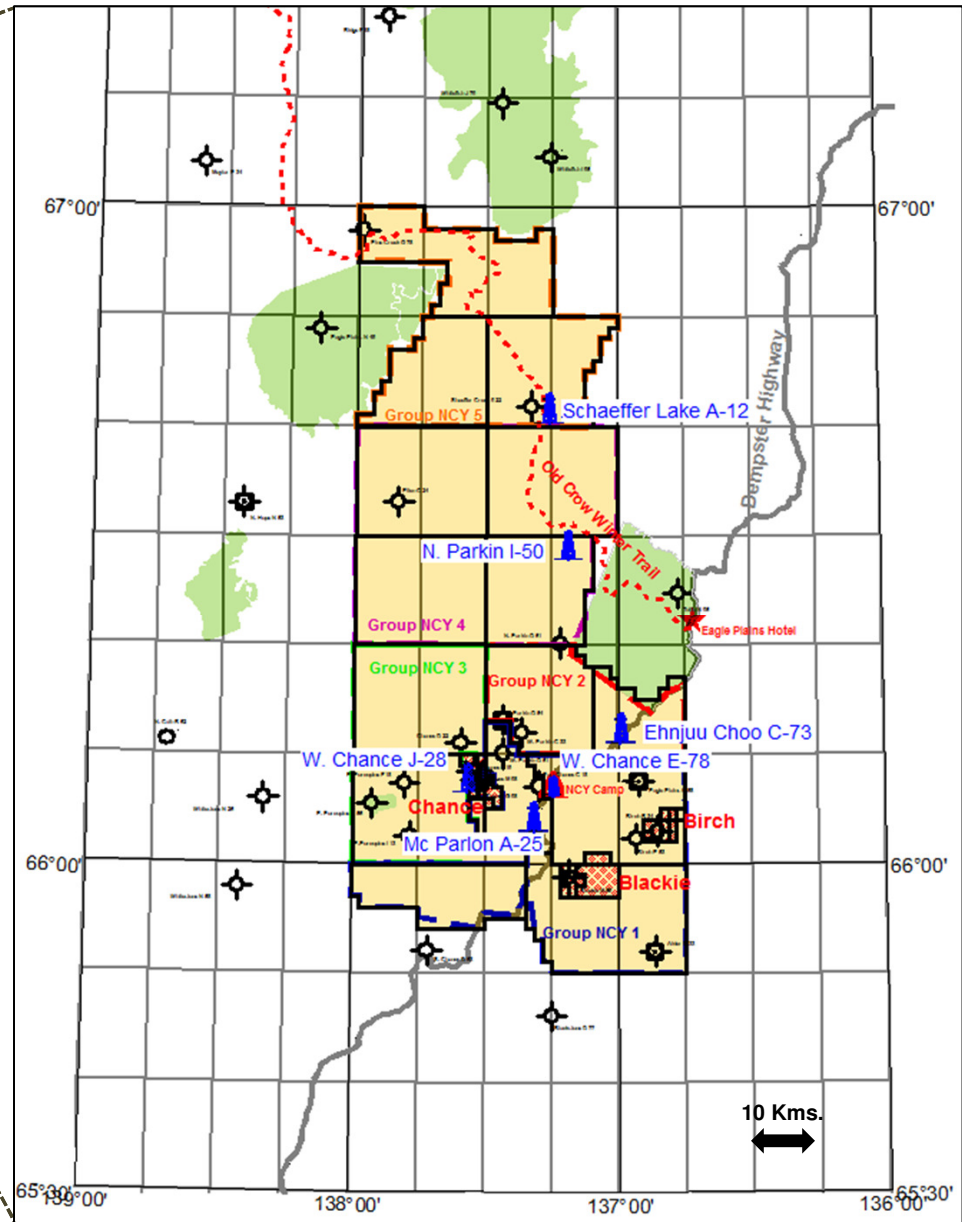
**Northern Cross (Yukon) Ltd. is using new geological and geophysical interpretations and modern exploration concepts to assess resource opportunities that have not been evaluated in the past at Eagle Plain**



# Eagle Plain Area of Operations



- ~1.3 million Net Acres
- 5 wells proposed to retain all land
- Assess BOTH unconventional and conventional potential
- Each well is INDEPENDENT and adds value





## Near Term (2012/13)

- Land Retention 2 Phases, 2 Rigs:

### Phase 1 - Patterson Triple Rig : South Area - 4 wells:

- McParlon A-25 **DRILLING**
- E. Chance E-78 **COMPLETED**
- West Chance J-28 **WINTER 2012/13**
- Ehnjuu Choo L-73 **SPRING 2013**

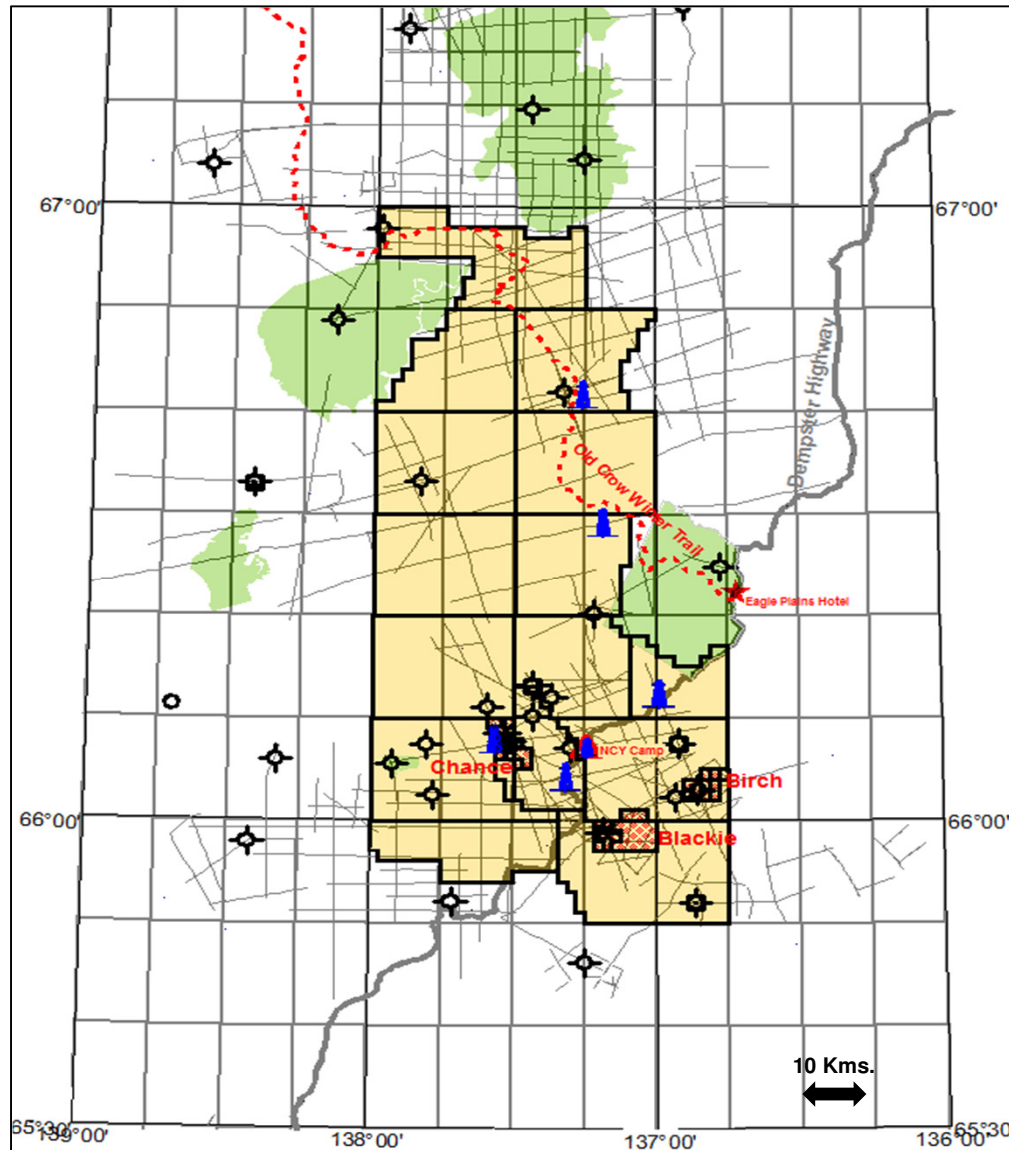
### Phase 2 - NCY Single Rig: North Area - 2 wells:

- Schaeffer Ck. A-12 **WINTER 2012/13**
- N. Parkin I-50 **WINTER 2012/13**

- Initial assessment of conventional sand/carbonate and unconventional shale prospects
- Validate Amplitude Versus Offset (AVO) seismic interpretation
- Exploration program will satisfy remaining work commitments under existing exploration permits of about \$18 million

## Long Term (Beyond 2013)

- Establish resource base to support development for domestic and export markets
- Development/Exploitation priority based on results of first phase of exploration drilling



## NCY Land

~1.3 million net acres

- 3 SDL's: Chance, Blackie, Birch
- Initial permit term expiries: 2013/08/31

## Historic Wells

- 34 wells tied to seismic
- 21 wells on NCY lands
- Average Depth 2,059m
  - 2 wells > 4,000m
  - 31 wells in 1960's & 1970's
  - 3 wells in 1980's and younger

## Seismic

- 265 2D seismic lines
- ~4,300 kms. of TOTAL data



NCY SDL's



NCY Land



First Nations Lands



NCY 2012/2013 Exploration Wells



2D Seismic

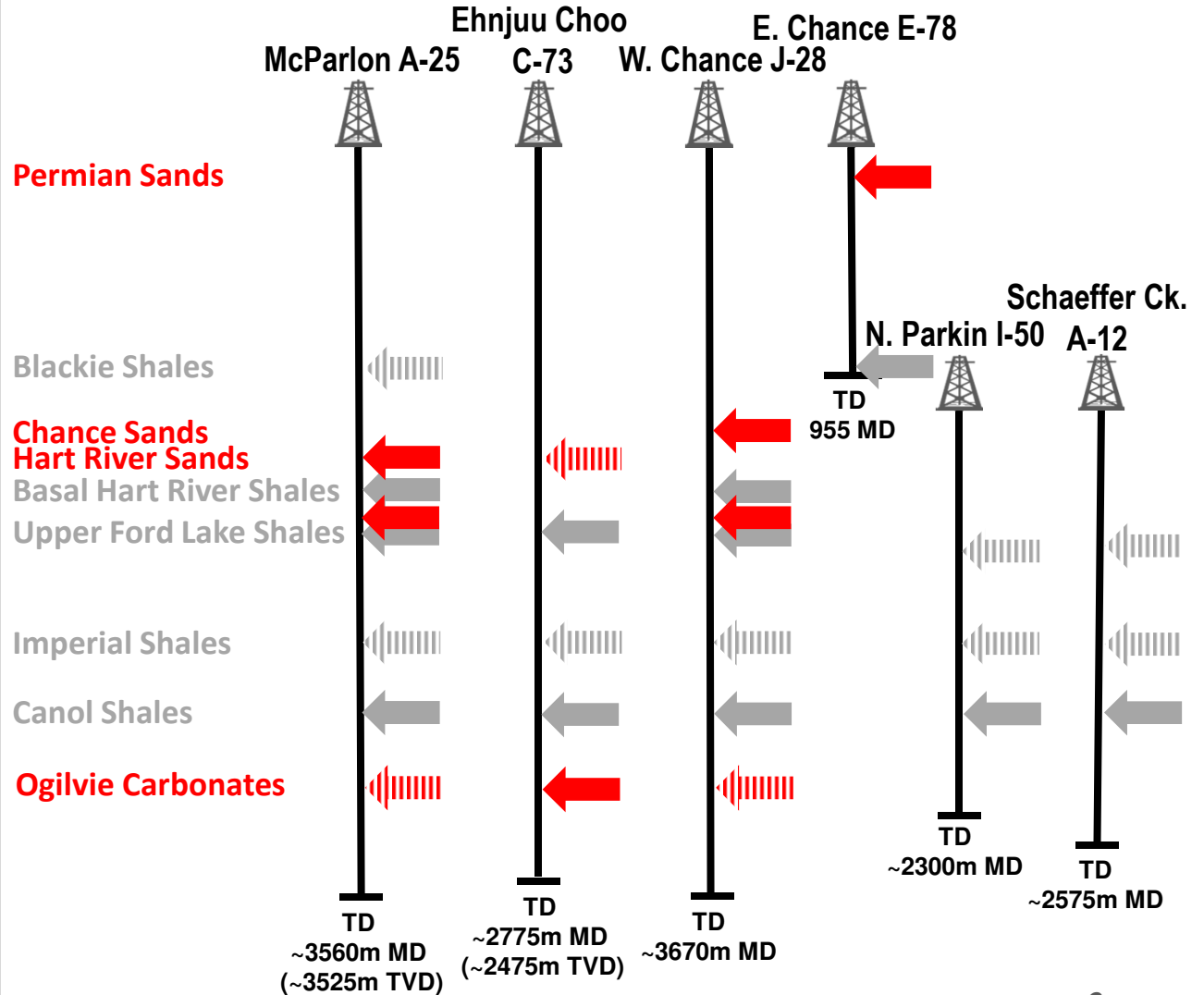
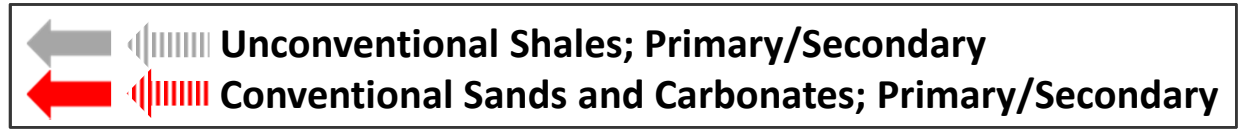
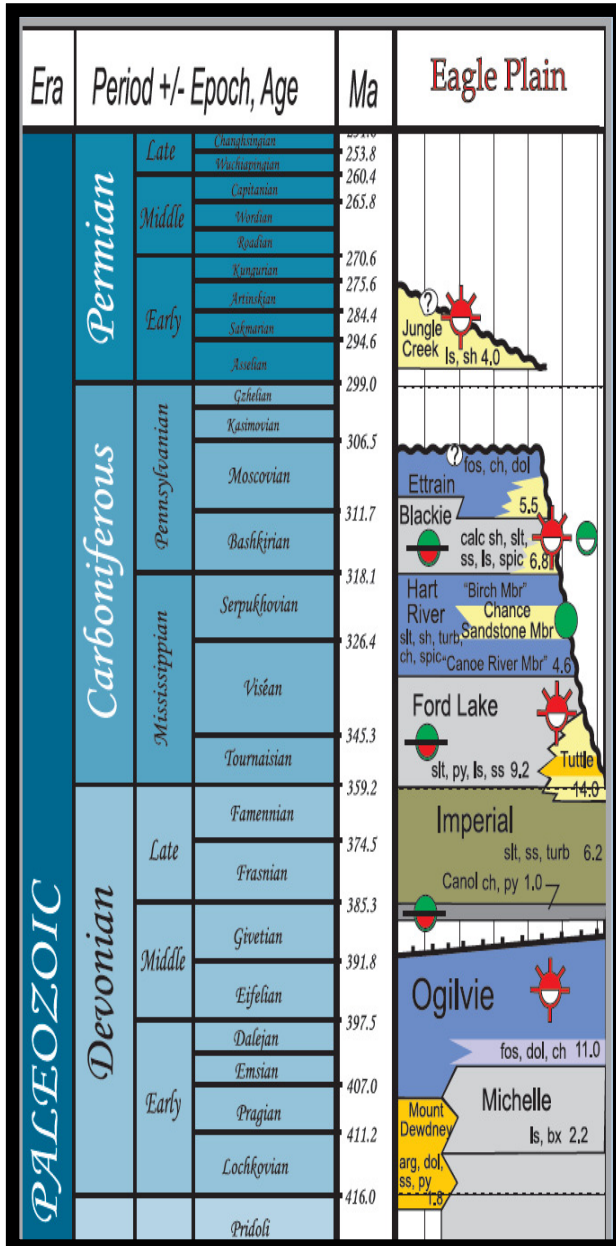


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# **2012/13 Exploration Program**



# Eagle Plain Exploratory Drilling Program: Objective Horizons





## **1. Data Calibration:**

- **Cut core, collect rock cuttings, mud gas data and wireline log data to calibrate the 2D seismic**

## **2. Conventional Reservoir (Seismic AVO anomalies) Calibration for Reservoir and Fluid:**

- **Permian and Carboniferous highstand shelf and lowstand fan sand reservoirs**
- **Ogilvie carbonate reef margin and mid-platform hydrothermal dolomite reservoir**

## **3. Unconventional Gas Shale Assessment :**

- **Free shale gas and gas desorption analysis; TOC%; shale densities; mineralogical analyses (brittleness); rock mechanics; rock maturity**
- **Formation pressure and hydrocarbon type assessment**
- **Post-well, gas, oil and formation water analysis**
- **Well log objectives: natural frac identification; rock properties measurement; fluid measurement; calibration to core and geochemical analyses**



## Eagle Plain: To Frac or Not to Frac?

- Northern Cross (Yukon) is focused primarily on *conventional* oil and gas exploration
- Unconventional shale oil and natural gas resource potential in Yukon is a possibility, but this potential still needs to be evaluated
- Natural gas has historically been tested from shale reservoirs in historic wells in Eagle Plain
- Based on information we get from our exploratory wells, we will evaluate the quality and quantity of the resource and then compare that with the cost of production to determine commerciality
- **We do not have plans to frac**
  - We are still at the exploration stage, not at the completion stage
  - Fracture stimulation is a completions method to produce resources
  - Once we know the results of our exploration test wells, we will determine the best way to produce the resources, if we believe there to be commercial viability



# **Unconventional Shale Gas**

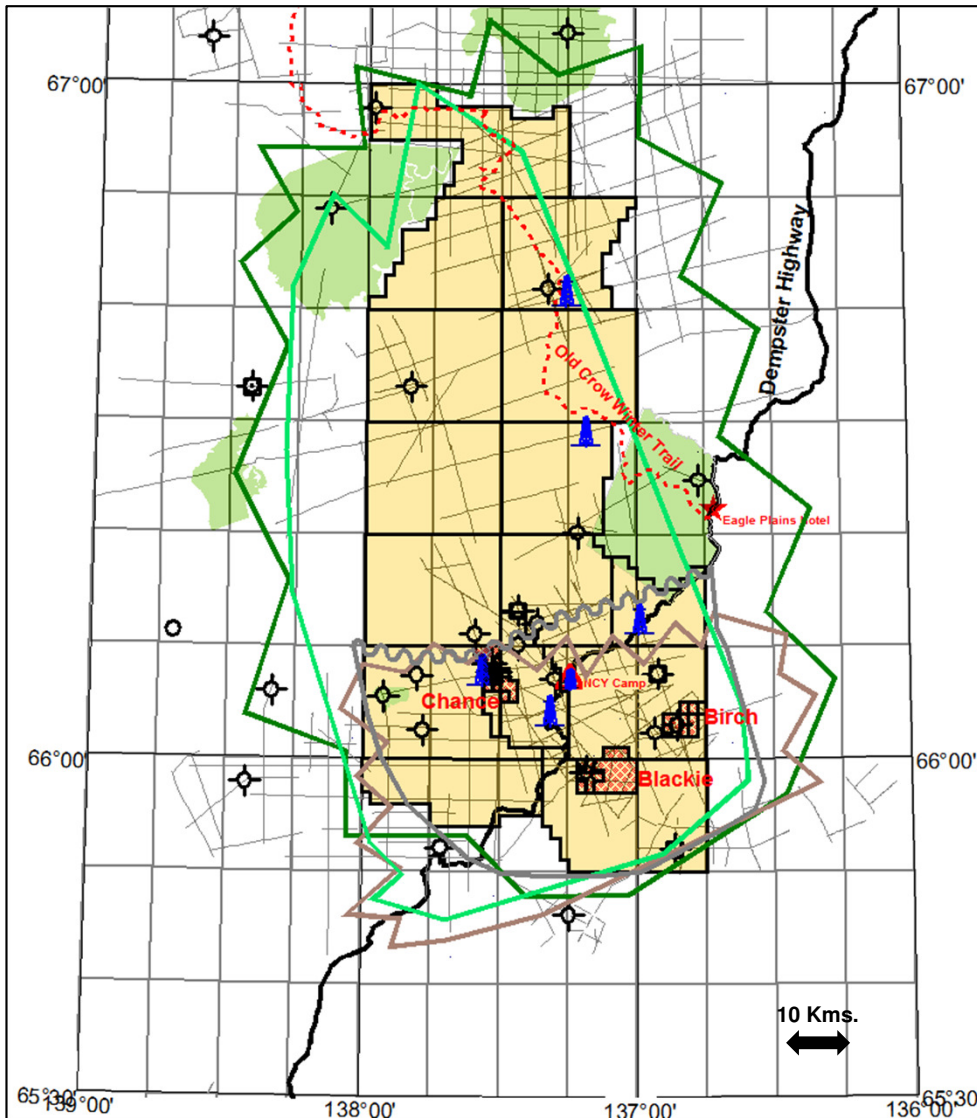


## 5 Shales to evaluate:

- Carboniferous (3): Blackie, Hart River, Ford Lake
- Devonian (2): Canol, Imperial

**Unconventional potential gas in place resource is larger than Conventional gas resource**

**Define future priorities and completion techniques**





# **Prospect Types Review Conventional Plays**

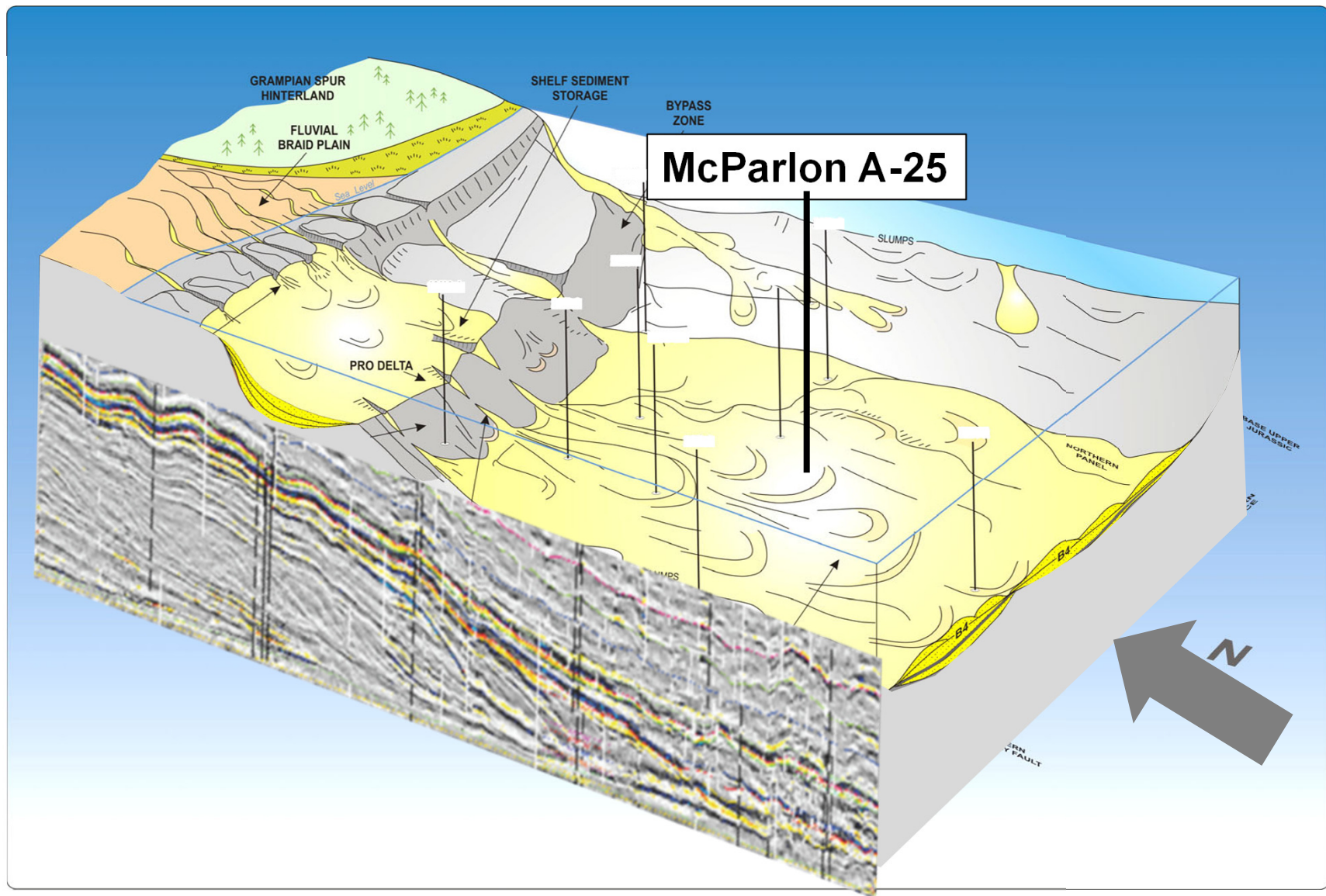
**Carboniferous Lowstand Fan Sands  
Ogilvie Hydrothermal Dolomite**



# Drilling Objectives: Hart River Fm. Lowstand Fan Setting

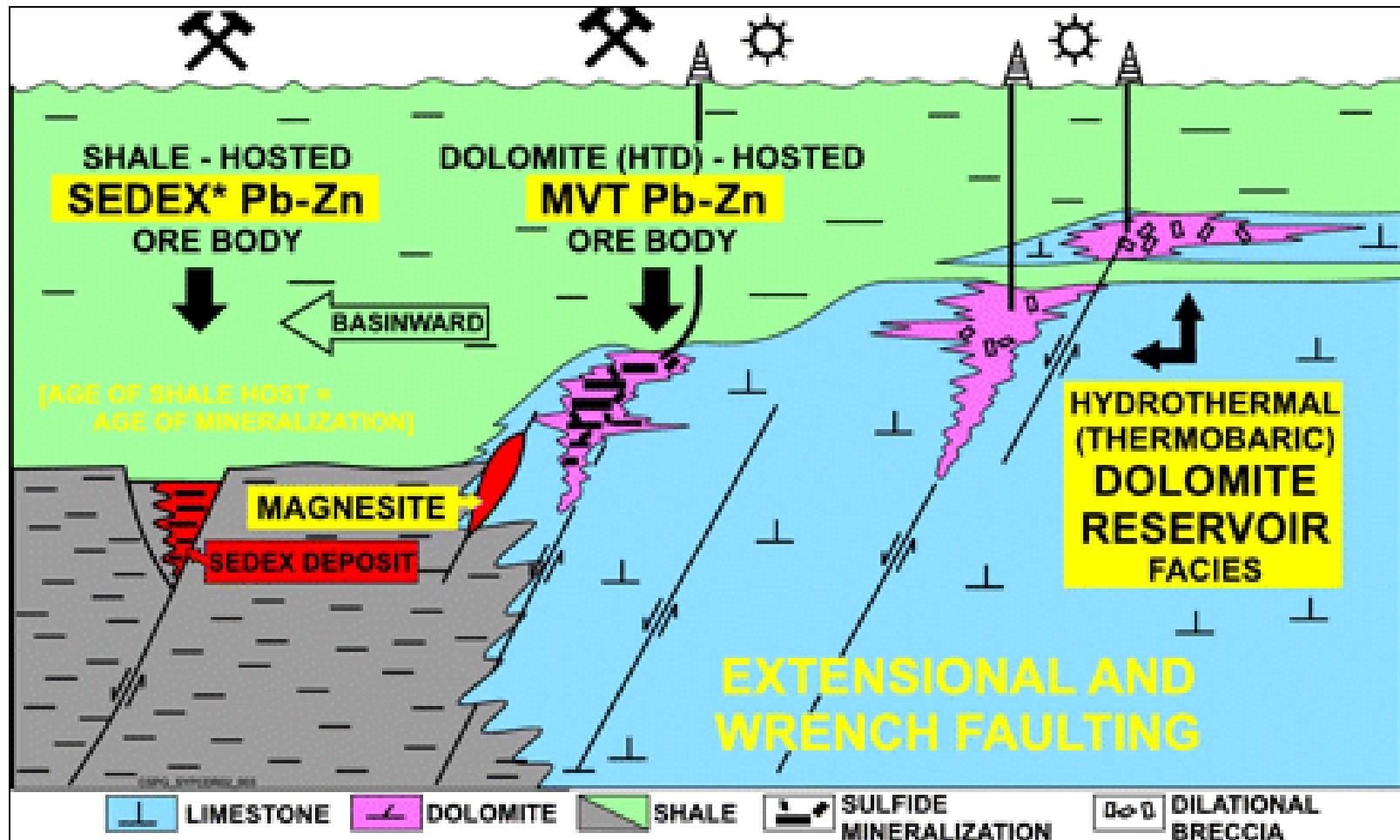
## Conceptual Diagram of Carboniferous Shelf to Basin Transition Setting Hart River Fm. McParlon A-25

Adapted From Interpreted Setting of Buzzard Field, North Sea U.K.





# Drilling Objectives: Ogilvie Hydrothermal Dolomite





- **Northern Cross (Yukon) Ltd. is at the beginning of an exploration program**
  - Time to commercial development is contingent on exploration success and is measured in years not months
- **Northern Cross (Yukon) Ltd. plans to operate in a safe and environmentally responsible manner**
  - NCY operates under extensive regulations specified by Yukon laws
- **Northern Cross (Yukon) Ltd. wants to work with Yukoners to build local expertise and share in potential future economic benefits**
- **Long Term Benefits to the Yukon include:**
  - An emerging oil and natural gas industry in Yukon offers economic diversification and the potential to expand the royalty and tax base for the benefit of all Yukoners
  - Successful exploration could displace costly imported fuel
  - Potential to diversify energy sources to include clean natural gas



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## **Northern Cross (Yukon) Ltd.**

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(403) 699-0055**

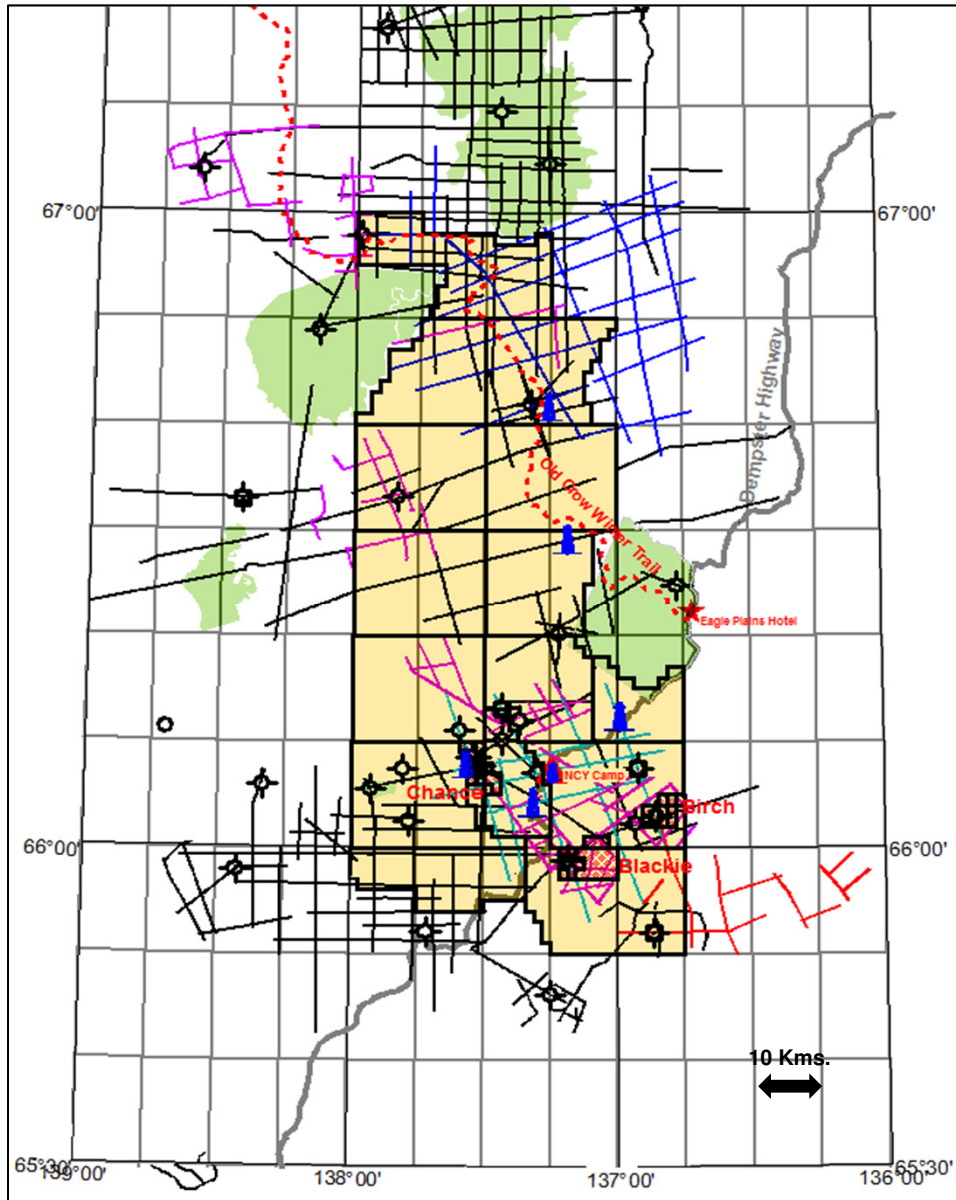
**201B 1191 First Ave  
Whitehorse, Yukon  
(867) 456-7805**

**[www.northerncrossyukon.ca](http://www.northerncrossyukon.ca)**

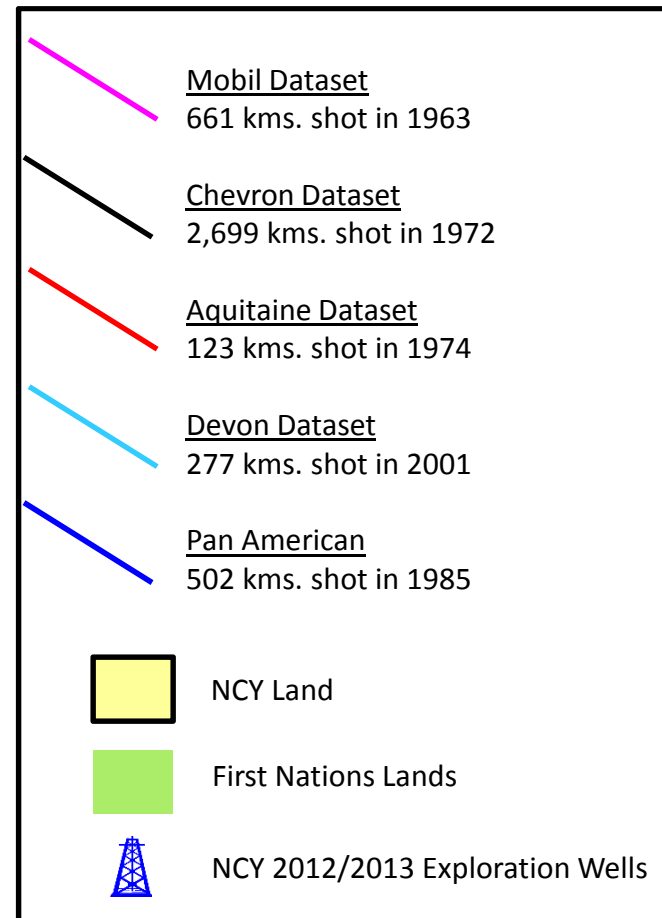


**Northern Cross (Yukon) Ltd. was formed in Yukon in 1994**

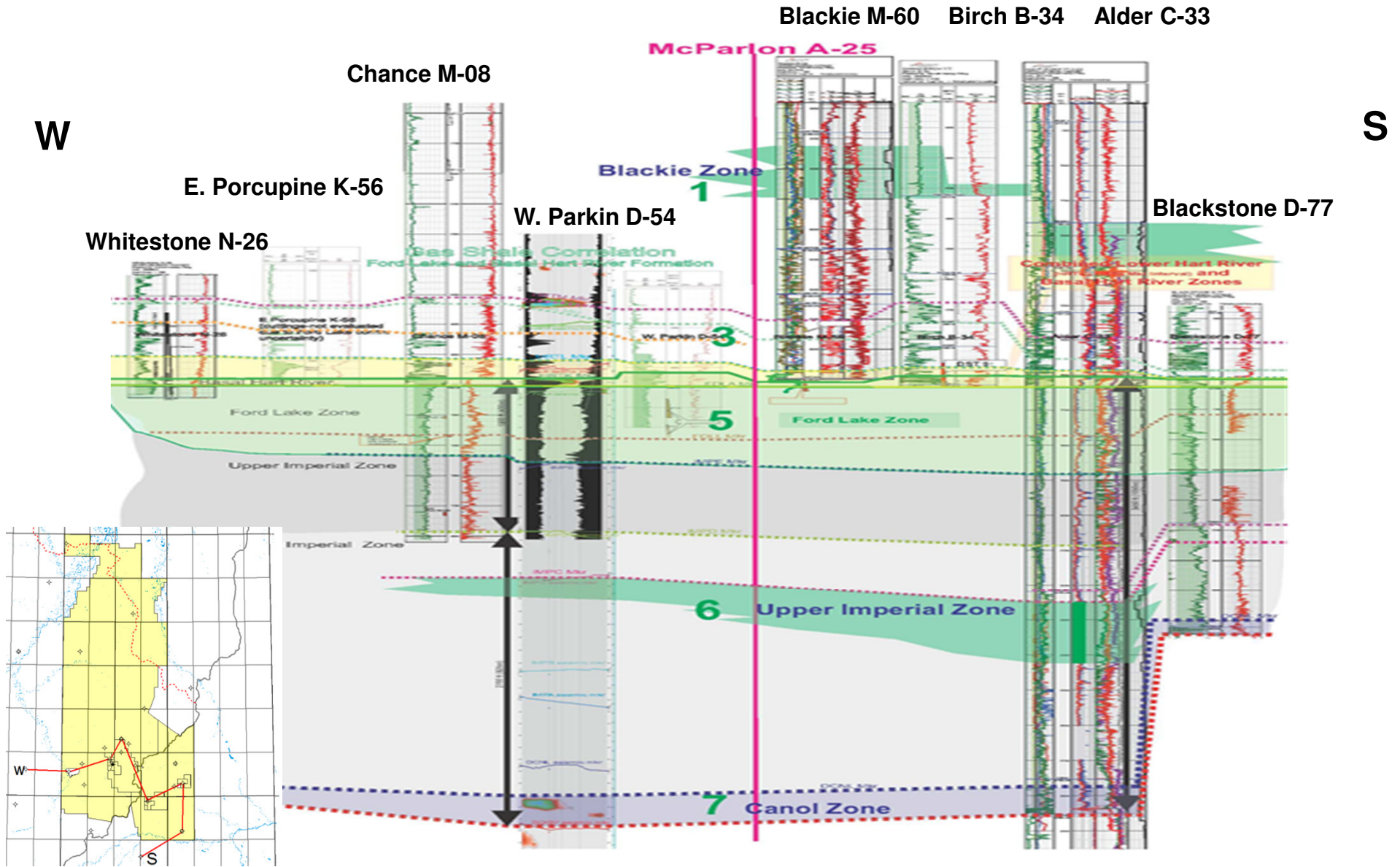
- **The company has been focused on the evaluation and use of oil and gas resources in Eagle Plain over the past 17 years.**
- **Eagle Plain sedimentary basin was first explored in the 1960's and 1970's by other companies.**
- **This effort significantly enhanced geological and geophysical understanding of the opportunities.**
- **Northern Cross operates 3 significant discovery licenses: 2 natural gas and 1 oil and natural gas.**
- **Northern Cross operates 15 exploration permits comprising 1.3 million acres.**
- **CNOOC International made a significant equity investment providing capital to undertake planned exploration activities**



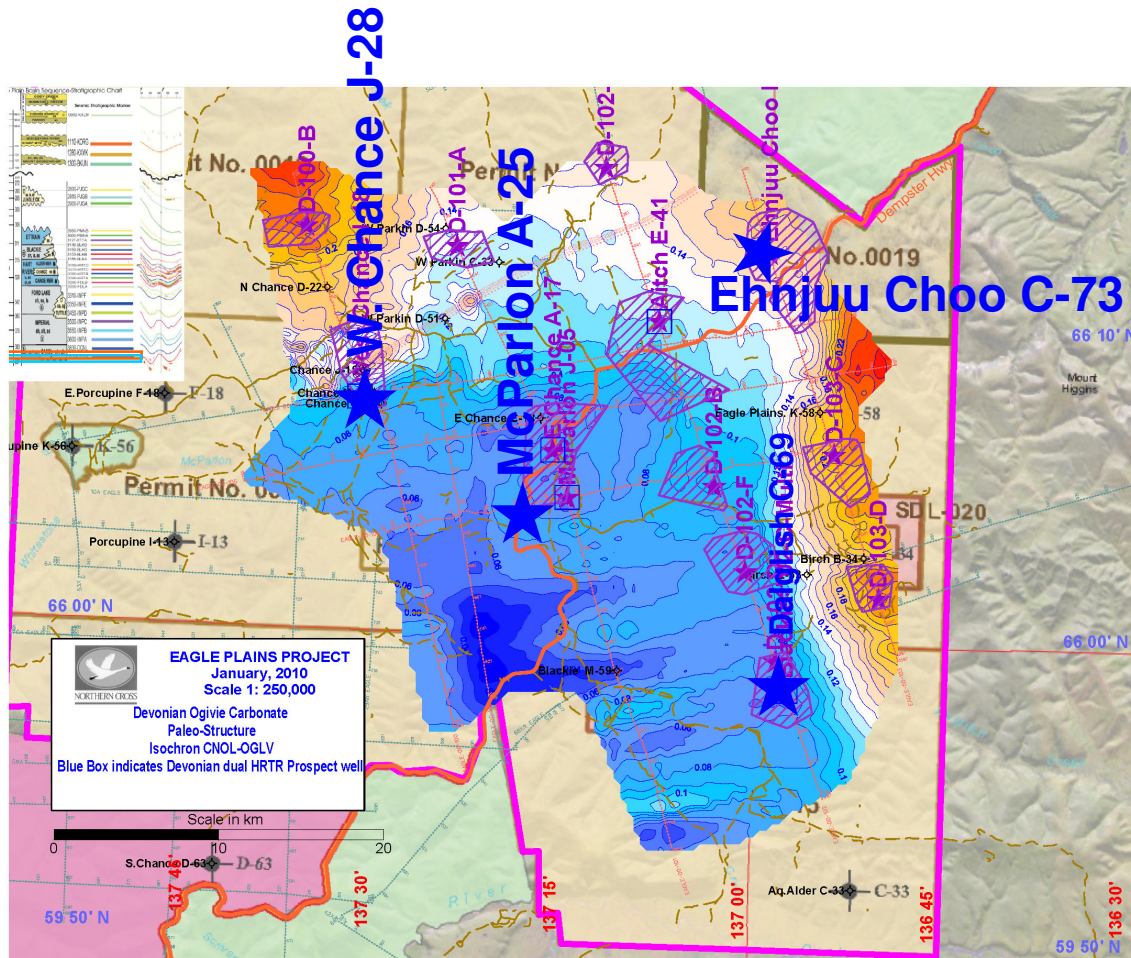
**265 2D seismic lines**  
**3,601 km of TOTAL digital data**  
**661 km of TOTAL scanned data**



# Prospect Types Review: Assessment of Shale Gas Potential



# Prospect Review: Conventional Prospects > Ogilvie HTD



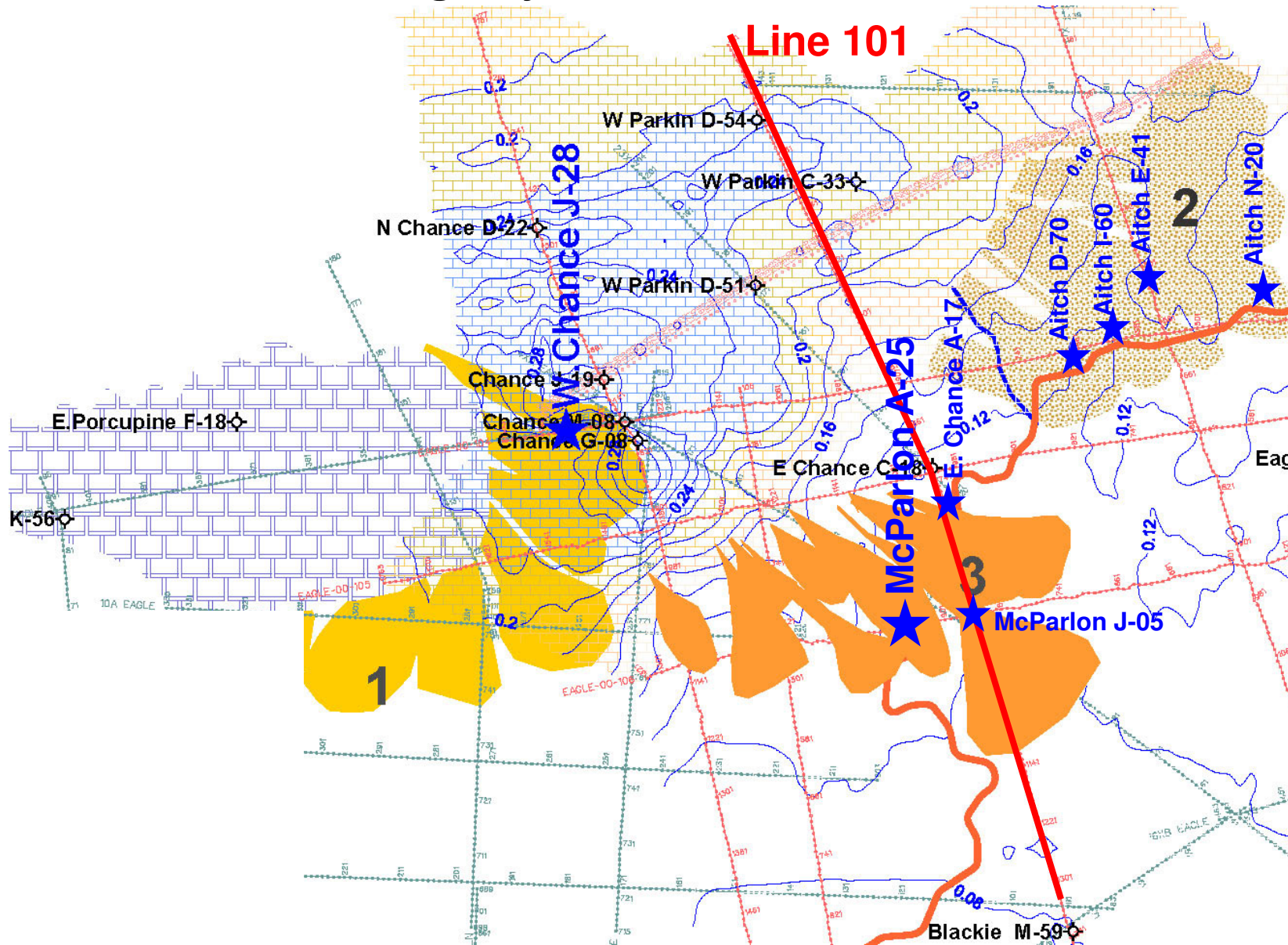
## AVO Assessment

### Ogilvie Carbonate Platform Play

- Hydrothermal Dolomite
- Potential for very large reserves
- Success supports more drilling and 3D seismic

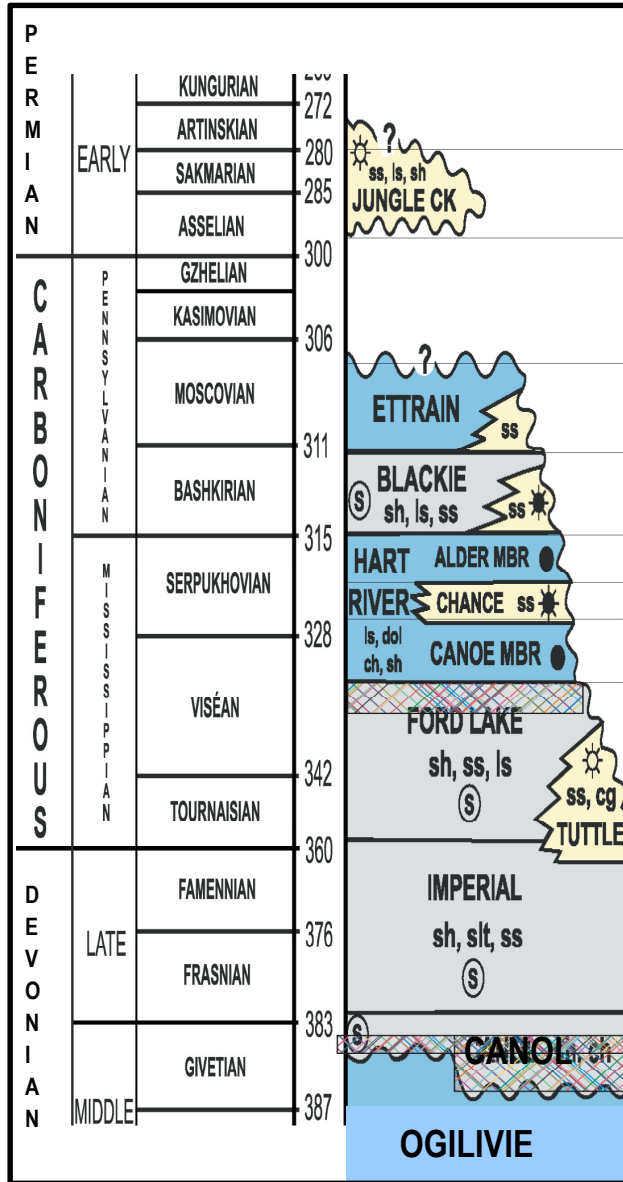
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# Drilling Objectives > Hart River Fm. Lowstand Fan Plays



**Southern Wells:  
McParlon A-25, Ehnjuu Choo C-73, W. Chance J-28**

# Southern Wells: Objective Horizons



Unconventional Shales; Primary/Secondary  
 Conventional Sands and Carbonates; Primary/Secondary

Permian Sands

Blackie Shales & Silts

Chance Sands

Hart River A/C Sands

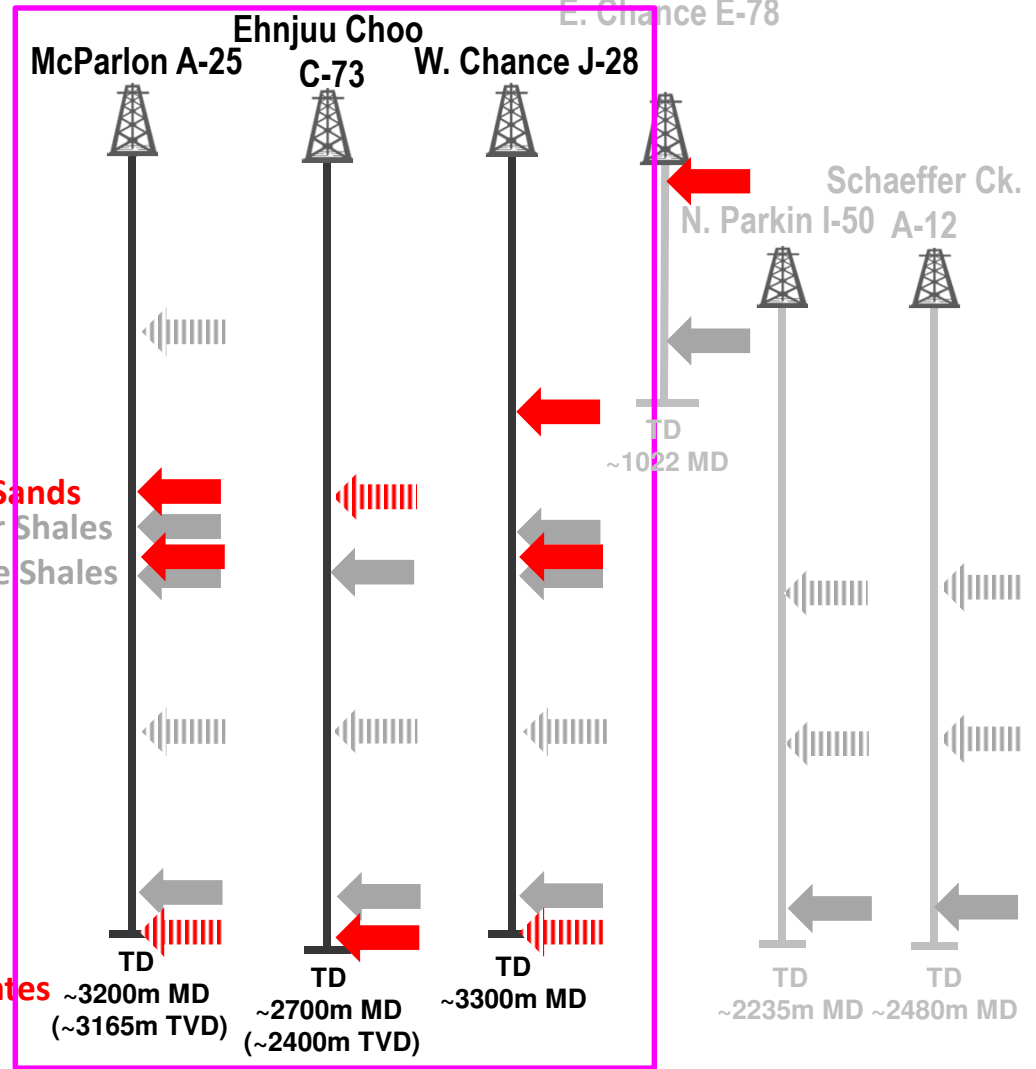
Basal Hart River Shales

Upper Ford Lake Shales

Imperial Shales

Canol Shales

Ogilvie Carbonates

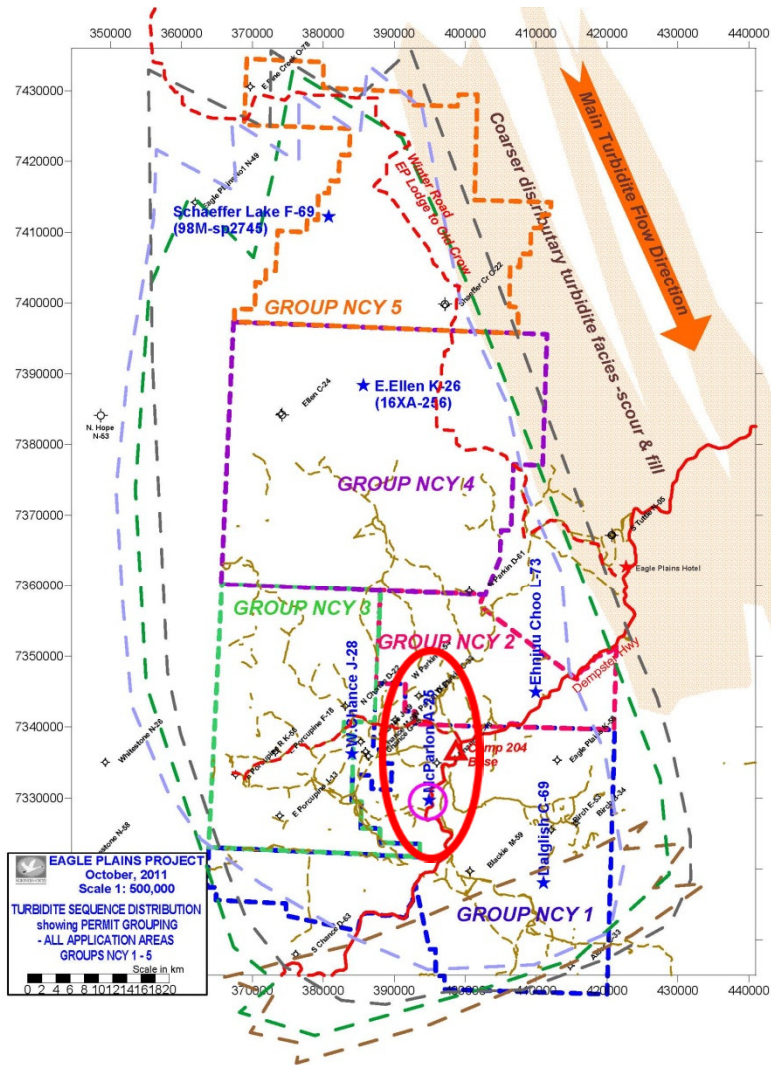


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**Well Review  
McParlon A-25**

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## Drilling Objectives: McParlon A-25 Shale Gas



**4 or 5 Prospective Unconventional (Shale Gas) Zones:**

Lower Permian?	50m?
Hart River	50m
Ford Lake	100m
Imperial	100m
Canol	100m

**A-25 Area Recoverable Gas Resource Estimate:  
279 Bcf Rec. OGIP Unrisked**

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# Drilling Objectives: McParlon A-25 Shale Gas

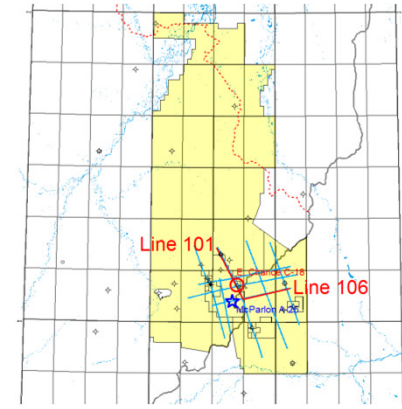
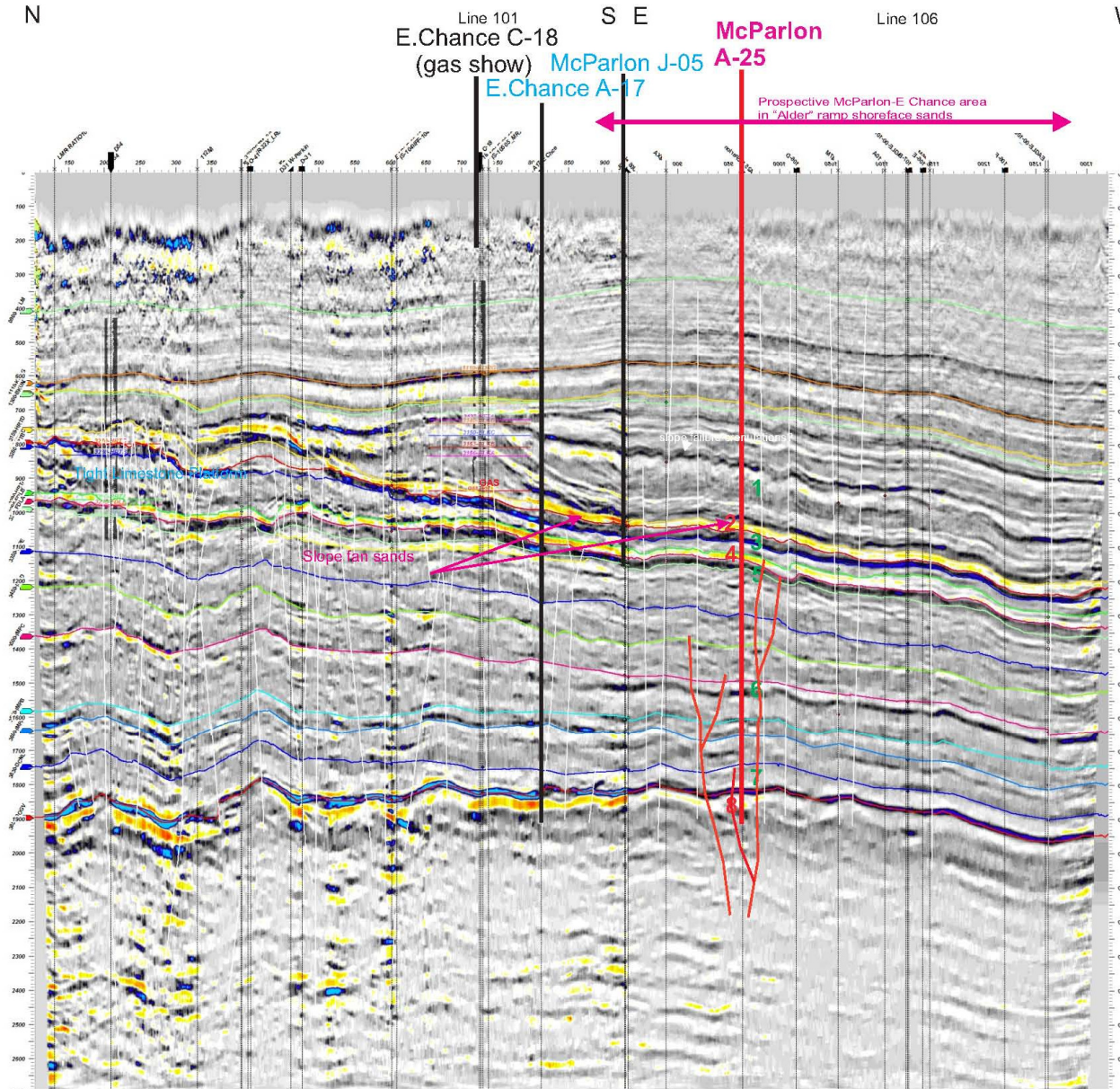
## 8 Prospective Zones:

### 5 Shale Gas:

1. Blackie Siltstone
3. Hart River Siltstone
5. Upper Ford Lake
6. Upper Imperial
7. Canol Fm.

### 3 Conventional

2. Hart River C-D (Alder Mbr.) fan
4. Hart River A-B fan
8. Ogilvie Fm. HDT

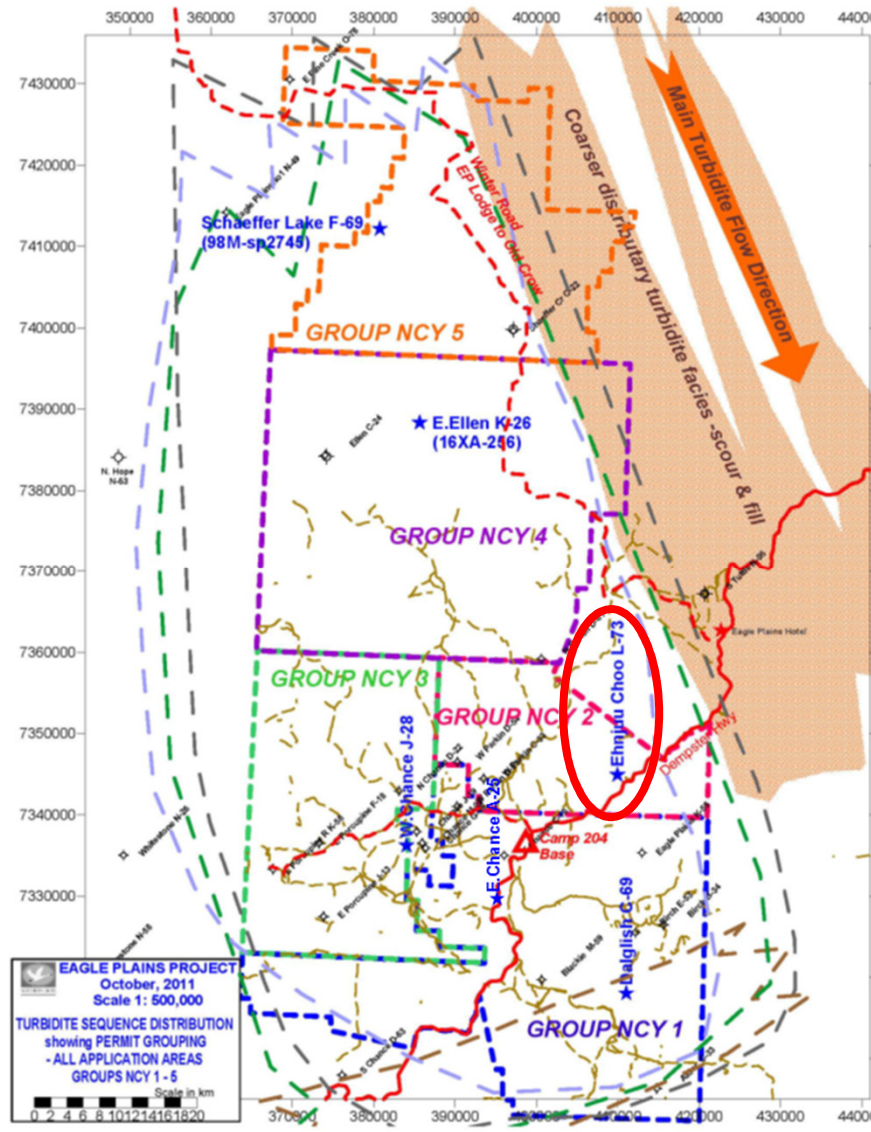


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**Well Review  
Ehnjuu Choo C-73**

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## Drilling Objectives: Ehnjuu Choo C-73 Shale Gas



**2 Unconventional (Shale Gas) zones:**

**Imperial                      100m**

**Canol                              275m**

**C-73 Area Recoverable Gas Resource  
Estimate: 357 Bcf Rec. OGIP Unrisked**



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# Drilling Objectives: Ehnjuu Choo C-73

## 5 Potential Zones:

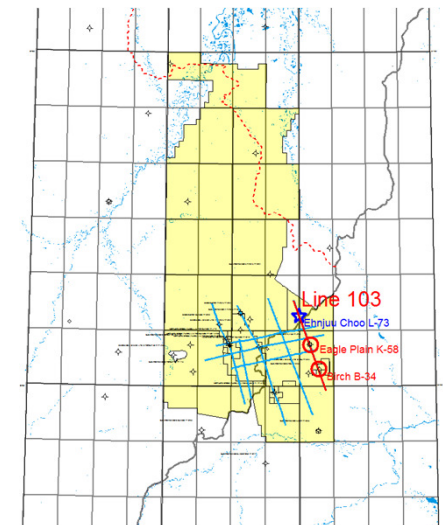
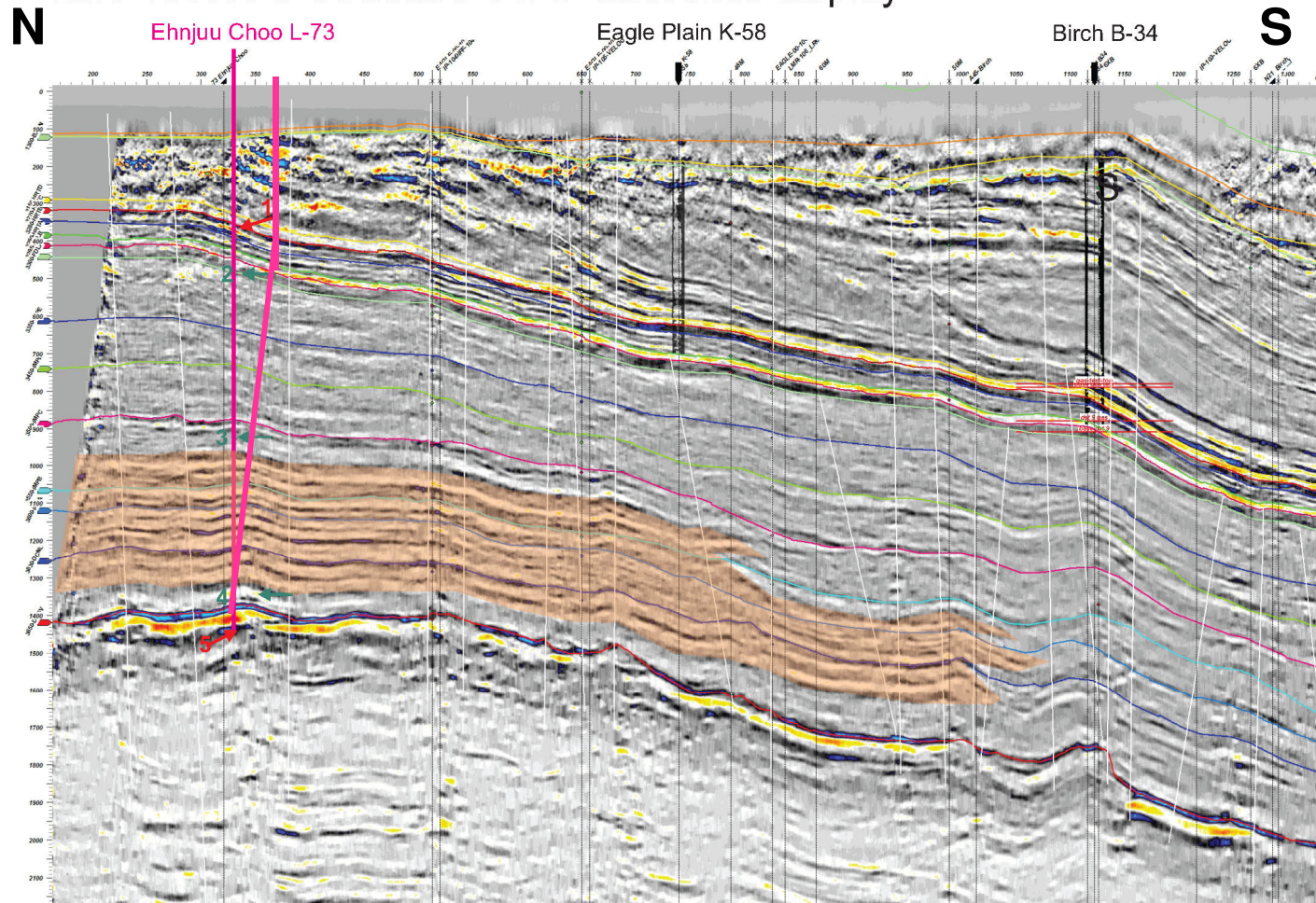
### 3 Shale Gas:

- 2. Lower Hart River
- 3. Upper Imperial
- 4. Canol

### 2 Conventional:

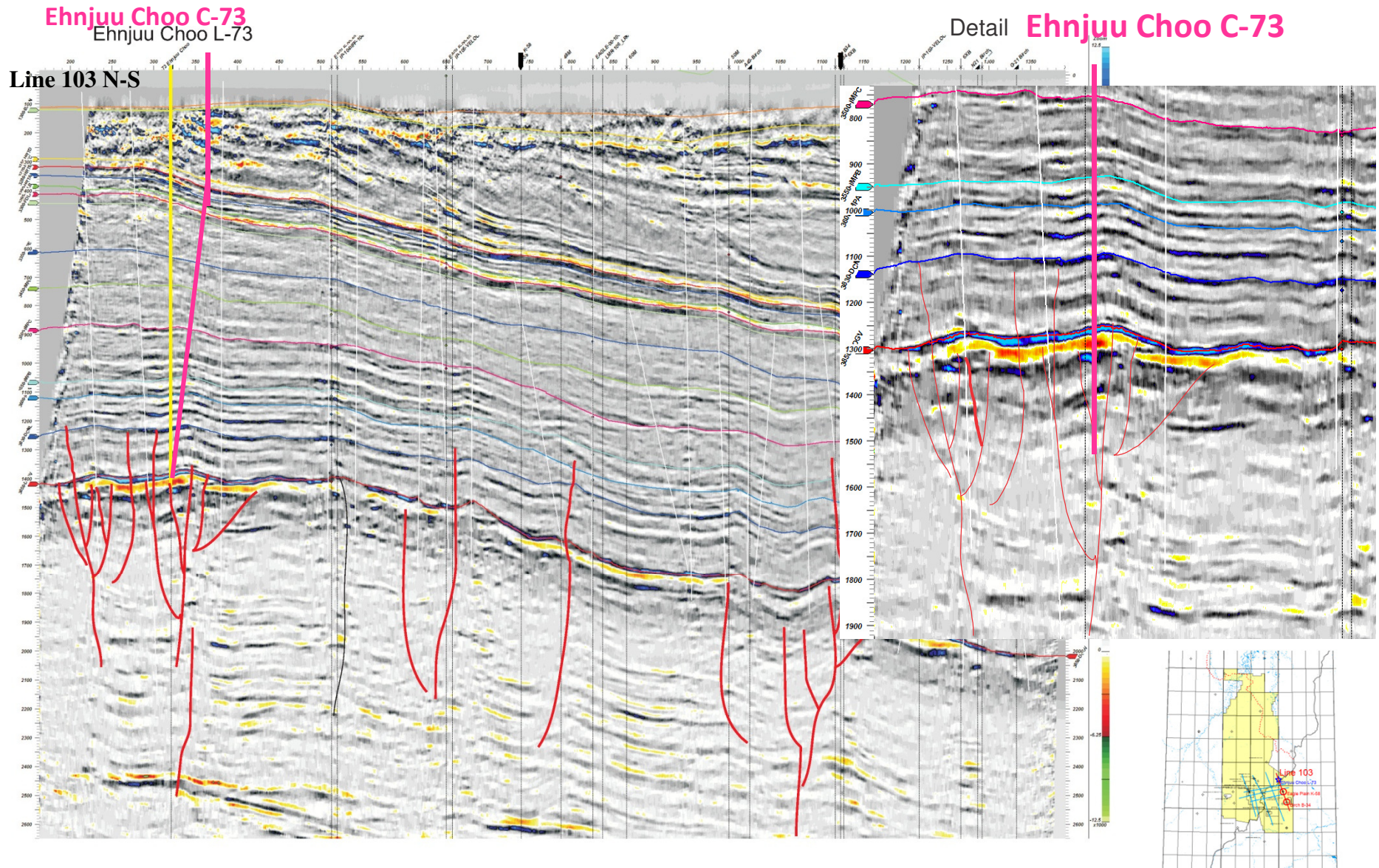
- 1. Hart River B-C
- 5. Ogilvie

Line 103: N-S Structure -AVO-difference display



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# Drilling Objectives: Ehnjuu Choo C-73 Ogilvie HTD

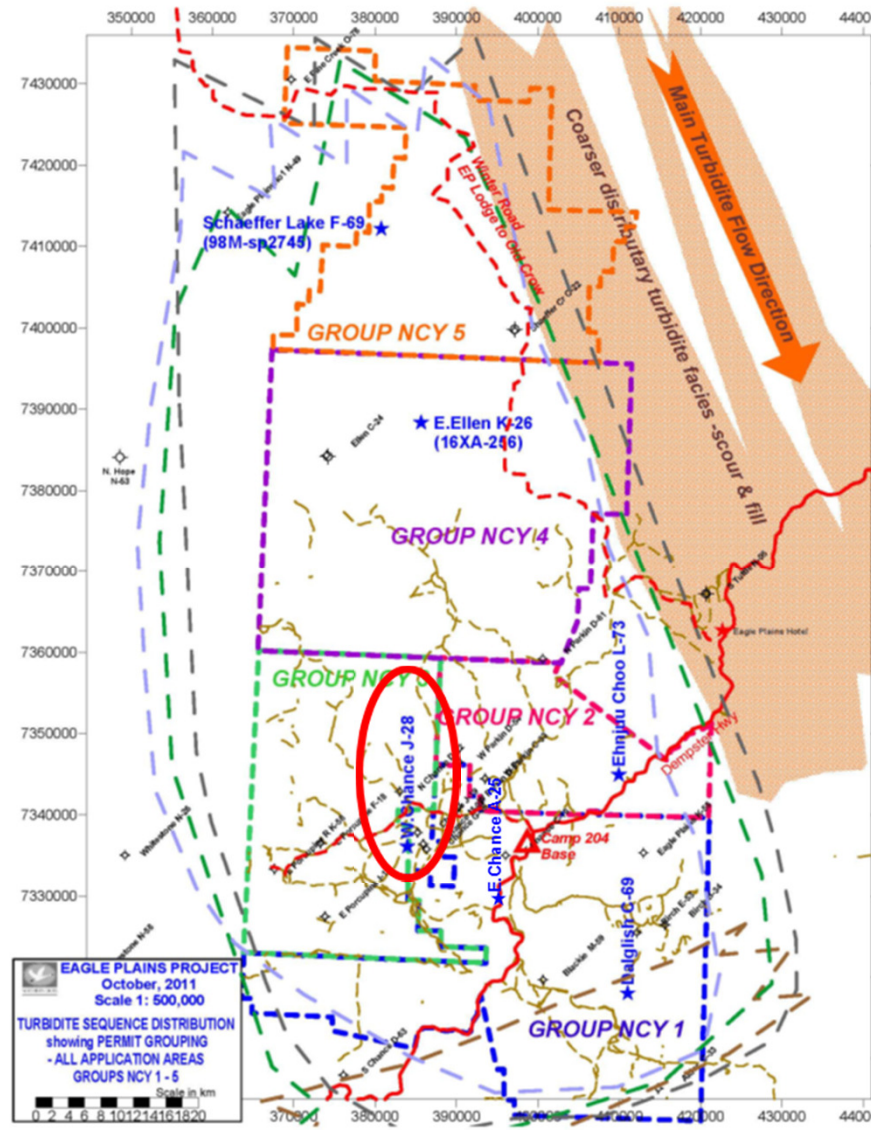


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**Well Review  
West Chance J-28**

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## Drilling Objectives: West Chance J-28 Shale Gas



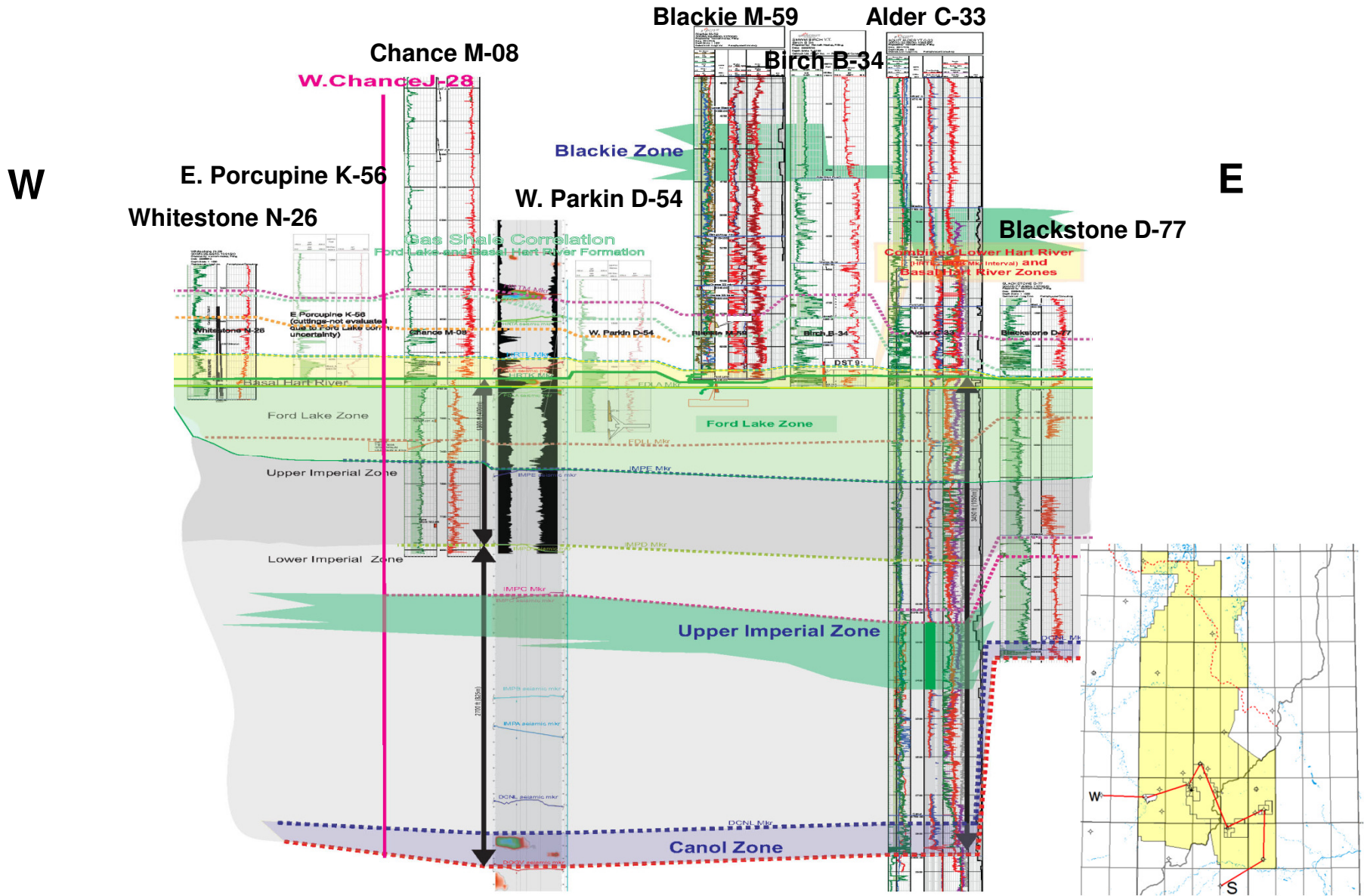
### 4 Unconventional (Shale Gas) zones:

Hart River	75m
Ford Lake	100m
Imperial	100m
Canol	50m

**J-28 Area Recoverable Gas Resource  
Estimate: 251 Bcf Rec. OGIP Unrisked**

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# Drilling Objectives: West Chance J-28 Shale Gas



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## Drilling Objectives: West Chance J-28

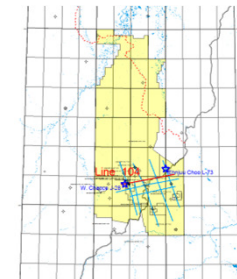
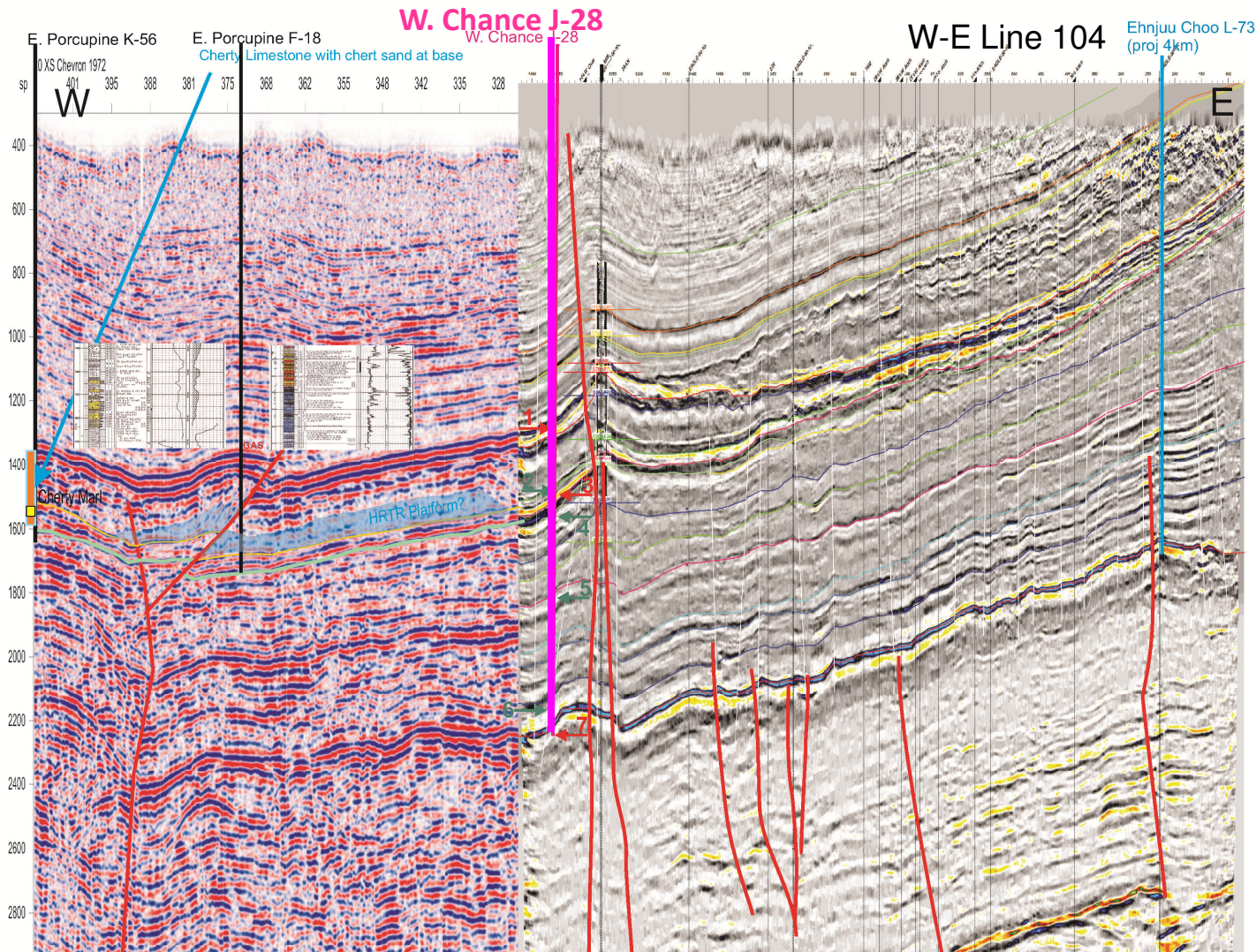
### 7 Prospective Zones:

#### 4 Shale Gas:

3. Lower Hart River
4. Upper Ford Lake
5. Upper Imperial
6. Canol

#### 3 Conventional:

1. Hart River C-D (Alder Mbr.) Topset sand
2. Basal Hart River A-B Lowstand fan sand
7. Ogilvie HTD



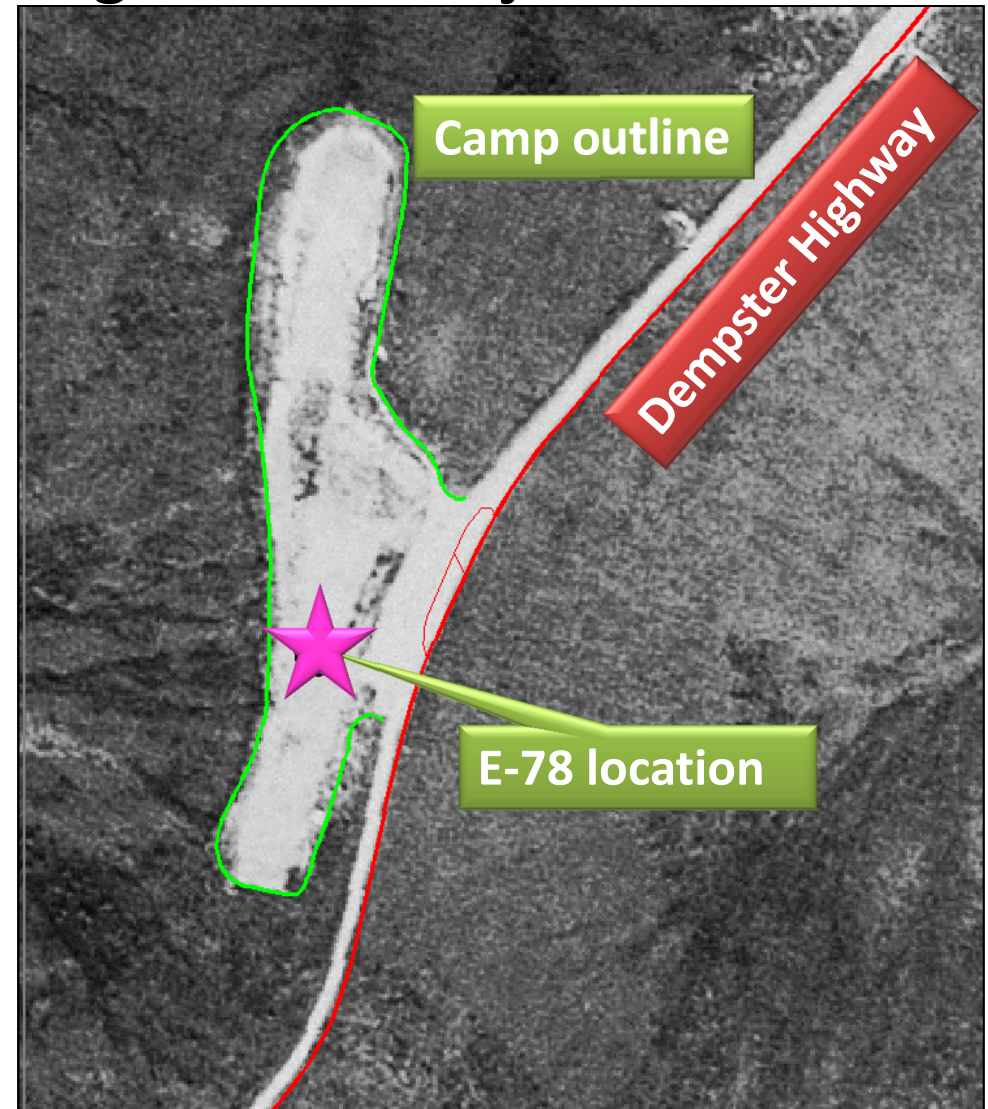
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## **E. Chance E-78 Camp Well**

## Permian Jungle Creek Conglomerate Objective

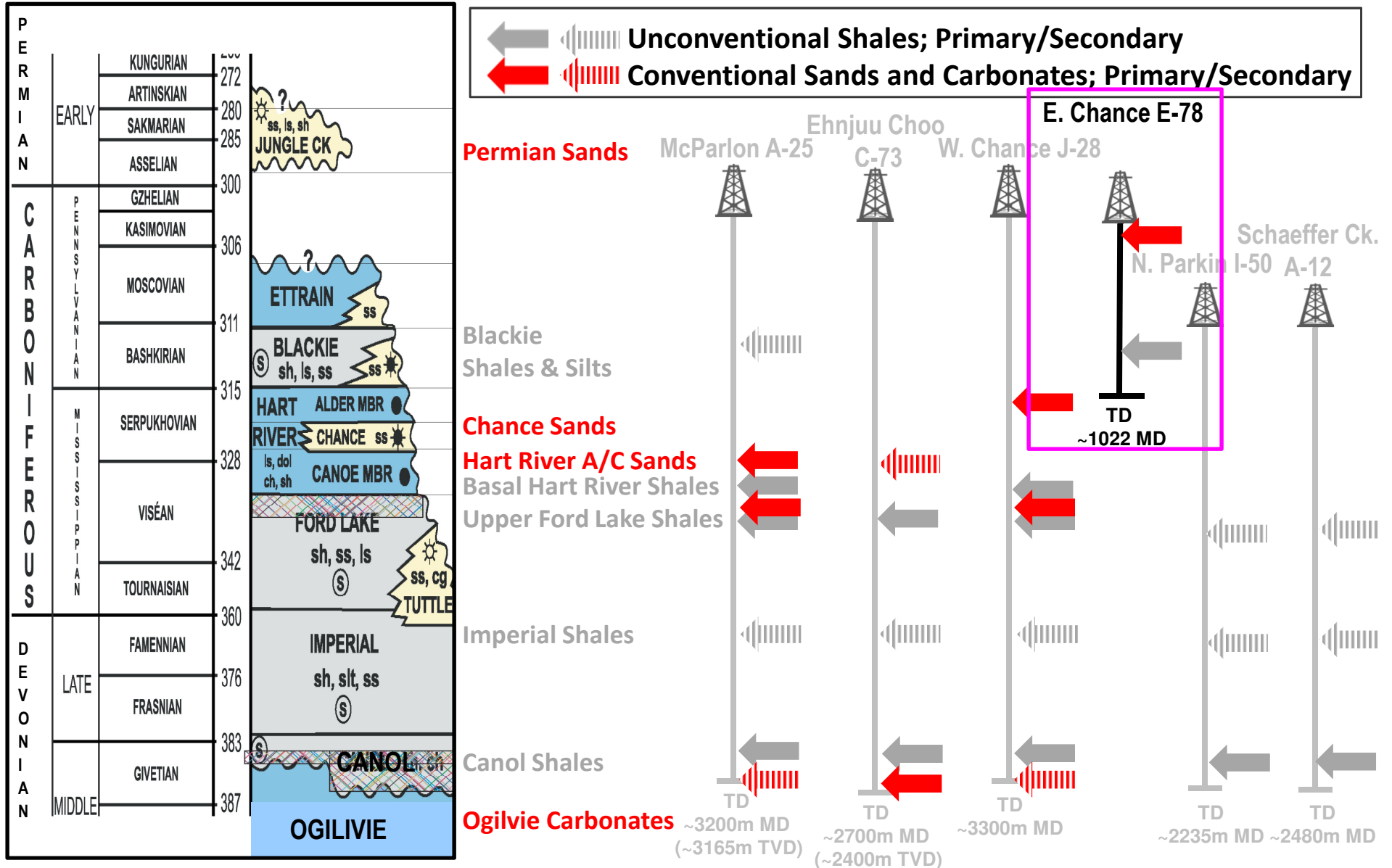
### 5 Reasons to Drill

1. NC Rig Warm-up (Crew, Core, DSTs)
2. Physically possible for access
3. Potential Water Disposal Well
4. Potential Water Source Well
5. Potential Gas Well (high methane LNG)



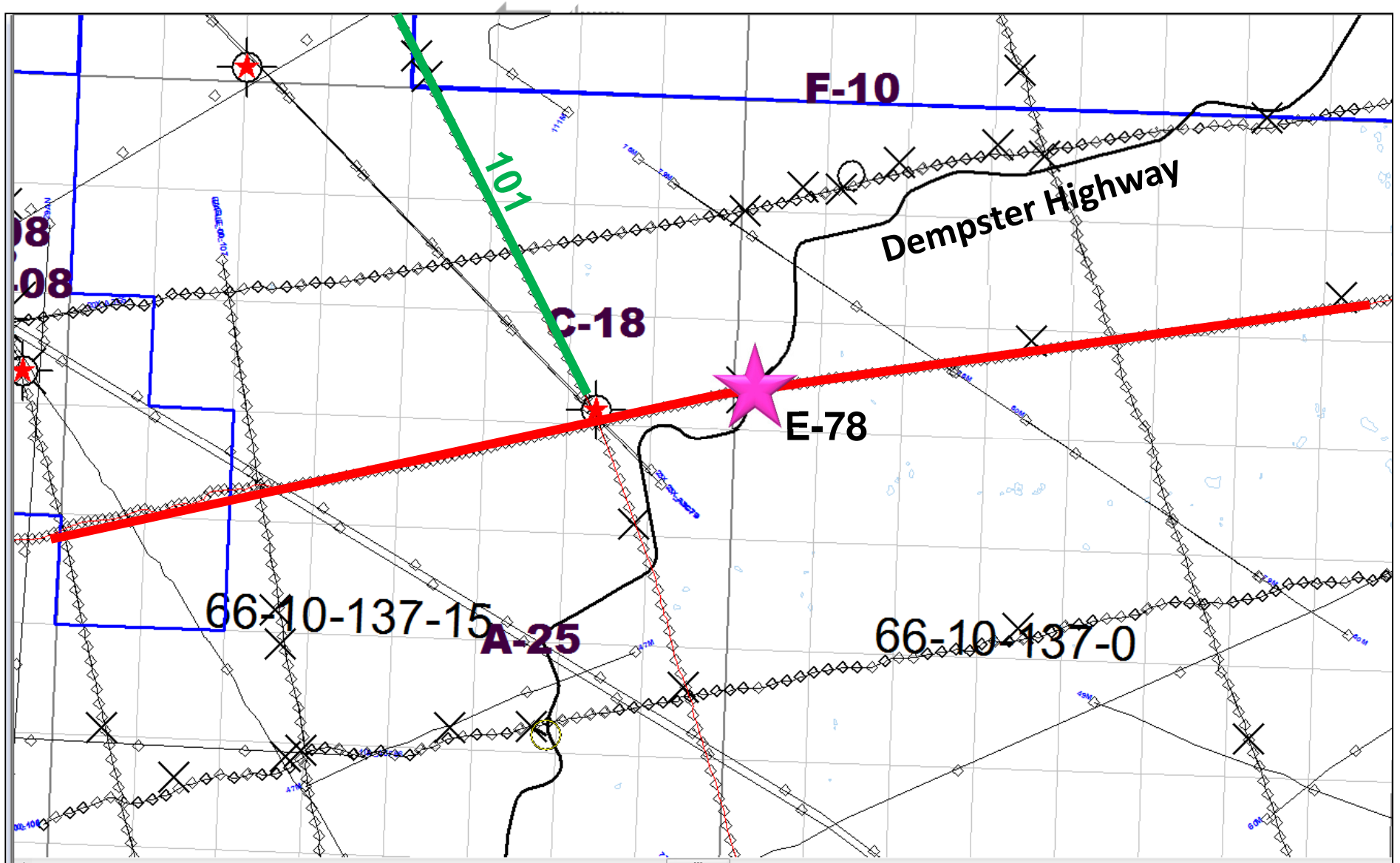
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# Camp Well: Objective Horizons



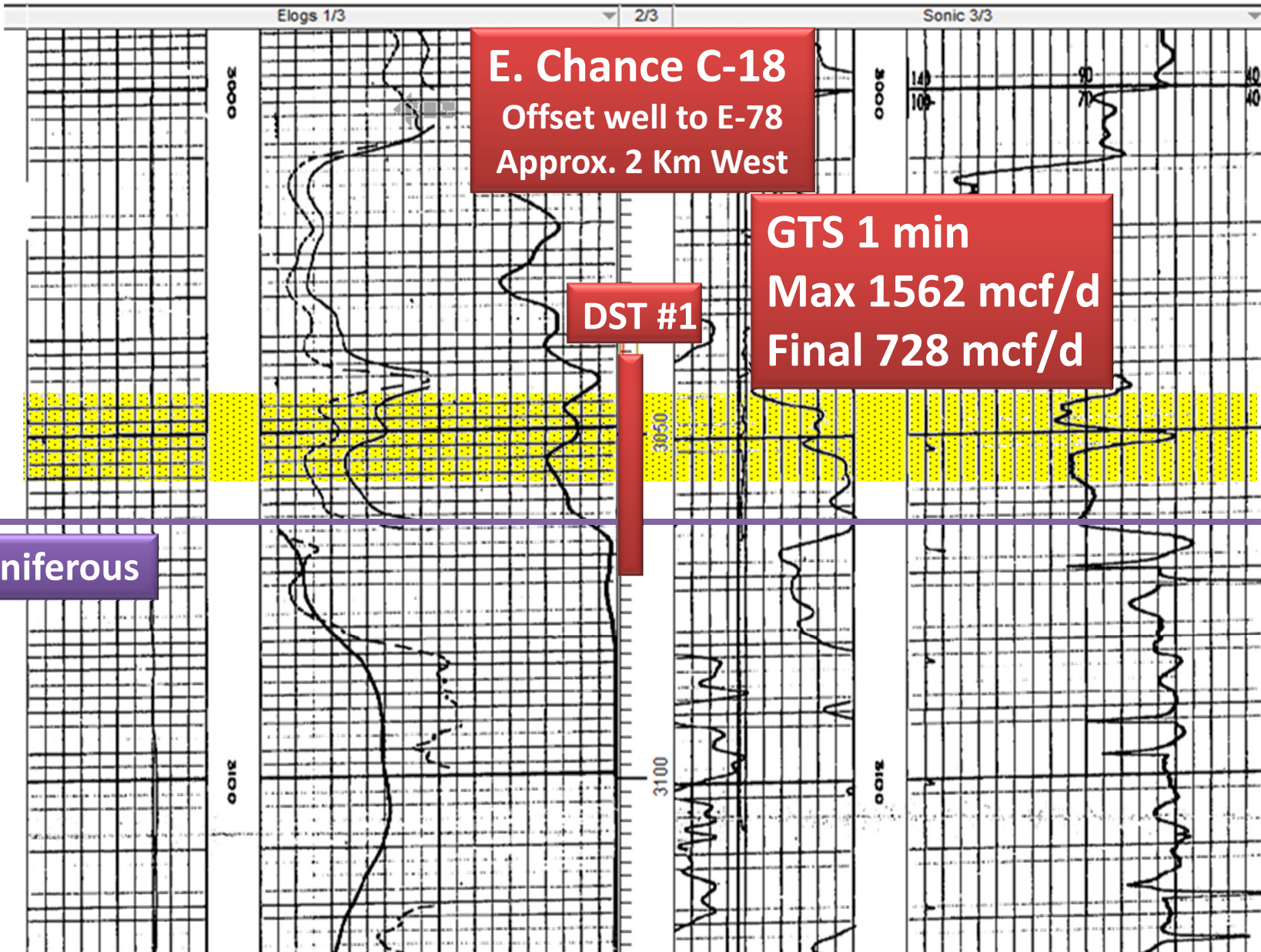
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# Camp Well: Seismic Base Map



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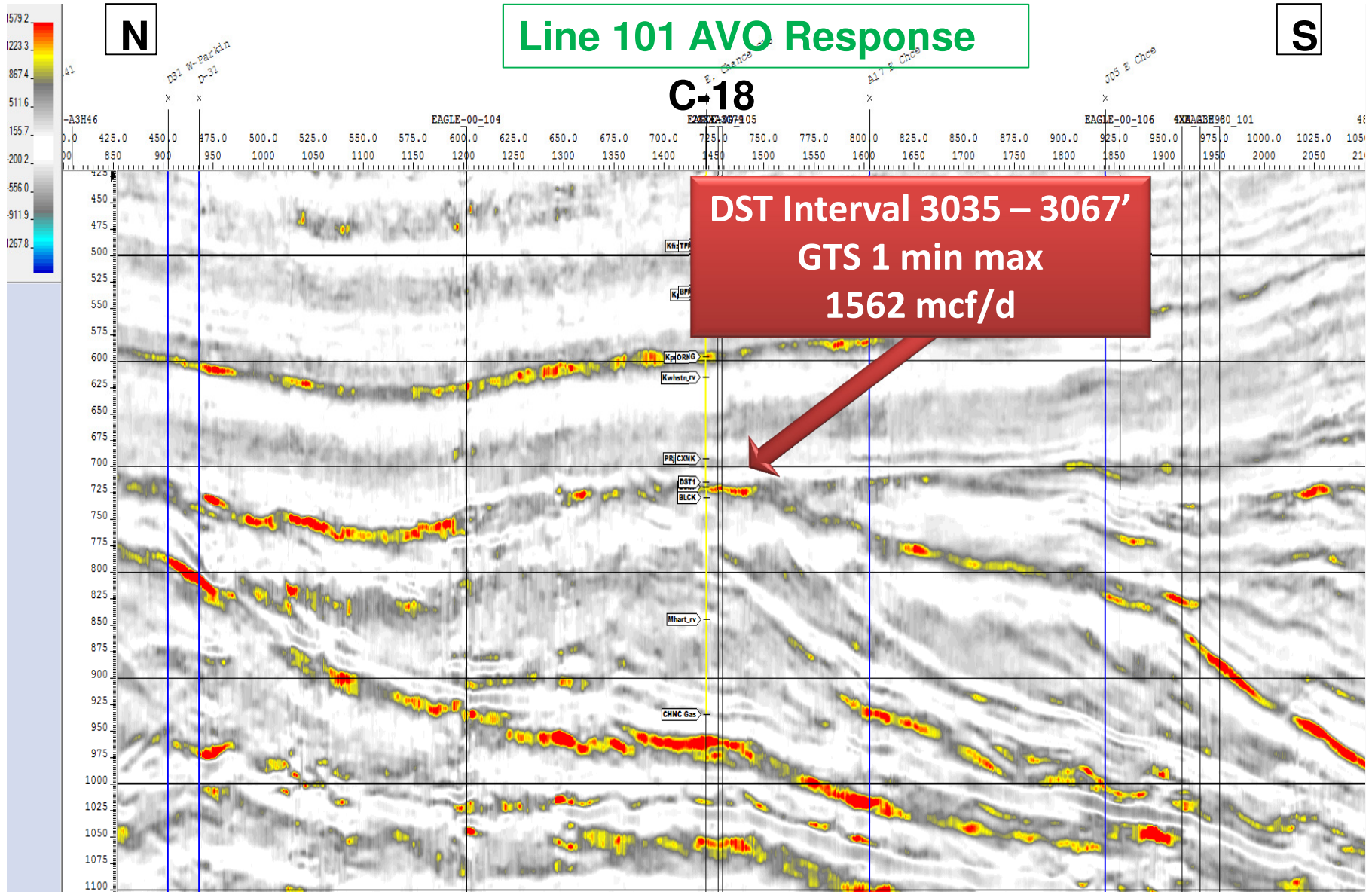
# Camp Well: E. Chance C-18 Logs





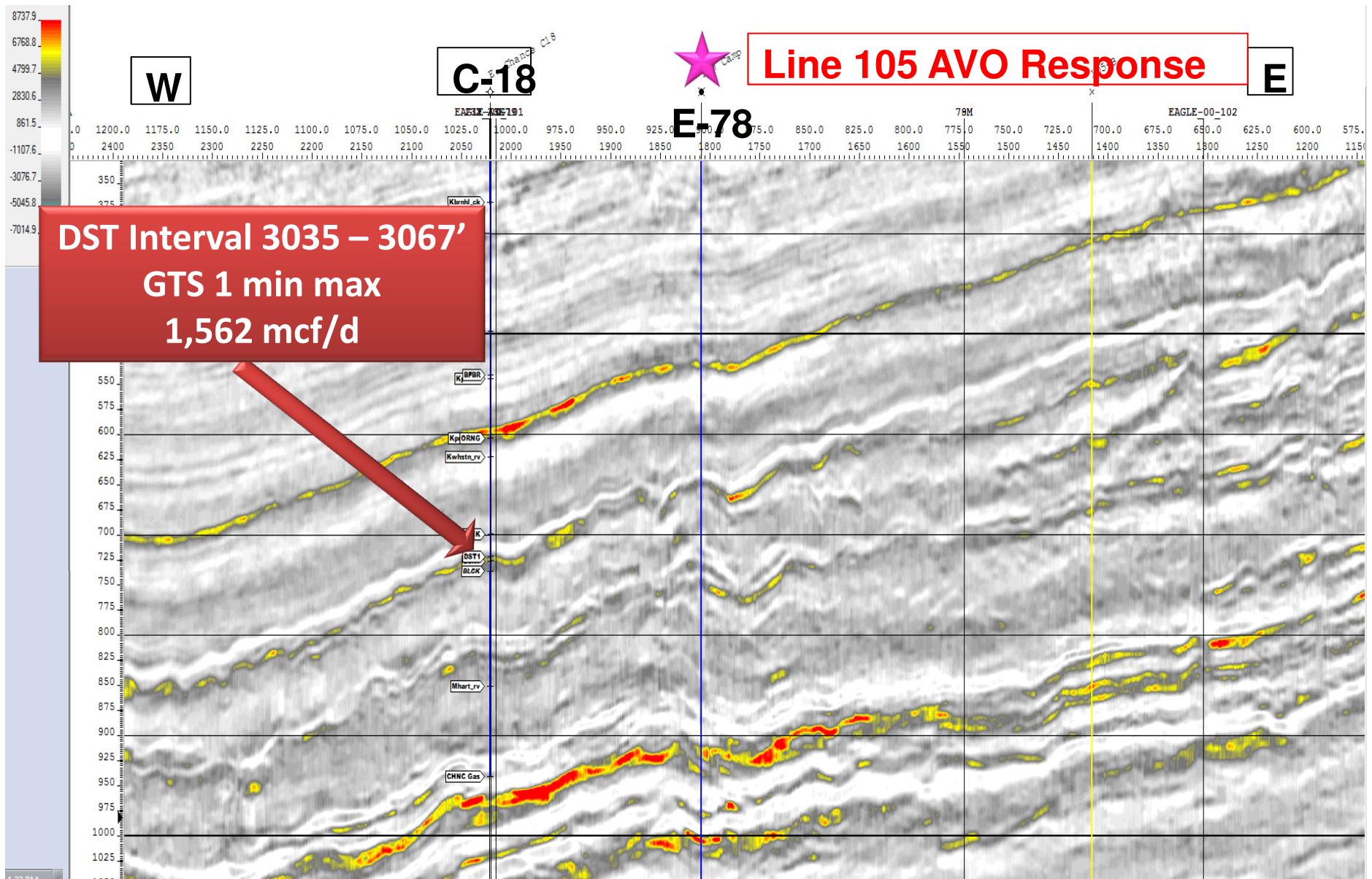
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# Camp Well: N-S Line 101 Through C-18 with AVO

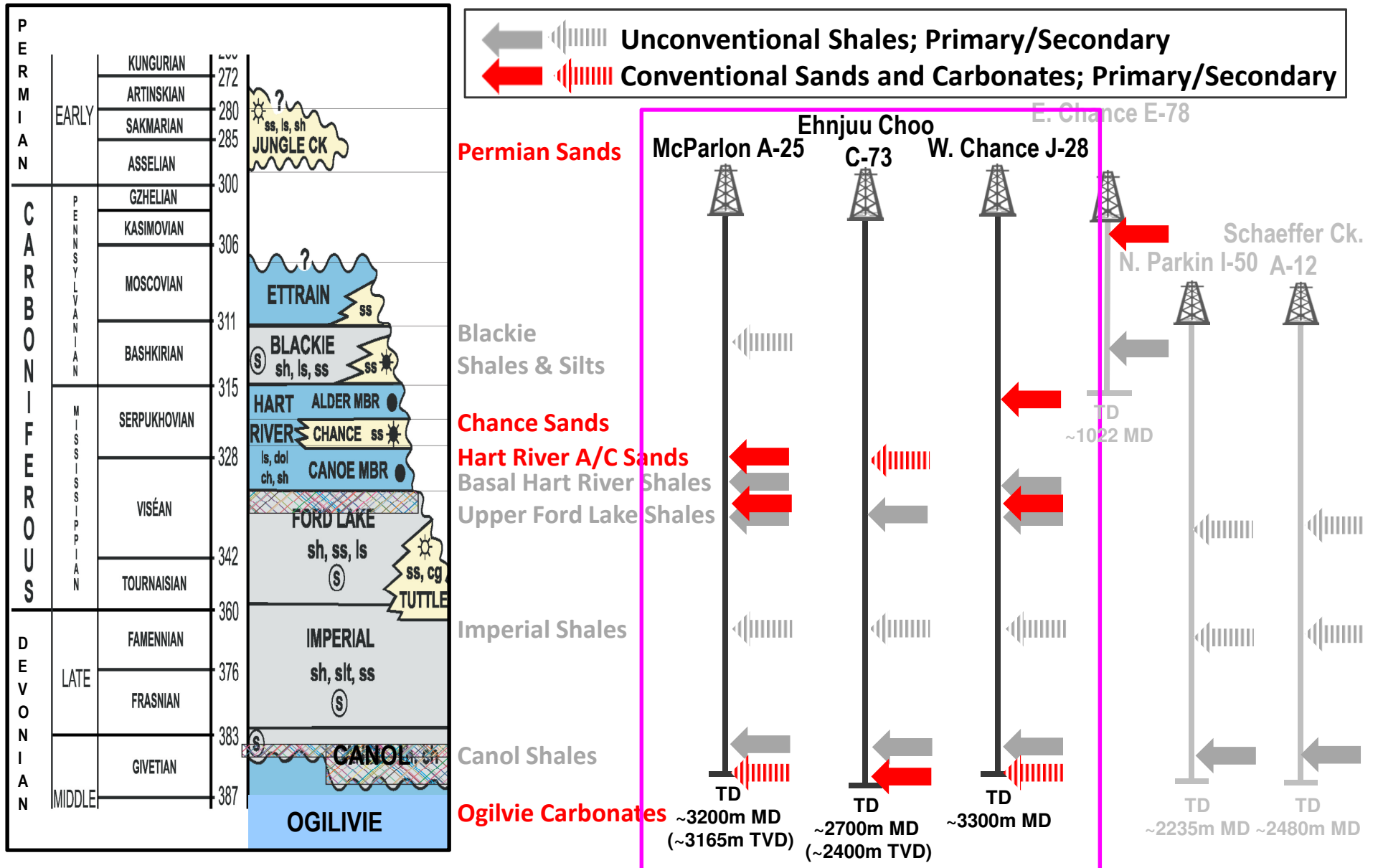


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# Camp Well: W-E Line 105 Through C-18 & E-78 with AVO



# Southern Wells: Objective Horizons



**New Data/Materials:**

NEW Pan American Seismic data + Reprocessed Chevron Seismic data + Seisware Workstation

**= NEW Depth Interpretation**

<u>Fm.</u>	<u>Well</u>	<u>Previous (TVD)*</u>	<u>Current (TVD)**</u>	<u>Difference</u>
Ogilvie	A-25	3645m	3062m	582m – 16%
Ogilvie	C-73	2755m	2286m	469m – 17%
Ogilvie	J-28	4063m	3200m	863m – 21%

\* **Previous Method:** Seismic Stacking Velocities.

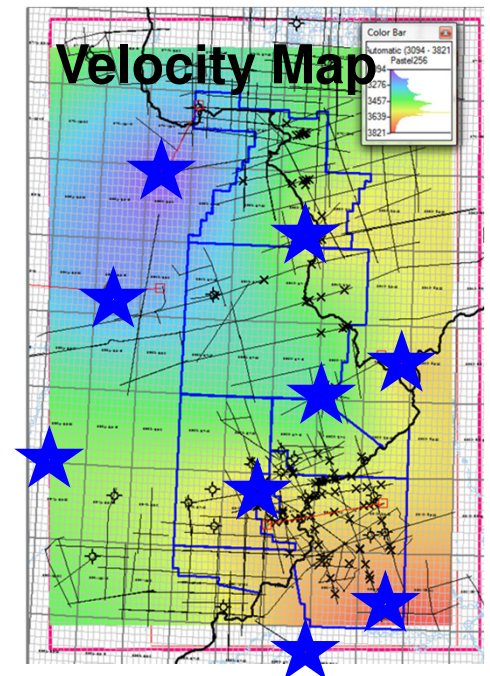
- Eagle Data set only (7 lines)
- No Ogilvie Well ties

\*\* **Current Method:** Regional Mapping : Time / Velocity / Depth  
 "Average Velocity to Ogilvie" derived from 8 +1 Ogilvie well ties



Issues: Sparse Sampling/Control points (seismic + wells)

- Lateral velocity changes i.e. stratigraphic, lithologic....
- Stress Anisotropy



**Northern Wells:  
Schaeffer Ck. A-12 & N. Parkin I-50**

# Northern Locations (Group 4 and 5) Selection Criteria

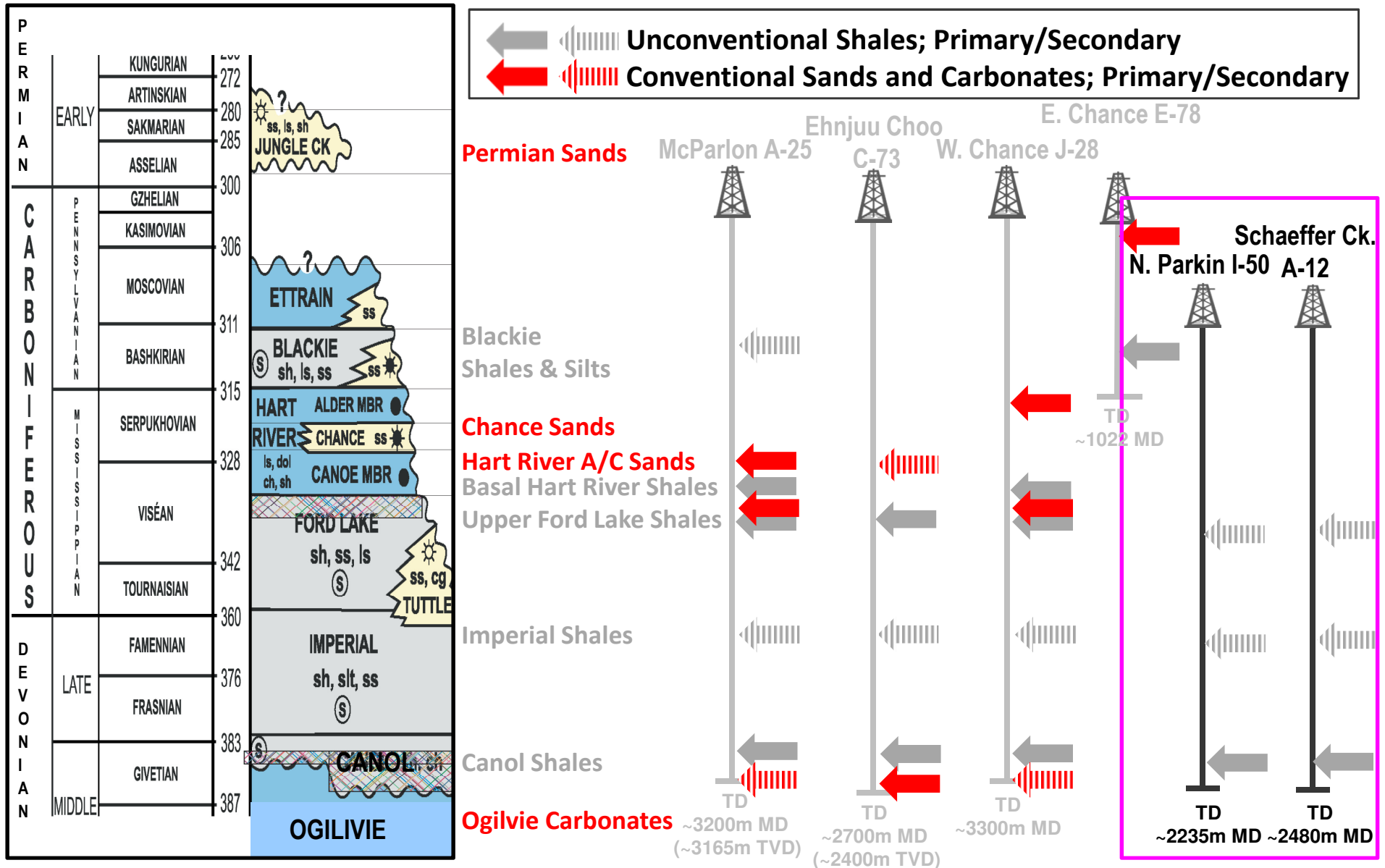
## Logistical Considerations:

- Grouping granted on shale gas/oil potential
- One Location in each Group (4 and 5)
- Drill Timing and cost considerations: Depth to Ogilvie: < 2500m
- Proximity to Old Crow Road

## Technical Considerations:

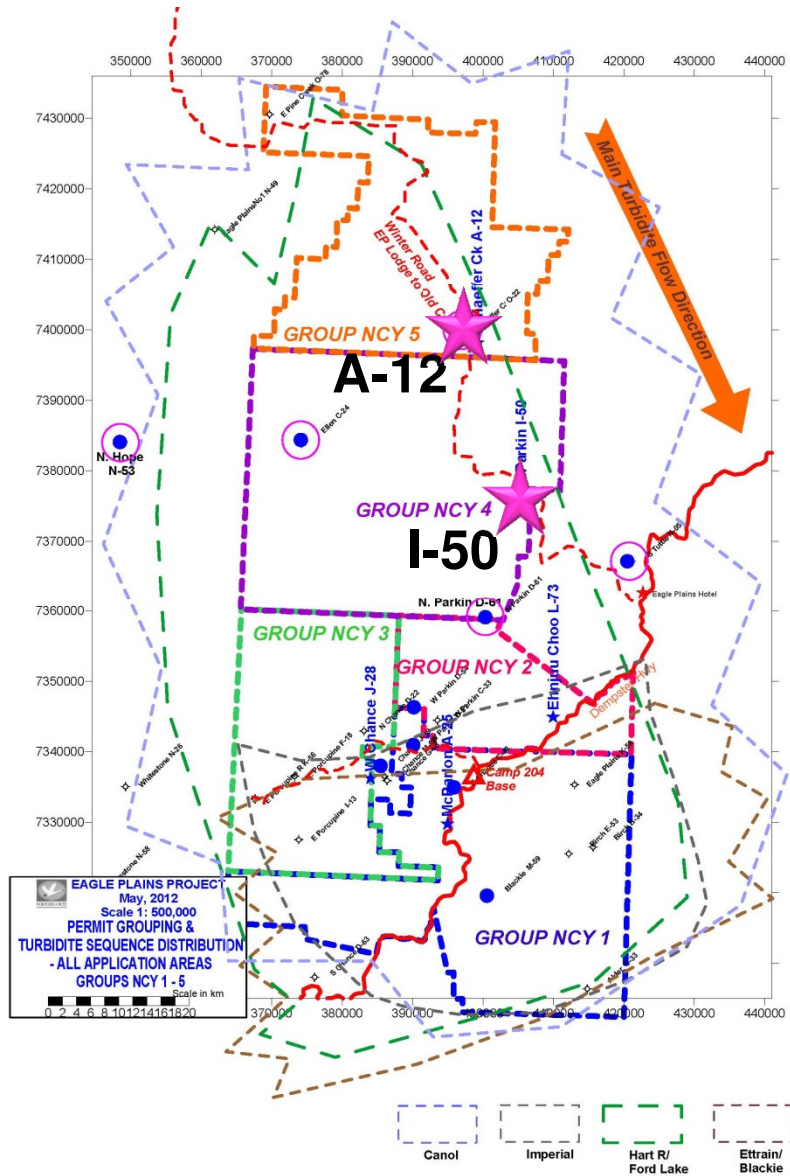
- Shale Maturity
- Primary Objective: Canol Shale
- Canol Facies Thickness/Stratigraphy
- Well distribution/sampling for resource assignment
- Fault leakage – pressure preservation
- Windward side of Ogilvie carbonate platform

# Northern Wells: Objective Horizons

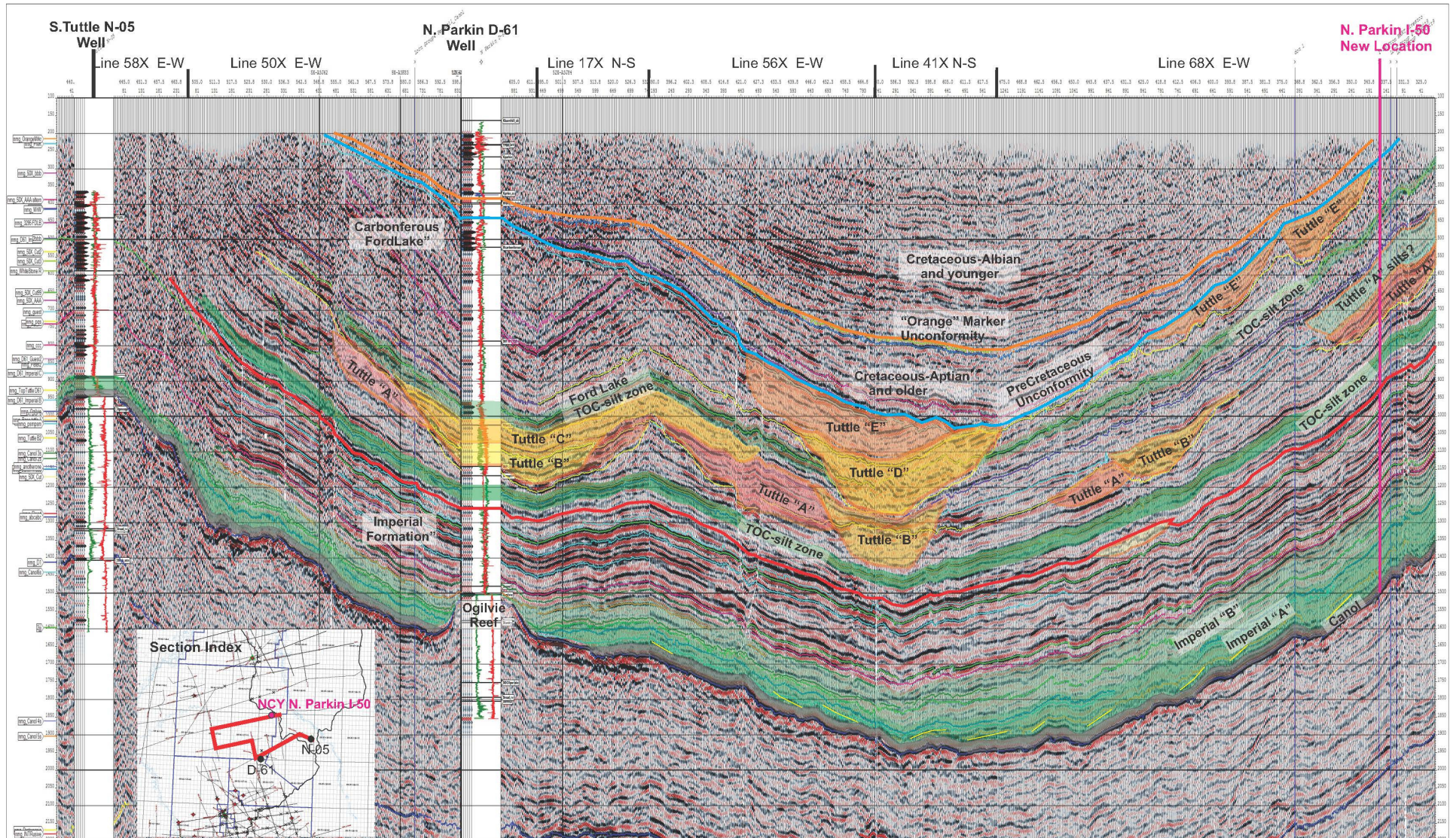


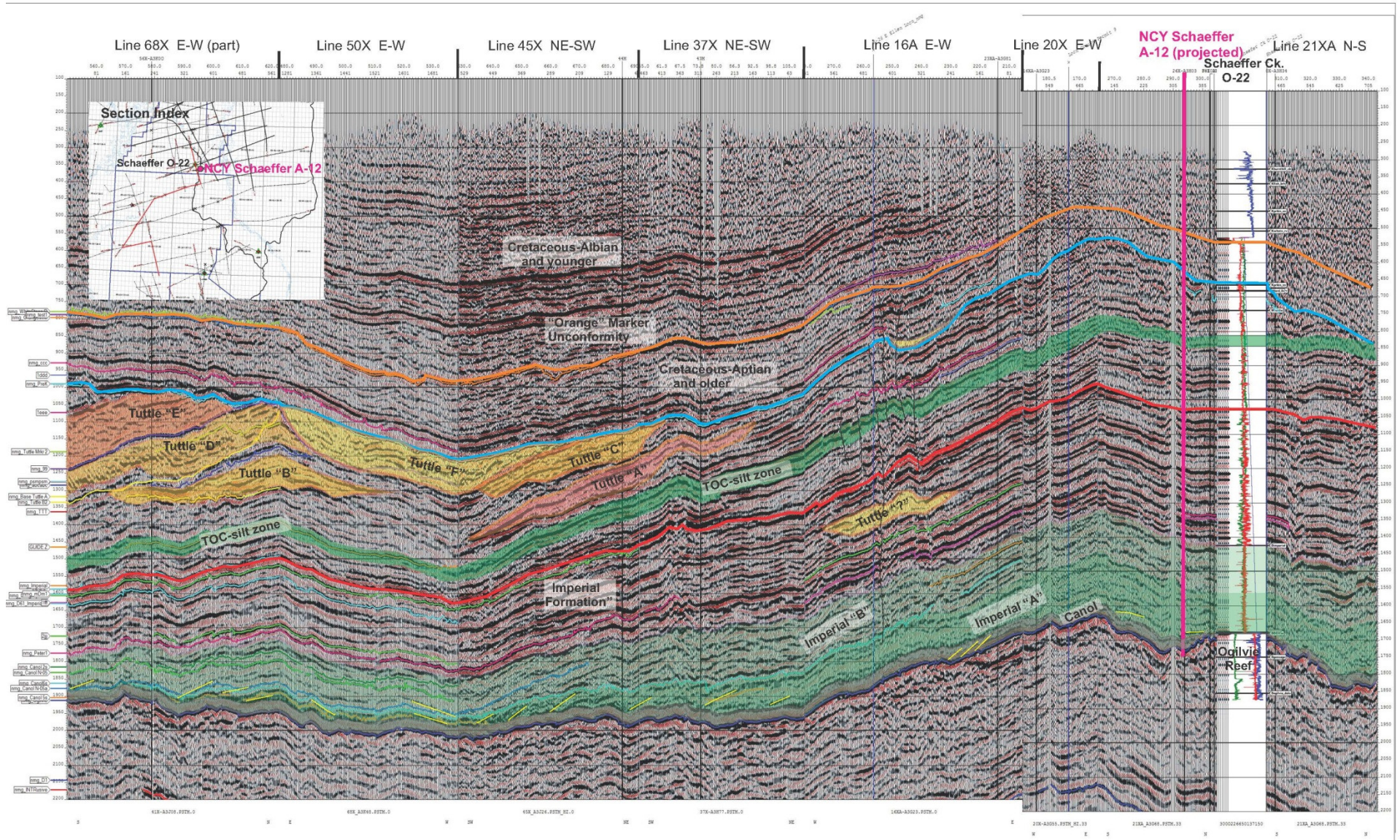
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## Prospect Types Review: Shale Gas Potential



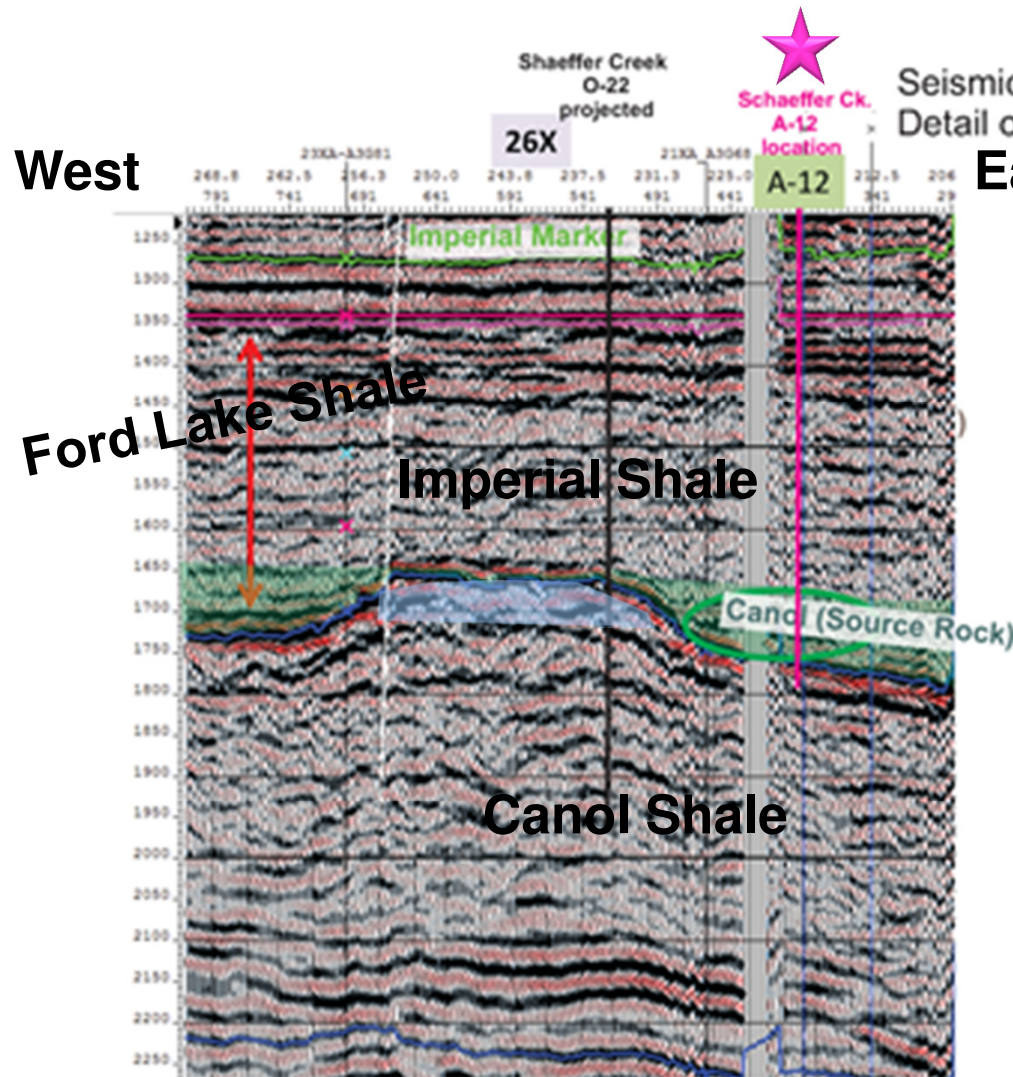
- 5 Regionally distributed gas/oil shales to evaluate:
  - Carboniferous (3): Blackie, Hart River, Ford Lake
  - Devonian (2): Canol, Imperial
- Estimated 200+ TCF potential gas in place
- Define future priorities and completion techniques





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# Shaeffer Ck. A-12 Objectives



**Index Map** shows southward thinning of Imperial-Ogilvie Interval, suggesting southerly onlap of the TOC-rich basal Canol facies (red dashed arrow & line)

**Seismic Section** shows onlap of Canol source rocks around the late Ogilvie reef mass tested by the Schaeffer Creek O-22 well. The section is flattened on the Imperial Marker, revealing the near-reef Canol zone objective of the proposed A-12 well. In this setting, it is likely that reef detritus may enhance the local TOC and brittleness of the Canol.