

SFD Case Example: Cretaceous Fluvial Plays, Western Canada (Stratigraphic Trapping)

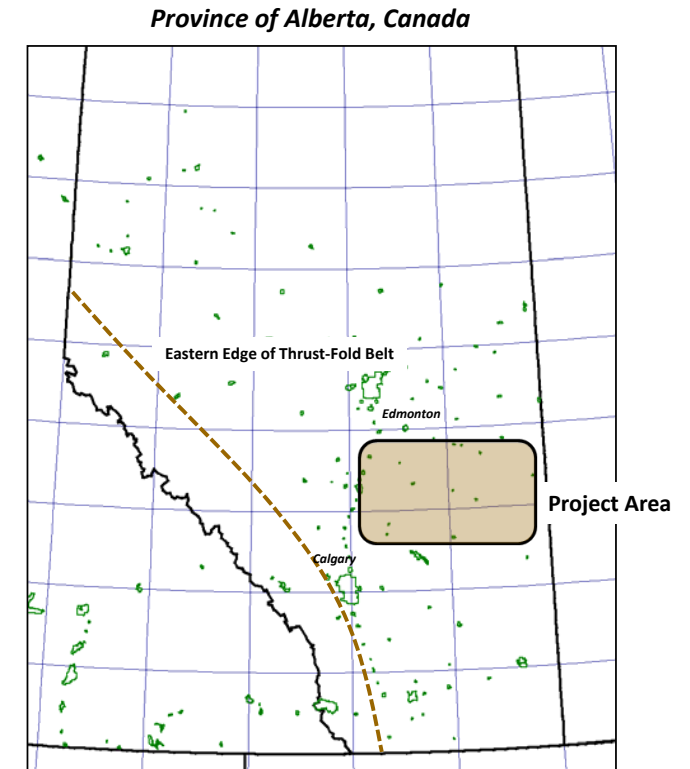
Lower Cretaceous Fluvial channel system of the Mannville Group is one of the most prolific hydrocarbon bearing strata in the province of Alberta. The individual pools can range from 1 MMbbl to 300 MMbbl of oil and associated gas.

NXT has conducted various test surveys in the area to resolve the detection resolution of the SFD survey system. These fields were used as template for surveys conducted in similar geological setting.

From numerous SFD surveys acquired in the area, three flight lines will be used for the scope of this presentation.

Reference:

Sherwin, M.D., 2001; CSPG Abstract: Mannville Paleogeography and depositional trends in the Glauconitic Formation, Southern and Central Alberta



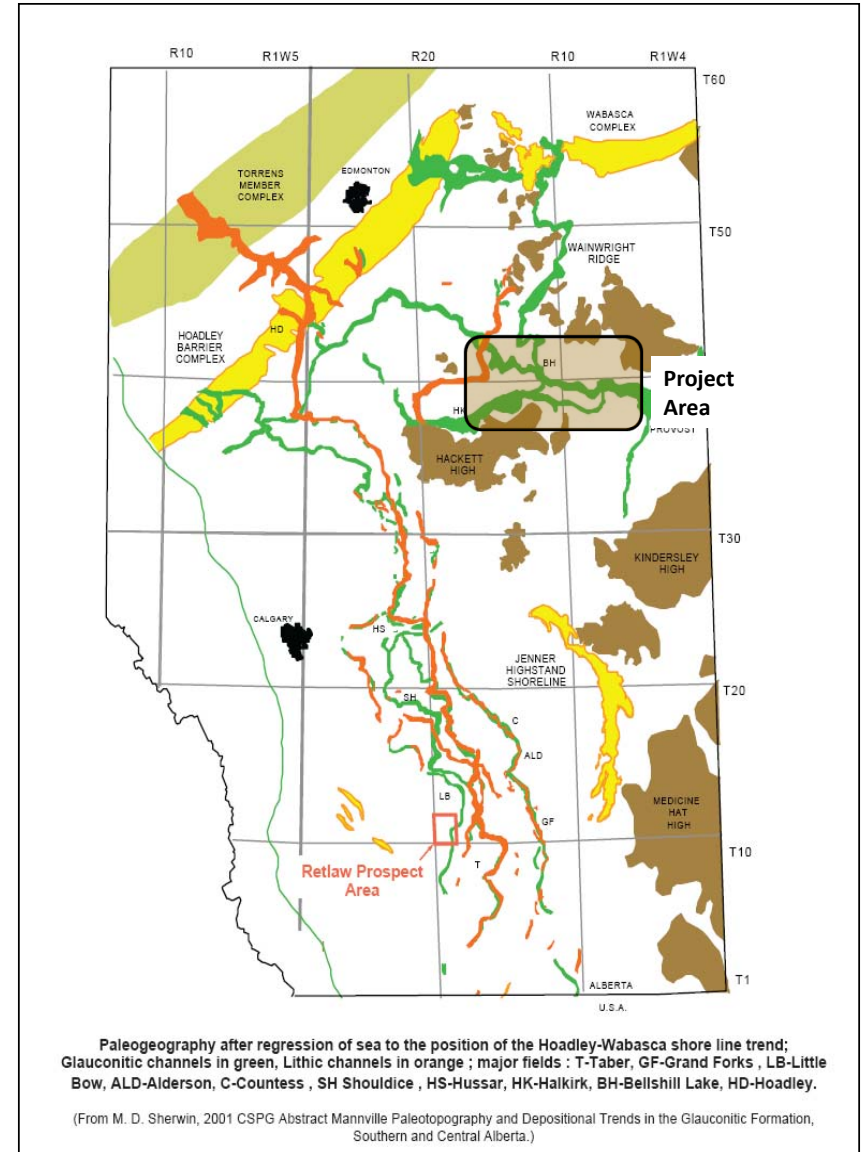
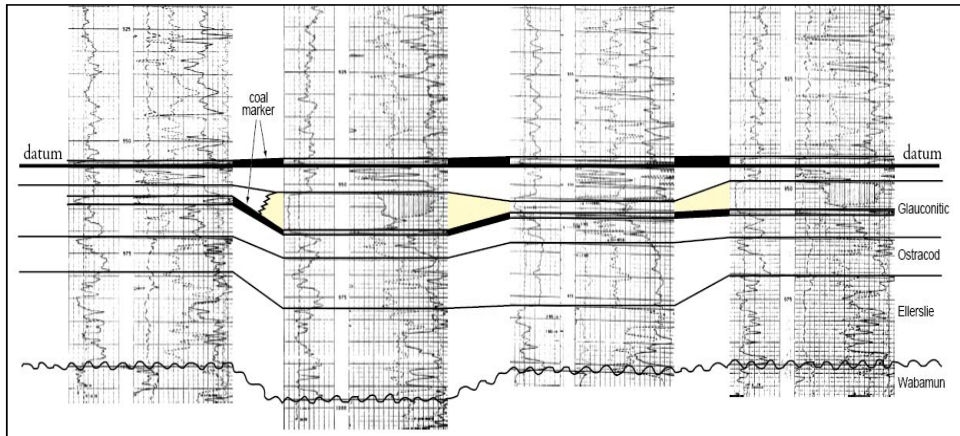
NXT Energy Solutions Inc.

SFD Case Example - Western Canada Cretaceous Fluvial Plays

Geological Setting

- The map shows the producing fluvial systems of Lower Cretaceous Mannville Formation. In Western Canada Sedimentary Basin (WCSB) Mannville Formation contains multiple stacked sand and shale channels which create quite a complex trapping system.
- Individual channel sands of Ellerslie, Sunburst, Ostracod, Blairmore and Glauconitic, have differential compaction and are cut by subsequent shale filled channels hence creating complex traps.
- There are more than 400,000 wells drilled in Alberta province alone. This extremely rich geological information provides a very clear model of the subsurface to test the SFD technology

Example Well Log Cross-section through Mannville

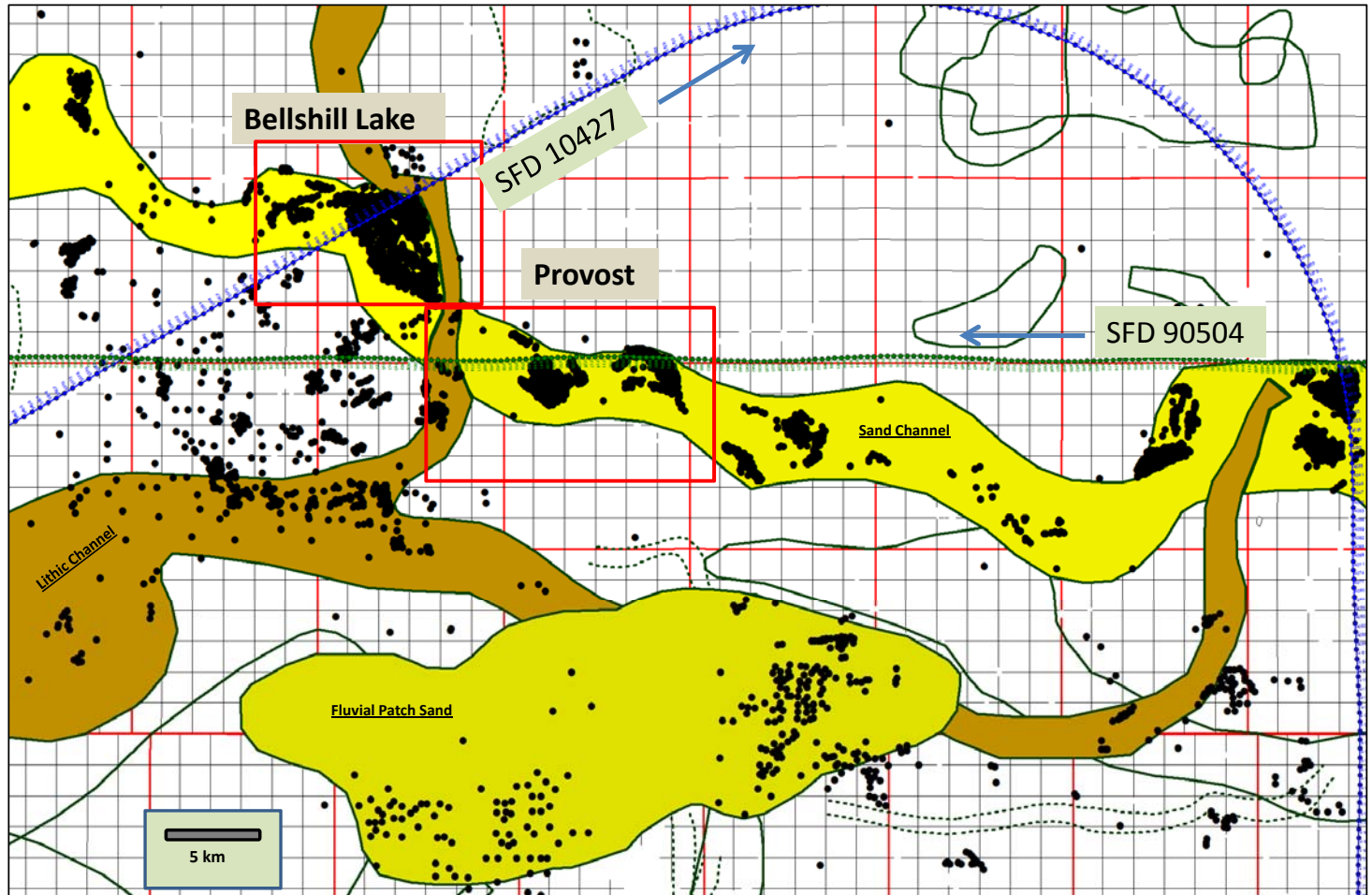


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Lower Cretaceous Fluvial System – South Central Alberta

South Central Alberta

- Two fields were chosen in this area to evaluate the SFD surveys.
- SFD 10427 (Blue) and SFD 90504 (Green) were acquired in South Central Alberta.



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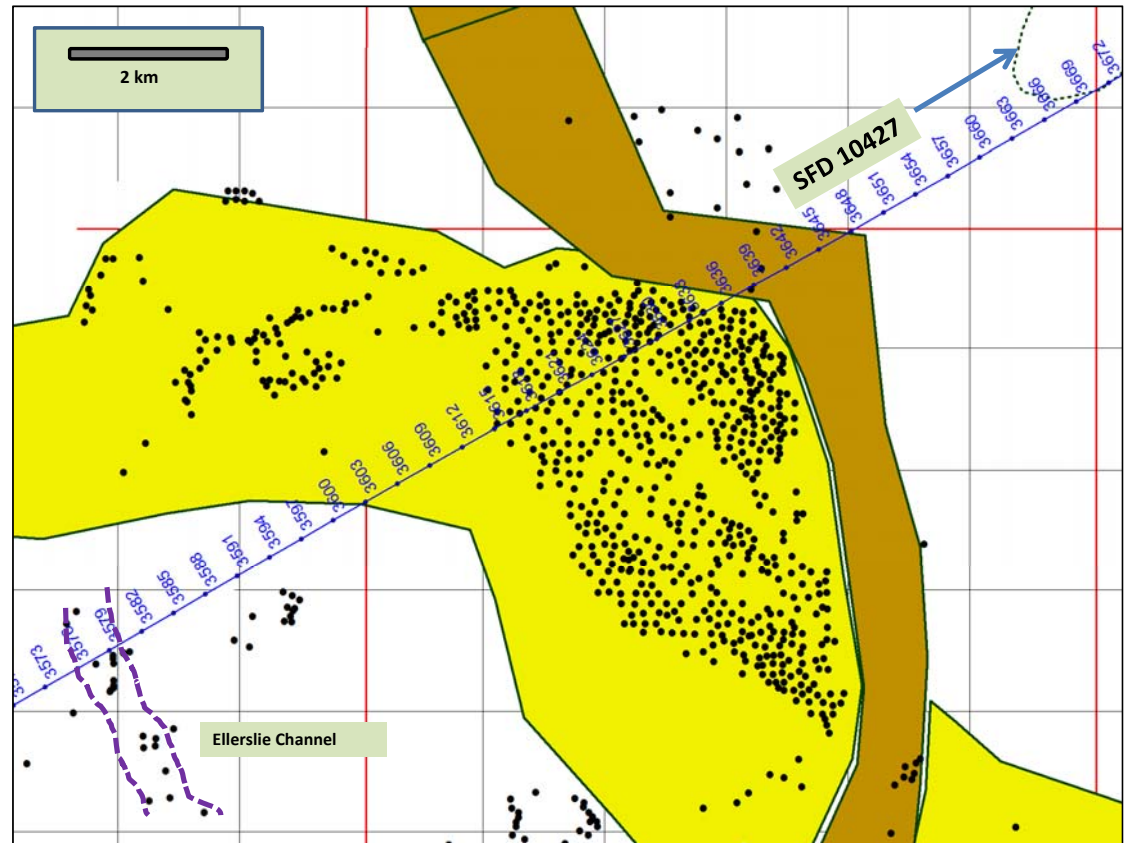
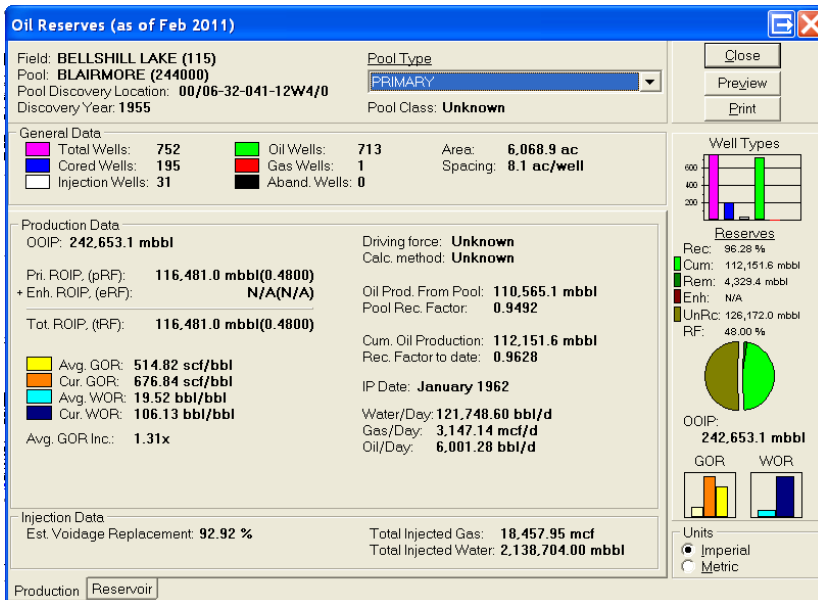
Bellshill Lake Field - Blairmore A Pool

Surface Area : 24.5 sq km
 Pool Reserves : 242.6 Million Barrels
 Net Pay : 8.45 meters
 Oil API : 27.1

Killam Field - Ellerslie UU Pool

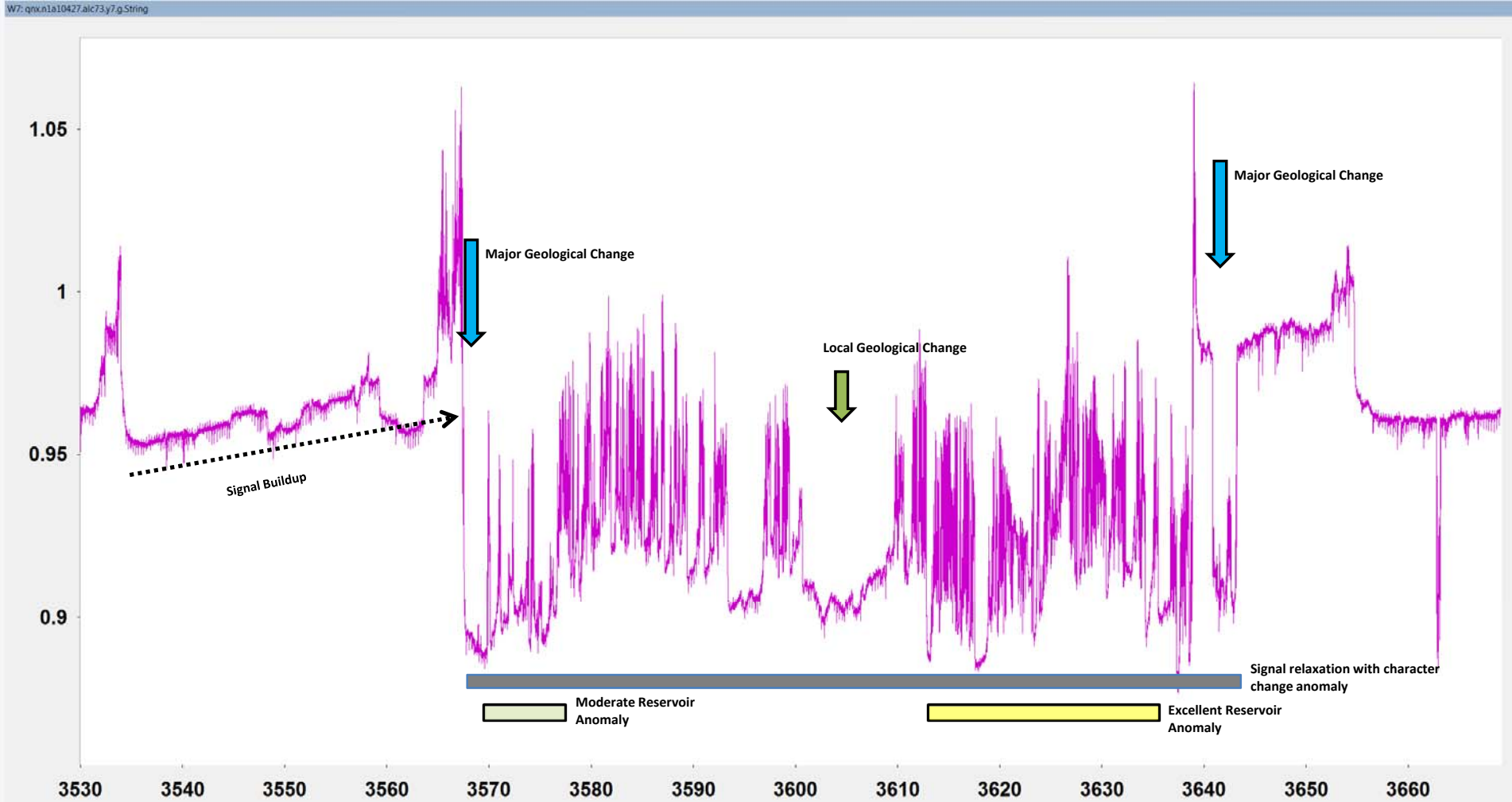
Surface Area : 1.5 sq km
 Pool Reserves : 4.7 Million Barrels
 Net Pay : 2.25 meters
 Oil API : 24.3

Bellshill Lake Field & Killam Field



SFD Case Example - Western Canada
Cretaceous Fluvial Plays

SFD 10427 Bellshill Lake & Killam Fields

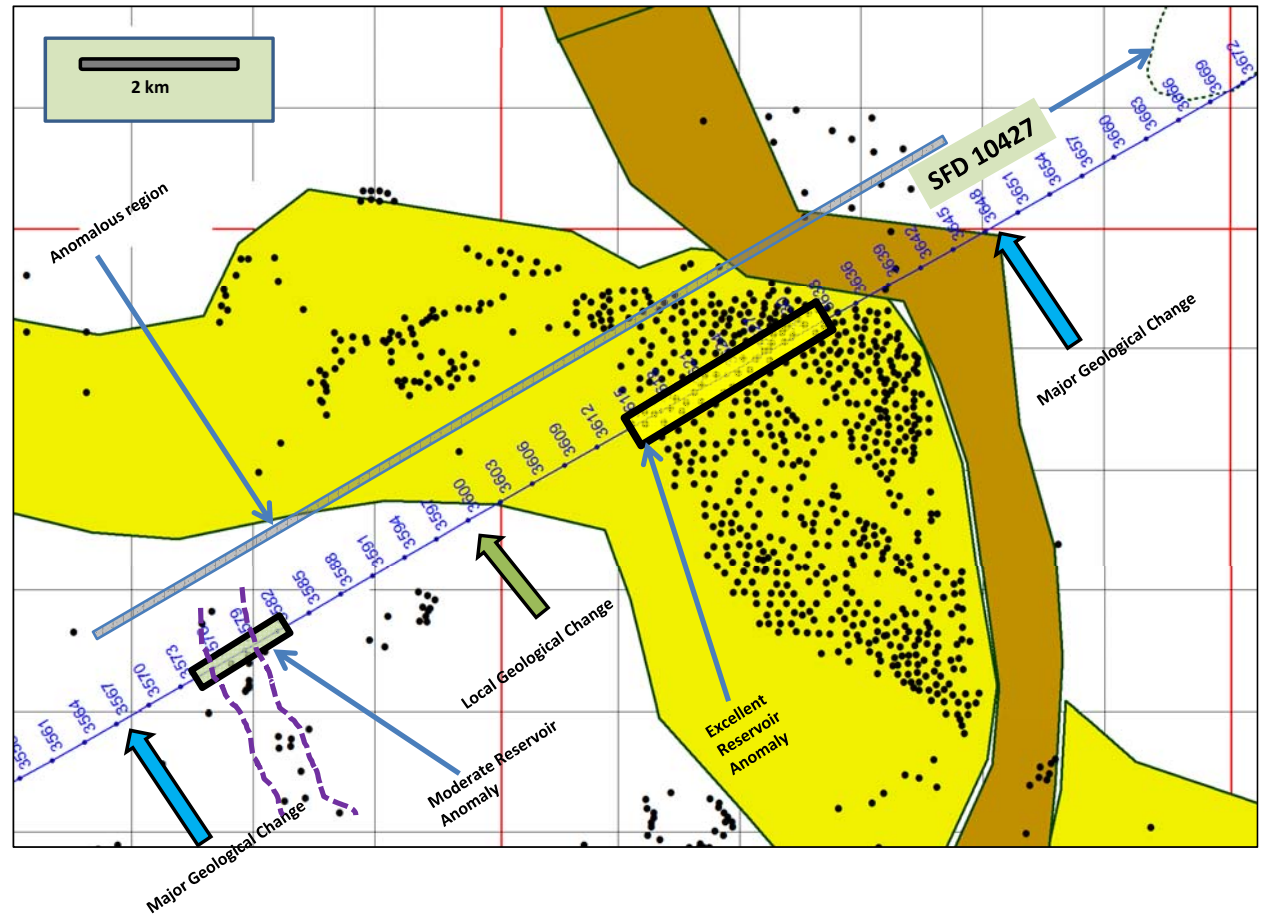


SFD Case Example - Western Canada Cretaceous Fluvial Plays

Summary

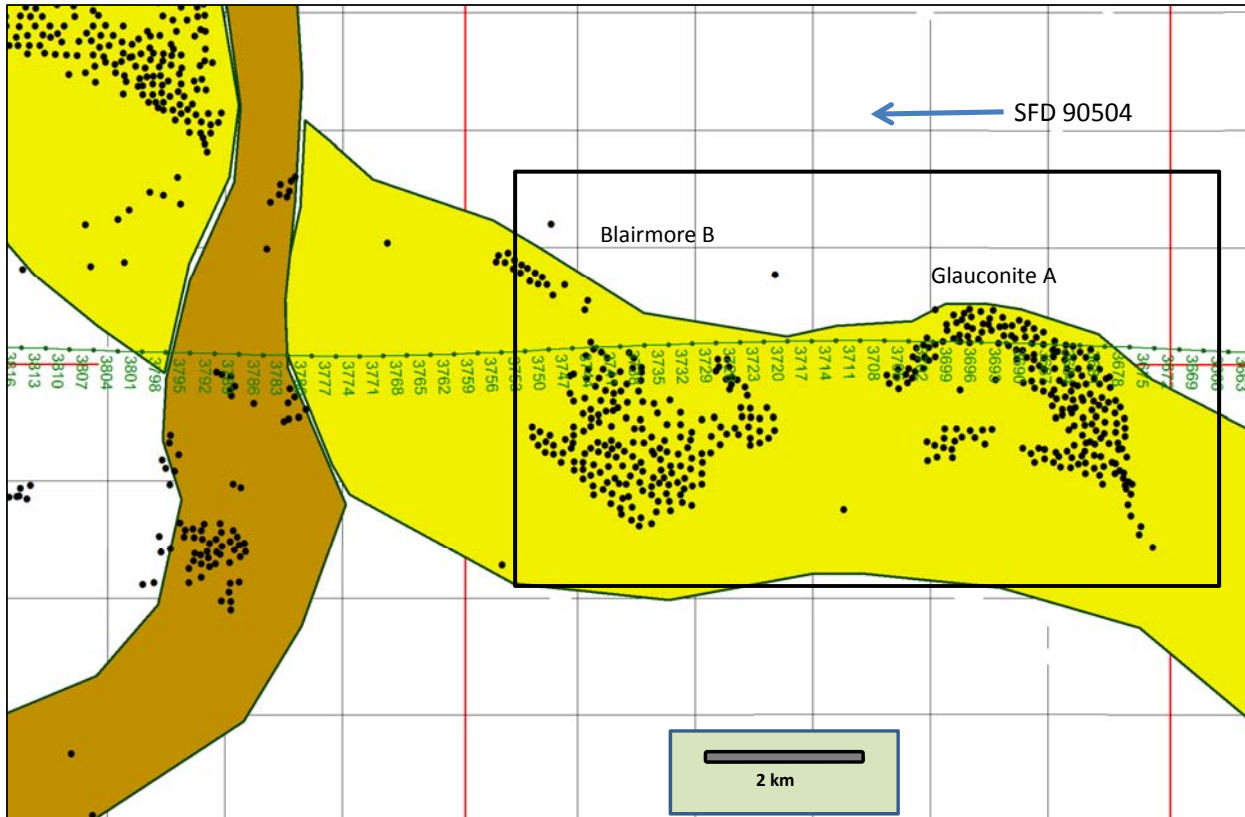
- SFD flight 10427 detected an excellent reservoir anomaly over the main Blairmore A pool.
- SFD flight 10427 detected a moderate reservoir anomaly over the smaller Ellerslie channel.
- SFD showed an anomalous region starting with a major geological change at 3567 seconds and finishing with a major geological change at 3648 seconds.

Bellshill Lake Field – Blairmore A Pool Killam Field – Ellerslie UU Pool



SFD Case Example - Western Canada
Cretaceous Fluvial Plays

Provost Field



Provost - Glauconite A Pool

Surface Area : 5 sq km
Pool Reserves : 46.6 Million Barrels
Net Pay : 6.87 meters
Oil API : 24.3

Provost - Blairmore B Pool

Surface Area : 7 sq km
Pool Reserves : 37.8 Million Barrels
Net Pay : 4.24 meters
Oil API : 27.1

Oil Reserves (as of Feb 2011)

Field: **PROVOST (750)**
Pool: **GLAUCONITE A (300001)**
Pool Discovery Location: **00/15-34-040-11W4/0**
Discovery Year: **1991**

Pool Type: **PRIMARY**
Pool Class: **Unknown**

General Data
 Total Wells: 239
 Cored Wells: 0
 Injection Wells: 0
 Oil Wells: 217
 Gas Wells: 1
 Aband. Wells: 0
 Area: 1,220.7 ac
 Spacing: 5.1 ac/well

Production Data
 OOIP: **46,560.9 mbbbl**
 Pri. ROIP (pRF): **24,208.7 mbbbl(0.5200)**
 Enh. ROIP (eRF): **N/A(N/A)**
 Tot. ROIP (tRF): **24,208.7 mbbbl(0.5200)**
 Avg. GOR: **268.14 scf/bbl**
 Cur. GOR: **2,194.19 scf/bbl**
 Avg. WOR: **39.37 bbl/bbl**
 Cur. WOR: **220.76 bbl/bbl**
 Avg. GOR Inc.: **8.18x**

Driving force: **Unknown**
 Calc. method: **Unknown**
 Oil Prod. From Pool: **23,568.1 mbbbl**
 Pool Rec. Factor: **0.9735**
 Cum. Oil Production: **23,770.8 mbbbl**
 Rec. Factor to date: **0.9819**
 IP Date: **September 1991**
 Water/Day: **133,726.40 bbl/d**
 Gas/Day: **895.08 mcf/d**
 Oil/Day: **3,338.13 bbl/d**

Injection Data
 Est. Voidage Replacement: **77.59 %**
 Total Injected Gas: **0.00 mcf**
 Total Injected Water: **744,536.30 mbbbl**

Well Types
 Reserves
 Rec: 98.19 %
 Cum: 23,770.8 mbbbl
 Rem: 437.8 mbbbl
 Enh: N/A
 UnRc: 22,352.3 mbbbl
 RF: 62.00 %

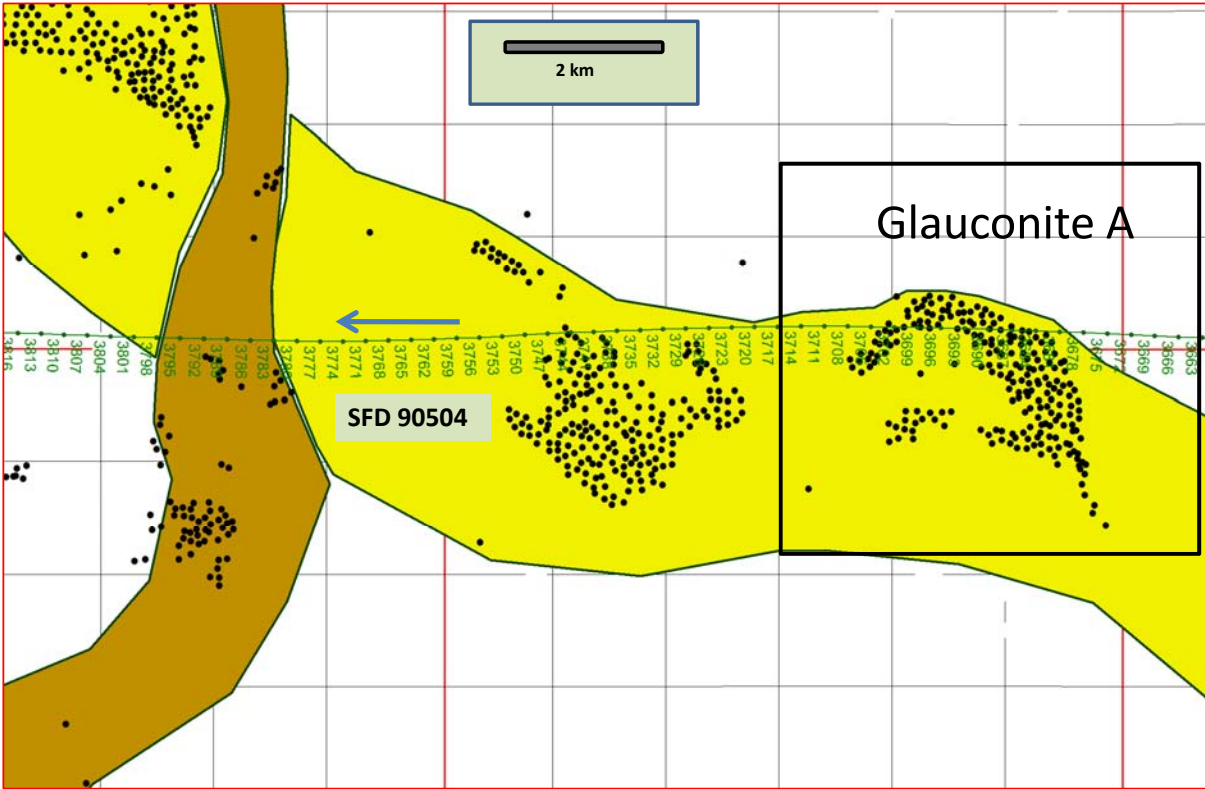
OOIP: **46,560.9 mbbbl**
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Units
 Imperial
 Metric

Production Reservoir

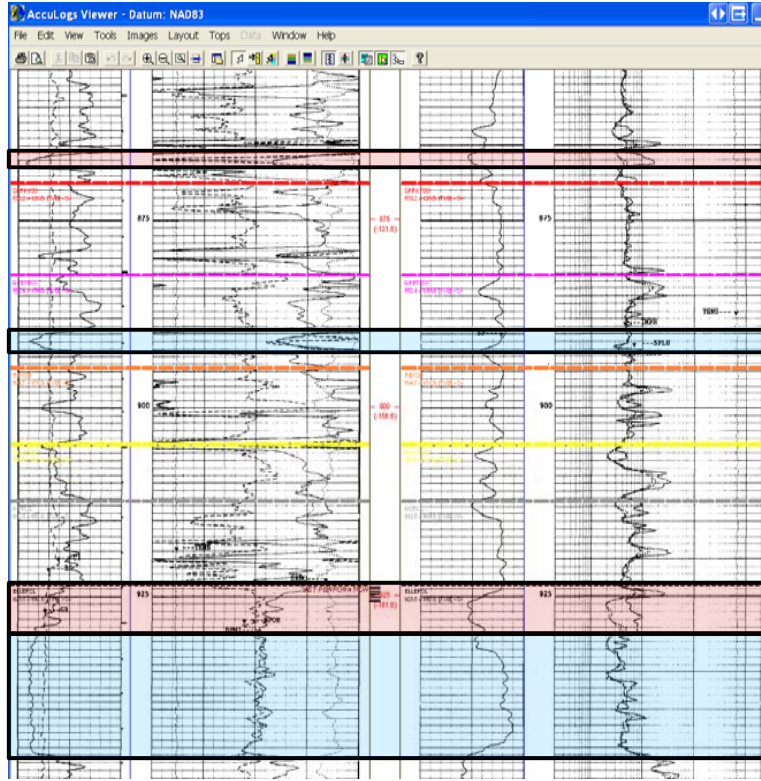
Provost Field – Glauconite A Pool

Lower Cretaceous is inter-layered sand and shale mostly containing fluvial channels. The shale-filled channels provide vertical seal and shaly zones laterally stop the oil flow.



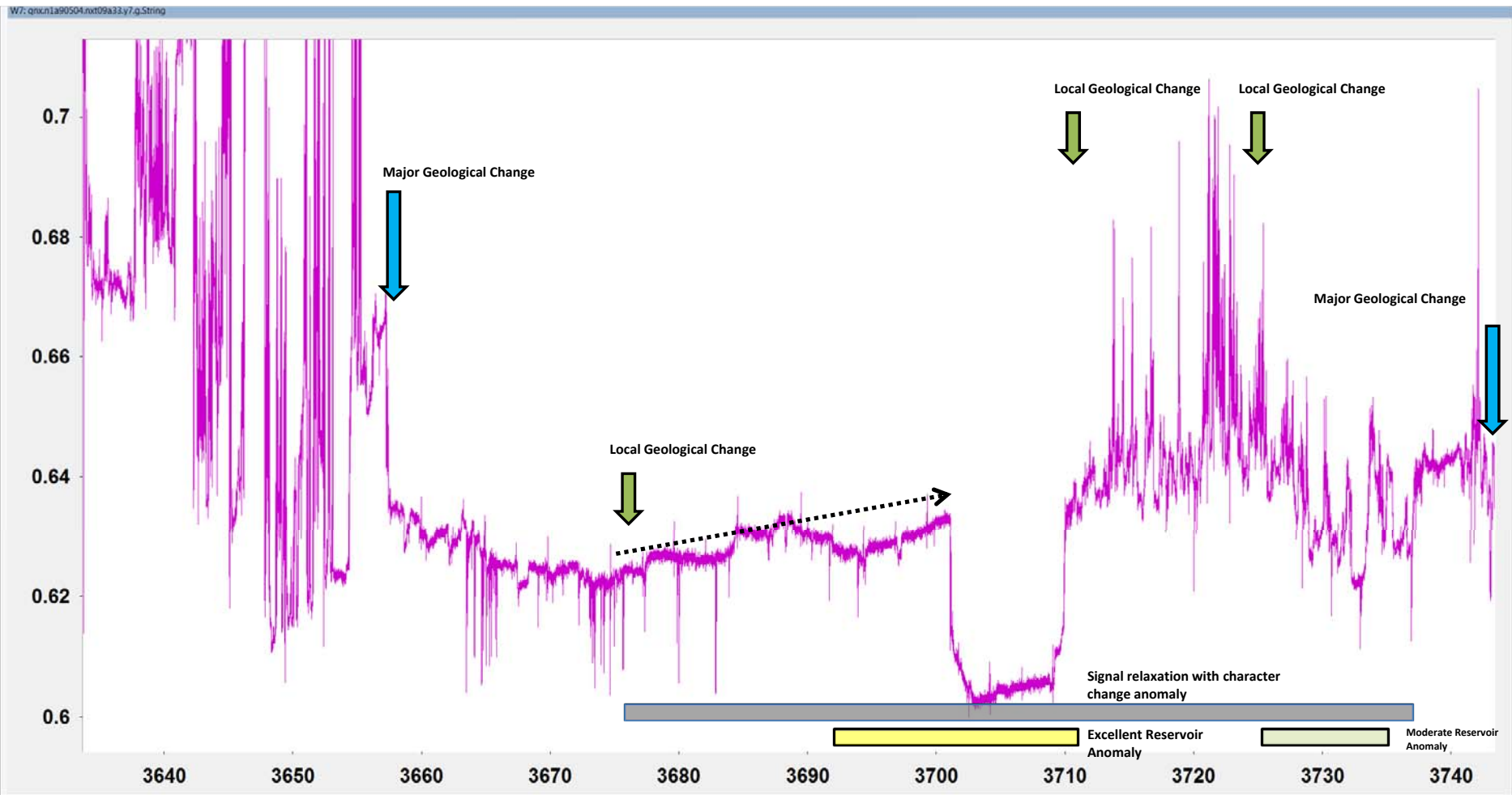
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Type well of Glauconitic A Pool

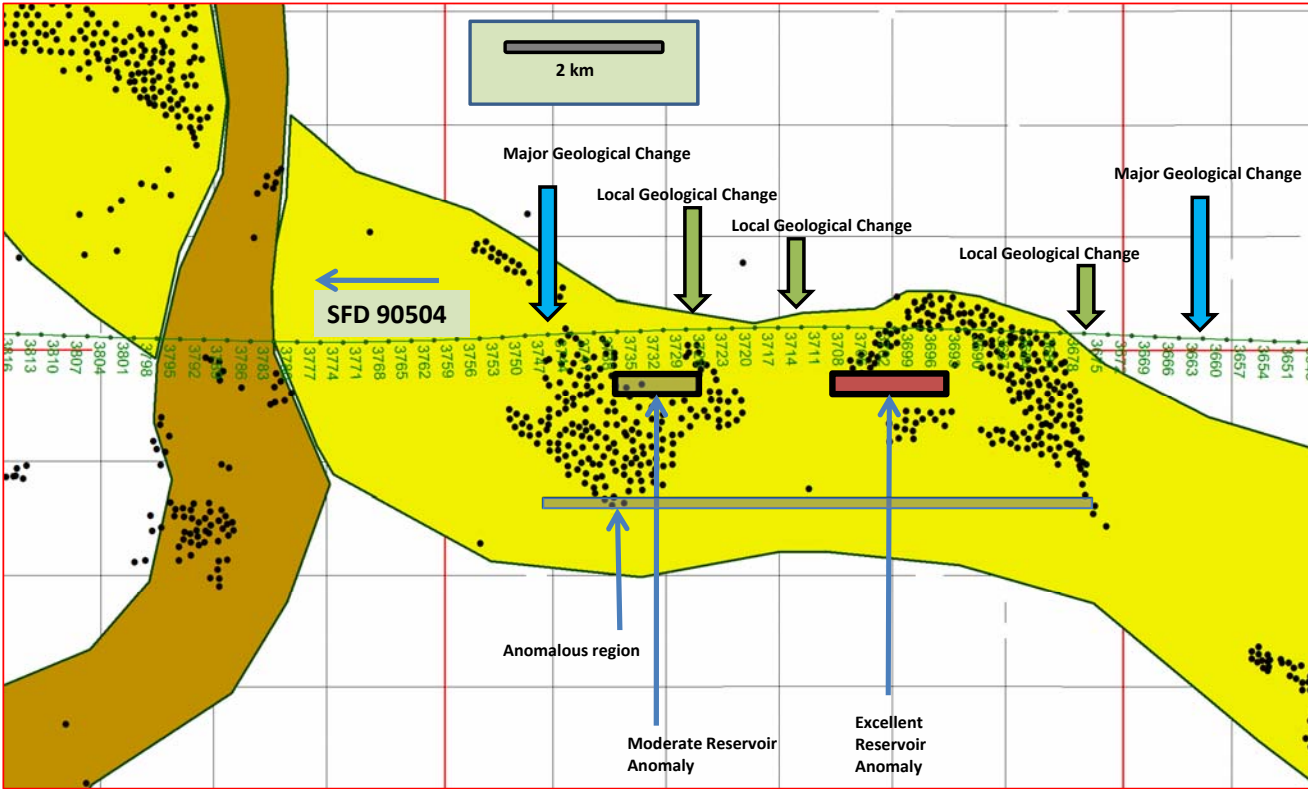


SFD Case Example - Western Canada
Cretaceous Fluvial Plays

SFD 90504 Provost Field



Provost Field – Blairmore B Pool & Glauconite A Pool



Summary

- SFD flight 90504 detected an excellent reservoir anomaly over the main Glauconite A pool as expected because the flight passes right over the center of this pool.
- SFD flight 90504 detected a moderate reservoir anomaly over the Blairmore B pool. Note that the flight line only side swipes the northern edge of the pool.
- SFD showed an anomalous region starting with a major geological change at 3660 seconds and finishing with a major geological change at 3747 seconds.

SFD Case Example - Western Canada
Cretaceous Fluvial Plays

Summary & Conclusions

1. Fluvial channel systems contain vast amount of trapped oil in various play types. SFD anomalies coincided with the plays quite accurately.
2. The porous channel sands with trapped fluids show a typical voltage-drop and U-shaped signal relaxation anomaly.
3. Four pools were studied varying spatially from 2 to 5 km along the flight line with pool areas of 5 sq km to 25 sq km. SFD signals show quite precise detection of the pools

The Cretaceous Fluvial plays template survey provides excellent SFD reference signals, which incorporate clear reservoir anomalies coupled with adjacent dense signal/frequency anomalies, plus good detection and spatial resolution of associated channel system