DUVERNAY SHALE

The New Millennium Gold Rush

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A&D Advisory

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*Well counts and Crown land-sale results are accurate to June 6th, 2012
Why the Duvernay?

- The Duvernay Shales have been credited as the source rock for many of the large Devonian oil and gas pools in Alberta, including the most famous - The Leduc Field discovered in 1947.

- With the successful development of unconventional shale reservoirs elsewhere in North America, attention has shifted to the Duvernay Shales in Alberta.

- In central Alberta, the Duvernay Shale Basin spans approximately 50,000 square miles, with an estimated 7,500 square miles within the thermally mature or “wet” gas window.

- The Duvernay compares favorably to other North American Shale plays, showing good porosity, overall thickness, organic content and is overpressured - all of which are key to a successful play.

- To date an estimated $4.2B has been spent on the play.
The Duvernay was deposited in a broad marine setting as a basin-filling shale, surrounded by and coeval with the Leduc reef build-ups.

At maximum sea-level transgression, rapid basin-filling resulted in enormous quantities of organic sediment being dumped in the deep, oxygen-starved basin. These are the Duvernay source rocks where total organic carbon (TOC) is as high as 20%.

Duvernay proximal to Leduc reefs will contain skeletal debris, which increases overall thickness and enhances the porosity and permeability.
What is special about the Duvernay Shale?

- **Lithology** – fine-grained and silica (quartz) rich. Fine-grained rocks have increased total surface area which equates to higher adsorbed gas component in organic-rich rocks. Silica-rich rocks are more brittle allowing for more effective fracture treatments.

- **Reservoir thickness** – required for storage and ultimate economics of the play.

- **TOC** – total organic carbon – measures the organic matter (hydrocarbon source material) that was preserved in the rock. The amount of adsorbed gas is related to the organic material.

- **Effective Porosity** – pore space required for storage of hydrocarbons once generated from the organic material contained in the rock.

- **Pressure Gradient** – overpressured reservoirs allow for increased storage and will also impact deliverability positively.

- **Areal Extent** – successful shale resource plays demand a large footprint for development leading ultimately to large resource in place numbers.

### Attributes of a Successful Shale Play

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Desired</th>
<th>Duvernay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithology</td>
<td>fine grained</td>
<td>✓</td>
</tr>
<tr>
<td>Thickness</td>
<td>&gt;40 m</td>
<td>10-70</td>
</tr>
<tr>
<td>TOC</td>
<td>&gt;1%</td>
<td>1-20</td>
</tr>
<tr>
<td>Effective Porosity</td>
<td>&gt;2.5%</td>
<td>3-15</td>
</tr>
<tr>
<td>Pressure Gradient</td>
<td>&gt;0.5 psi/ft</td>
<td>0.68-0.81</td>
</tr>
<tr>
<td>Mud Log</td>
<td>evidence of gas</td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: BMO Capital Markets, Marc Bustin 2010

- **Liquid content** – liquid content adds to well economics and overall viability of gas resource plays.
The approximate oil and gas edges are derived from thermal maturity isotherms based on vitrinite reflectance and equivalent data.

Not surprisingly, Duvernay locations are concentrated in the “wet” gas window, where operators are having success producing liquid-rich gas from horizontal wells with multi-stage fracture completions.

West of the $R_o$ line of 1.8% we would expect the gas to be drier, eventually losing all liquid content.

We estimate the liquid-rich gas window to be approximately 7,500 square miles and could contain as much as 750 Tcf of gas.

Activity continues with an additional 16 new licenses since our early March 2012 Drill Bits.
Areally Extensive and Thick – 50 m (avg) Interval Over 280 km from North to South

### Regional Stratigraphic Cross Section – 280 km of Duvernay from Kaybob to Pembina

<table>
<thead>
<tr>
<th>Location</th>
<th>Duvernay</th>
<th>Swan Hills</th>
<th>Pembina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celtic 15-33-060-20W5</td>
<td>3,270 m TVD</td>
<td>SwG SCS</td>
<td>3,100 m TVD</td>
</tr>
<tr>
<td>CNRL 01-03-052-17W5</td>
<td>3,715 m TVD</td>
<td>SwG SCS</td>
<td>3,100 m TVD</td>
</tr>
<tr>
<td>ConocoPhillips 02/11-16-044-07W5</td>
<td>3,100 m TVD</td>
<td>SwG SCS</td>
<td>3,100 m TVD</td>
</tr>
</tbody>
</table>

**Kaybob**
- 64 m thick
- 3,270 m TVD

**Edson**
- 35 m thick
- 3,715 m TVD

**Pembina**
- 60 m thick
- 3,100 m TVD

**Source:** GeoSCOUT, BMO Capital Markets
Vitrinite Reflectance Provides Boundaries for the Liquid Rich Fairway

- Where vitrinite isotherms are between 1.0 and 1.8, the Duvernay is within the wet gas window for hydrocarbon generation.
- These isotherms also bound the majority of the activity in the fairway, where liquid yields are high (75-150 bbl/MMcf) and include co-production of significant free condensate.
- All pressures taken to date confirm the fairway to be overpressured.
The Duvernay is Overpressured, Positively Impacting Deliverability and Storage

Pressure data reveals significant overpressuring in the Duvernay, a beneficial attribute to have in a permeability challenged, liquid-rich reservoir as it not only helps with deliverability but also increases storage.

- Vitrinite reflectance provides estimated boundaries for the liquid-rich gas window from $R_o=1.0$ to $R_o=1.8$
Land Rush Began in 2009 at Kaybob with an Estimated $1.8B Spent to Date

- Nine very large blocks were sold in Q4-2009 at $2,500+/ha (pink & red blocks indicated on map). All nine were purchased under broker name for a total of $323MM. Subsequently, Husky, Talisman and Encana have licensed or drilled wells into these leases.

- The first Duvernay horizontal in the area (Celtic 15-33-060-20W5) was rig-released in Q3-2010, which coincides with the next big land sale quarter. Much of the land sold in the last half of 2010 is north of the Wild River Sub-Basin, close to the successful Celtic well.

- The large purple lease in Township 061-20W5 is immediately north of Celtic’s well, this ~16 section block sold to broker in August 2010 for $42.3MM.

Source: Government of Alberta, GeoSCOUT, GeoEDGES, BMO Capital Markets
Kaybob – Tightly Held Land Base with Numerous Active Operators – 45 Wells Drilled or Drilling and 16 Licensed

- New Duvernay players trying to enter at Kaybob must either acquire or joint venture with existing operators to gain any footprint in the area. As a result activity around divestiture and joint ventures has accelerated.

- Activity since the first Celtic/Yoho/Trilogy well in 2010 has been brisk, with 45 wells (horizontal and vertical) either drilled or drilling and a further 16 licensed. For each operator, the histogram shows well counts in two ways, vertical & horizontal count, and well status count (license, drilling, rig-released, producing). Several operators are shown to be evaluating the play using vertical wells (blue) prior to drilling horizontally.

- Of note is the activity by large caps/international oil companies such as Shell, Chevron, Husky, Talisman and Encana. The two most active operators are Encana and Celtic. However recall Celtic is partnered with Yoho and Trilogy in approximately 30 sections of land.

Source: GeoSCOUT, Daily Oil Bulletin, BMO Capital Markets
Duvernay rights are very tightly held in the area, and a very large portion of the rights are held in broker name. This makes it problematic to determine true land positions without company disclosure (see appendices where company disclosures are discussed).

The Duvernay in the Kaybob area is predominantly within the thermal “gas-window” of hydrocarbon generation. Thermal maturation increases to the southwest, as does depth, and locations situated within the Wild River Sub-Basin may produce drier gas than at Kaybob proper. In this portion of the reservoir we see just two wells attempted to date by Talisman and Husky, and a recent horizontal drill by Encana.
Kaybob Drilling Results – an Estimated $430MM Spent to Date on Drilling – First Well Tested in the Oil Window

Current Activity Map and Drilling Results

Yoho/Celtic 100/14-16-062-21W5
CTD: 5.8 MMcf; 638 bbl Cnd (12/2011)
(110 bbl/MMcf)
Confidential Until Dec 8, 2012

Celtic/Yoho #4 102/13-22-062-21W5
Test Rate: 6.8 MMcf/d +
658 bbl/d Field Condensate
(109 bbl/MMcf)
Confidential Until Dec 8, 2012

AOC 102/07-18-064-17W5
650 boe/d on test (390 bbl oil and 1.5 MMcf/d gas)
RR 02/2012

Petrobakken 100/09-34-062-17W5
Flowing Oil
CTD: 550 bbl; 284 Mcf
(GOR 516 scf/bbl)
Confidential Until Oct 7, 2012

Celtic/Yoho/Trilogy #1 100/15-33-060-20W5
Initial Pressure: 58.0 MPa
CTD: 256 MMcf; 761 bbl Cnd (12/2011)
Test Rate: 2 MMcf/d +
104 bbl/d Field Condensate
(42 bbl/MMcf)
Confidential Until Nov 26, 2012

Celtic/Yoho/Trilogy #2 100/03-13-060-20W5
Initial Pressure: 56.4 MPa
CTD: 422 Mcf; 18 bbl Cnd (06/2011)
Test Rate: 5.2 MMcf/d +
1,350 bbl/d Field Condensate
(80 bbl/MMcf)
Confidential Until June 29, 2012

Celtic/Yoho/Trilogy #3 100/13-36-060-20W5
Initial Pressure: 58.0 MPa
CTD: 930-1,830 bbl/d Field Condensate
(92 bbl/MMcf)
Confidential Until Nov 26, 2012

Encana 102/11-08-062-24W5
CTD: 2.3 MMcf; 1,632 bbl Cnd (06/2011)
(709 bbl/MMcf)

Chicago Gas Field

Shell 100/07-30-058-22W5
“Upper Leduc”
58.8 MPa (09/2008)

Encana 100/11-34-057-23W5
HZ RR 05/18/2012

Husky 100/10-33-056-22W5
Vertical Test RR 08/2010

Talisman 100/01-18-060-20W5
CTD: 209 MMcf; 63 bbl Cnd
(0.3 bbl/MMcf)
Confidential Until Nov 4, 2012

Petrobakken 100/09-34-062-17W5
Flowing Oil
CTD: 550 bbl; 284 Mcf
(GOR 516 scf/bbl)
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Initial Pressure: 58.0 MPa
CTD: 930-1,830 bbl/d Field Condensate
(92 bbl/MMcf)
Confidential Until Nov 26, 2012

Trilogy/Celtic/Yoho #1 100/15-33-060-20W5
Initial Pressure: 56.4 MPa
CTD: 422 Mcf; 18 bbl Cnd (06/2011)
Test Rate: 5.2 MMcf/d +
1,350 bbl/d Field Condensate
(80 bbl/MMcf)
Confidential Until June 29, 2012

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1,350 bbl/d Field Condensate
(80 bbl/MMcf)
Confidential Until June 29, 2012

Source: GeoSCOUT, Daily Oil Bulletin, Sherwin GeoEDGES, BMO Capital Markets, various corporate presentations and press releases

BMO Capital Markets
Pembina – The Rush Continues with $1.4B Spent to Date at Land Sales

- At Pembina, land sale activity for Duvernay Crown PNG began to heat up in Q4-2010 about a year after it began at Kaybob. During that quarter, seven large blocks (32 sections each) sold to brokers for a total bonus of $144.5MM.

- As the land rush continued in late 2010 and into 2011, individual lease size increased to where 81% of the total land area sold belonged in leases of at least six sections in size (1,536 hectares, 3,840 acres).

- Heated activity continued in 2011 when a remarkable $1,084MM was spent for 1,189 sections of Crown in the Pembina area.

- Most of the large postings will be offered at sales in late July and early October.
Pembina – Big Dollars for Big Leases

The largest land sale in 2011 occurred on June 1, at which 572 single sections of Duvernay rights sold for $752MM.

2012 land sales already total 215 sections for total bonus of $51.2MM after ten sales.

PNG rights are now largely held in the prime parts of the Duvernay fairway, and future sale parcel size is expected to get smaller.

Source: Alberta Government, GeoSCOUT, BMO Capital Markets
Pembina Activity – Operators Beginning to Drill With 11 Wells Drilled or Drilling and 7 Licensed

As with Kaybob much of the activity surrounds multinational oil companies/large caps such as ConocoPhillips, Encana, Talisman, Sinopec/Daylight and Bonavista.

Smaller operators such as Bellatrix, Sirius (Seaview) and Yoho are all active at Pembina.

To date, 11 wells have been drilled or are underway, with a further 7 licensed.

Several of the existing wells are reported to be testing gas with the new Bellatrix well reporting overpressured reservoir.
ConocoPhillips drilled the first Pembina Duvernay wells beginning with a vertical/horizontal pair in Township 044-07W5, rig-released last October. Gas production in the horizontal well (02/11-16-044-07W5) began last November. ConocoPhillips’ second horizontal well at 07-11-045-07W5 was rig-released in December, and is reported to have tested gas (DOB Weekly Drilling Report Jan 27).

The east side of the map sheet tags the edge of a vast freehold checkerboard; in the Pembina area, Encana is the primary freehold owner with some of its lands having been leased by Bonavista with the purchase of the Encana Hoadley assets. On the west side of the map Bellatrix’s well is on O’Chiese First Nation lands.

Much of the Crown lands purchased to date have been bought by brokers to maintain the anonymity of the purchaser. The large amount of broker-held land speaks to the fact that the Duvernay Resource Play is in an early stage of development. Occasionally, operators will even license and drill under broker as is the case in the Antelope well in Township 045-06W5.
Pembina Drilling Results – with an Estimated $110MM Spent on Drilling

- Initial indications are that the gas may be leaner at Pembina than at Kaybob
- Bellatrix’s well confirmed the reservoir to be overpressured
- Much of the activity at Pembina has been done by larger companies; ConocoPhillips, Encana and Sinopec/Daylight

Source: GeoSCOUT, Daily Oil Bulletin, Sherwin GeoEDGES, BMO Capital Markets
Edson – the Newest “Subdivision” in the Duvernay Resource Play

- $408MM spent to date focused in central Edson
- Activity continues to increase in late 2011 and early 2012

Crown Land Sales Price Thermometer Map

$408 Million Spent Since Q4 2009

Source: Alberta Government, GeoSCOUT, BMO Capital Markets

Source: Alberta Government, GeoSCOUT, GeoEDGES, BMO Capital Markets
In July of last year, Angle Energy drilled a vertical Duvernay test well at 04-36-052-17W5, which is confidential until this summer.

CNRL has drilled and recently cased their horizontal at 01-03-052-17W5. The horizontal leg is immediately next to a 1990 vertical well which shows the Duvernay to be 35 m thick.

Vermilion intends to re-enter and test the Duvernay in their vertical well at 15-22-052-16W5.

The uncoloured land reflects open rights in the Duvernay, which are rapidly vanishing. Positive results from these wells may spark another land sale rush in the Edson area.
Clash of the Titans – Disclosed Operator Positions Within Study Area

<table>
<thead>
<tr>
<th>Active Players in Study Areas</th>
<th>Disclosed Land Position</th>
<th>Strike Areas</th>
<th>Operated Well count in Study Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alta Energy Partners</td>
<td>n/a</td>
<td>Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Angle</td>
<td>72.7 net sections</td>
<td>Edson</td>
<td>1</td>
</tr>
<tr>
<td>Athabasca Oil</td>
<td>1000 sections</td>
<td>Kaybob and north</td>
<td>6</td>
</tr>
<tr>
<td>Bellatrix</td>
<td>43 net sections</td>
<td>Pembina</td>
<td>2</td>
</tr>
<tr>
<td>Bonavista</td>
<td>400 net sections</td>
<td>Willesden Green (Pembina)</td>
<td>1</td>
</tr>
<tr>
<td>Canadian Natural</td>
<td>602 sections (385,000 acres)</td>
<td>Edson</td>
<td>1</td>
</tr>
<tr>
<td>Celtic</td>
<td>172 net sections</td>
<td>Kaybob</td>
<td>12</td>
</tr>
<tr>
<td>Chevron</td>
<td>391 net sections (250,000 net acres)</td>
<td>Fox Creek (Kaybob)</td>
<td>5</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>n/a</td>
<td>Pembina</td>
<td>3</td>
</tr>
<tr>
<td>Encana</td>
<td>578 net sections (370,000 net acres)</td>
<td>Simonette, Kaybob, Willesden Green</td>
<td>13</td>
</tr>
<tr>
<td>Husky</td>
<td>86 net sections (55,000 net acres)</td>
<td>Kaybob</td>
<td>7</td>
</tr>
<tr>
<td>Navarone</td>
<td>n/a</td>
<td>Kaybob</td>
<td>1</td>
</tr>
<tr>
<td>Petrobakken</td>
<td>190 net sections (includes other zones)</td>
<td>Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Shell</td>
<td>n/a</td>
<td>Kaybob</td>
<td>4</td>
</tr>
<tr>
<td>Sinopec/Daylight</td>
<td>203 net sections (130,000 net acres)</td>
<td>Pembina</td>
<td>2</td>
</tr>
<tr>
<td>Sirius</td>
<td>35 sections</td>
<td>Pembina</td>
<td>2</td>
</tr>
<tr>
<td>Talisman</td>
<td>563 sections (360,000 acres)</td>
<td>Kaybob and Pembina</td>
<td>5</td>
</tr>
<tr>
<td>Taqa North</td>
<td>n/a</td>
<td>Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Terra</td>
<td>86 net sections (55,000 net acres)</td>
<td>Greater Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Trilogy</td>
<td>207 net sections</td>
<td>Kaybob</td>
<td>4</td>
</tr>
<tr>
<td>Vermilion</td>
<td>n/a</td>
<td>Edson</td>
<td>1</td>
</tr>
<tr>
<td>Yoho</td>
<td>17.7 net sections</td>
<td>Kaybob and Ferrier (Pembina)</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Various Corporate Presentations and Press Releases

- The table lists all operators with Duvernay well licenses or drills in the study areas of Kaybob, Pembina and Edson (red denotes changes from the Drill Bits publication)
- Remarkably the play includes many large caps and multi nationals such as Canadian Natural, Chevron, ConocoPhillips, Encana, Husky, Shell, Sinopec/Daylight and Talisman

- To date Encana, Celtic, Husky, Athabasca Oil, Chevron and Talisman have the most well activity
- Encana, Talisman and Yoho are active in both the Kaybob and Pembina areas
What to Watch for

At Kaybob – Year of Results

- At Kaybob it will be a year of data results as the first wells drilled have their data enter the public domain. This will help to establish both liquid content, deliverability and economics.
- Expect that this will be the year of consolidation and as players determine that their land positions are secure and complete, land positions will be disclosed.

At Pembina – Year of Drilling Activity

- ConocoPhillips was the first to drill the Duvernay at Pembina, and their wells will be the first to come off confidential in September.
- Watch the licensing at Pembina, as most of the large Crown leases that sold in 2011 were under broker names, so the true operators in that area are largely hidden.
- The true operator of the broker well (Antelope 10-17-045-06W5) will be revealed in October, when the well comes off confidential.
- Disclosure of the new JV partner that Mako/Woma/Warren found in their process, as they’re committed to drill a Duvernay vertical well in 2012.
- Results from recent drilling by Encana, Bellatrix and Sinopec/Daylight.

At Edson – Year of Land Activity

- Angle’s well will be released from confidential status in August, and any publically released information from CNRL or Vermilion.
- Any new licenses on Crown lands recently purchased, as the bulk of this went to brokers.
Appendices
WHAT ELSE IS HAPPENING?
DUVERNAY SHALE – SPECULATIVE RESOURCE VALUE

Duvernay Hz Type Curve

Duvernay Landsales
- 2009 Dry Gas Target?
- 2010 Liquids Rich Target?
- 2011

ANDE
4-36-52-17W5

EDSON
Sub-basin

KAYBOB
Sub-basin

WILD R
Sub-basin

CNRL 1-3 HZ
Spud Feb 2, 2012

Vermillion 02/15-22
Re-entry

ANGLE
4-36-52-17W5

PEMBINA

FERRIER

Duvernay Landsales
- Angle Duvernay Rights
- Duvernay Well Licenced > 2010
- Leduc Reef Trend

72.7 NET SECTIONS - HIGH NGL POTENTIAL

BMO Capital Markets
April 2012 Press Release

Kaybob East

Athabasca’s horizontal well at 102/07-18-064-17W5 is the first reported horizontal Duvernay oil well in the Province of Alberta. The 1,237 metre horizontal leg in 07-18 was completed with a 12 stage, 100 tonne per stage completion and over a 16-day period, the well produced approximately 6,100 bbls of 44° API oil. The 07-18 well tested at a final rate of 650 boe/d which was comprised of 390 barrels per day (bbl/d) of oil and 1.5 million cubic feet per day (mmcf/d) of gas flowing up 2 7/8-inch tubing. At Kaybob, Athabasca owns approximately 225 net sections of Duvernay rights (Kaybob East and West) which exhibit more than 20 metres of net pay.
Duvernay Shale - Resource Play

- 44 Gross, 43 Net sections held in liquids rich gas fairway
- Thickness 33 m, TOC 4-5%, Adsorbed gas 8-10%; porosity 8-10%
- Over pressured 15.6 KPa/m
- Expected recoveries of 70-100 bbls liquids per mmcf
- Over $1.4 B invested by industry on offset Duvernay rights
- Wells qualify for emerging technologies shale gas incentive of 10% royalty rate holiday for 36 months; no volume cap
May 2012 Press Release

Emerging Opportunities

Bonavista’s first vertical Duvernay well, which was drilled and cored in the fourth quarter of 2011, was completed in the first quarter of 2012. The objective of this vertical well completion was to gather information on the initial reservoir pressure and the composition of hydrocarbons in the formation. After completing the fracture stimulation, the well recovered liquids rich natural gas and free condensate with test results suggesting potential natural gas liquid recovery rates of approximately 75 bbls per mmcf. In addition, pressure analysis suggests a significantly over-pressured reservoir. The results achieved with this vertical well provide sufficient encouragement for continued evaluation of the play. Bonavista will continue to monitor industry activity in the area, while determining the most appropriate manner to develop our 400 net sections of Duvernay rights.
Kaybob - Devonian Duvernay

- **Land** (Mar/31/12)
  - 138,080 acres (gross)
  - 110,034 acres (net)
  - → 172 net sections

- **Reservoir**
  - over pressured @ 60 MPa
  - wet gas leg is rich in liquids @ 75-115 bbls/MMcf

- **Drilling Potential**
  - 4 to 8 wells per section

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**Celtic Duvernay Wells/Locations:**

- **Verticals (6):** 14-16 (50%), 14-15 (51%), 13-25, 5-20, 14-17, 11-24 (100%)
- **Horizontals (5):** 15-33, 3-13, 13-36, 4-11 (33.3%), 13-22 (50%)
  - 15-31 (100%), 13-9 (50%)

- **Proposed Celtic HZ locations**

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**BMO Capital Markets**
Peace River Arch Core Area

Chinook’s most active area with 2012 evaluation planned in the Montney, Dunvegan, Nordegg, Duvernay & Nikanassin resource plays with planned drilling of conventional Triassic oil targets:

- Current net production 5,500 boe/d
- Multi-zone, operated, conventional area with resource play overprint
- >200,000 net acres of undeveloped land
- 8-10 wells to be drilled in 2012
  - 4-6 HZ Dunvegan oil locations
  - 2-2 Vertical Triassic oil locations
  - 1-2 Vertical or Hz Montney locations
Delphi “Creating Value in The Deep Basin”

Core Area Attributes
- Concentrated land base of over 400 sections
- Multiple targets to commingle in one wellbore
- Synergistic deep basin play-types
- Regulatory approval for 4 wells per section per zone

Dawson Creek
Hythe
Wapiti
Sturgeon Lake (Duvernay Shale)
Bigstone
Tower Creek
Exploration on Liquids-rich Lands
Duvernay – Exciting Potential Liquids Opportunity

- Started building land position in 2009
  - Simonette
  - Kaybob
  - Willesden Green

- 2011 Program
  - Drilled 2 horizontal wells and 1 vertical

- 2012 Program
  - 5 wells planned in first half of 2012
Duvernay Shale – Willesden Green

Key Facts

- **Key Properties**: Willesden Green, AB
- **Net Acreage**: ~70,000 acres (110 sections)
- **Est. OGIP**: ~65 Bcf/section
- **Est. Density**: 4 wells/section
- **Expected EUR/Well**: 3.5 Bcf

- Early stage liquids rich natural gas play in central Alberta
- Over-pressured at ~56MPa
- Targeted type well:
  - Hz well cost of ~$12 million
  - 30 day IP of ~5 MMcf/day
  - Liquids 75 - 100 bbls/MMcf
- Focus on early stage evaluation in 2012
  - 2 wells planned for Q3/Q4
The Duvernay – Key Land Position in Emerging Play

- Big land position held by deep production
- Depth of 2,500 to 3,000 metres with anticipated 1,200m horizontal leg
- Over-pressured zone (30-40% over normal gradient)
- Industry moving play north from Kaybob discovery area at rapid rate
Duvernay Overview

- World class, NGL rich, shale resource play
- Evolving fracturing technologies have unlocked new potential of this prolific liquids rich gas play
- Mako has one of the highest exposures to the Duvernay, by market cap
- 36,640 net acres with an average 41% W.I.
- Average OGIP/section is 76 bcf
- NPV 10% = $8.5 million/well
- Recent horizontal drilling results have yielded NGLs of up to 100+ bbls/mmcf

Early Duvernay players include: Sinopec Daylight, Bonavista, Encana, Talisman, Bellatrix and Conoco Philips amongst others
Duvernay – High Rate / High Return Potential

- Two play phases: Wet gas and Oil
- Wet gas phase: Trilogy / Celtic announced HZ results suggest EUR better than Eagleford / Marcellus (1.2 Mmboe+ / well, condensate + NGL up to 100 bbl / MMcf)
- Oil phase: no HZ tests; several areas with Bakken-like petrophysical characteristics
- Costs coming down (~$10.5 MM / well)
- **Sonde 62,500 net acres split 40% wet gas (160 HZ locations) and 60% oil (230 HZ locations)**
- **Sonde lands nearly all 100% operated WI, nearly all consolidated licenses where 1 well can extend license for up to 5 years**
- **Recent land prices in vicinity of Sonde: wet gas $3,500-$16,000 / ha; oil prices up to $2,500 / ha and escalating in recent sales**
PROGRESSING DUVERNAY SHALE

- Significant land position of 360,000 net acres
- Encouraging early industry results
- Plan to have 6 wells drilled by end of 2012 – 3 North and 3 South
- Two wells currently producing and expect 4-5 wells on production by end of 2012
Duvernay Rights
86 Net Prospective Sections

Terra Energy Corp. - January 2012

Terra owns a total of 86 net prospective sections with Duvernay rights.
Duvernay Unconventional Shale Play

- 100+ sections in gas/condensate reservoir area
- 100+ additional sections in potentially “oilier” reservoir

BMO Capital Markets
- Yangarra owns 72 Gross (70 net) sections of Duvernay land
- Land tenure of typically 4 years before expiry, which can be extended by 5 years with minimal drilling
- Estimated to contain 80-100 bcf per section with liquid content estimated to be greater than 100 bbls/mmcf
- Current industry development program envisions 6-8 locations per section with recoveries of 20% to 30% of the original gas in place
- The play is currently being de-risked by industry drilling
- Yangarra will decide whether to allocate drilling budget in 2013
Duvernay Shale Gas – Land Holdings
## Additional Disclosed Positions Duvernay

### Duvernay Players

<table>
<thead>
<tr>
<th>Other Duvernay Players</th>
<th>Disclosed Land Position</th>
<th>Strike Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birchcliff</td>
<td>196 net sections (125,696 net acres)</td>
<td>Kaybob and NW</td>
</tr>
<tr>
<td>Chinook*</td>
<td>70 sections</td>
<td>NW of Kaybob</td>
</tr>
<tr>
<td>Delphi*</td>
<td>79 net sections</td>
<td>Sturgeon Lake (north of Kaybob)</td>
</tr>
<tr>
<td>Enerplus</td>
<td>100+ section (70,000 net acres)</td>
<td>not specified</td>
</tr>
<tr>
<td>Guide*</td>
<td>547 net sections (350,000 net acres)</td>
<td>Sturgeon Lake (north of Kaybob)</td>
</tr>
<tr>
<td>Mako</td>
<td>57 sections (36,480 acres)</td>
<td>Pembina and Edson</td>
</tr>
<tr>
<td>Sonde*</td>
<td>98 net sections (62,500 net acres)</td>
<td>Ante Creek/Bezanson (north of Kaybob)</td>
</tr>
<tr>
<td>Yangarra</td>
<td>70 net sections</td>
<td>Edson/Pembina</td>
</tr>
</tbody>
</table>

* Operators whose land positions are outside the study areas

- Most of the players, especially with extensive lands exposed to the play, hold their positions under broker names, making it problematic to show their holdings geographically for now

Source: Various Corporate Presentations and Press Releases
Acquisitions & Divestitures Advisory Team Members

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Ian is the Managing Director responsible for the Acquisitions and Dispositions business for BMO Capital Markets and has over 25 years of oil and gas related experience. Prior to joining BMO Capital Markets, Ian was a founding partner of Tristone Capital where he led the development of the A&D practice as it became the dominant A&D broker in Canada.

He has been involved in over 155 engagements with total sales exceeding $25 billion with a further $10 billion being evaluated for merger processes. Through this work he has gained intimate technical knowledge of practically every play type in Western Canada. Prior to joining Tristone, Ian ran his own consulting practice focusing on A&D evaluations and was COO for an oilfield data/technology company. Ian also worked for Canadian Hunter Exploration for 10 years where he helped discover significant gas reserves and deliverability.

Ian holds a BASc (Honours) Chemical Engineering from the University of Waterloo. He has also been a registered Professional Engineer since 1987.

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Wendy is the Managing Director responsible for project execution of the A&D advisory business for BMO Capital Markets and has more than 25 years of oil and gas related experience. Prior to joining BMO Capital Markets, Wendy was a Senior Vice President at Macquarie Tristone, where she was a key member in the successful development of the A&D business.

Throughout her tenure she was involved in more than $35 billion of disposition and merger work providing her with unique insight into most plays in the Western Canadian Sedimentary Basin. Prior to Macquarie Tristone in 2002, Wendy was a Vice President and Officer of a Canadian oil and gas service company. Wendy began her career with Canadian Hunter Exploration where she was involved in a number of research and exploration engineering capacities.

Wendy holds a Bachelor of Science degree from the University of Calgary.

Gary Fisher
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Gary is a Vice President, Commercial with BMO Capital Markets A&D Advisory Group and has almost 30 years of experience in the oil and gas sector with 15 years of experience in oil and gas acquisitions and divestitures.

Gary was one of the original founders of Tristone Capital Partners (now part of Macquarie Tristone) and was responsible for developing the economic models, publications and client data transfers for the practice. Gary was also involved in several start-up companies as manager of A&D or reservoir evaluation. During this time Gary acquired skills in unconventional resources with a recent specialization in shale oil evaluation. Gary brings a wide and extensive knowledge of A&D practices, oil and gas economics, reservoir characterization and day-to-day E&P operations to the table.

Gary has Master of Science (Economics) from the University of Guelph and a Bachelor of Arts (Honors Economics) from the University of Calgary.
### Team Biographies Continued

<table>
<thead>
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Joyce is a Vice President in BMO Capital Markets’ Acquisitions and Dispositions group in Calgary, joining in March 2010. Prior to BMO, Joyce spent six years as part of the A&D team at Macquarie-Tristine / Tristine Capital performing geological and geophysical analysis throughout the Western Canada Sedimentary Basin and in various international projects. With over 25 years of broad oil and gas experience, Joyce has held positions with senior E&P companies (Dome, Amoco, Unocal) and in the service sector (Rileys Datashare, iDc, Landmark Graphics).

Joyce holds Bachelor of Science degrees in Geology and Computer Science from the University of Saskatchewan, and is registered as a Professional Geologist.

Ryan Twa joined BMO Capital Markets in August 2010 and has over 10 years of diverse oil and gas industry experience. Ryan has worked at several senior E&P companies (Suncor, Burlington, BP and Amoco) in multiple upstream engineering and leadership roles throughout Western Canada. He has experience in both conventional and unconventional oil and gas assets. Ryan has worked as a production, reservoir, and facility engineer as well as in business development and joint venture positions.

Ryan holds a Bachelor of Chemical Engineering degree from University of Saskatchewan and a Masters of Chemical and Petroleum Engineering from University of Calgary. He is a registered Professional Engineer (APEGGA) since 1998.

Kathleen Dixon is an Associate with BMO Capital Markets A&D Advisory group, joining in April 2010. Prior to joining the group, Kathleen spent the past 10 years working as an exploration geologist for Iteration Energy and CNRL. During her exploration experience, she explored for and drilled successful wells in conventional heavy oil, shallow gas and deep carbonate oil. In addition to exploration, Kathleen provided geological evaluation basin wide of prospects for acquisition, worked on CNRL’s Horizon project and completed a variety of geologic studies using core and cuttings.

Prior to working in the oil and gas sector, Kathleen incorporated and took public a junior mineral exploration company, focused on Nevada gold exploration.

Kathleen holds a Bachelor of Science degree in Geology from the University of British Columbia and a Master of Business Administration from the University of Durham, England. Kathleen has been a Professional Geologist since 1996.

Steve is an Associate in the BMO Capital Markets A&D group, focusing on engineering and economic analysis. Prior to joining BMO Capital Markets, Steve was an Exploitation Engineer at Iteration Energy where he was responsible for all matters related to the exploitation of the company’s British Columbia and Central Alberta properties. Previous to Iteration, Steve was an Evaluations Engineer at RBC Capital Markets where he was responsible for determining borrowing base levels for E&P companies with lending values ranging from less than $1.0MM to greater than $1.6B.

Steve holds a MESc in Mechanical Engineering and a BESc (With Distinction), both from the University of Western Ontario. Steve has been a registered Professional Engineer since 2003.
Mandy Edwards  
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Mandy is the A&D Co-ordinator responsible for datarooms and commercial functions in the team. Prior to joining BMO Capital Markets, Mandy spent five years working for Wyeth (now Pfizer) BioTech in Ireland in a computer systems application support role. She held various positions prior to that in web design and technical editing and various other administrative roles.

Mandy holds a Latin BA Hons Degree from Nottingham University, England, a Diploma in Computers for Engineers from Trinity College in Dublin, Ireland and most recently, she completed the Petroleum Land Administration Certificate in SAIT and Olds College, Calgary.

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Jennifer McQueen is the Desktop Specialist for BMO Capital Markets, A&D Advisory group. Jennifer performs desktop publishing and word processing functions in preparation for print and digital media. Prior to joining BMO in November 2010, Jennifer worked for Cushman & Wakefield Ltd., where she was Marketing Coordinator for the Calgary office.

Jennifer holds a Bachelor of Fine Arts degree from the University of Calgary as well as a Master Certificate in Graphic and Web Design from the Southern Alberta Technical Institute.
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