

Energy

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Industry Brief

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Energy: Stat of the Week

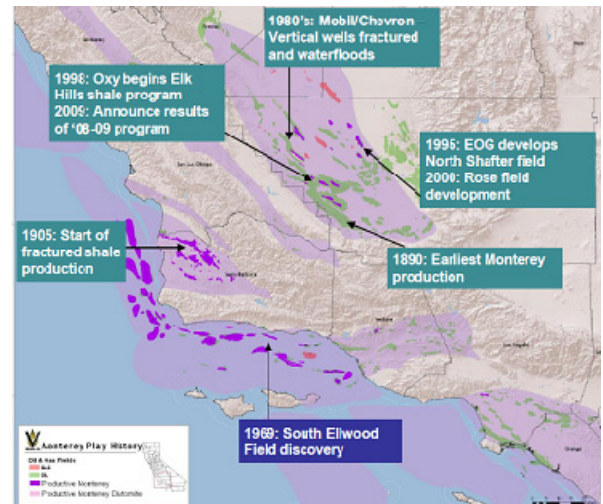
A Golden Opportunity in the Golden State: A Monterey Shale Primer

Surprise, surprise, there's a new shale play in town. Well, to call it "new" wouldn't exactly be true – it's been producing oil for more than 100 years – but newly popular, at least. Following Occidental (OXY) and Venoco's (VQ) May analyst days, California's Monterey Shale has received much investor attention the past several months as potentially being "the next Bakken Shale." But is this oil shale the real deal? With Occidental betting that its California shale program could be its biggest business unit in 10 years – but not giving out any specific well results – and Venoco unsuccessfully testing its first prospect, the jury is still out. With potential estimated ultimate recovery (EUR) per well of 400-700 Mboe and well costs of just \$3-5 million, we'd like to stick around for the verdict. In this Stat, we detail (1) the definition and history of the Monterey, (2) the technical characteristics that distinguish it from other oil shales, (3) potential recovery rates and their impact on per well reserves, (4) industry expectations and results to date, and (5) which companies have the most leverage to the play.

The Definition and History of the Monterey

Though investor attention has turned toward the Monterey only recently, the play has a long, rich history, with first production as early as 1895 in the Santa Joaquin Basin. In 1905, the first fractured Monterey shale production began in the Santa Maria basin with vertical initial production (IP) rates ranging from 100 to 700 Bbls/d. In 1969 the first offshore Monterey reservoir was discovered by Arco/Mobil at South Ellwood field on the Santa Barbara County coast.

Occidental began development of its Elk Hills shale program in 1998, and in 2009 announced results from a "non-traditional hydrocarbon bearing zone." While most current Monterey production hails from conventional traps and natural fracturing, unconventional technology will lead future development, including highly deviated frac and acidizing techniques. The Monterey is a Miocene-age biogenic shale that serves as both source rock and reservoir rock. The geologic composition of the play consists of siliceous shales, limestones, and clay/mud shales deposited during a unique Miocene era.



Source: Venoco

Unique Deposition Distinguishes from Other Oil Shales

The depositional environment of the Monterey differs from most shale plays around the country in that many shales are deposited in a restricted shallow water environment – in a swamp, for example. The Monterey is rather unique compared to other U.S. shale plays in that it was deposited in over 3,000 feet of water, and is thus sourced from deep marine sands. As shown in the stratigraphic column at right, Occidental will target the upper (Antelope) and lower Monterey shales in addition to a host of other formations – the Santos, Salt Creek, and Kreyenhagen zones. Occidental started its "California Shales" program at Elk Hills in 1998, and has since successfully tested its shale concept in eight additional fields. Occidental will test 10-15 wells in different areas per year over the next four years.

myBP	AGE	FORMATION	BASIN			
			SACRAMENTO	SAN JOAQUIN	VENTURA	LOS ANGELES
2	PLEISTOCENE			TULARE	PICO	PICO
5	PLIOCENE			ETCHEGOIN	SISQUOC	
				REEF RIDGE		RANGER
10	MIOCENE	MONTEREY		ANTELOPE SHALE	STEVENS SANDS	MOHNIAN SHALES
20					MUHNIAN SANDS	TERMINAL
30	OLIGOCENE	TEMBLOR				FORD
60	EOCENE		MORENO SHALE			
140	UPPER CRETACEOUS		GAS SANDS			
	JURASSIC		SACRAMENTO SHALE			
				FORBES		

Sources: Occidental

Please read domestic and foreign disclosure/risk information beginning on page 6 and Analyst Certification on page 6.

Technical Comparison with Other Major Oil Shales

The table below provides a cross-section of some of the important technical characteristics of Venoco and Occidental’s targets and how those relate to the other major U.S. oil shales. Two aspects that jump out immediately are exceptional gross thickness and EUR per 640 acres. Because the Monterey is located within an active margin basin that is compression loading, the Monterey has substantially larger gross thickness (500- feet to 6,000 feet) than its peer oil shales. Most importantly, we would point to the immense original oil in place (OOIP) estimates, which Venoco has pegged at an average of 84 MMBbbls per 640 acres. This resource potential is multiples above the estimated OOIP of the Middle Bakken, Niobrara and Eagle Ford shales. With a conservative 2% recovery factor (Venoco estimates around 3%), that would imply a healthy 1.7 MMBbbls of EUR per 640 acres, slightly above the Eagle Ford and again, multiples above the Bakken and Niobrara.

	Venoco Prospect A	Venoco Prospect B	Venoco Prospect C	Oxy Upper Monterey	Oxy Lower Monterey	Middle Bakken	Niobrara	Eagle Ford
Vertical Depth	6,000'-11,500'	9,900'-11,000'	7,000'-14,000'	3,500'-12,000'	9,000'-14,000'	8,500'-10,500'	2,000'-8,000'	8,000'-14,000'
Thickness	500'-6,000'	500'-6,000'	500'-6,000'	500'-3,000'	1,000'-3,500'	150'	<50'	250'
Oil Gravity	33°	27°	42°	20°-40°	20°-40°	42°	39°	45°
Perm (millidarcies)	3.73	1.0-18.9	1.3-18.7	0.1-1	<0.001-2	0.005-0.2	n/a	0.0013
Porosity (%)	25%	26%	13-29%	15-30%	5-28%	5%	6%	12%
Oil Saturation	49%	53%	61%	-	-	75%	50%	72%
TOC (%)	0.1-4%	0.1-4%	5%	0.1-4%	5-12%	6%-20%	5%	4.7%
OOIP/640 acres (MMBbbls)	71	97	84	-	-	10	25	30
EUR/640 acres (MMBbbls)	2.1	2.4	3.1	-	-	0.5	0.3	1.57
Recovery Factor	3.0%	2.5%	3.7%	-	-	5.0%	5.0%	5.2%

Sources: Venoco, Occidental, Chesapeake, Raymond James

Recovery Rate Determines the True Potential

As mentioned above, the Monterey has an extraordinary amount of original oil in place (OOIP), and so the real question becomes: How much will operators be able to recover? Venoco estimates recovery of around 3% of OOIP across its three primary prospect areas, but in light of the significant variability of the play (exemplified above), we should see different recovery rates by basin and prospect area. The chart below and left provides a sensitivity for implied EUR per well based on sequentially higher recovery rates. Assuming 115 acre spacing per well (the average of Venoco’s internal estimates across the entire play), we calculate as little as 127 MBbbls per well at 1% and up to 696 MBbbls at 4% recovery. For the Bakken, we have assumed three wells per 1,280 acre spacing unit and for the Niobrara and Eagle Ford we have assumed four wells per 640 acre spacing unit.

Our 1-4% recovery sensitivity is not out of the question given historical production data from other Monterey projects both onshore and offshore, including South Belridge at 7%, Lost Hills at 10%, and Elk Hills at 12% recovery. Venoco estimates that each incremental 1% recovery would equate to roughly 200 MMBoe of resource upside.

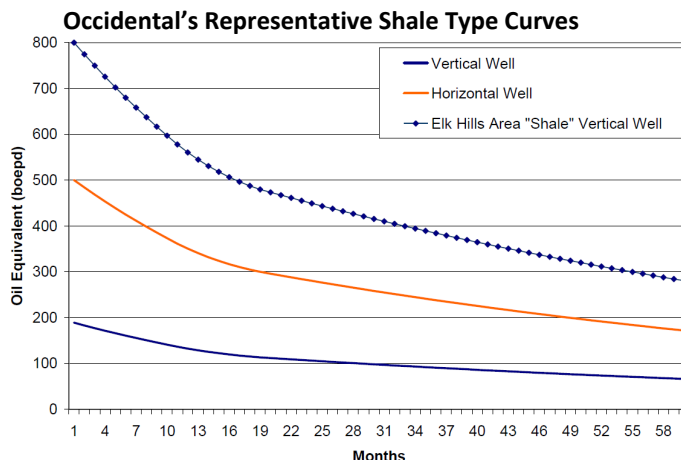
	Implied EUR Per Well (MBbbls)			Implied EUR Per Well (MBbbls)		
	Original Oil in Place Per 640 (MMBbbls)			Original Oil in Place Per 640 (MMBbbls)		
Venoco Prospects:	"A"	"C"	"B"	Bakken	Niobrara	Eagle Ford
	71	84	97	10	25	30
1.0% Recovery	127	151	174	167	156	188
2.0% Recovery	255	301	348	333	313	375
3.0% Recovery	382	452	522	500	469	563
4.0% Recovery	510	603	696	667	625	750

Sources: Raymond James

IP and EUR Assumptions

Though we do not believe that any one well will either make or break the Monterey, there is a need to define what early success will look like. Venoco is currently testing its **second horizontal Monterey test** in Area “C” in the Santa Maria Basin, which is by far the company’s most prospective area. As presented in its corporate presentation, Venoco expects **30-day initial production rates** in the area to average around **500 Bbbls/d (oil only)**. Occidental, on the other hand, has pegged its expected average 30-day initial production rate (for *all* its California shales, not just the Monterey) at 400-800 Boe/d, with its representative type curve (shown at right) showing a **500 Boe/d** expectation.

In terms of estimated ultimate recovery (EUR), Venoco’s estimates imply an average recovery of **470 MBbbls per well** across its land position with individual prospects ranging from 425 MBbbls to 810 MBbbls per well. Occidental guides to an average EUR of **400-700 Mboe** per well – again, across all of its California shales, not just the Monterey.



Source: Occidental

Well Results Thus Far

Though activity has certainly picked up of late in terms of leasing and “hype,” we’ve yet to get any successful publicly announced well results. For its part, Venoco drilled one well in its B prospect in the San Joaquin Basin, which was deemed uneconomical. Management described the well as having good oil shows but believes that it went in and out of zone while drilling. Venoco has since hit total depth on its second well in its C prospect in the Santa Maria Basin, which is currently being acidized and undergoing testing. As expected, Occidental has remained very quiet about its success in the Monterey, and has yet to give out any initial production rates or results from specific well tests. We would note, however, that since its May analyst day (where the company predicted 400-800 Boe/d across all areas) Occidental has tested a number of wells across its acreage position – and has made note of the fact that results have generally fallen within expectations (or at least haven’t prompted a revision of guidance).

Takeaway: Which Companies Are Most Leveraged to the Monterey?

As shown in the chart below, a number of other operators have publicly announced Monterey positions or have been identified by Venoco as having Monterey-prospective positions, and are ordered in terms of leverage to the play – with a higher acre/EV signifying greater leverage. At its May analyst day, Venoco included internal estimates in its corporate presentation of other operators’ Monterey-prospective acreage. After speculating for months that Plains Exploration (PXP) had approximately 70,000 net acres, Plains announced in October that it did in fact have 86,000 net Monterey acres. Given Venoco’s success in estimating Plains’ position, we believe the company’s internal estimates for National Fuel Gas (NFG) and Berry Petroleum’s (BRY) acreage positions should similarly be broadly accurate, especially in light of the relatively minor acreage positions.

Company	Net Acres	EV (\$Mn)	Acres/EV (\$Mn)
Zodiac Exploration	40,000	288	139
Gasco	10,700	105	102
Venoco	170,000	1,690	101
Plains Exploration	86,000	7,432	12
Occidental	873,000	77,412	11
Berry Petroleum	6,500*	3,262	2
National Fuel Gas	14,000*	7,192	2

Source: Venoco, Gasco, Occidental, Plains, Zodiac, Raymond James.

* Venoco estimates.

With 873,000 net acres, Occidental’s massive acreage position dwarfs Zodiac’s (ZDEXF) moderate-by-comparison 40,000 net acres. However, on a pure leverage basis, it appears that incrementally positive results would likely be better reflected in the stock price of Zodiac, Gasco (GSX), and Venoco. We would note, however, that both Zodiac and Gasco are currently targeting formations other than the Monterey. Both operators have chosen to allow other operators to “prove up” their acreage (mainly Occidental and Venoco) as Zodiac is primarily targeting the deeper Vaqueros and Kreyenhagen formations and Gasco targets shallower, conventional structures. Despite both operators’ clearly substantial Monterey leverage, we would caution that both companies’ acreage positions carry a higher risk factor as the Monterey has not been tested in these zones and the acreage lies outside of Occidental and Venoco’s core targeted areas.

Conclusion

While Monterey production has been in existence for over 100 years, operators are now interested in the horizontal development of deep, tight rock using modern drilling technology. With more than 17,000 wells having penetrated the Monterey, there is an abundant amount of technical data with which to compare the play to its peer oil shales, and the Monterey’s comparatively immense original oil in place (OOIP) estimates may yield impressive EURs of 400-700 Mboe per well. Should the Monterey indeed live up to its potential, our analysis of the acreage positions of Zodiac Exploration, Gasco, and Venoco suggests that these companies have the most leverage to the play and likely have the most upside to its success.

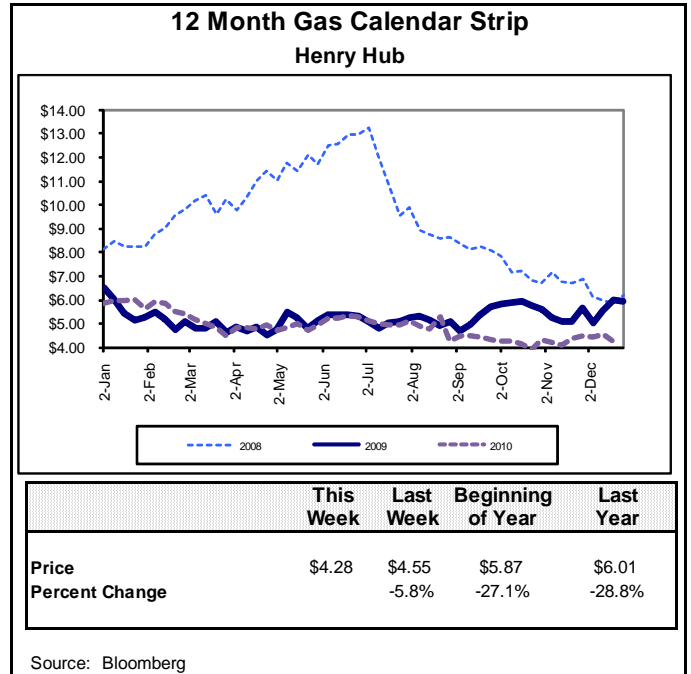
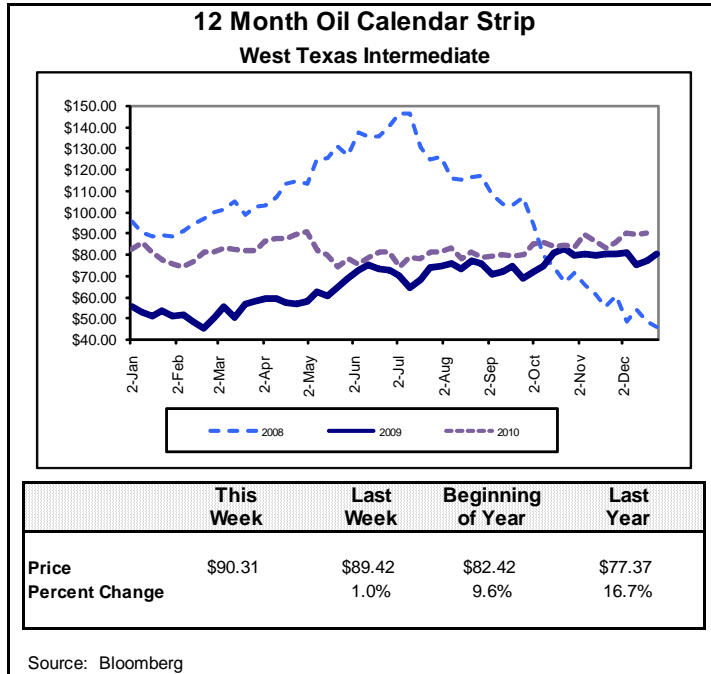
Company Citations

Company Name	Ticker	Exchange	Currency	Closing Price	RJ Rating	RJ Entity
Berry Petroleum Company	BRY	NYSE	\$	42.75	2	RJ & Associates
Chesapeake Energy Corp.	CHK	NYSE	\$	23.30	3	RJ & Associates
Gasco Energy Inc.	GSX	AMEX	\$	0.30	NC	
National Fuel Gas Company	NFG	NYSE	\$	63.69	2	RJ & Associates
Occidental Petroleum Corp.	OXY	NYSE	\$	95.20	2	RJ & Associates
Plains Exploration & Production Company	PXP	NYSE	\$	30.16	1	RJ & Associates
Venoco, Inc.	VQ	NYSE	\$	18.74	NC	
Zodiac Exploration Inc.	ZDEXF	PINK	\$	0.75	NC	

Notes: Prices are as of the most recent close on the indicated exchange and may not be in US\$. See Disclosure section for rating definitions. Stocks that do not trade on a U.S. national exchange may not be approved for sale in all U.S. states. NC=not covered.

Raymond James Weekly Oilfield Review

For Week Ending: 12/17/2010



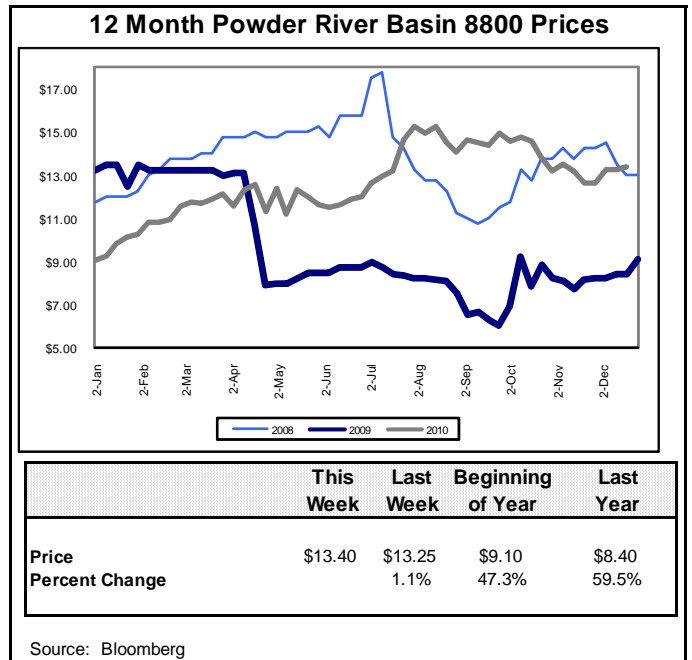
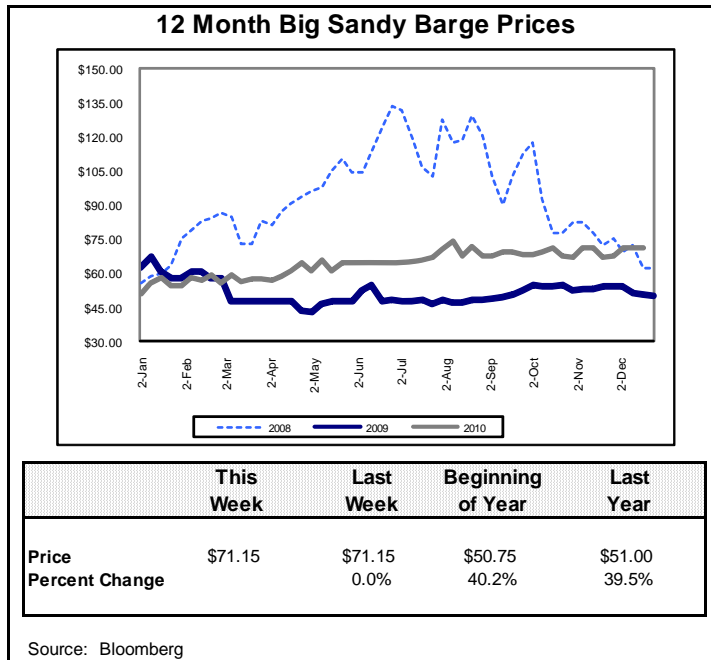
	17-Dec-10	10-Dec-10	18-Dec-09	Change From:	
	This Week	Last Week	Last Year	Last Week	Last Year
1. U.S. Rig Activity					
U.S. Oil	756	763	409	-0.9%	84.8%
U.S. Gas	941	948	773	-0.7%	21.7%
U.S. Miscellaneous	12	12	11		
U.S. Total	1,709	1,723	1,193	-0.8%	43.3%
U.S. Horizontal	954	966	572	-1.2%	66.8%
U.S. Directional	220	225	202	-2.2%	8.9%
U.S. Offshore	23	23	33	0.0%	-30.3%
U.S. Offshore Gulf of Mexico					
Fleet Size	123	123	117	0.0%	5.1%
# Contracted	61	63	63	-3.2%	-3.2%
Utilization	49.6%	51.2%	53.8%	-3.1%	-7.8%
U.S. Weekly Rig Permits *	1,488	1,217	994	22.3%	49.7%
3. Stock Prices (12/17/10)					
OSX	238.5	236.7	192.1	0.8%	24.2%
S&P 500	1,243.9	1,240.4	1,102.5	0.3%	12.8%
DJIA	11,491.9	11,410.3	10,328.9	0.7%	11.3%
S&P 1500 E&P Index	568.5	568.8	518.6	-0.1%	9.6%
Alerian MLP Index	350.0	358.2	274.6	-2.3%	27.5%
4. Inventories					
U.S. Gas Storage (Bcf)	3,561	3,725	3,566	-4.4%	-0.1%
Canadian Gas Storage (Bcf)	578	611	581	-5.4%	-0.4%
Total Petroleum Inventories ('000 bbls)	887,786	898,633	871,927	-1.2%	1.8%
5. Spot Prices (US\$)					
Oil (W.T.I. Cushing)	\$88.02	\$87.79	\$73.36	0.3%	20.0%
Oil (Hardisty Med.)	\$75.15	\$75.47	\$59.78	-0.4%	25.7%
Gas (Henry Hub)	\$4.01	\$4.34	\$5.87	-7.6%	-31.7%
Residual Fuel Oil (New York)	\$12.31	\$12.11	\$11.00	1.6%	11.9%
Gas (AECO)	\$3.75	\$3.99	\$5.54	-6.0%	-32.3%
UK Gas (ICE)	\$10.37	\$9.92	\$5.48	4.5%	89.3%

Sources: Baker Hughes, ODS-Petrodata, API, EIA, Oil Week, Bloomberg

* Note: Weekly rig permits reflect a 1 week lag

Raymond James Weekly Coal Review

For Week Ending: 12/17/2010



	17-Dec-10	10-Dec-10	18-Dec-09	Change From:	
	This Week	Last Week	Last Year	Last Week	Last Year
1. Coal Prices					
Eastern U.S.					
CSX 1%	\$71.15	\$71.15	\$51.00	0.0%	39.5%
Western U.S.					
Powder River 8800	\$13.40	\$13.25	\$8.40	1.1%	59.5%
2. Production					
Eastern U.S.	8,858	8,940	8,924	-0.9%	-0.7%
Western U.S.	12,850	12,842	11,165	0.1%	15.1%
Total	21,708	21,782	20,089	-0.3%	8.1%

Source: Bloomberg

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Outperform (MO2) Expected to appreciate and outperform the S&P 500 over the next 12 months. For higher yielding and more conservative equities, such as REITs and certain MLPs, an Outperform rating is used for securities where we are comfortable with the relative safety of the dividend and expect a total return modestly exceeding the dividend yield over the next 12 months.

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Market Perform (MP3) The stock is expected to perform generally in line with the S&P/TSX Composite Index over the next twelve months and is potentially a source of funds for more highly rated securities.

Underperform (MU4) The stock is expected to underperform the S&P/TSX Composite Index or its sector over the next six to twelve months and should be sold.

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Company Name	Disclosure
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