

The Hirschberg Premium Stockpick Series Part I: MGX Minerals



1. Introduction

This is the first episode in a series of featured junior mining stocks, which are part of the portfolio of famous resource investor Robert Hirschberg from Toronto, Canada. He has made his fortune by being the owner/manufacture of a promotional clothing company, and invests in junior mining stocks since 1981. Hirschberg has been devoting more and more time to mining stocks over the years, and has made it into being a full-time speculator nowadays.

He specializes in very early stage nano caps, often with share prices still under C\$0.10, and completely under the radar. There is a beautiful [video](#) on CEO.CA about him telling his story about riding the commodity swings, and besides having won and lost millions of dollars, the one thing he has learned is taking more profits from the table sooner. For 2016 he did quite alright, with a total return of 96% over 27 stocks [according](#) to a fellow CEO.CA user who tracks his stockpicks.

When talking to Robert last year for the first time, it appeared that he didn't operate on his own. He works together with two very close friends of his, Dr. K. Sethu Raman, and Sam Sahota, and I'm told that if you see one of them, the other two aren't very far away, as they work all day together on doing due diligence in order to find the best deals.

Dr. K. Sethu Raman is probably a familiar name in mining circles. He is a geologist by training and holds a Ph.D in Geology, and developed into becoming a serial minefinder and successful mining entrepreneur with a very wide range of experience at all stages of mining projects, including financial and legal areas, over the last 46 years. He discovered 11 significant gold/silver/copper/zinc/phosphate/uranium deposits during his career, and no less than 7 of those became operating mines. Most famous one is probably the Timmins West Gold mine of Lake Shore Gold, bought out by Tahoe Resources for \$945M in 2016.

Sam Sehota is the lesser known person in this team. He is a seasoned investor who has been investing in the markets for 30 years. He is also an entrepreneur like Robert, and owns a British luxury car dealership (with brands like Jaguar, Land Rover) in Toronto for the last 26 years.

Sam, Robert and Sethu already knew each other for a long time, and formed an investing group for the last 7 years, and are enjoying their time together, being very successful in finding opportunities to invest in the resource sector.

A quick note for the necessary paperwork on liabilities etc:

Disclaimer: Robert Hirschberg, Sam Sehota and Sethu Raman are not registered investment advisors, have a strategic long position in the company, and have only reviewed the introduction paragraph of this article for relevant facts about themselves.

As they often invest substantial amounts of money (C\$500k-2M) in strategic private placements at such an early stage, where no other investor would even bother to look, the word is spreading, and nowadays dozens of new deals land on their desks every week. As a consequence, they have to be very selective. Mr. Hirschberg and his friends look for the following main features in a company:

1. executives with successful track records
2. strong assets with future economic potential, in demand commodity
3. easy access to funding
4. lots of upside (at least a 5-bagger) independent of commodity pricing
5. tight share structure with small float
6. management needs to have substantial skin in the game
7. management needs to have powerful (financial) backing
8. there has to be a solid and substantial marketing plan in place

Of course they can't have best-in-class on every feature, but they come a long way for most of Robert's stockpicks I reviewed. As I was looking for interesting early stage stockpicks to write about, after writing a lot on more established names, Robert and his team liked the idea of me featuring my personal selection of their best stockpicks, and the "Robert Hirschberg

When talking to Robert and his team in the last quarter of 2016, he recommended a little CSE stock to me, new sponsor of my website MGX Minerals. He even said it belonged to his top 5 of stockpicks. Although I usually stop due diligence the second I notice CSE or OTC, he urged me on to have a second look, as this one could be different. So I did. At first glance, the lithium project looked very premature, with a new proprietary method needed to recover lithium from oil brines, a method being sought after by many other parties for years. However, the magnesium project definitely caught my eye because of the very high grade, size, location, consolidation of surrounding claims and simple, permissible, and likely profitable operation. Some personal back of the envelope calculations/estimates indicated excellent economics, generating NPV's many times over the current marketcap.

Looking again into the lithium story, it appeared that first testing of the recovery process was advanced, top notch engineers were working on it, and O&G heavyweight advisor Larry Marks got a lot of serious interest from large producers for this method, as it could be beneficial to them to efficiently solve their costly wastewater issues. On top of that management was seriously contemplating the possibility of an uplisting to the Venture, hard-pressed by Hirschberg, and this took away most of my doubts about covering a CSE stock. In this article you will find out why I do think MGX Minerals could be worth much more in the near term future, solely based on its magnesium project, and why the experimental lithium venture might be a wildcard of vast proportions.

All presented tables are my own material, unless stated otherwise.

All pictures are company material, unless stated otherwise.

All currencies are in US Dollars, unless stated otherwise.

2. The company

MGX Minerals (XMG.CSE) is a diversified Canadian mining company engaged in the development of large-scale industrial mineral portfolios in western Canada. The Company operates magnesium, lithium and silicon projects throughout British Columbia and Alberta. Although the company has a Canadian Stock Exchange (CSE) listing at the moment, it is one of the most liquid stocks over there, and management is currently looking into the possibility of uplisting to the TSX Venture.

The strategy of MGX Minerals is well-thought out by management. It seeks to build long-term shareholder value through development of industrial mineral assets, in specific commodities and mining-friendly jurisdictions. Benefits of this

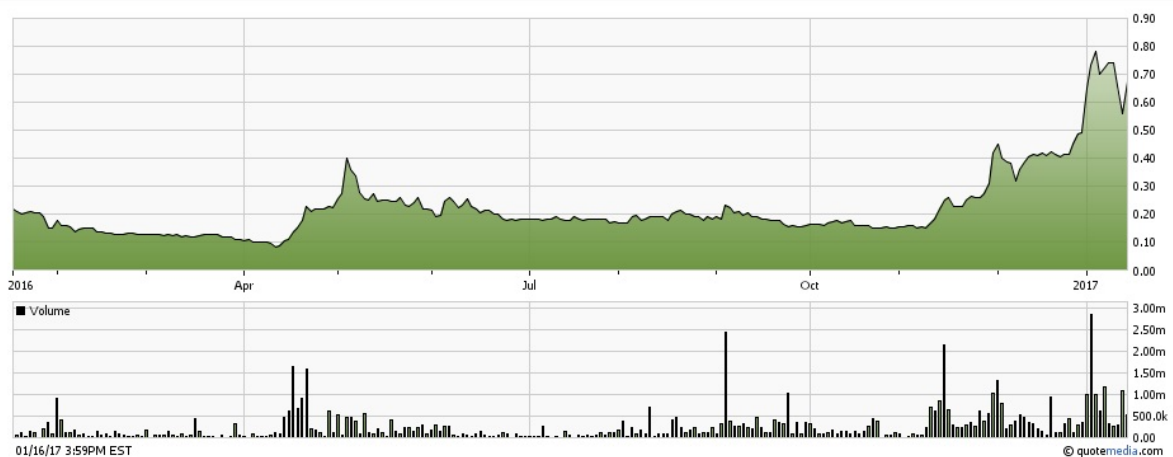
type of assets are relatively low initial capex needs, solid demand and price decks, near term cash flow, very simple quarry-like open pit operations with shovel and scoop mining with no tailings, fixed operating inputs, long -term supply and energy contracts, streamlined permitting as industrial minerals like magnesium and silicon just need quarry permitting. On top of that the company also has partnerships in place or is seeking those, providing financing, engineering expertise and low-cost energy solutions.

The company is led by President and CEO Jared Lazerson, who is a relatively unknown name in the field of junior mining. When talking to him, I became impressed by his knowledge on almost every aspect of the company, the projects and by his strategic thinking, work ethic and enthusiasm. Robert Hirschberg and his team feel the same way about him, and we all think Jared could make waves in the mining business soon. He gathered an experienced team around him with many decades of experience, but particularly impressive is his team of technical consultants, where Larry Marks, Claudio Manissero and Cementation AG stand out. Larry Marks is a former Shell Canada executive, Claudio Manissero a former FMC executive, and Cementation AG is a renowned engineering firm working with the likes of Suncor, Rio Tinto and Hudbay Minerals. Larry Marks and Cementation AG are very important for the lithium project, based on oil brine recoveries. Larry Marks is laying down the framework for MGX Minerals with large oil producers for all sorts of collaborations through his vast network in O&G, and Cementation AG is instrumental in developing the new lithium recovery method.

MGX Minerals has its main listing on the main board of the Canadian Securities Exchange as mentioned, where it's trading with XMG.CSE as its ticker symbol. The US ticker is MGXMF.US. With an average volume of in excess of 91,000 shares per day, the company's trading pattern is already quite liquid, but it has to be noted that the daily volume is increasing rapidly, due to possible catalysts and upscaled marketing efforts (I am just a small component of this) to get the story out to a much wider audience.

MGX Minerals currently has 56.7M shares outstanding (fully diluted 71.9M) which gives it a market capitalization of C\$37.9M based on yesterday's share price of C\$0.67. At the end of the fourth quarter, the company had an estimated working capital position of just over C\$350k, and in excess of C\$500k in cash in the treasury, which will probably see MGX Minerals going to the markets rather sooner than later.

Charting for MGXMinerals



Share price; 1 year *time frame*

As the lithium project seems to gain traction as the testing of the first, small pilot plant was nearing completion at the end of December 2016, the share price reacted accordingly, rendering a convenient, early low entry something of the past. Fortunately the share price retracted a fair bit on profit taking. Notwithstanding this volatility, I will try to explain why I think this is just the beginning of much more possible upside. Needless to say why Robert Hirschberg and his team are such excellent early stage stockpickers, as they took down most of a C\$500k private placement (5M shares @ C\$0.10) in April 18, 2016. So far they haven't sold a single share, as they too are aware of the potential here.

3. The projects

MGX Minerals rather has several portfolios of projects instead of individual projects, as it amassed lots of claims for each mineral/metal: magnesium, lithium and silicon. Their flagship Driftwood Creek magnesium project, surrounded by numerous adjacent claims, is probably closest to the definition of a single project, and most advanced by having a recent resource estimate. The lithium venture doesn't have a NI43-101 compliant resource estimate yet (as economic potential has to be established by then, for example by verifiable testing), but pilot testing of lithium recoveries from oil brines is well underway as a first step, which if successful will undoubtedly lead to resource estimates and economic studies to define economic potential.

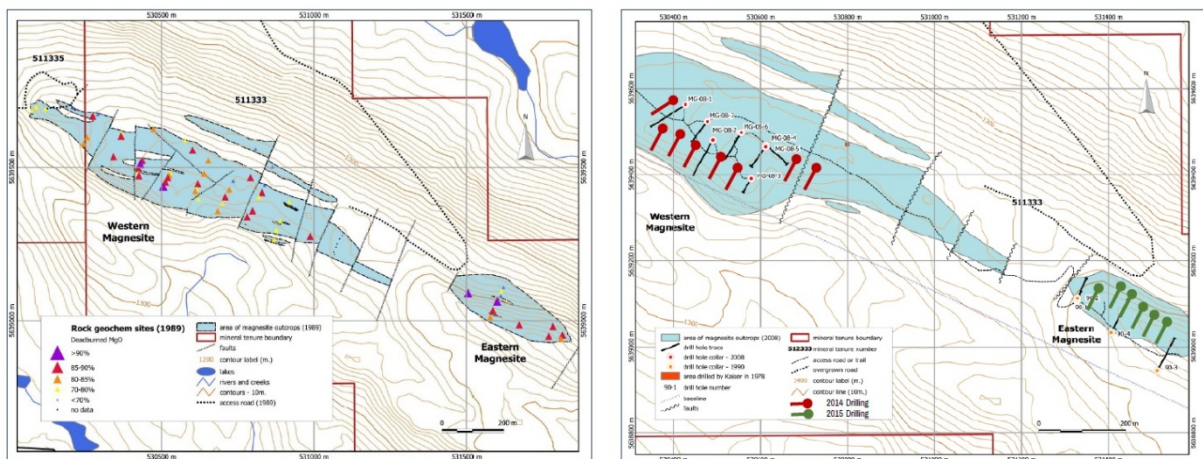
Silicon, the third commodity, is still at a very early stage on a project level, as no claim set has a resource being done on them, but has only seen sampling and limited drilling, also by previous owners. However this was enough to establish the high grade nature of all claims, and therefore could be interesting for further exploration and analysis of economic potential. As the company is focusing all attention on the magnesium and lithium projects, and the silicon projects are very early stage, I will focus solely on the first two as well.

A. The Driftwood Creek magnesium project

Core asset with the most tangible value is the Driftwood Creek magnesium project, located in mining friendly British Columbia, Canada. MGX Minerals hasn't only acquired this project, but also managed to buy an extensive package of surrounding claims with former magnesium mines, effectively consolidating the entire area for magnesium production potential. A maiden NI43-101 resource estimate has been completed in September 2016, announcing a Measured and Indicated (M&I) resource of 8M tonnes grading 43.31% magnesium oxide (MgO), and an Inferred resource of 0.85M tonnes grading 43.20%, which is not a particularly large deposit but it really is a world class average grade.

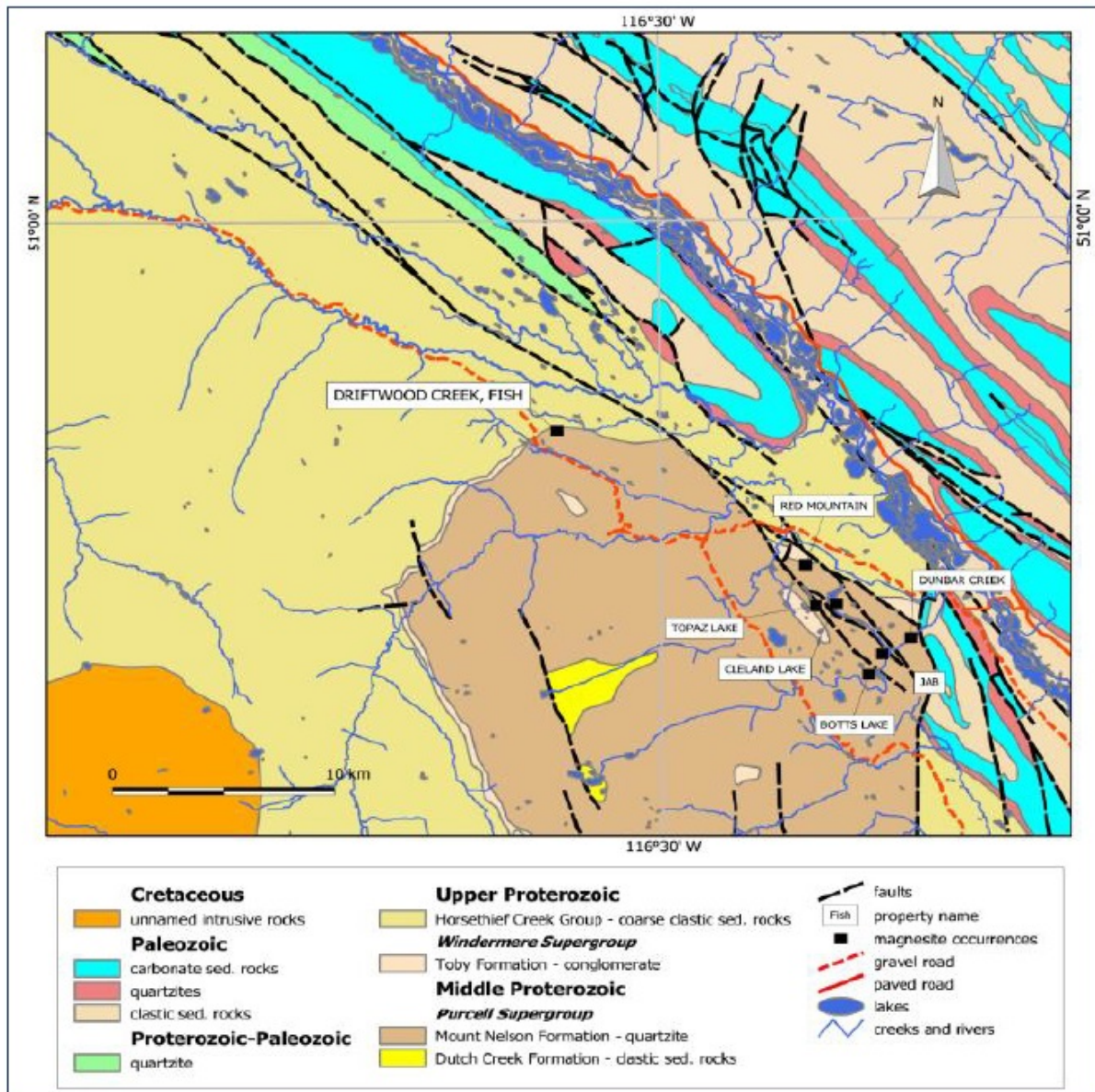
For example two other rare magnesium juniors, West High Yield Resources (WHY.V) and Nevada Clean Magnesium (NVM.V), of which I will discuss the project economics later on, don't even come close with grades of 24.6% and 12% respectively. Another fun fact is when pure, magnesite contains 47.8% magnesium oxide and 52.2% carbon dioxide, so the magnesite of Driftwood comes very close to pure magnesite. China is believed to have some very high grade deposits, and in Australia are a number of magnesite MgO deposits that come close to 40% MgO, and a few have MgCO₃ deposits that contain close to 47.6% MgO, but I think it's safe to say that Driftwood Creek is a likely candidate for the best magnesiumoxide deposit in the Americas.

The average grade for Driftwood Creek is also very consistent, and the mineralized zone has been traced over a strike length of 2,000m and up to 200m wide. The deposit remains open along strike and at depth according to the company.



Driftwood Creek: mineralized zones

As soon as MGX Minerals got a hold of the confirmed mineralization, it strategically acquired all other claims in the area surrounding Driftwood Creek, in order to avoid future competition of nearology plays. The following map doesn't show the claim boundaries, but it gives you an impression:



Driftwood Creek; adjacent magnesiumoxide claims

Most of the mineralization is located less than 100m from surface with hardly any overburden, indicating a very low strip ratio which is always a big plus for economics. A Preliminary Economic Assessment (PEA) is on its way, as soon as this is completed in early Q1 2017, management will submit their operating permit applications directly after this. Next up will be an updated resource estimate as management thinks the deposit can easily be doubled for tonnes, and in H2, 2017 a PFS with defined reserves is planned, which will be the foundation for capex funding talks. The objective is production in the summer of 2018.

Before I start with the setup for a hypothetical PEA in order to indicate the economic potential for Driftwood Creek, first a little bit of magnesium processing [theory](#), in order to understand the abbreviations EFM and DBM, which will be featured in the comparison of economic studies later on:

"The processing of magnesite ore begins with crushing, screening and washing.

When crude magnesite is heated to between 700°-1000°C, carbon dioxide is driven off to produce caustic-calcined magnesia (caustic magnesia). Caustic magnesia is able to absorb liquids and to absorb heavy metals and ions from liquid streams making it useful in water treatment.

When calcined magnesia is heated to between 1530°-2300°C, the product produced is non-reactive and exhibits exceptional stability and strength at high temperatures. This product known as 'dead-burned' (DBM) or 'sintered' magnesia is mainly used mainly as a refractory material because of its inertness and high melting point.

When calcined or dead-burned magnesia is heated in excess of 2800°C in an electric arc furnace, electrofused magnesia (EFM) is produced. It has higher strength, resistance to abrasion and chemical stability than dead-burned magnesia. It is used in the manufacture of premium grade refractory bricks used in the high wear hot spots of Basic Oxygen Furnaces, electric arc or similar furnaces where temperatures can approach 950°C."

As there are different methods to produce magnesium products (magnesium oxide, concentrates, EFM, DBM), which all have different market prices and costs, it will be clear that an outright peer comparison of companies using exactly those different methods and produce different products, is difficult to achieve. The two mentioned juniors West High Yield and Nevada Clean Magnesium do just that. On top of that their studies are from 2011 and 2013, when not only capex and opex were at different levels, but also the prices of magnesium products. The last one could be normalized for the product itself (although there are no public figures on magnesium product pricing as it is one of those not transparent commodities) but other metrics are almost impossible to convert.

Besides this, pricing of magnesium oxide is very dependent on purity. For example in 2013 (WHY.V PEA), pricing varied from \$300/t @87% MgO EFM to \$3000/t @98+% MgO EFM. Still, I'm having a go at it, to see if I can deduct some useful metrics. In the following table you see the PEA's lined up of West High Yield and Nevada Clean Magnesium:

Company	Nevada Clean Magnesium	West High Yield Resources
Ticker	NVM.V	WHY.V
Share price C\$	0,04	0,13
Shares outstanding MM	152,51	53,59
Marketcap C\$ MM	6,1	6,97
Study	2011 PEA (amended 2014)	2013 PEA
Project	Tami -Mosi	Record Ridge
Jurisdiction	Nevada, US	British Columbia, Can
Corporate tax	42,00%	35%
Minetype	Open Pit	Open Pit
Processing	Milling, thermal reduction (Bolzano)	Milling, leaching, heating
Deposit	Dolomite	Ultramafic Silicate
Strip ratio	0,04:1	1,1:1
Throughput tpd	840	3000
Mine Life (LOM) y	30	42
Mill feed grade Mg	12%	24,60%
Recovery rate	81%	80%
Average production Mg tpa	30000	258238
Average production MgO EFM tpa	N/A	342857(MgO EFM)
Total production Mg t LOM	900000	10846000
Total production MgO EFM t LOM	N/A	14400000(MgO EFM)
Initial Capex \$ MM	424,06	605
Capex/tpd \$	504833	201667
Cash cost \$/lb Mg	1,28	0,3 (MgO EFM)
Sustaining capital \$ MM	84	144
AISC \$/t Mg	1,32	0,36
Magnesium price \$/lb Mg	2,45 (Mg 99.9%)	0,5 (MgO EFM 92%)
Magnesium price \$/t Mg	5390	1100 (MgO EFM 92%)
CDN/US exchange rate	1:1	1:1
Discount	6%	5%
NPV \$ MM	335	830
IRR	13,40%	17,00%

As can be seen, the pricing between various magnesium products with various purities varies a lot. To look for current pricing of anything isn't easy either, as for example Infomine sports [this chart](#), last updated at October 31, 2016:



Magnesium (Mg); metal price, time period 5 years

As the magnesium production is controlled by China (produces about 80% of world production), and therefore pricing is more or less controlled by China, my feeling is that financiers want to see a much higher IRR than presented by these two companies, to create some margin of safety. It is probably one of the reasons these companies are progressing slowly in my view.

To get a feeling for the intentions of MGX Minerals with Driftwood Creek, I sat down with CEO Jared Lazerson in Munich. He told me they were looking for a relatively small capex mine plan, to get into production as quickly as possible, still with a decent NPV. As I mentioned before, the resource will probably pan out much larger, leaving room in the future to build a much bigger operation if possible. After discussing a number of metrics, a few things stood out for me:

- he expected the resource update to contain significantly more MgO (MGX is aiming at doubling it at the next resource update)
- He aimed at a life of mine (LOM) of 20 years and 100,000 t MgO DBM per annum, as the company recently received a 20 year mining lease for Driftwood Creek
- he aimed at all in sustaining costs of \$0.075/lb MgO DBM, and a capex of roughly \$60M

Estimating a strip ratio of 0.1:1 as the mineralization almost starts at surface, and estimating a capex/tpd ratio of about 75% of the ratio of West High Yield

(which is conservative), all numbers resulted in this addition to the table for MGX Minerals:

Company	Nevada Clean Magnesium	West High Yield Resources	MGX Minerals
Ticker	NVM.V	WHY.V	XMG.CNX
Share price C\$	0,04	0,13	0,67
Shares outstanding MM	152,51	53,59	56,7
Marketcap C\$ MM	6,10	6,97	37,99
Study	2011 PEA (amended 2014)	2013 PEA	Hypothetical 2017 PEA
Project	Tami -Mosi	Record Ridge	Driftwood
Jurisdiction	Nevada, US	British Columbia, Can	British Columbia, Can
Corporate tax	42,00%	35%	35%
Minetype	Open Pit	Open Pit	Open Pit
Processing	Milling, thermal reduction (Bolzano)	Milling, leaching, heating	Milling, leaching, heating
Deposit	Dolomite	Ultramafic Silicate	Dolomite, magnesite
Strip ratio	0,04:1	1,1:1	0,1:1
Throughput tpd	840	3000	400
Mine Life (LOM) y	30	42	20
Mill feed grade Mg	12%	24,60%	43%
Recovery rate	81%	80%	80%
Average production Mg tpa	30000	258238	N/A
Average production MgO EFM tpa	N/A	342857(MgO EFM 92%)	100000 (MgO DBM 95%)
Total production Mg t LOM	900000	10846000	N/A
Total production MgO EFM t LOM	N/A	14400000(MgO EFM 92%)	2000000 (MgO DBM 95%)
Initial Capex \$ MM	424,06	605	60
Capex/tpd \$	504833	201667	150000
Cash cost \$/lb Mg	1,28	0,3 (MgO EFM 92%)	0,06 (MgO DBM 95%)
Sustaining capital \$ MM	84	144	15
AISC \$/t Mg	1,32	0,36	0,075
Magnesium price \$/lb Mg	2,45 (Mg 99.9%)	0,5 (MgO EFM 92%)	0,18 (MgO DBM 95%)
Magnesium price \$/t Mg	5390	1100 (MgO EFM 92%)	400 (MgO DBM 95%)
CDN/US exchange rate	1:1	1:1	1:0,8
Discount	6%	5%	5%
NPV \$ MM	335	830	152
IRR	13,40%	17,00%	29,70%

The NPV resulted from this table:

MGX Minerals	Mg \$/lb	400					
Driftwood Creek							
year	Production Mg t	all in cc	CF	corp.tax	after tax	disc 5%	NPV
0	0	0	-60000000		-60000000	1,00	-60000000
1	50000	210,00	9500000	0,0%	9500000	1,05	9047619
2	100000	185,00	21500000	0,0%	21500000	1,10	19501134
3	110000	165,00	25850000	0,0%	25850000	1,16	22330202
4	120000	160,00	28800000	25,0%	21600000	1,22	17770373
5	120000	160,00	28800000	35,0%	18720000	1,28	14667610
6	120000	160,00	28800000	35,0%	18720000	1,34	13969152
7	120000	160,00	28800000	35,0%	18720000	1,41	13303955
8	110000	160,00	26400000	35,0%	17160000	1,48	11614563
9	100000	160,00	24000000	35,0%	15600000	1,55	10055899
10	100000	160,00	24000000	35,0%	15600000	1,63	9577047
11	100000	160,00	24000000	35,0%	15600000	1,71	9120997
12	100000	160,00	24000000	35,0%	15600000	1,80	8686664
13	100000	160,00	24000000	35,0%	15600000	1,89	8273013
14	100000	160,00	24000000	35,0%	15600000	1,98	7879060
15	100000	160,00	24000000	35,0%	15600000	2,08	7503867
16	100000	160,00	24000000	35,0%	15600000	2,18	7146540
17	100000	160,00	24000000	35,0%	15600000	2,29	6806228
18	100000	160,00	24000000	35,0%	15600000	2,41	6482122
19	100000	180,00	22000000	35,0%	14300000	2,53	5658996
20	50000	200,00	10000000	35,0%	6500000	2,65	2449782
Total	2000000		210450000		138570000		151844822

The IRR comes from another table:

	date*	payment**	interest days***	bound capital****		
1 .)	2017-01-01	-60000000,00	7.305,0	60000000,0	Yield (XIRR) p.a.:	29,89%
2 .)	2018-01-01	9500000,00	8.940,0	68312780,2	Yield (Excel-only) p.a.:	29,71%
3 .)	2019-01-01	21500000,00	8.575,0	67093465,9	periodic Yield p.a.:	29,7%
4 .)	2020-01-01	25850000,00	6.210,0	61162138,9		
5 .)	2021-01-01	21600000,00	5.844,0	57776448,1		
6 .)	2022-01-01	18720000,00	5.479,0	56209101,0		
7 .)	2023-01-01	18720000,00	5.114,0	54178440,3		
8 .)	2024-01-01	18720000,00	4.749,0	51640324,1		
9 .)	2025-01-01	17160000,00	4.383,0	49729221,5		
10 .)	2026-01-01	15600000,00	4.018,0	48892816,4		
11 .)	2027-01-01	15600000,00	3.653,0	47808099,6		
12 .)	2028-01-01	15600000,00	3.288,0	46401362,5		
13 .)	2029-01-01	15600000,00	2.922,0	44619845,3		
14 .)	2030-01-01	15600000,00	2.557,0	42266570,3		
15 .)	2031-01-01	15600000,00	2.192,0	39214655,7		
16 .)	2032-01-01	15600000,00	1.827,0	35256689,8		
17 .)	2033-01-01	15600000,00	1.461,0	30156261,2		
18 .)	2034-01-01	15600000,00	1.096,0	23509042,1		
19 .)	2035-01-01	15600000,00	731,0	14888398,8		
20 .)	2036-01-01	14300000,00	366,0	5008461,7		
21 .)	2037-01-01	6500000,00	0,0	0,0		
					Sum of disbursements:	-60000000,00
					Sum of yields:	328570000,00
					Gain/Loss:	268570000,00

The bottom line is that with a relatively low investment for initial capex of \$60m a very decent post-tax NPV of \$152M can be achieved. A post-tax IRR of 29.7% for a magnesium project is more than high enough in my view to attract capex financiers for debt packages. Considering the current marketcap of C\$37.9M, the marketcap/NPV ratio would be just 0.19 if the upcoming PEA would confirm my estimates, based on Driftwood Creek alone. This is not all, as my calculations just take into account 2Mt MgO out of a 8Mt MgO resource, which could easily

double after limited drilling according to management, indicating a much larger project and NPV. But there is more.

B. The Alberta Lithium project: the wildcard

2016 was the year of the lithium hype, turning many retail investors instantly into freshly minted millionaires. The connection to that other development, the Electric Vehicle (EV) mania (turning into something fairly serious [recently](#) besides the inevitable Tesla, as most European car manufacturers are planning to build a supercharger network across Europe, conveniently beating Tesla's charger grid for charging time), is clear. 14 Giga/mega factories are also being built (predominantly in Asia), and current battery producers bought up all supply, creating a deficit which is projected to last at least to the end of 2018. You can read some of my earlier [work](#) for my analysis of the situation, and I haven't seen anything substantial yet which makes me think I should alter my outlook on lithium for the next few years. If anything, it looks like EV is getting more and more mainstream. Lithium prices have stabilized, and are rumored to experience a lift again as producers like Galaxy is able to fetch higher prices at the moment. This bodes well for lithium projects which could forecast production within about 2 years from now.

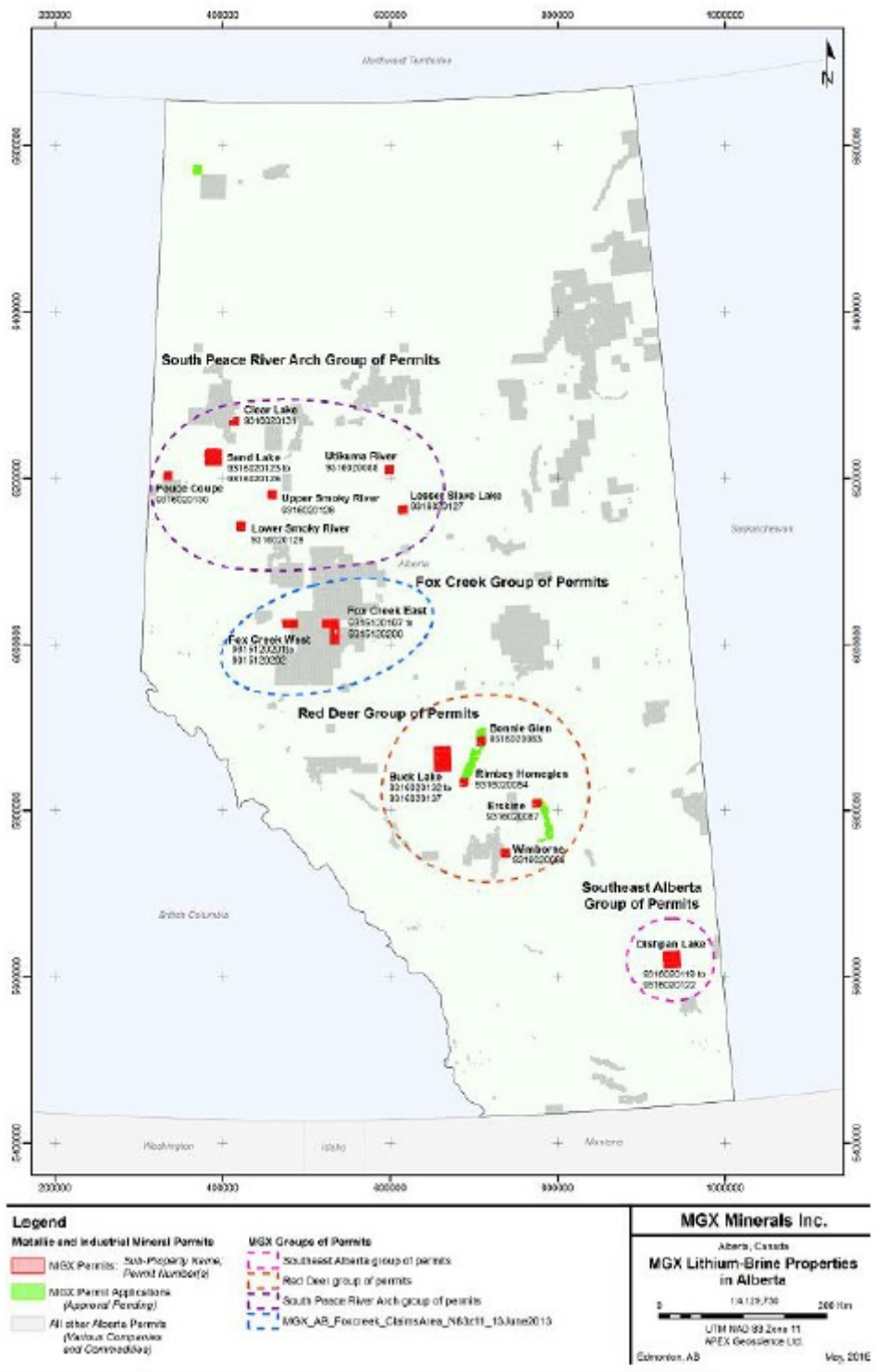
Where does MGX Minerals fit in all this, as a new lithium player? It has no defined project, no NI43-101 compliant resource estimate, no economic studies, no permits. Nonetheless, it wants to produce in H2 2018, which sounded a bit like a stretch to me when I first found out about it. In addition, hearing about a proprietary method to economically extract lithium from oil wastewater, a process being researched unsuccessfully for many years by O&G majors all over the world, generated the distinct feeling of a red herring with me.

However, as Driftwood Creek is a very viable project, and Hirschberg and his team couldn't stop talking about the lithium potential, I looked further into it. The first thing I noticed was the presence of the aforementioned former Shell exec Larry Marks. If this was a crazy idea, why would someone like Marks, who knows everybody in the O&G industry, but is also known by everybody in that universe, risk his carefully built reputation over marketing this proprietary concept to O&G majors? Nonetheless, because of his network, MGX Minerals is already negotiating terms on contracts to treat oil field wastewater at the moment, which is a heavy burden for producers as costs are high. I found this to be astounding for a CSE listed company with just a few patents pending and one very small pilot plant, which just started testing. What is going on here?



Alberta lithium project; very first 75 bpd pilot plant

Let's start from the beginning here. MGX Minerals noticed the runup in lithium product prices like many other juniors did, at the end of 2015. After carefully analyzing traditional methods and projects, and speaking to sector experts, chemists, engineers, etc, CEO Jared Lazerson came up with the bold idea to become the first in producing lithium from oil brines, which is wastewater to oil producers and needs to be taken care of at high costs. Convinced after his talks with various experts it was doable, Lazerson started buying oil brine properties in the state of Alberta, Canada, which contain the highest average lithium grade in the country (up to 140mg/L Li), and hired two experts to shape this strategy, one of them being Larry Marks. Plans were laid out for a pilot plant design, and Cementation AG, part of a global engineering and construction firm, was hired to engineer this plant. In the meantime the Alberta land positions increased rapidly, to the point MGX Minerals is now the largest holder of lithium brine land in Canada, with 486,800 hectares.



Alberta lithium project; locations of brine properties

A few months later, at April 14 2016, Cementation AG didn't exactly sit on their hands either and produced an initial Process Design and Scoping Study, which indicated a 20,000 bpd (barrels per day) commercial pilot plant, reducing the recovery time from 18 months to one day. To be clear: this would be nothing short of the holy grail in lithium recovery, for example giants like POSCO and

Tenova Bateman are searching for commercial methods like this for 5 years now, to be used in their cases for conventional brines, not connected to oil brines.

3 weeks later, MGX received a [report](#) on initial capex of the pilot plant, without publicly mentioning any figures. According to Lazerson, the initial capex of a 20,000 bpd plant would amount to ballpark numbers to the tune of \$20-50M, depending on optimization engineering. When scaling up, other 20,000 bpd units can be added. On a side note: this conceptual system of scaling up by adding plant units can be compared to the 500tpa LiOH units of Nemaska Lithium at their Shawinigan plant.

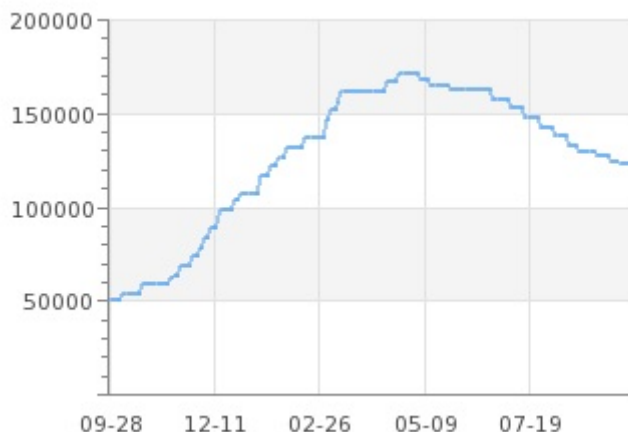
An annual production of 611t LCE was estimated at a brine grade of 130mg/L Li, byproducts being sodium chloride (106,000t) and calcium chloride (43,000t). Gross annual revenue is expected by management to be about \$25M, with cash flow of about \$16M, based on a \$12,000/t LCE price, a \$89/t NaCl and \$200/t CaCl₂. As a consequence, as opex is indicated by management to be about \$9M, the overall cash cost for such an operation would theoretically be \$15,000/t LCE if we assign no costs to byproducts. Keep this in mind with other calculations in this chapter, cash costs are always those \$9M divided by tonnes LCE. The byproduct credits are obviously very important in this concept. I worked on a bit of DCF analysis in order to get some feeling for economics here, and see if this venture could be economic (my minimum threshold for these kinds of lithium operations would be a post-tax IRR of 25% at a conservative metal price).

The post-tax IRR would come in at an estimated 24.2-65.7% depending on capex (I used a 10 year life of "mine" which I assume to be a solid minimum to calculate NPV's and IRR's):

MGX Minerals	LCE	12000		Li mg/L	130,00	Recovery	78%	
Alberta Lithium capex \$50M	IRR	24,20%						
year	Production LCE t	all in cc	Byproducts CF	CF	corp.tax	after tax	disc 5%	NPV
0	0	0		-50000000		-50000000	1,00	-50000000
1	611	15000,00	18034000,00	16201000	0,0%	16201000	1,05	15429524
2	611	15000,00	18034000,00	16201000	0,0%	16201000	1,10	14694785
3	611	15000,00	18034000,00	16201000	0,0%	16201000	1,16	13995033
4	611	15000,00	18034000,00	16201000	32,0%	11016680	1,22	9063450
5	611	15000,00	18034000,00	16201000	35,0%	10530650	1,28	8251040
6	611	15000,00	18034000,00	16201000	35,0%	10530650	1,34	7858133
7	611	15000,00	18034000,00	16201000	35,0%	10530650	1,41	7483936
8	611	15000,00	18034000,00	16201000	35,0%	10530650	1,48	7127558
9	611	15000,00	18034000,00	16201000	35,0%	10530650	1,55	6788151
10	611	15000,00	18034000,00	16201000	35,0%	10530650	1,63	6464906
Total	6110			112010000		72803580		47156515

MGX Minerals	LCE	12000		Li mg/L	130,00	Recovery	78%	
Alberta Lithium capex \$20M	IRR	65,70%						
year	Production LCE t	all in cc	Byproducts CF	CF	corp.tax	after tax	disc 5%	NPV
0	0	0		-20000000		-20000000	1,00	-20000000
1	611	15000,00	18034000,00	16201000	0,0%	16201000	1,05	15429524
2	611	15000,00	18034000,00	16201000	24,0%	12312760	1,10	11168036
3	611	15000,00	18034000,00	16201000	35,0%	10530650	1,16	9096771
4	611	15000,00	18034000,00	16201000	35,0%	10530650	1,22	8663592
5	611	15000,00	18034000,00	16201000	35,0%	10530650	1,28	8251040
6	611	15000,00	18034000,00	16201000	35,0%	10530650	1,34	7858133
7	611	15000,00	18034000,00	16201000	35,0%	10530650	1,41	7483936
8	611	15000,00	18034000,00	16201000	35,0%	10530650	1,48	7127558
9	611	15000,00	18034000,00	16201000	35,0%	10530650	1,55	6788151
10	611	15000,00	18034000,00	16201000	35,0%	10530650	1,63	6464906
Total	6110			142010000		92758960		68331648

Such figures would indicate a (very) profitable operation, although the used LCE price is not conservative but very high for long term contracts, which is the standard for DCF analysis and capex funding parties for industry scale projects. The current spot price is at \$15,000/t LCE levels but the spot market isn't leading for industry scale projects like this, that is the long term (LT) contract market.



Lithium Carbonate Equivalent (LCE); spot price

The majors are negotiating LT prices of \$8,000-10,000 at the moment, and the question is if this would be sustainable after two years down the road. There are experts who see deficits for the next 10 years out, but I would like to join the

more conservative majority of juniors doing economic studies, which use much lower LCE pricedecks. The used NaCl and CaCl₂ prices are conform current prices so there lies no additional pricing risk.

If I would use for example a \$7500/t LCE price, and leave the byproduct prices unchanged, the cash flow would lower marginally to \$14.5M, and the estimated corresponding post-tax IRR would be about 18-54%:

MGX Minerals	LCE	7500		Li mg/L	130,00	Recovery	78%	
Alberta Lithium capex \$50M	IRR	18,00%						
year	Production LCE t	all in cc	Byproducts CF	CF	corp.tax	after tax	disc 5%	NPV
0	0	0		-50000000		-50000000	1,00	-50000000
1	611	15000,00	18034000,00	13451500	0,0%	13451500	1,05	12810952
2	611	15000,00	18034000,00	13451500	0,0%	13451500	1,10	12200907
3	611	15000,00	18034000,00	13451500	0,0%	13451500	1,16	11619911
4	611	15000,00	18034000,00	13451500	28,0%	9685080	1,22	7967939
5	611	15000,00	18034000,00	13451500	35,0%	8743475	1,28	6850741
6	611	15000,00	18034000,00	13451500	35,0%	8743475	1,34	6524516
7	611	15000,00	18034000,00	13451500	35,0%	8743475	1,41	6213824
8	611	15000,00	18034000,00	13451500	35,0%	8743475	1,48	5917928
9	611	15000,00	18034000,00	13451500	35,0%	8743475	1,55	5636122
10	611	15000,00	18034000,00	13451500	35,0%	8743475	1,63	5367735
Total	6110			84515000		52500430		31110577

MGX Minerals	LCE	7500		Li mg/L	130,00	Recovery	78%	
Alberta Lithium capex \$20M	IRR	54,00%						
year	Production LCE t	all in cc	Byproducts CF	CF	corp.tax	after tax	disc 5%	NPV
0	0	0		-20000000		-20000000	1,00	-20000000
1	611	15000,00	18034000,00	13451500	0,0%	13451500	1,05	12810952
2	611	15000,00	18034000,00	13451500	18,0%	11030230	1,10	10004744
3	611	15000,00	18034000,00	13451500	35,0%	8743475	1,16	7552942
4	611	15000,00	18034000,00	13451500	35,0%	8743475	1,22	7193279
5	611	15000,00	18034000,00	13451500	35,0%	8743475	1,28	6850741
6	611	15000,00	18034000,00	13451500	35,0%	8743475	1,34	6524516
7	611	15000,00	18034000,00	13451500	35,0%	8743475	1,41	6213824
8	611	15000,00	18034000,00	13451500	35,0%	8743475	1,48	5917928
9	611	15000,00	18034000,00	13451500	35,0%	8743475	1,55	5636122
10	611	15000,00	18034000,00	13451500	35,0%	8743475	1,63	5367735
Total	6110			114515000		74429530		54072784

This still looks good (IRR of 25% is my minimum threshold so capex has to go down to about \$40M at least when using \$7500/t LCE), although one must keep in mind that this is based on 130mg/L Li, which is close to the maximum level of lithium grade monitored at the claims. A lot of wells have much lower figures (50-75mg/L), so not all claims are useful. For example, the average lithium grade of Sturgeon Lake oilfield is reported at just 67mg/L Li, which is pretty low.

After numerous land package increases, it was time for the company to acquire (or at least sign a binding LOI with) Purlucid Treatment Solutions, a company which developed proprietary technology to separate oil from lithium bearing brine. The separation of oil from brine has always been an important hurdle for processing, which had to be cleared first before the lithium recovery process from the resulting brine could proceed in the pilot plant. Therefore, in my view this has been a very important development for MGX Minerals.

The acquisition of Purlucid will be staged, as MGX Minerals will have to pay C\$5M in 2 years for 50%, and another C\$10M for the second 50%. A legitimate question would be if Purlucid is worth C\$15M as I can't find any project data or

financials, and only find a very simple and outdated website of this company, something I would expect to be up to date from a state of the art cleantech company worth that much money. I will not be the only one asking, as MGX Minerals is looking into an uplisting to the TSX Venture, and they will look at deals like this with extra scrutiny. When asked about it, Lazerson admitted that the acquisition price wasn't cast in stone yet, and depended on a lot of factors, among them a possible grant from the government for clean technologies of up to C\$10M. We will see.

The most interesting development was of course the testing of the first small pilot plant, with a capacity of 75bpd, of which the results were [announced](#) on January 3, 2017. According to Mr. McEachern, CEO of Purlucid, this test data has been registered:

- Starting EBD with Li concentration of 87 mg/L.
- Final recovery of Li was 34.8 mg/L or 40%.
- Li was lost in the initial softening of the EBD (18%) when approximately 20% of the fluid mass is lost due to removal of silica and other solids,
- 1% of the Li was lost in the NaCl removal step.
- 16% of the Li was lost in the magnesium removal step.
- 4% of Li was lost in the CaCl₂ removal step.
- 21% of the total Li remained in the final brine. This portion of lithium has a high probability of recovery by further reaction or during a second pass.
- Li was crystallized as lithium carbonate.
- Other primary recoveries of minerals in total were 83% sodium and 100% calcium.
- The final brine still contained high concentrations of sodium, potassium, and boron indicating where optimization will focus on.
- Additional applicable data was collected for the potential extraction of boron, bromine, magnesium and potassium.
- The treatment process removed all suspended solids, 99.97% of the hydrocarbons and reduced scale forming ions such as silica to levels suitable for reuse in steam generating processes.

So 21% of total lithium could be recovered in the end. During this testing, no NaCl or CaCl₂ byproducts were recovered but simply removed. As lithium recovery is still much lower than anticipated in the scoping study (about 78% at an average grade of 130mg/L), the pilot plant has to be thoroughly optimized in order to be economically viable. It's important to calculate the break even point here for different scenarios, if possible of course. With all scenarios, the total cash costs (about \$9M) and total production (and recoveries) of byproducts are assumed to be constant, independent of capex and lithium recoveries.

When the grade is brought down to the tested 87mg/L, and I would use the 20,000 bpd figures, the post-tax IRR on the worst case capex of \$50M and \$12,000/t LCE price (byproducts are included as in the scoping study) for 100% recovery is 22.7%, which is below my 25% threshold. This will be reached at a capex of \$46M btw. But a 100% recovery for lithium is very unlikely if not impossible. A 78% recovery as used in the scoping study results in a post-tax

IRR of 20% which is clearly not sufficient, but at a capex of \$41M the IRR goes to 25%.

At a \$7500/t LCE price things change. A capex of \$41M would generate a post-tax IRR of 21.4%. A capex of \$36M results in 25%. The next question arises: at what LCE price could a midpoint \$35M capex operation at an average grade of 87mg/L Li with a decent recovery percentage be viable according to my threshold post-tax IRR of 25%? I ran the numbers again, and assumed a 50% recovery for lithium (total costs and byproduct revenues constant again). It turned out that the estimated resulting LCE price is \$10300/t:

MGX Minerals	LCE	10300		Li mg/L	87,00	Recovery	50%	
Alberta Lithium capex \$50M	IRR	25,00%						
year	Production LCE t	all in cc	Byproducts CF	CF	corp.tax	after tax	disc 5%	NPV
0	0	0		-35000000		-35000000	1,00	-35000000
1	262	35000,00	18034000,00	11562600	0,0%	11562600	1,05	11012000
2	262	35000,00	18034000,00	11562600	0,0%	11562600	1,10	10487619
3	262	35000,00	18034000,00	11562600	0,0%	11562600	1,16	9988209
4	262	35000,00	18034000,00	11562600	30,0%	8093820	1,22	6658806
5	262	35000,00	18034000,00	11562600	35,0%	7515690	1,28	5888740
6	262	35000,00	18034000,00	11562600	35,0%	7515690	1,34	5608324
7	262	35000,00	18034000,00	11562600	35,0%	7515690	1,41	5341261
8	262	35000,00	18034000,00	11562600	35,0%	7515690	1,48	5086915
9	262	35000,00	18034000,00	11562600	35,0%	7515690	1,55	4844681
10	262	35000,00	18034000,00	11562600	35,0%	7515690	1,63	4613982
Total	2620			80626000		52875760		34530535

The post-tax IRR table looks like this:

	date*	payment**	interest days***	bound capital****		
1.)	2017-01-01	-35000000,00	3.852,0	35000000,0	Yield (XIRR) p.a.:	24,98%
2.)	2018-01-01	11562600,00	3.287,0	32173150,9	Yield (Excel-only) p.a.:	24,98%
3.)	2019-01-01	11562600,00	2.922,0	28640740,5	periodic Yield p.a.:	25,0%
4.)	2020-01-01	11562600,00	2.557,0	24228865,5		
5.)	2021-01-01	8093820,00	2.191,0	22198135,1		
6.)	2022-01-01	7515690,00	1.826,0	20222941,7		
7.)	2023-01-01	7515690,00	1.461,0	17754754,0	Sum of disbursements:	-35000000,00
8.)	2024-01-01	7515690,00	1.096,0	14670524,3	Sum of yields:	87875760,00
9.)	2025-01-01	7515690,00	730,0	10827687,2	Gain/Loss	52875760,00
10.)	2026-01-01	7515690,00	365,0	8014510,9		
11.)	2027-01-01	7515690,00	0,0	-0,0		

A LCE price of \$10300/t is still high, but not unrealistic. However, when the capex is lowered to \$31M, a LCE price of \$7500/t would also achieve a post-tax IRR of 25%. So to lower the capex as much as possible has the biggest effect on economics, since lithium production is just generating a relatively small part of revenues. If MGX Minerals would go really low with their recoveries for lithium, but manages to keep cash costs and byproducts constant, a capex of \$27M would be sufficient to support economics at just a 25% lithium recovery.

I must say I didn't look into possible equilibrium shifts for byproducts NaCl and CaCl₂. When MGX Minerals would ramp up production to for example 10 or 20 units of 20,000bpd, the amounts of byproduct would be very significant, and effects on supply/demand are warranted in that case in my view.

According to management, there are several ways to bring costs down. One of them is the leverage by the patent pending technology of the availability of thermal energy in the oil brines deep down below. Others are by leveraging the advanced filtration expertise of Purlucid to reduce opex and capex significantly as they have successfully done with their patented water filtration technology.

An advantage for MGX Minerals with this oil brine concept is existing infrastructure in the oilfields, which allows for direct connection to daily, large-scale brine production. MGX Minerals controls mineral rights at the moment containing over 1M barrels per day of current brine production, so depending on the development of testing, the opportunities are substantial. The company is also planning to upgrade a non-43-101 compliant resource estimate of a ballpark 2Mt LCE figure at the Alberta Lithium project, after it has established economic extraction through series of testing, to indicate tangible economic potential of the various brine properties. Another convenient feature is the pre-treatment of brine which would remove oil and heavy metals, and produces a by-product of clean water which can be sold, released or sent back down hole with significantly reduced impact.

For now it seems that the current recovery methods don't generate spectacular economics or huge revenues. However, management told me they were aiming at a lower capex/lower opex pilot plant, possibly even deferring the need to recover byproducts, substantially improving economics. Results of engineering and testing of this new concept are expected after a few weeks.

Cost structures or cash flow potential on this topic has to be studied in-depth and tested first by the company before anything can be stated here. Saying anything about implied value of the Alberta Lithium project is very difficult for several reasons, but the Driftwood Creek project can be used as a basis for valuation after the PEA comes out.

4. Valuation

99% of the tangible value of MGX Minerals can be assigned to the Driftwood Creek magnesium project, especially after the PEA comes out, which could be any day now. As calculated before, the post-tax NPV5 is estimated at \$152M, which translates into C\$200M, and implies a NPV/marketcap ratio of 0.19. I tried to compare NPV's at certain stages with peers in the past, but due to the variety in projects and project specific details, this is armwaving at best. With many projects at the same stage, commodity and jurisdiction you can come a long way, but with magnesium it's different, as there are hardly any comparable projects.

Since management is planning on production in the summer of 2018, and projects going into production have a NPV/marketcap ratio of 1.0-1.4 on normal profitability (this could go to extremes with for example very high grade precious metals projects like developer MAG Silver with a ratio of 3.1), it isn't unrealistic that the marketcap of MGX Minerals would close in on C\$200M when it is about to commence commercial production next year. As the capex isn't made out of thin air and needs financing, as a rule of thumb the often used 2/3-1/3

debt/equity package, C\$67M should be raised in the markets. Assuming a share price of C\$1.00 at that time, 67M shares (and hopefully no warrants) will be added to the current number of shares, totaling after capex financing 138.9M shares outstanding. This would result in a hypothetical **target of C\$1.44**. This doesn't assign any value to the lithium or silicon projects, and doesn't assume off-takes or JV partners, possibly diluting interests.

How to value the lithium venture of MGX Minerals? As mentioned, there is no proof yet for a commercially viable recovery method, also involving the byproducts, which deliver more revenues than the lithium itself unless LCE prices go to very lofty levels of about \$24,000/t LCE.

However, if the company really manages to find a cheap and efficient method that doesn't need byproducts, and still can recover lithium within a day, then the sky will be the limit. Company management told me that's exactly what they are looking for in the next weeks/months, so this is definitely a subject that could be a major catalyst.

5. Conclusion

MGX Minerals is a truly interesting stockpick by Hirschberg and his companions, with an excellent flagship project (Driftwood Creek magnesium) and a wildcard (Alberta lithium project). Driftwood Creek is a simple open pit operation, easy to permit, easily scalable, and the deposit is open in several directions, making it amendable for a wide range of capex arrangements. The current low capex base case scenario as indicated by management already could generate a post-tax NPV at the upcoming PEA which is 6 times the current market cap. Imagine what could happen if the lithium project becomes very economic through optimization, and plans for uplisting could eventually materialize, reaching out to a whole new audience. If Lazerson and his advisors would succeed, the sky really is the limit here. I like the odds, and so does Robert Hirschberg.

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Driftwood Creek; 2016 drilling

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