A Key Piece in the Clayton Valley Lithium Patchwork

In the staking frenzy of recent months, little historical ground has gone unturned, and yet Sienna Resources (TSXV: SIE | OTCBB: HBNRF) has still managed to sneak under the skirts of some major players and grab hold of a key piece in the long-established Clayton Valley lithium district. While its early days to draw conclusions specifically on the Sienna territory, here I shall look at the area and its geological and production history to see if the "tealeaves" look as prospective as they seem.

Clayton Valley

This saline lake in Nevada has become a veritable patchwork of interests as the Lithium boom has fired imaginations. In the beginning there was Albemarle (which operates North America's only producing Lithum brine deposit here), but surprisingly they had been comfortable enough to have not secured all the available territory with the result that the door was left ajar for a handful of other players to move in and get themselves a foothold.

Clayton Valley is located in Esmeralda County, Nevada, USA approximately 180 km north of Death Valley, CA. Clayton Valley is a closed basin with an area of 1,342 km2 and a playa surface of 72 km2. The basin lies in the eastern rain shadow of the Sierra Nevada and is arid with an annual average precipitation of 13 cm, average evaporation rates of 142 cm/yr and an average temperature of 13°C. The elevation of the valley floor is 1298 m, lower than any of the basins in the region.

It is located in a closed-basin system with an arid climate. The Li-rich brines are currently being produced from six different aquifers in the playa. The brines have formed from a

complex process involving evaporation, mixing, and halite, and hectorite (dissolution, precipitation, ion exchange and sorption). Climate fluctuations in Clayton Valley over time (at least since ~ 1Ma) have played a role in the preservation of Li in clays (hectorite).

Other Pieces of the Patchwork

As mentioned the Clayton Valley is home to the only lithium brine producing operation in North America (Albemarle's Silver Peak Mine). Lithium X is also in the scrum and so is an entity called Cruz Capital Corp. Pure Energy Minerals, which owns the Clayton Valley South project, has recently released an inferred resource of 816,000 tons of lithium carbonate equivalent on the Clayton Valley South project. According to the Pure Energy's website, "Geophysics shows that the same brine-bearing formations encountered during drilling appear to extend to much greater depths within the basin."

When we compared the zone to a patchwork quilt we are not exaggerating as the map below shows.

Some Back History

Of all the locations in North America for Lithium prospectivity the Clayton Valley has the new buzzword "closeology" going for it. The Foote Mineral Company began extracting lithium from below the floor of Clayton Valley in 1966. The mine then ended up in the hands of the German group Chemetall, which was then rolled into Rockwood, which most recently became Albemarle after a takeover. Its evaporation pans are shown below:

The company speaks of its production numbers in cagey terms blending together its output from this site with its Chilean

production. However, the site is clearly important. The fact that it has received Department of Energy grants in the past for production expansion clearly shows that the *Powers That Be* in Washington have a desire to keep a US source of Lithium production going.

Sienna's Deal

In late May, Sienna announced that it had acquired what it termed the "Clayton Valley Deep Basin Lithium Brine Project". This project is located directly between and bordering Pure Energy Minerals Limited and Lithium X Energy Corp. The "Clayton Valley Deep Basin Lithium Brine Project" is located in parts of the deepest sections of the valley. Sienna's concession wraps around that of Pure Energy.

The company's attitude is that as saline brines are higher density than fresh or brackish water they therefore tend to sink. Based on this, management is optimistic regarding this project as its concession is located in the deeper sections of this basin. Work so far on the territory is scanty but management plans to commence operations on this new project shortly.

Geology

It is useful to look at the geology of the whole saline lake. A USGS report note that the basement consists of late Neoproterozoic to Ordovician carbonate and clastic rocks that were deposited along the ancient western passive margin of North America. The basin is bounded to the east by a steep normal fault system toward which basin strata thicken. Tuffaceous lacustrine facies (termed the Esmeralda Formation) deposited during the Late Miocene or Pliocene, contain up to 1300 ppm Li and average 100 ppm Li. Late Miocene or Pliocene felsic tuffs and rhyolites along the basin's eastern flank have Li concentrations reported to be as high as 228 ppm, however, the highest Li concentrations in these volcanic rocks

is actually an order of magnitude less (~22 ppm). Multiple wetting and drying periods during the Pleistocene resulted in the formation of alternating lacustrine deposits, salt beds, and Li-rich brines. Hectorite in the playa sediments contains from 350-1171 ppm Li. Prior to development of the brine resource by Albemarle's predecessors, a salt flat and brine pool existed in the north part of the basin, but groundwater pumping has eliminated the surface brine pool.

Conclusion

Sienna look like they have managed to buy the "last ticket to ride" on the Clayton Valley Express. As historical (and present) Lithium producing districts in North America go, this is the one to go for. Now it's a case of getting down to some work on the concession and seeing if it can match or exceed what Pure Energy have managed to achieve here.

Blue Jays, Lithium, Uranium and Pot

Back in April, the smart money picked the Washington Nationals to win the World Series, and with good reason, but as the season played out and Jonathon Papelbon reverted to old school choking, the Nats failed to make the post-season. No playoffs for you! The "experts" were wrong.

There were also pre-season picks like St. Louis and the Dodgers, who did in fact have very good seasons. The experts were right.

No one picked the Blue Jays to be a team verging on greatness. Mid-season changes and players having career-years propelled

the organization to an expectedly giddy post-season. The experts couldn't have been expected to see that one coming.

Making calls on public companies is similar to picking teams in the pre-season. Some calls look easy, but they don't pan out. Others do. Some surprise everyone. And against that background we're going to re-visit some of our 2015 picks.

We started the year with Integra Gold – we call that one a win. Our first article of 2015 said Integra was a likely takeover target. It had just released its Preliminary Economic Analysis on its Lamaque properties in Quebec, form which we observed, "…Integra cut its cash needs, reduced the lead time to production by 25%, crammed down its all-in sustaining costs and provided visibility on the key metrics for success. They significantly de-risked the company and as a result made it very attractive to larger companies with stronger balance sheets."

In August, 2015 Eldorado Gold Corporation ("Eldorado") invested $14.6 million into Integra by way of a non-brokered private placement of common shares, resulting in Eldorado holding 15% of Integra's voting common shares. In a widely held company like Integra (and despite it being under the 20% threshold), that gives Eldorado control.

Integra continues to report strong results and is running a $1M Gold Rush challenge aimed at crowd-sourcing brainpower to find the next gold prospect on its property. We expect more good news from Integra over the next several months.

Copper Mountain Mining – unfortunately, we were right here, too. The full story of Copper Mountain's shame can be found here, and the links in that article can be tracked backwards to the sorry beginning.

In July we called it a "slow-motion disaster movie". We have been highly critical of the board and management, not only for the poor operational results but mainly for the non-compliance

with disclosure obligations. Copper Mountain misled the market for over a decade, seriously harming the holders of the NSR on the property.

Copper Mountain continues to disappoint. From a year high of over $2.30 down to its current price of roughly $0.55 a share, CUM shows what leverage does to a producer on the way down. With copper treading around $2.40 a pound, it's unclear whether Copper Mountain will be able to continue as a viable operation. If it can hang on for another year or so, a supply-demand imbalance in copper might get leverage working upwards for the shareholders.

In April we looked at two companies exploring in Brazil. Since then, one (Cancana Resources – manganese) has established a strong path to success while the other (DNI Metals – graphite) is still trying to find a way.

Back then we said, "Cancana's business model is to start with the known knowns. Develop the known manganese fields, consolidate title to the local boulder fields, and bring processing into one central plant. This should result in short term revenue, high plant usage, low downtime, and higher margins. Combining this with organic growth through the drill bit (scheduled to commence in May, 2015), Cancana has the opportunity to supply the global steel market while maintaining its premium charges."

Cancana has delivered on these goals. It has expanded its footprint, reported good exploration results, made progress with mining engineers Ausenco on centralizing the processing, begun selling product, and increased efficiencies. We like this narrative and expect more positive news from Cancana over the next 18 months.

DNI Metals is still trying to execute on its business plan. It had a hard time closing on its announced private placement, and eventually had to change the terms of the offering to get

the minimum amounts in the door. But close they did, and management deserves credit for that. They have put the funds to work in Brazil and in Madagascar. The stock has drifted down significantly from its opening and finance price – time will tell if management can deliver. DNI's season had a rough beginning but isn't over yet.

In a somewhat confusing move, DNI also recently announced it is acquiring a lab in the Greater Toronto Area to carry out testing and metallurgic work for itself and for third parties. We don't like this acquisition. A junior exploration company needs focus to survive, and this acquisition is an unneeded deviation from the business plan.

A company that is sticking to its business plan is Carube Copper, who is exploring assets in Jamaica. We've looked at them twice, once briefly and once in greater detail. We recently met with management for an update and are enthusiastic about its chances for success.

Carube, in addition to the Jamaican assets, holds the British Columbia gold-copper assets puppied out of Wallbridge Mining in 2010.

Carube has had considerable success staying on path. This is a strong deal with considerable upside offered by the assets themselves, the high quality management team and the partnership with OZ Mining, an Australian mining company with a billion dollar market cap. So far, Carube is having a good season and we expect that to continue.

Another company we looked at who has ties to a much larger company was Contagious Gaming. At the time Contagious was operationalizing its English gaming assets and earning revenue in North America from its software platforms. Since then, Contagious has announced two large deals, made a serious disclosure gaffe, and is generally a puzzling company. The board and management have not done a good job engaging the

shareholder base, but closing on either of the large announced deals on accretive terms would be similar to the Blue Jays roster makeover halfway through the season. A failure to close on either deal would likely see the management team get demoted. Watch the news flow to judge management's success.

Also on the high tech front, in July we looked at Seair Inc. and its SWEET technology, aimed at oil / water separation in the oil patch. SWEET's passive technology creates microbubbles in the oil, which lowers the cost of operation. Seair can separate more oil at a lower cost than any competing process. Customer payback ranges from only 3 – 6 months, an astounding short period of time.

At that time we referred to Seair's formal exclusive strategic partnership with Renewable Fluid Services (RFS), a U.S. based process and product development company. Seair will provide SWEET to RFS to use in RFS' oil recovery process. This relationship has borne fruit. In late September Seair announced it had signed a confidentiality agreement with Petroleum Development Oman (PDO) with the intent to run a SWEET major field trial in a large polymer flood operation.

Seair's new management team is clearly focussed on taking what had been benched technology and commercializing it. We expect more good news as SWEET undergoes more field trials.

Also in July we looked at the Fission – Denison proposed merger. At the time we liked the combined uranium portfolio of exploration and development properties, the cash flow from toll-milling at the Cigar Lake Mine and management fees from Uranium Participation Corporation, and the strength of the proposed leadership team. We also acknowledged weaknesses in the deal, which goes to Fission's shareholders for approval next Wednesday, October 14.

Some of those shareholders are strongly opposed to the deal. At a town-hall style held by Fission in Toronto on Oct 6,

those shareholders made their voice heard. It’s going to be a close call whether the deal is approved. Expect major consequences if the shareholders vote down the merger.

And speaking of voting, we’re still waiting on the Allard decision and on the federal election before we make any medium term call on the marijuana industry. The Conservatives have made their anti-marijuana stance very clear – if you have any financial interest in the Canadian cannabis industry then a vote for the BigC is a self-inflicted wound. Purely from a cannabis viewpoint, the best result would be a Liberal government with the NDP having enough seats to make a difference. Cast your ballot accordingly.

Last, we closed the season with a short piece that asked, given its poor energy density ratio, how did lithium become the metal of choice in the battery industry? How did this minor leaguer come to play in the big leagues? That simple question sparked an incredible amount of debate. My inbox was filled with conflicting commentary, opinions and science as to lithium’s properties when compared to other metals.

Lithium’s continued use by electric vehicles and power tool manufacturers could be increased by better technologies for extraction and processing (see our piece on Pure Energy), but is at risk by commercialized research that empowers other metals to economically take lithium’s place.

We will be moderating a panel at the Technology Metals conference in Toronto on Oct 13 and 14 at the King Edward Hotel. Chris Reed of Neometals Ltd. will lead a separate panel looking at lithium’s role and future – we intend to be there.

Play ball!

Lithium, New Tech and Pure Energy

Energy cannot be created or destroyed.

That one simple sentence, also known as the **Law of Conservation of Energy**, underpins every action we make, every song we hear, everything we touch. Your bicycle moves because you power it. You live because you digest food and convert its nutritional content to biologic energy. Baseballs curve, penicillin cures, sound carries, fires burn – all examples of energy changing form.

New technologies are vital to creating more efficient forms of converting energy, and as the wonderfully grumpy Jack Lifton pointed out, this is especially true when attacking a rare earth deposit. The old ways just don't work for the rare earths. As Lifton wrote, "Lithium production is almost a poster-child for the time it takes for 'new' technologies to become 'standard.' And in case you didn't notice all of this has been driven by an increase in demand."

One company that gets this concept is Pure Energy Minerals Ltd. of Vancouver (TSXV: PE), which is focusing on more efficient lifecycle solutions for lithium supply in North America. The flagship project is a lithium brine project in Clayton Valley, Nevada.

In the cities of Reno and Las Vegas, financial energy gets converted to fun and loss of memory. Located halfway between those two cities is Clayton Valley, which has hosted mining activity dating back to the 1860s. It is here that Pure Energy has over 8000 acres of placer mining claims contiguous to the only lithium production facility in North America. Pure Energy is looking to convert those claims into revenue for its shareholders.

Pure Energy sees Clayton Valley as being surrounded by lithium-enriched Tertiary rhyolitic tuffs, lithium-bearing sediments, and an active geothermal system. Geologically the lithium mobilized from these sources to be deposited into the groundwater. The dry climate concentrated the groundwater by evaporation into hypersaline lithium-rich brines which are hosted mainly within the more porous parts of the basin. Pure Energy's claim block extends for 12 kilometres to encompass the deepest sections of the valley, and is contiguous to the only producing lithium mine in North America.

A Clayton Valley cross section and gravity survey are here.

Conventional lithium extraction techniques are expensive, harmful, and inefficient. Too much energy is wasted in the process, resulting in higher costs and less margin for the shareholders. This old technology, developed in the 1960's, requires extensive evaporation ponds (4000+ acres) to concentrate the brines prior to processing, resulting in significant and valuable quantities of water being evaporated away into the desert atmosphere. These ponds are expensive to build, recover less than half of the available lithium, and require an 18-24 month process cycle to deliver product.

Pure Energy is embracing novel technologies that are potentially capable of producing customized high-grade lithium products at costs below that of hard rock, clay or existing brine facilities. These new processes are attractive because they are environmentally friendly, highly efficient (capable of extracting >99% of lithium from brine), weather-independent, and have a process time of hours not years.

Clayton Valley brine is currently being tested at POSCO's lithium research facility in South Korea and at Tenova Bateman's lithium research facility in Israel. Pure Energy expects that its lithium brines, coupled with recent technological advancements in processing, will outperform hard rock and clay sources on cost, sustainability and permitting.

Pure Energy has an experienced management team with backgrounds in finance, exploration, geoscience, lithium processing, permitting and construction. These varied backgrounds will be vital to helping Pure Energy convert its assets into a win for the shareholders.