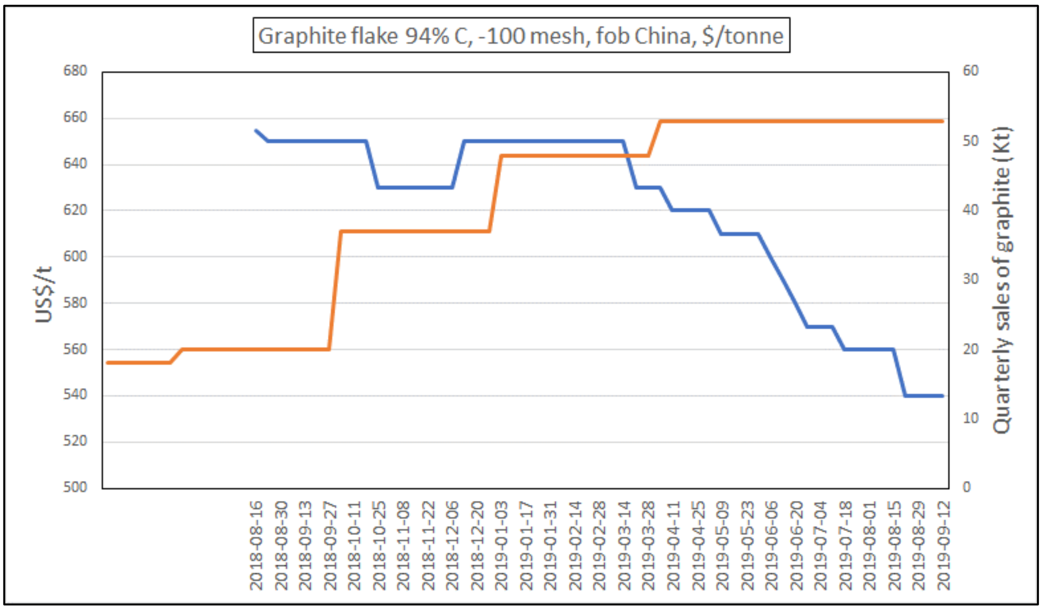
Dr Chris Baker
September 2019

Graphex Mining (GPX AU, market cap A$18m)

SYR/Balama fails, proving a large volume fine flake graphite strategy is flawed. Coarse flake graphite pricing remains strong.

- We were not that surprised that SYR's Balama project was doing it tough. But we were very surprised with the speed and severity of the wind-down of Balama's production levels. But what does this mean for the medium/coarse flake graphite projects?
- The global graphite market is one of the least transparent of our commodity markets. However, it has been clear for at least 6 to 9 months that Balama was having a significant impact on the fine flake graphite market. What has been less clear to us is why SYR's achieved prices have been so far away from levels quoted by independent commodity groups.
- The chart below shows Industrial Minerals price quotes* for the past 2 years, and shows the price trend for fine graphite. The downward trend since late February 2019 appears to have been a 3-4 month lagged response to SYR's production ramp up.



Source: Industrial Minerals, Syrah ASX reports

- That SYR can report prices achieved at just US$400/t (CIF, which implies FOB pricing around US$360/t) is extraordinary, and reflects poorly on the company's marketing strategy.
- We will present independent pricing information in this report which demonstrates that prices of medium and coarse flake graphite has actually increased, reflecting ongoing supply-side tightness. This reflects well for the FID for GPX's Chilalo project, due later this year. GPX's graphite price assumptions look realistic to us. There has been no sudden decline in the pricing of medium and coarse flake production.

(* We are conscious of issues surrounding the reporting of 'spot' graphite prices. This is discussed in the following pages)

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Background to the Syrah situation

- On 10 September, Syrah Resources (SYR:ASX) announced a dramatic cut in graphite production from its new Balama operation in Mozambique, from 15kt to 5kt/month. This was supposedly in response to a "sudden and material decrease in spot natural flake graphite prices in China", its major market.
- Price achievement quoted by SYR each quarter had already been woeful. Prices in 3Q19 plummeted to US$400/t (quoted CIF China which means SYR were picking up the cost of insurance and transport, which could be as much as US$40/t).
- $400/t (CIF) might translate to around US$350/t (at the port, or FOB), which is very disappointing. At the mine gate, it would have been even less, possibly just over $300/t!
- Market participants have suggested to us that SYR has been dumping product to clear inventory positions and deliver revenue to the company. (See a summary of the recent Industrial Minerals graphite conference in Appendix 1).
- We note as well that SYR announced that it had signed up for a 9kt/month with a trader into Asia (mainly China it seems). We are not aware of the commercial terms, but traders commonly take 20-25% off the top. This might well have impacted SYR's disappointing price achievement.
- With cash costs quoted in recent quarters at over US$500/t, it is no surprise management has had to act. There will undoubtedly be job losses at the mine, and head office. Sad, and sad for Mozambique in particular. The board might even need to take a reduction in its ritzy salary packages.
- Given that 30-50% of costs at a mine like Balama might be fixed, we find it hard to imagine how the company can ever deliver positive cashflow for the project (without worrying about profitability).
- We believe that the pricing of Balama fine flake graphite will not recover until (1) the existing product exits the market and (2) better sales agreements are procured. It's possible that by focussing on product specification rather than volume, Balama might be able to produce what the Chinese battery makers actually need, at a price they are prepared to pay. To stress, this is our view from a distance. We have not spoken with SYR directly.
- China marketing groups we have spoken to suggest the "China FOB price" for fines is currently around US$550/t. The price decline since early in 2019 appears to be real, but to nothing like the prices achieved by SYR. We believe that graphite fines (eg -195 grade, which is -100 mesh and 95% carbon LOI basis) is in oversupply in China. The province of Heilongjiang has large mines more than sufficient to meet the needs of the battery anode industry. We believe that SYR's strong Chinese import market was more related to price than any sort of production shortfall from China this year.
- A story we have heard from more than one source is that one of the large Chinese battery anode manufacturers was buying from SYR as their prices were lower than the marginal cost of their own mines. Could this be correct? If it is, SYR management has a lot of questions to answer.
- As the chart above suggests, to say that the company had seen a "sudden and material decrease in spot graphite prices" beggars belief. Prices of fine graphite, as demonstrated by Industrial Minerals, have been in decline since February/March 2019. The following comments regarding the graphite fine flake market were made at Diggers and Dealers as recently as August 2019 (slide 7, Diggers and

Dealers Mining Forum, Shaun Verner, August 2019). What was the marketing department at SYR telling the board about an emerging deficit in China?

> ***Fines Products (-100#)***
> *•Fines price ex-China driven by incentive price to export a marginal tonne*
>
> *•Syrah exports to China entering competitive and established domestic fines market; initial pricing challenging*
>
> *•Syrah carbon grade, density, quality / low impurities establishing differentiated position*
>
> *•Syrah becoming one of the largest fines product suppliers into the global electric vehicle supply chain*
>
> *•Expect positive price support as China moves to market deficit for high grade fines product*

- SYR appears to have been selling increased volumes of fine flake graphite into a competitive and rapidly falling market. Clearly, SYR badly misread the market for fine flake graphite.

- Recent reports from SYR have suggested that better price achievement might emerge from the production of a larger proportion of coarser flake graphite from Balama. As shown in the following chart from SYR's technical presentation to shareholders, the proportion of medium, large and extra large flake product is still under 50% of that targeted in the BFS. We said at the time that it was clear that Syrah's production at these levels is unlikely to cause stress on the valuable coarse flake markets being targeted by GPX. Now with the dramatic wind-back of production from Balama, it should now have no impact.

US Mesh	Description	Product Mix by Mesh Size[3]					Application
		Q1 2019	Apr-19	May-19	Target End 2019	Long-term Target[4]	
+50	Extra large flake	2%	2%	2%	4%	8%	Traditional uses (e.g steelmaking, iron castings, foundries, automotive parts, lubricants)
+80	Large flake	9%	7%	11%	12%	12%	Traditional uses (e.g steelmaking, iron castings, foundries, automotive parts, lubricants)
+100	Medium flake	3%	1%	1%	4%	12%	Traditional uses (e.g steelmaking, iron castings, foundries, automotive parts, lubricants)
-100	Fines	86%	90%	85%	80%	68%	Spherical graphite for anode in Lithium-ion batteries and recarburiser products

Source: Syrah Resources presentation, June 2019

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The issue of graphite pricing: fine medium and coarse flake

- Graphite pricing commonly quoted by the likes of Benchmark Mineral Intelligence and Industrial Minerals (IM) is on an FOB China basis, and is typically derived from direct contact with suppliers. Some in the market question the reliability of these estimates.
- We have had the opportunity to discuss global graphite markets with an independent group, Lone Star Tech Minerals (LSTM), run by a 2**2** year veteran of graphite marketing, Chris Whiteley. He pointed out that market prices he obtains (on an FOB Port basis) represents the whole gamut of graphite products, with a broad range in specification (size distribution being one of the most important), differing packaging types (from 25kg bags on pallets to bulker bags; both shipped in containers) and varying contract qualities.
- All this goes to the point that pricing of industrial minerals is not in any way similar to, for example, the LME metals, or even the bulks, iron ore and coal for example. Coking coal is perhaps the best analogy where the premium coals (hard coking coal) attract the highest prices; the semi-softs are less expensive, and are useful in coke blends. It's all about value in use.
- With these comments in mind, we were surprised when LSTM provided us with its recent market pricing intelligence for fine flake graphite. As far as LSTM is concerned, the median graphite price globally for -100 mesh, 90-94% C (LOI) – is still over US$700/t (FOB). Remember, these prices are reflective of established <u>global</u> contract volumes, blanket orders and spot sales at a variety of sizes and delivery methods across multiple applications. It also assumes a minimum 20 tonne order.

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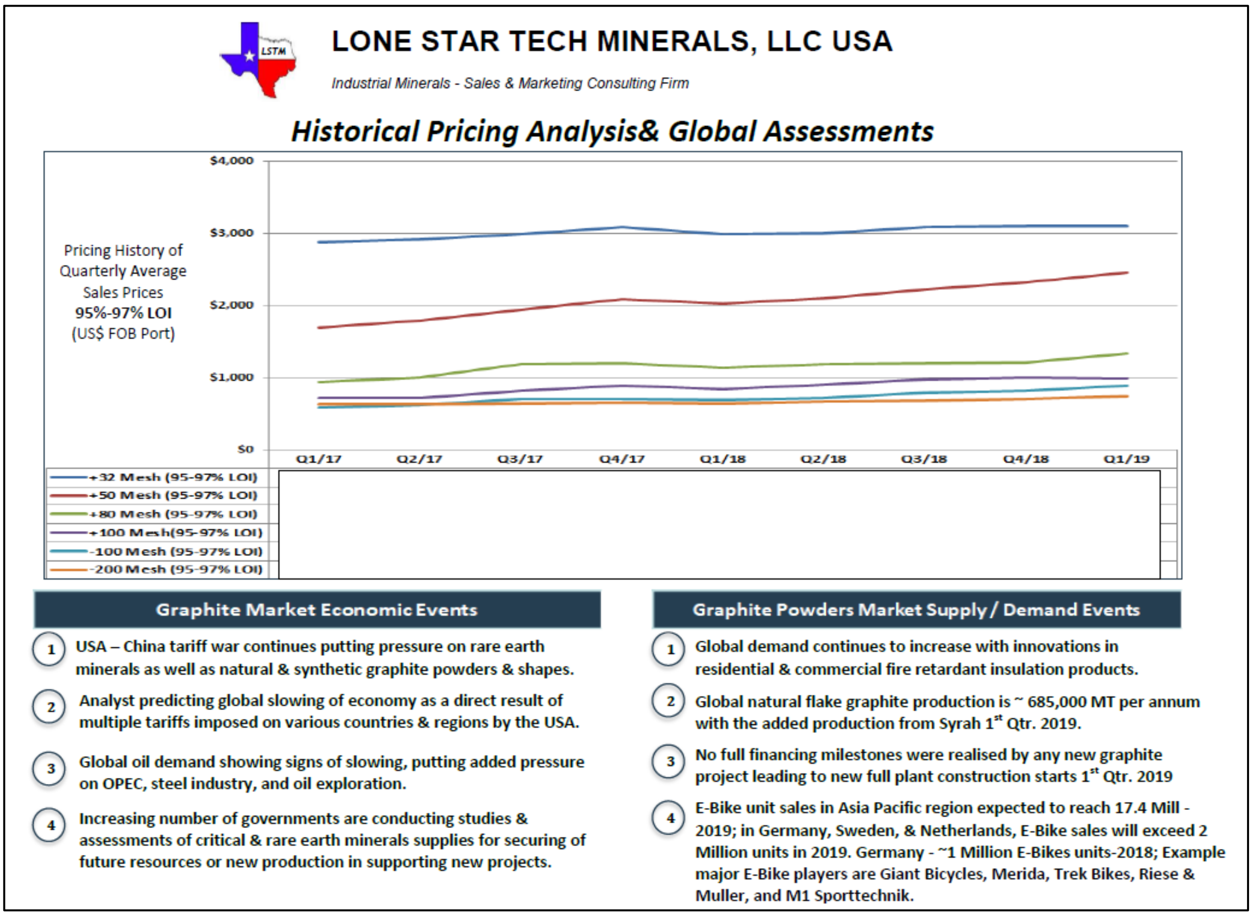

Source: Lone Star Tech Minerals, September 2019. Reproduced with permission.

- Interestingly, medium and coarse flake products (say the +80, +50 and +32 mesh products) have actually been increasing in price since 2017. As we said in previous reports, this has been in direct response to a tightening of supply globally. Much of this has been driven by the strong environmental push in China to close environmentally unacceptable graphite operations.

- LSTM has redacted pricing detail, but it's quite clear that the coarser products are achieving well over US$2000/t. At the risk of being repetitive, these prices represent a wide range of end-users, delivery method and volumes across multiple applications. But these are the median prices reported to LSTM's clients, in good faith. These represent true market prices, in our view.

What does this mean for GPX's Chilalo large flake graphite project?

- The failure of SYR's Balama project will have given the market good reason for concern. If a so-called Tier 1 project (which in our view it is not) can fail, surely all other graphite projects are destined for difficulty. This is not the case, in our view.

- The following table summarises GPX's price deck from the PFS reported in September 2018. (See Appendix 2 for conversion of mesh sizes to microns).

US mesh (approx)	Product size (microns)	Mass distribution	Cumulative distribution	Price US$/t	Basket price US$/t	Cumulative price US$/t	Cumulative price %
>20	>850	9%	9%	5150	438	438	25%
35-20	500-850	24%	33%	2540	620	1058	59%
50-35	300-500	25%	57%	1757	430	1488	84%
80-50	180-300	9%	66%	974	83	1571	88%
100-80	150-180	5%	71%	779	39	1610	90%
<100	<150	29%	100%	583	171	1781	100%

Source GPX ASX releases

- LSTM are suggesting that prices of over US$3000/t (FOB) can be achieved for +32 mesh material compared to GPX's price deck of US$2540. + 50 mesh (and less than 32 mesh) prices from LSTM have been the strongest performer recently, at around US$2400/t. GPX's assumptions are around US$1750/t for this size fraction. Could there be upside to the GPX price deck. LSTM's numbers suggest that.

- And to the fine flake products, under 150 microns (or -100 mesh): GPX's assumption of US$583/t doesn't look out of the ballpark. It does against prices SYR have achieved, prices which represent the activities of a forced seller.

- To conclude, we believe GPX's price deck is realistic, and possibly even conservative. The message from the failure of the SYR/Balama strategy is (1) know your market and (2) manage your way into that market by not overwhelming that market with unwanted product. GPX's CEO Phil Hoskins has been preaching this to the market for many years.

- There could well be a price and volume ramp-up period, perhaps over a year or 2. We await further clarity on this matter in the Chilalo BFS.

Our investment thoughts on GPX

The following comments are updated from our August 2019 research report on GPX. A copy of this report can be made available.

- Based on our assumptions, GPX is remarkably inexpensive. Even if we assume our valuation is wrong by a factor of 2, or even 3, the stock is still dramatically under-priced.

- We understand that Tanzanian resources exposures should trade at a discount. But with an imminent resolution of the Acacia situation (the takeover by Barrick is due to complete on 17/9/19), we believe the country is open for business. Our country visit earlier in the year confirmed this view.

- We also note that Orecorp, owner of the Nyanzaga gold project received key approvals from the Tanzanian Government on 16 September. The re-activation of the Tanzanian mining industry appears to be underway.

- Our recent experience in the graphite sector suggests investors still do not understand the graphite sector. It is a small industrial mineral sector, and commodity supply/demand dynamics are far from clear. To use Syrah Resources as a benchmark is simply comparing apples and oranges. GPX is not trying to participate in the fine flake graphite market.

- Without wishing to make the point too strongly, IT IS NOT POSSIBLE FOR SYRAH RESOURCES TO PARTICIPATE MATERIALLY IN THE LARGE FLAKE GRAPHITE MARKET. It is simply not possible. The characteristics of the Balama orebody do not allow it. Oversupply of fine flake graphite is unlikely to impact the large flake producers.
- The supply/demand dynamics for large flake graphite are very strong. Pricing remains robust, and seems likely to remain so for some time.

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Appendix 1: Key Points from recent Industrial Minerals Graphite 2019 conference

GRAPHITE 2019: Industry hopes for price stabilization from Syrah production cutback

From Industrial Minerals,12 September 2019

- Delegates in Berlin say the market may gradually rebalance due to reduced volumes from Mozambique, but argue a turnaround may take time.
- Reactions to the news of Syrah's reduction in output reverberated in the conference room since the first panel discussions, and continued to be among the leading topics of conversation during the event. A number of critics to the Syrah project said the market may now work toward pursuing a new balance between supply and demand.
- Jamie Deith, president of Canadian graphite producer Eagle Graphite, said the announcement should not take the industry by surprise. "I felt for quite some time that the Syrah project was insane, from an economics [perspective]," he said during a panel discussion.
- His perception, shared by other executives on the panel, is that Syrah's project brought too large a volume of new material into a market when demand was not growing at a sufficient pace to absorb it, resulting in weak prices and oversupply.
- "Dumping huge quantities of graphite, where there wasn't a huge shortage to begin with, wasn't a great idea," he added.
- Puruvi Poddar, group manager at Indian supplier Tirupati Graphite, said Syrah brought in a large part of the additional consumption of graphite that the industry added over the past couple of years, since the beginning of its operation in late 2017.
- "Capacity and supply is so much greater than demand: it's a buyer's market," Stephen Riddle, CEO of US supplier Asbury Carbons, said. "Prices have not necessarily reached the bottom. They may not go down much more, but there is room to go down."
- Fastmarkets assessed the price of graphite flake, 94% C, -100 mesh, fob China, at $540 per tonne on September 5, unchanged since August 22 but down from $650 per tonne at the start of the year.
- Neither speaker admitted to have been taken by surprise by the announcement, although a number of other delegates in conversations with Fastmarkets IM during the event did say they were not expecting such a sudden cutback.
- Other delegates questioned the viability of the project in its current form, citing too large an operation carrying high costs, which even at a reduced rate may prove difficult to contain.
- "Their costs won't be going down much [as Syrah reduces production], because about 30% of your costs in a mining operation are fixed, from energy, fuel, labor and so on. You don't have much room to act there," a delegate said.
- The undeniable presence of Syrah's graphite deposit and the high-spec infrastructure it has developed means the influence of the Balama project would continue to represent a force to be reckon with in the market, said another delegate.
- One Syrah Resources executive told Fastmarkets IM this week: "It was the right thing to do in light of the market weakness. We will continue to produce," adding the cutback would support a market recovery.
- The company ascribed the decision to weak overall conditions that are affecting not just graphite but a number of commodity markets and industries. The source at the company

<u>denied Syrah had a leading role in driving supply and prices to current levels, but said it is suffering an unfavorable phase in the commodity cycle.</u> He highlighted the role the company played in the shift in trade flows toward China, which saw its imports surge over the past year. Syrah imported 105,000 tonnes of flake graphite in January-June, a five fold increase year on year. "China has turned into a new importer of graphite, and Syrah today supplies 75% of that volume. That means a lot/something," the source added.

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Appendix 2. Mesh to microns conversion

MESH TO MICRON CONVERSION CHART

U.S. MESH	INCHES	MICRONS	MILLIMETERS
3	0.2650	6730	6.730
4	0.1870	4760	4.760
5	0.1570	4000	4.000
6	0.1320	3360	3.360
7	0.1110	2830	2.830
8	0.0937	2380	2.380
10	0.0787	2000	2.000
12	0.0661	1680	1.680
14	0.0555	1410	1.410
16	0.0469	1190	1.190
18	0.0394	1000	1.000
20	0.0331	841	0.841
25	0.0280	707	0.707
30	0.0232	595	0.595
35	0.0197	500	0.500
40	0.0165	400	0.400
45	0.0138	354	0.354
50	0.0117	297	0.297
60	0.0098	250	0.250
70	0.0083	210	0.210
80	0.0070	177	0.177
100	0.0059	149	0.149
120	0.0049	125	0.125
140	0.0041	105	0.105
170	0.0035	88	0.088
200	0.0029	74	0.074
230	0.0024	63	0.063
270	0.0021	53	0.053
325	0.0017	44	0.044
400	0.0015	37	0.037

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