Dr Chris Baker February,2020

Graphex Mining (GPX AU, Market cap A$12m)

A significant shift in strategy delivers a 36% post tax IRR assisted by sales of expandable graphite. Capex up.

- GPX recently released a long-awaited definitive feasibility study (DFS) for the coarse flake Chilalo graphite project in Tanzania. This has been a comprehensive study of the project and is one of the critical steps needed to secure financing.
- While the economics of the project remain attractive the DFS falls short of the very attractive proposition presented in the pre-feasibility study in 2018. In this report we discuss what has changed between the two studies. In summary the major differences were driven by the following:
    - Significantly higher capital cost, largely driven by the higher cost of a 0.5mtpa plant. This is in part due to a lesser reliance on Chinese equipment and installation. The DFS plant configuration is focussed on maximising coarse flake production. Capex is now estimate at US$87.4m.
    - A single stage development, producing 50ktpa graphite concentrate is proposed (against the PFS which assumed a 2x expansion in year 3).
    - Higher mining costs, driven largely by a higher strip ratio, a result of an open cut optimiser. However, it has also delivered an 18 year mine life significantly longer than the PFS.
    - A reduced basket price, a result of a lesser proportion of +20 mesh flake graphite. The basket price employed in the DFS is now estimated at US$1,534/t (FOB) against prior estimates of US$1,777/t.
    - Following advice from its marketing advisors, GPX is seeking to move downstream with the production of expandable and micronized graphite products. This has the opportunity of enhancing the overall basket price to US$2500/t and expanding EBITDA margins from 49% (concentrate alone) to 63% (the partly integrated solution).
- We believe this to be a conservative study, aimed at attracting capital to the project and allow development (including from existing finance partner, Castlelake). We believe there may be a number of opportunities to enhance the project's ROIC.
- Chilalo's NPV is now reported at US$331m (post tax, 8% discount rate). Of the total project NPV, some 36% can be attributed to the mine/processing and sale of concentrate, around 64% to the incremental value obtained from the production and sales of expanded and micronized graphite.
- Overall, this has been a disappointing outcome, but one which has been at least partly driven by a highly conservative approach to engineer a robust project and a more realistic approach to graphite markets. Without this approach, and given the poor history of the embryonic graphite industry outside of China, GPX would struggle to find financiers for the project.
- We have not determined a valuation per share for GPX, but will do so when a final funding solution is evident. Our previous valuations (per share) should be disregarded.

Summary of the Chilalo coarse flake graphite definitive feasibility study

Preamble

GPX has taken a 'belt and braces' approach for the Chilalo DFS and has moved into downstream upgrading of graphite concentrate to help improve returns for the project. We believe this has been done to deliver a conservative study to potential financiers of the project and to ensure no repetition of production/product disasters seen in the past.

The new generation of graphite mine development has been the subject of major technical and marketing challenges. We believe the GPX feasibility study should be looked at in that context. As we always remind ourselves, it is far better to identify challenges during the study phase, than to build and retrofit remedies when the project fails to deliver. This will be a far less expensive outcome.

We are reminded of the grim end for Valance Industries which wound up in administration in 2017, driven by an ill-designed plant and the inability to produce a saleable product. (As an aside, Valance has now relisted as Quantum Graphite Limited, QGL ASX, with metallurgical gurus Lycopodium as major shareholders. It will be interesting to see if this is a successful combination).

And then to Syrah Resources (SYR ASX) which came close to achieving the same outcome. It was only a dramatic cut in production and costs following an equity raise which allowed its survival, for now. Despite numerous reassuring presentations over several years, SYR's Balama project proved unable to produce to the specification required from the plant. This together with what seems to us to have been a ham-fisted marketing strategy led to a market flooded with already oversupplied fine flake graphite. Prices plummeted and SYR's cashflows were put under extreme stress.

And even the large producers can stumble. Imerys Graphite and Carbon (one of the worlds largest graphite producers outside China) reported 'geological and processing issues' at its Okanjande flake graphite project in Namibia which came on line in 2017. It is believed to have had trouble reaching scheduled output of graphite concentrate and meeting sufficient yield levels and closed the mine in late 2018.

The Syrah situation emerged as GPX was undertaking its DFS, so it's hardly surprising that directors insisted on a conservative approach to the resource itself, subsequent engineering and marketing.

Investors might be disappointed with a dramatic drop in Chilalo's IRR disclosed in the DFS – we certainly are. But it is well to understand that the DFS has been undertaken by highly reputable consultants (non-Chinese), and the marketing approach has drawn in a global appetite for graphite, not just China's. There has been a significant scope change for the project, targeting a 50ktpa production rate and 'cherry-picking' very low capital, value adding opportunities. We have discussed this approach with GPX's independent marketing consultants and are of the view that this will prove to be the lower risk strategy and improve returns.

The challenge now is to fund the project's +US$80m capex requirement.

The Chilalo Definitive Feasibility Study

The following table compares line-by-line the difference between what was proposed in the PFS and what emerged from the DFS.

Key issues to focus on include the following:

- Reserve and resource base and conversion rates.
- Project scope.
- Metallurgical behaviour of Chilalo graphite.

- Capital costs.
- Operating costs.
- Marketing issues, and the proposal to move into downstream markets.
- Transport costs.
- Opportunities to extract greater returns from the Chilalo project.

The table on the following page presents a comparison of both studies.

		PFS (2018)	DFS (2020)
Resource			
High grade, tonnes (M+I+I)	Mt	16.9	20.1
Grade (M+I+I)	% TGC	10.2	9.9
Contained graphite, calculated	Kt	1724	1990
Reserves			
Proven + probable	Mt	5.3	8.9
Grade	% TGC	10.9	9.9
Contained graphite, calculated	Kt	578	889
Resources to reserves conversion	%	34%	45%
Mine life	Years	8.5	18
Strip ratio	x	not disclosed	4.92:1
Annual plant feed, St 1	Ktpa	500	500
Annual plant feed, St 2	Mt	1000	n/a
Av. Head grade	% TGC	10.6	10.1
Av. graphite concentrate production, St 1	Ktpa	58	50
Av. graphite concentrate production, St 2	Ktpa	100	n/a
Average sales price (FOB), concentrate only	US$/t	1777	1534
C1 operating costs (FOB)	US$/t	500	778
Operating margin	US$/t	1277	756
Operating margin	%	72%	49%
Average sales price (FOB), full project basis	US$/t	n/a	2500
C1 operating costs (FOB)	US$/t	n/a	905
Operating margin	US$/t	n/a	1595
Operating margin	%	n/a	64%
Capital cost (pre-production), stage 1	US$m	43.6	87.4
Capital cost (pre-production), stage 2	US$m	32.5	n/a
Capital cost (pre-production), total	US$m	76.1	87.4
NPV(8) DFS, NPV(10) PFS, post tax	US$m	349	331
IRR, post tax	%	131	36
Post tax payback	Years	<1	3.5

Source: various GPX releases, 20018 – 2020

1. **Reserve and resource base**
   - GPX reported a revised mineral resource in 3Q19, with around 10mt of higher grade ore in the indicated category (10.5% TGC) and a further 10mt at 9.3% in the inferred category.
   - The resources to reserves conversion ratio has improved (to 44%), but this is still a relatively low figure. As we understand it, only a moderate amount of resources for the NE pit were included in the mine plan due to geological complexity, so in the current mine plan the majority of ore is derived from the main orebody. More effort will be needed in the future to refine the reserve model, in our view.
   - The resource model was subject to Whittle optimisation analysis, which, delivered a pit which bottomed at around 165m with a strip ratio of around 5:1, against around 100m used in the PFS (and we would guess at a significantly lower strip). This analysis has delivered an impressive 18 year reserve life (8.9mt at a grade of 9.9% TGC).
   - The company notes that should the mine life contract to around 10 years, and the pit base lifted to around 115m, this would substantially reduce the strip ratio and in turn reduce mining costs. A chart presented in the release suggests cost could drop by as much as US$100/t or 38% from the current estimate of around US$268/t. This will be discussed in more detail below.
   - There is a significant incentive for GPX to identify additional near surface tonnes to reduce the strip and keep the mine life at 15-20 years. Mining in total makes up over 40% of total costs and around 46% of site costs for Chilalo. This is clearly a very important aspect of the project going forward, and there appears to be ample opportunity to identify lower stripping ratio reserves at Chilalo.

2. **Project scope**
   - The PFS provided for the production of ca. 58ktpa graphite concentrate in Stage 1 (years 1-2) with a virtual doubling of production capacity for Stage 2 (to 100ktpa).
   - From this announcement it is not clear as to why a Stage 2 concept was not included in the DFS. GPX does acknowledge that an expansion is possible, but the company has chosen a more conservative scope for the project.
   - GPX report Benchmark Mineral Intelligence estimates that annual incremental coarse flake demand is some 145kt, and therefore around four mines of Chilalo's scale would be needed to satisfy demand. We have no visibility on these estimates, but if correct, suggest that an expansion of the Chilalo mine is easily justifiable.
   - To start at modest scale, and not flood the market with unwanted product makes sense to us. Syrah provides a textbook example of what not to do in this regard. Graphite markets need to be developed with care, and attention to product quality and customers' requirements.
   - As part of the DFS GPX have decided to extend their production into the downstream market, to enhance revenues, with the production of expandable graphite (using toll facilities in China) and micronised graphite. This is highly material to the economics of the project. We discuss this is further detail below

3. **Metallurgy, processing and graphite pricing**
   - The DFS incorporated a large number of metallurgical tests, to establish the optimum flow sheet and then to test the behaviour of a variety of ore-types through the proposed concentration process. There results were significantly different from the initial work done during the PFS.
   - The good news from the test work is the following:
     - The various ore-types tested show quite consistent behaviour, so variability should not be an issue, and
     - There is good correlation between laboratory and pilot plant test work. 27t of near surface, weathered material collected in trenches were tested in a pilot plant.
   - However, the test work by an independent Canadian laboratory, and reviewed by a Chinese metallurgical institute, failed to replicate the very encouraging size distributions obtained from the PFS testing.
   - It is not clear whether this is a result of a change to the metallurgical process or of non-

representative samples tested during the PFS. Either way, it is disappointing and results in a 13.6% drop in the life-of-mine basket price for Chilalo ore (from US$1777/t to $1534/t). This is summarised in the following table:

Updated PFS, September 2018			
Product size (microns)	Mass distribution	Cumulative distribution	Price US$/t
>850	8.5%	8.5%	5150
500-850	24.4%	32.9%	2540
300-500	24.5%	57.4%	1757
180-300	8.5%	65.9%	974
150-180	5.0%	70.9%	779
<150	29.4%	100.3%	583
DFS, January 2020			
Product size (microns)	Mass distribution	Cumulative distribution	Price US$/t
>850	0.7%	0.7%	5000
500-850	9.8%	10.5%	3017
300-500	20.6%	31.1%	2242
180-300	26.9%	58.0%	1270
150-180	6.3%	64.3%	969
<150	35.8%	100.1%	749
Change			
Product size (microns)	Mass distribution	Cumulative distribution	Price US$/t
>850	-91.8%	-91.8%	-2.9%
500-850	-59.8%	-68.1%	18.8%
300-500	-15.9%	-45.8%	27.6%
180-300	216.5%	-12.0%	30.4%
150-180	26.0%	-9.3%	24.4%
<150	21.8%	-0.2%	28.5%

Source: GPX announcements, September 2018 and January 2020

- There has been quite a marked drop in the proportion of coarser flake sizes where pricing is dramatically higher than the fines. It is possible that more test work needs to be undertaken with the company commenting that it “will continue to conduct optimisation test work aimed at improving the preservation of coarse flake graphite. Initial results appear encouraging and, if successful, could yield an improved flake size distribution, average sales price and therefore revenue.”
- As we’ve discovered in our discussions with GPX’s marketing consultant, this might not be as disappointing as originally thought. We now understand that the market for very large flake graphite (>20 mesh, 850 micron) is actually quite modest. Demand for +50 mesh (300 micron) material is much greater.
- GPX had taken a hard look at graphite pricing as a part of the DFS and with the assistance of a number of independent groups (and internal consultants) has proposed a higher price deck than used in the PFS. The study has also incorporated a 5 year price ramp-up, which makes a good deal of sense for this difficult to analyse commodity.
- We understand that the significant increase in the sub 850 micron (20 mesh) fractions is driven by higher pricing assumptions from non-Chinese customers.

Table 12: Average sales price for Chilalo flake graphite concentrate

Mesh size	Microns	Mass Dist. %	Price (Yr1)	Price (Yr2)	Price (Yr3)	Price (Yr4)	Average (LOM)
+20	> 850	0.7	5,000	5,000	5,000	5,000	5,000
+32	500 – 850	9.8	2,359	2,582	2,895	3,031	3,017
+50	300 – 500	20.6	1,745	1,935	2,235	2,357	2,242
+80	180 – 300	26.9	1,057	1,133	1,251	1,299	1,270
+100	150 – 180	6.3	794	853	945	983	969
-100	< 150	35.8	631	673	735	761	749
Weighted average sales price (US$/t) FOB			1,178	1,303	1,475	1,535	1,534

Source GPX release 29 January 2020

- The proposed process flow sheet is as expected, involving crushing, primary grinding (using a rod mill; typically used to minimise fines production), followed by a series of flotation cells and regrind mills to progressively upgrade the various graphite products.
- Wisely, GPX have included flexibility in packaging options to ensure it can meet the needs of specific customers. To give GPX credit, this is the first time in the many years of looking at the graphite sector that this level of detail has been addressed. It may sound a trivial issue, but if a project is unable to supply product to a customer in 20kg bags, and the customer can only deal with 20kg bags, the miner is unlikely to secure a contract.

4. Capital costs

- Capital cost estimates were well above those provided in the PFS. DFS capex is now at US$87m against an estimate for Stage 1 in the PFS of US$43.6m. This is a significant difference, with most of the difference in the process plant (now US$41.8 vs $11.8). This escalation has been blamed on the need to use non-Chinese sourced equipment and construction, driven by the western source of financing and Tanzania requirement for local content.
- So minor scope changes have occurred aimed at maximising the retention of coarse flake graphite, providing flexibility in the plant and ensuring product sizing and packaging meet customer expectations.
- The cost for a lined tailings dam is also significantly higher than previously estimated.

5. Operating costs

- As discussed above the average operating cost has been elevated by a higher strip ratio in the DFS open cut. The DFS strip is 4.92:1 which delivers a mining cost of US$325/t both significantly higher than estimates in the PFS.
- Much of the higher cost has been driven by the Whittle optimiser, which drives the pit floor deeper so long as the NPV of the project continues to improve. This takes no account of the ensuing operating costs and at pit bottom is likely to have produced only marginally profitable ore.
- There is significant resource and reserve upside and Chilalo. We suspect the ultimate mining costs for Chilalo will be lower as the company expands the resource and reserve base.
- The DFS release demonstrates the relationship between mine life (ie pit depth) and mining cash costs. To contract the mine life to 9-10 years, and therefore shallow the open cut, mining costs would contract by $100/t or 30% of total mining costs.

6. Marketing issues, and the proposal to move into downstream markets

- A reduction in the proportion of the very large flake graphite, and therefore a drop in the basket price for Chilalo perhaps should come as no surprise. It is the constant challenge for the industry to deliver the larger size fractions, which attract the highest prices. As discussed above, retesting of representative samples were simply unable to replicate earlier work.
- In order to increase the revenue stream for Chilalo, GPX has decided to move into downstream graphite markets. Thankfully this does not mean it will be looking to the anode markets (fine, high purity, spherical) which to us looks hugely oversupplied. Instead, GPX has focussed on products

which appear to be (1) in strong demand, (2) appear to be undersupplied and/or (3) enhance the value of its lowest value concentrate. These are **expandable graphite** and to a lesser extent **micronized graphite**. The table below summarised the production profile from the DFS:

Table 3: Graphite sales profile – increasing volumes to high-value applications

PRODUCT ('000)	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7
Flake graphite concentrate sales	43	56	50	48	45	39	28
Feedstock to Expandable Graphite	-	-	3	6	9	12	12
Feedstock to Micronised Graphite	-	1	2	3	5	6	8
Additions to inventory	3	2	-	-	-	-	-
TOTAL PRODUCTION	46	59	55	57	59	57	48

Source GPX release 29 January 2020

- The lion's share of the volume emerges in the early years as concentrate sales. Ramping up from year 3 is feedstock for the production of expandable and micronized graphite. These are forecast to add significantly to the project's EBITDA. The following table illustrates the conceptual impact in Year 6.

Year 6		Concetrate	Expandable	Micronised
Tonneage	Kt	39	12	6
Sales price	US$/t, FOB	1534	5690	2802
C1 Operating costs	US$/t, FOB	512	1917	2046
Margin	US$/t, FOB	1022	3773	756
Project EBITA	US$m	39.9	45.3	4.5
C1 operating costs includes direct opex plus concentrate transfer price, excluding o/h, taxes, etc.				

Source GPX release 29 January 2020

- GPX for several years has spoken of a very attractive opportunity for Chilalo: **expandable graphite markets** for use in fire retardants, foils and gaskets. To us, this looks to be a market limited by the availability of graphite of suitable quality to produce expandable product. GPX has demonstrated that Chilalo medium-coarse flake graphite is some of the best in the world for the production of expandable.
- So, the DFS has gone one step further than just supply coarse flake to the expandable producers as was proposed in the PFS. The company has negotiated a deal with a Chinese group (Yichang Xincheng Graphite Co. Ltd., YXGC) to produce expandable graphite on a toll basis. GPX then have the ability to sell this product into global markets. As we discuss below, the economics of this deal is as attractive as the mine itself: even more so, in that it delivers significant value with supposedly zero capital risk.
- The risk, of course, sits with security of the deal with YXGC. Points to note here are (1) that GPX spoke with 4 expandable graphite producers in China and signed a term sheet with YXGC; and (2) GPX will sell medium/coarse flake concentrate to YXGC for its own use in foils and fire-retardants, which should give YXGC a strategic advantage over its competitors.
- YXGC is the largest manufacturer of expandable graphite in China (and therefore globally).
- GPX stress that there will be a lead time for Chilalo expandable graphite to gain market acceptance. GPX state that it can take 12 to 24 months to achieve qualification for commercial production. This is reflected in the sales ramp-up in the table above.
- GPX is also proposing to move into the **micronized graphite** market. Here, it's proposed that the lowest value fines fraction is milled using specialised micronisation equipment to deliver 5 industry-standard micronized grades to meet industry specification with prices ranging fromUS$1620 to $5646/t (FOB). As we understand it micronized graphite can be used in as additive in welding flux,

lubricants, colouring agents and many other applications.

- The total capital cost associated with the micronized graphite product is estimated at US$2m (which is additional to the total capex of US$87.4m).
- As we discuss below, the impact of the sales price of expandable graphite is very material to the valuation of the Chilalo project. This is illustrated in the following table:

PRODUCT SEGMENT FINANCIALS	UNIT	CONC.	EXPANDABLE GRAPHITE	MICRONISED GRAPHITE	CONSOLIDATED PRODUCTION[3]
Average sales price (FOB)	US$/t	1,534	5,690	2,802	2,500
C1 operating costs per tonne (FOB)[2]	US$/t	778	512	383	905
Operating margin	US$/t	756	5,178	2,419	1,595

Source GPX release 29 January 2020

- The impact of expandable graphite on average pricing of GPX product is dramatic, and with micronized material assists to increase the average sales price by some 63%. But how realistic is this?
- We have spoken with one of the key North American graphite sales companies, Mr Chris Whiteley of Lone Star Tech Minerals LLC, one of the leading graphite marketing specialists globally. He makes the following points:
    - Chilalo material appears to be highly suitable for the production of expandable graphite for use in fire retardants and for graphite foil/gasket manufacture.
    - The optimum flake size for these products is around the 32 mesh (+500 micron) flake sizes. He stressed that there really isn't a market for the very large flake sizes (eg 20 mesh or + 850 micron). This is important given the recent pilot plant work which effectively has removed +850 micron material from the product mix).
    - Mr Whiteley contends – contrasting with conventional wisdom – that in the coarse flake graphite space, super expansion rates for expandable graphite is not necessarily better for end users. Coarse flake fractions (i.e. +32, +50, +80) will always be in demand for a number of critical applications; hence the higher price points over medium and fine flake.
- While there is no capital attached to the production of the expandable product, there are costs associated with its manufacture. We have not been able to conduct due diligence on the quoted cost of US$512/t outside of questioning management on the source of these costs.
- The impact of micronized is less, but a relatively low incremental cost and an attractive sales price, is forecast to drive a very attractive product. This is particularly so given the feedstock is the -100 mesh (-150 micron) product which is in oversupply competing with Syrah and Chinese supply.
- Regarding pricing of expandable and micronized graphite, we have sighted pricing information which suggest that the numbers proposed by GPX and their advisers are conservative. This information is commercial in confidence, and cannot be disclosed.
- Regarding the marketing, GPX has also identified numerous non-Chinese customers requiring expandable graphite and micronised graphite.

7. Transport costs

- We note that GPX is now proposing to ship product to Dar es Salaam by road rather than to tranship via the local port of Mtwara.
- This has added US$48/t to operating costs.

8. Opportunities to extract greater returns from the Chilalo project

- GPX has identified a number of opportunities to improve Chilalo's economics. These include:
    - **Exploration upside.** We see good opportunity to expand the resource and reserve base at Chilalo with a target to obtaining graphite ore at a low strip.
    - **Better recovery of coarse flake graphite.** Further testwork is proposed to enhance the production of coarse flake.

- **A faster ramp-**up in sales of value-added products or concentrate into higher value applications than forecast in the DFS.
- **Project expansion**. As discussed above the PFS provided for an expansion in the production facilities which then forecast the doubling of production for year 3. The DFS took a more conservative approach, and simply has a single stage development.
- **Power costs**. While not a power hungry project, some cost reductions will emerge should access to the Tanzanian grid become possible. The DFS assumes diesel generated power.

Project economics

We have taken GPX inputs at face value, and have attempted to break up the project into its various components, production/sales of concentrate from Chilalo, production/sales of micronized graphite on site and the production of expandable graphite in China and sales to western markets at the prices assumed in the DFS. This analysis assumes the transfer price of concentrate to the value adding processes at the average price achieved for those flake sizes.

As the production of expandable will occur outside Tanzania, it is assumed that no royalties will be paid on the incremental value obtained from expandable graphite. Micronised graphite will be produced in country, so royalties will be paid on the final product, we assume. Corporate tax will be paid at Tanzanian rates.

Regarding the 16% free carry now applicable in Tanzania, we assume this will affect the mine, but not the downstream businesses.

A summary of NPV estimates based on GPX's publicly available information is presented in Appendix 1. In summary our estimates for the NPV (on an after-tax basis and excluding corporate overheads) of each of the elements of Chilalo and the downstream processing is as follows:

	NPV(8)	% contribution
Chilalo concentrate	127.1	36%
Micronised product	53.6	15%
Expandable graphite	171.6	49%
Total NPV*	352.3	
* excluding corporate overheads		

The downstream expandable graphite strategy is therefore critical to the outcome for the Chilalo project, unless the company is able to engineer an upside, such as improving the average flake size of the project (possible), extend the life of low strip component to the mine (likely) or reduce capex (unlikely).

The post-tax IRR for 100% of the Chilalo concentrate project on a stand-alone basis we estimate at around 31% (NPV_8 of US$127m). However, GPX is obliged to deliver 16% of the project to the Tanzanian Government. Allowing for this the project IRR drops to 23% (NPV_8 of US$94m).

Our valuation for Chilalo incorporating the above segment values, allowing for royalties and corporate tax and net of a 16% free carry to Tanzania is now in line with GPX's own estimates.

Consolidated NPV, GPX basis		
NPV of projects	US$m	352.3
NPV of overheads, after tax	US$m	-33.6
NPV of Tanzanian interests in Chilalo	US$m	-33.3
GPX, NPV	US$m	**285.4**
Exchange rate		0.75
GPX, NPV	A$m	**380.6**

Funding

As we reported in October 2018, Graphex announced the financing terms of a package offered by well-regarded private equity firm Castlelake L.P. The deal is quite straightforward:

- US$5m of debt to be issued immediately to fund completion of the Chilalo BFS and for general working capital. Castlelake became a 2% shareholder in GPX and as agreed, assumed a single board position.
- Up to US$40m of debt capacity ("Senior loan notes").
- Up to US$40m of equity in GPX (equity raise at maximum 28cps, offered to all shareholders; Castlelake shareholding in GPX likely to be 40%).
- There are several conditions precedent for the senior debt and equity investments, the most important of which is the resolution of issues associated with the mining legislation in Tanzania. Castlelake also requires completion of the BFS and the execution of material agreements including off-take, mining and EPC agreements.

In the January release, GPX state that it is working with a financier (we assume this is Castlelake) on procuring the finance necessary for the development of Chilalo. This is now the rate determining step for the project.

The US$5m debt facility is largely fully drawn. See below.

The Tanzanian situation

In July 2017, the Tanzanian Government introduced major and highly disruptive changes to the Tanzanian mining act. Without resolution, these changes would be prohibitive to providing the legal and fiscal stability and certainty required by mining financiers. GPX sought to engage constructively with the Tanzanian Government to resolve these issues.

It should be noted that GPX received its Mining Licence in February 2017 and had already received its environmental approvals and so its tenure position has never been in question.

GPX (and others in country) have bent over backwards to accommodate what we judge are unreasonable fiscal imposts on the mining industry. The worst of these unquestionably is the 16% free carried interest to be gifted to the state, in return for approval to mine and export. The company now has approvals to export graphite concentrate, has accommodated local content requirements (where it is able) and have put in place what appears to be acceptable local banking arrangements. We understand the key assurances sought by GPX in its 2018 submission have been received in writing or in principle during meetings. As such, GPX seem to be presenting quite positive commentary on Tanzania.

Although not directly relevant to GPX but critical for the Tanzanian mining industry broadly was resolution of the Barrick/Acacia situation, an impasse which has been simmering for several years, and which was at the heart of changes to the Mining Act. A deal was finally done in October 2019 whereby Barrick will sign over 16% of all its operations in country to a Government entity (Twiga Minerals) and pay some US$300m to the State. In return, the Government would free up exports of gold-bearing concentrate. This deal was finally ratified in late January 2020.

While GPX appear to have received resolution of key issues, other miners in Tanzania continue to experience frustration (note the below issues don't directly impact GPX but can contribute to negative sentiment towards the Tanzanian mining sector):

- There are 4 Special Mining Licences (SML) that remain to be granted. But no sign that this is happening any time soon. But the noises in the local press suggest this may happen within weeks. The requirement for an

SML to negotiate a Mine Development Agreement with the Government might mean that these SMLs were held up pending completion of the Barrick deal (which was recently ratified).

- Disappointingly the issue surrounding Retention Licences (RL) has become worse. In many countries of the world an RL is granted over a known, but likely uneconomic orebody usually due to underlying commodity prices. This was the case in Tanzania. In the changes to the Tanzanian Mining Act, the concept of RL's was abandoned with no replacement classification, effectively nationalising these assets.

  As we understand it, the Ministry of Minerals in December 2019 announced that the projects held under RL would be put out to tender, with compensation payable to the previous RL holders. Then a day later, the Department announced that the successful bidder would not have to compensate the RL holder. This is a clear example of "policy on the run" and leaves us deeply concerned that things are still not well in Tanzania. Indiana Resources and Windshear Gold have served notice on the Government of Tanzania that it would seek international arbitration in an attempt to resolve this issue. We understand other companies in the same position are considering a similar path.

We are concerned that "policy on the run" might become an issue during the lead up to the forthcoming election. A rapid resolution of the RL issues – without the need to resort to litigation – would be a positive signal in our mind. The Tanzanian Government might concede that compensation should be payable to the parties.

Conclusion

- The Chilalo DFS has presented a substantially different scope than envisaged in the PFS. We were surprised that GPX has incorporated a downstream strategy into the business plan but we understand this to be the progression of GPX's focus on graphite market understanding. However, the results obtained, particularly expandable graphite production and sales, deliver an attractive return for the project.
- Stand alone, the Chilalo concentrate project is substantially less attractive than that portrayed in the PFS. This is driven by higher capital and operating costs, and to a lesser extent by a lower basket price achievement. This has been driven by more rigorous testwork and more precise costings than in the PFS.
- We think that Chilalo is unlikely to proceed purely on the export of concentrates from Tanzania. The value-add strategy is essential and it is this vertically integrated model that we understand Castlelake are conducting due diligence on.
- The revised strategy – incorporating a downstream component into reveneues - makes sense to us, but the challenge is that there are now additional moving parts. GPX is reliant on a Chinese manufacturer of expandable graphite to deliver returns for the project
- Based on informal discussions with GPX's independent marketing consultants, the price deck as it is now portrayed seems to be realistic. That said, we have not undertaken channel checks on graphite pricing.
- The geopolitical outlook for Tanzania looked to be improving, but we are now concerned about the Government tinkering with a small group of previous tenement holders for little apparent gain. This seems contrary to the government's policy of reinvigorating the mining industry post resolution of the Barrick/Acacia situation. Delays in the granting of 4 Special Mining Licences is also a concern but these may be forthcoming shortly.
- GPX's future hangs on its ability to fund the Chilalo project. The DFS has delivered a feasible project, but it remains to be seen whether the present potential financier (or others that might come along) are prepared to adopt this new proposal for Chilalo.

Capital structure

Graphex Mining (GPX)		
Share price	A$	$0.12
Number of shares (fpo)	m	101
Market capitalisation	A$m	$12.12
Share options (at 12/19)	m	5.3
Cash (at 12/19)	A$m	0.8
Debt*	A$m	7.1
Top 20 shareholders, appr.		54%
Board/management ownership, appr.		2%
Board structure		
Stephen Dennis	NE Chairman	
Daniel Saint Don	NE Director	
Phil Hoskins	Managing Director	

Attention is drawn to the debt owed to a potential financier to the project, Castlelake.

Liability to Castlelake

The facilities are secured Loan Notes issued to funds managed by private equity firm Castlelake L.P. as announced 29 October 2018. The Loan Notes have a term of 2 years with an interest rate of 15% and a commitment fee on undrawn funds of 4%. The loan notes are denominated in USD and as at quarter end, the Company has issued US$4M of the US$5M total Loan Notes. The numbers in the table above are presented in AUD translated at the AUD/USD rate as at 30 June 2019 of 0.70.

Source: GPX December 2020 quarterly

Appendix 2. Chilalo NPV model

Year		0	1	2	3	4	5	6
Inputs								
Sales price, size fraction basis								
20 Mesh	US$		5,000	5,000	5,000	5,000	5,000	5,000
32 Mesh	US$		2,359	2,582	2,895	3,054	3,017	3,017
50 Mesh	US$		1,745	1,935	2,235	2,378	2,242	2,242
80 Mesh	US$		1,057	1,133	1,251	1,307	1,270	1,270
100 Mesh	US$		794	853	945	989	969	969
-100 Mesh	US$		631	673	735	766	749	749
Basket prices								
Concentrate	US$		1,178	1,303	1,475	1,545	1,534	1,534
Expandable graphite	US$		5,690	5,690	5,690	5,690	5,690	5,690
Micronised graphite	US$		2,802	2,802	2,802	2,802	2,802	2,802
Production/sales								
Concentrate	tonnes		43,000	56,000	50,000	48,000	45,000	39,000
Expandable graphite	tonnes		-	-	3,000	6,000	9,000	12,000
Micronised graphite	tonnes		-	1,000	2,000	3,000	5,000	6,000
Operating costs (per tonne concentrate)								
Concentrate	US$		766	766	766	766	766	766
Expandable graphite	US$		512	512	512	512	512	512
Micronised graphite	US$		352	352	352	352	352	352
Tax rate	%		30%	30%	30%	30%	30%	30%
Royalty	%		4%	4%	4%	4%	4%	4%
Capital costs								
Mine, concentrator, infrastructure	US$m	87.4						
Micronised graphite	US$m	2.2						
NPV of Chilalo								
Revenue								
External sales	US$m		50.7	73.0	73.8	74.2	69.0	59.8
Transfer sales for value add	US$m		0.0	0.7	6.7	13.4	19.5	25.6
Royalties	US$m		-2.0	-2.9	-3.2	-3.5	-3.5	-3.4
Gross sales	US$m		48.6	70.7	77.2	84.0	85.0	82.0
Capital cost	US$m	-87.4						
Operating costs	US$m		-32.9	-43.7	-42.1	-43.7	-45.2	-43.7
Operating margin	US$m	-87.4	15.7	27.0	35.1	40.4	39.8	38.3
Depreciation	US$m		-17.5	-17.5	-17.5	-17.5	-17.5	
Taxation	US$m		0.5	-2.9	-5.3	-6.9	-6.7	-11.5
Cashflow after tax	US$m	-87.4	16.2	24.2	29.8	33.5	33.1	26.8
Net of TZ share (16%)		-87.4	13.6	20.3	25.0	28.1	27.8	22.5
NPV	US$m	127.1						
IRR		28%						
Net of TZ share								
NPV	US$m	93.8						
IRR		23%						
NPV of Expandable production								
Revenue								
External sales	US$m				17.1	34.1	51.2	68.3
Royalties	US$m				0.0	0.0	0.0	0.0
Gross sales	US$m				17.1	34.1	51.2	68.3
Purchase of concntrate (at sales price)	US$m				-5.2	-11.1	-15.8	-21.1
Operating costs	US$m				-1.5	-3.1	-4.6	-6.1
Operating margin	US$m				10.3	20.0	30.8	41.1
Taxation	US$m				-3.1	-6.0	-9.2	-12.3
Cashflow after tax	US$m	0.0	0.0	0.0	7.2	14.0	21.6	28.7
NPV	US$m	$171.6						
NPV of micronised production								
Revenue								
External sales	US$m		0.0	2.8	5.6	8.4	14.0	16.8
Royalties	US$m							
Gross sales	US$m		0.0	2.8	5.6	8.4	14.0	16.8
Capital	US$m		-2.2					
Flake graphite purchased internally	US$m		0.0	-0.7	-1.5	-2.3	-3.7	-4.5
Operating costs	US$m		0.0	-0.4	-0.7	-1.1	-1.8	-2.1
Operating margin	US$m		-2.2	1.8	3.4	5.1	8.5	10.2
Taxation	US$m		0.7	-0.5	-1.0	-1.5	-2.6	-3.1
Cashflow after tax	US$m	0.0	-1.5	1.2	2.4	3.5	6.0	7.1
NPV	US$m	53.6						

Appendix 2, continued

Year		0	1	2	3	4	5	6
Consolidated, project basis								
Revenue								
External sales	US$m	0.0	50.7	75.8	96.4	116.7	134.3	144.9
Royalties	US$m	0.0	-2.0	-2.9	-3.2	-3.5	-3.5	-3.4
Gross sales	US$m	0.0	48.6	72.8	93.2	113.2	130.7	141.5
Capital	US$m	-87.4	-2.2	0.0	0.0	0.0	0.0	0.0
Operating costs	US$m	0.0	-32.9	-44.0	-44.4	-47.8	-51.6	-51.9
Operating margin	US$m	-87.4	13.5	28.8	48.8	65.4	79.1	89.6
Taxation	US$m	0.0	1.2	-3.4	-9.4	-14.4	-18.5	-26.9
Cashflow after tax	US$m	-87.4	14.7	25.4	39.4	51.0	60.6	62.7
NPV	US$m	352.3						
IRR		41%						
Consolidated, GPX basis								
NPV of projects	US$m	352.3						
Overheads, tax affected	US$m	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
NPV	US$m	-33.6						
NPV of Tanzanian interests in Chilalo	US$m	-33.3						
GPX, NPV	US$m	**285.4**						
Exchange rate		0.75						
GPX, NPV	A$m	**380.6**						

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

By downloading this report you acknowledge receipt of our Financial Services Guide, available on our web page www.bridgestreetcapital.com.au.

Bridge Street Capital Partners Pty Ltd is licensed to provide financial services in Australia; CAR AFSL 456663; Level 14, 234 George Street, Sydney NSW 2000
Bridge Street Capital Partners Pty Ltd is providing the financial service to you.

General Advice Warning

Please note that any advice given by Bridge Street Capital Partners Pty Ltd or its authorised representatives (BSCP) is GENERAL advice, as the information or advice given does not take into account your particular objectives, financial situation or needs. You should, before acting on the advice, consider the appropriateness of the advice, having regard to your objectives, financial situation and needs. If our advice relates to the acquisition, or possible acquisition, of a particular financial product you should read any relevant Prospectus, PDS or like instrument.

Disclaimers

BSCP provides this financial advice as an honest and reasonable opinion held at a point in time about an investment's risk profile and merit and the information is provided by BSCP in good faith. The views of the adviser(s) do not necessarily reflect the views of the AFS Licensee. BSCP has no obligation to update the opinion unless BSCP is currently contracted to provide such an updated opinion. BSCP does not warrant the accuracy of any information it sources from others. All statements as to future matters are not guaranteed to be accurate and any statements as to past performance do not represent future performance. Assessment of risk can be subjective. Portfolios of equity investments need to be well diversified and the risk appropriate for the investor. Equity investments, made by less experienced investors, in listed or unlisted companies yet to achieve a profit or with an equity value less than $50 million should collectively be a small component of a balanced portfolio, with smaller individual investment sizes than otherwise. Investors are responsible for their own investment decisions, unless a contract stipulates otherwise. BSCP does not stand behind the capital value or performance of any investment. Subject to any terms implied by law and which cannot be excluded, BSCP shall not be liable for any errors, omissions, defects or misrepresentations in the information (including by reasons of negligence, negligent misstatement or otherwise) or for any loss or damage (whether direct or indirect) suffered by persons who use or rely on the information. If any law prohibits the exclusion of such liability, BSCP limits its liability to the re-supply of the Information, provided that such limitation is permitted by law and is fair and reasonable.

Disclosures

Dr Chris Baker, an authorised representative of BSCP, certifies that the advice in this report reflects his honest view of the company. He has 29 years investment experience in wholesale capital markets. He worked as a mining analyst for brokers BZW and UBS for 11 years and has a further 16 years' experience as a mining analyst and portfolio manager with Colonial First State and Caledonia Investments. He now provides independent financial advice on a part time basis. He may own securities in companies he recommends but will declare this when providing advice. He currently owns shares in GPX. He is remunerated by BSCP but is not paid a specific fee for providing this report. BSCP are Corporate Advisors to GPX and receive fees from GPX for services provided. BSCP, its directors and consultants may own shares and options in GPX and may, from time to time, buy and sell the securities of GPX.

BSCP earned fees from a capital raising undertaken by GPX.

US Disclaimer: This investment research is distributed in the United States by Bridge Street Capital Partners Pty Ltd and in certain instances by Enclave Capital LLC (Enclave), a U.S.-registered broker-dealer, only to major U.S. institutional investors, as defined in Rule 15a-6 promulgated under the U.S. Securities Exchange Act of 1934, as amended, and as interpreted by the staff of the U.S. Securities and Exchange Commission. This investment research is not intended for use by any person or entity that is not a major U.S. institutional investor. If you have received a copy of this research and are not a major U.S. institutional investor, you are instructed not to read, rely on or reproduce the contents hereof, and to destroy this research or return it to Bridge Street Capital Partners Pty Ltd or to Enclave. The analyst(s) preparing this report are employees of Bridge Street Capital Partners Pty Ltd who are resident outside the United States and are not associated persons or employees of any U.S. registered broker-dealer. Therefore, the analyst(s) are not subject to Rule 2711 of the Financial Industry Regulatory Authority (FINRA) or to Regulation AC adopted by the U.S. Securities and Exchange Commission (SEC) which among other things, restrict communications with a subject company, public appearances and personal trading in securities by a research analyst. Any major U.S. institutional investor wishing to effect transactions in any securities referred to herein or options thereon should do so by contacting a representative of Enclave.

Enclave is a broker-dealer registered with the SEC and a member of FINRA and the Securities Investor Protection Corporation. Its address is 19 West 44th Street, Suite 1700, New York, NY 10036 and its telephone number is 646-454-8600. Bridge Street Capital Partners Pty Ltd is not affiliated with Enclave or any other U.S. registered broker-dealer