

# Lake Resources LKE.AX, OTC: LLKKF

## Pole position for the lithium super-cycle



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## **Executive summary**

Lake Resources is developing five lithium projects in Argentina. The company has the largest lithium lease holding in the country, amounting to more than 2,200 km<sup>2</sup>, all of which it currently owns 100%. The most advanced project is Kachi, where the company announced a maiden resource of 4.4 million tonnes lithium carbonate equivalent (LCE) in November 2018, and a refreshed pre-feasibility study (PFS) in March 2021.

Lake offers incredible value: Revised estimates are prepared for NPV and earnings that reflect management's January 2022 decision to build Kachi to 50,000 tpa LCE, and higher lithium prices. Chinese spot market lithium carbonate prices have soared 805% since the start of 2021 with prices for 99.5% lithium carbonate now above US\$75,000/t. While management's approach in the PFS was sensibly conservative, the simple fact is that current spot market prices are almost five time the level adopted in the study. Factoring in a selling price of US\$30,000/t LCE suggests an attributable post-tax NPV<sub>8</sub> from the Kachi project to Lake (75%) of US\$5.9bn (A\$8.2bn). On this basis, the market is valuing Lake at just 12% of attributable NPV<sub>8</sub>, which looks incredibly cheap. Valuing Kachi at NPV<sub>8</sub> could support a valuation a year from now of A\$5.90/share, more than 6x the current share price.

Kachi is expected to start-up in 4Q24, and to reach full production in 2026. EBITDA is estimated at US\$735m in 2025, US\$1,194m in 2026, and US\$1,225m pa in 2027-2050. Assuming the project is financed 70% with debt, that Lilac Solutions contributes its 25% of the equity, and that remaining equity is raised at A\$1.80/share, applying an EV/EBITDA multiple range of 15x to 25x suggests Lake could be valued at A\$12.70/share to A\$21.47/share. This represents 14x to 24x the current share price. If this is achieved by early 2026, it would represent an annual return of 93% to 121% over the next four years.

**Lithium 'super-cycle' is just kicking off:** The run-up in lithium prices over the past year has been reminiscent of the Chinese commodities super-cycle from the 2000s. Two decades ago, Chinese economic reforms let the brakes off the economy. What followed was a period of staggering economic expansion in which fixed asset investment growth averaged 24% pa in US dollar terms from 2001 to 2015. This period had an enormous impact on commodities markets. Chinese crude steel consumption grew by 15% pa in 2001-2013. By 2008, iron ore prices had quintupled from levels five years earlier. **Higher prices have turned out to be far more sustainable than expected at the start of the super-cycle**; in the 18 years from 2004 to 2021, iron ore prices averaged more than three times the level they were at before the super-cycle commenced.

Similar to the super-cycle two decades ago, **the lithium market is being propelled by a new and substantial structural driver of demand.** This time, electric vehicles and energy storage could have an even bigger impact on small markets such as lithium. Global EV sales are expected to grow by 25%-30% pa this decade, as much as twice the rate of Chinese steel demand in 2001-2015. Whereas by 2013, China represented half of the world crude steel market, electric vehicles are expected to account for about 80% of lithium demand by 2030. Further, **lithium demand is expected to grow 9x this decade;** global crude steel demand merely doubled in 2001-2015.

Once again, supply is struggling to keep pace with demand. Previously, the supply response in iron ore, for example, was initially held back by mine, rail and port constraints. **This time the issues are likely to revolve around ESG concerns and financing.** 

**Experience of the super-cycle suggests that lithium prices are going to remain far stronger than previously anticipated.** Lake stands to be a key beneficiary of this. Commodities analysts may be initially hesitant to call for a new super-cycle; as confidence grows that the cycle is sustainable, investors can look forward to continual price and earnings upgrades.

**New supply takes time:** In order to meet demand, lithium capacity will need to reach about 4.0m tpa LCE by 2030. This increase in required capacity through the rest of this decade represents about 40x Albemarle's production of lithium products in 2021. It **represents about 70 Kachi projects at 50,000 tpa LCE.** This is going to be very challenging. Evaporation ponds are slow to establish, not readily scalable, and are being subjected to increasing environmental scrutiny. In terms of financing, the sector will need an estimated US\$50bn in investment for new capacity; global lithium revenues were about US\$4bn last year. Delaying funding will inevitably prolong the cycle.

**Direct lithium extraction is perhaps the only viable way of balancing the market:** Over the next few years, DLE is expected to become the primary method of lithium extraction. The chemical techniques employed are already well-established in the water industry, which is why companies involved in water treatment such as Suez Group, Schlumberger, Veolia, Adionics, and others are entering the lithium space. Direct extraction is also widely used in the uranium sector. As project financing becomes increasingly tied to ESG credentials, new lithium projects will need to adhere to strict ESG standards. DLE offers substantial benefits in terms of environmental footprint, water use, and carbon emissions. It is high time lithium producers stopped relying on inefficient 1<sup>st</sup> Century technology and started to embrace 20<sup>th</sup> Century chemical extraction techniques.

**Targeting 100,000 tpa LCE:** In addition to Kachi, Lake owns four other projects, three of which, Olaroz, Paso and Cauchari are located in Jujuy province, northwest Argentina. In December 2021, Lake announced an initial 4,000m 10-hole drill program aimed at testing these projects, with the first drill holes targeting the northern parts of Olaroz. Seismic geophysical surveys have already been completed. By using rotary drills, management hopes to achieve an understanding of grade, and importantly, to generate sufficient brine to provide larger samples for testing with a number of parties, including Lilac. Lake's aspirational target is to reach capacity of 100,000 tpa LCE; this would underpin Lake's position as a leading lithium producer globally.

**Share price catalysts:** A number of factors are expected to drive the stock over the next few months. Lake is aiming to move the Kachi project to DFS (pushed back by the decision to expand it). This will involve completing the current drilling program (final hole underway), upgrading the resource (targeting end 2Q22), publishing an initial Mineral Reserve, completing an Environmental and Social Impact Assessment (2Q22), and undertaking brine extraction and reinjection tests. Discussions with Export Credit Agencies and regarding offtake agreements are ongoing. A final investment decision is targeted around 3Q22. Positive developments at other projects could also drive the shares.

The lithium market is entering a new 'super-cycle' in which prices are expected to remain at much higher levels than previously anticipated. With five lithium projects, Lake Resources stands to be a major beneficiary. The stock looks incredibly undervalued at current levels.

Simon Francis

February 2022

## Key financial data

Figure	4.	Shareholding	structure
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ASX code		LKE
Share price, 21 February, 2022	A\$/share	0.905
Shares on issue	Millions	1,227.2
Options	Millions	186.3
Fully diluted shares	Millions	1,413.5
Market capitalisation	A\$ millions	1,110.6
Cash on hand, 31 December, 2021	A\$ millions	71.3
Top 20 shareholders:		34.1%

Source: Lake Resources

#### Key Management:

**Mr Stephen Promnitz, Managing Director:** Stephen Promnitz joined Lake as Managing Director in November 2016. Prior to Lake Resources, Stephen was 2IC of Kingsgate Consolidated, a listed Pacific Rim gold producer with assets in Chile. Before this time, he held senior corporate finance roles with Westpac and Citigroup. He started his career as a geologist with Rio Tinto before managing Western Mining Corp's mining operations in Argentina. He holds a Bachelor of Science Honours (Natural Resources) from Monash University and is fluent in Spanish.

**Mr Stuart Crow, Chairman and Non-Executive Director:** Stuart has global experience in financial services, corporate finance, investor relations, international markets, salary packaging and stock broking. Stuart is passionate about assisting emerging listed companies to attract investors and capital and has owned and operated his own businesses.

**Dr Nick Lindsay, Executive Technical Director:** Dr Lindsay is Executive Technical Director, in charge of delivering the Kachi Project to FID. He has over 30 years' experience in Argentina, Chile and Peru in technical and commercial roles in the resources sector with major and mid-tier companies, as well as start-ups. A fluent Spanish speaker, Dr Lindsay has successfully taken companies in South America, such as Laguna Resources which he led as Managing Director, from inception to listing, development and acquisition. He is a member of the AusIMM and the AIG and holds a Bachelor of Science (Honours) in Geology, a PhD in Metallurgy and Materials Engineering and an MBA.



#### Figure 2: Lake Resources share price chart

## Lake offers incredible value

- ➤ Valuing the Kachi project at attributable post-tax NPV<sub>8</sub> could support a valuation a year from now of A\$5.90/share, more than 6x the current share price
- With production underway, valuations could reach A\$12.70/share to A\$21.47/share based on multiples of 15x to 25x EV/EBITDA
- Share price catalysts include potential offtakes, a resource upgrade, the DFS, project financing, and FID for Kachi, as well as developments at other projects

The valuation framework is based on valuing Kachi at a percentage of NPV prior to production, and at a multiple of earnings once production commences.

#### One year valuation of A\$5.90/share

Based on lithium carbonate capacity of 50,000 tpa and Lake achieving a selling price of US\$30,000/t LCE, the Kachi project could boast a post-tax NPV<sub>8</sub> of US\$7.9bn (A\$10.9bn). Assuming Lilac funds its 25%, post-tax NPV<sub>8</sub> attributable to Lake could amount to US\$5.9bn (A\$8.2bn). Including Lake's four other lithium projects, which are at earlier stages and valued herein at just US\$100m in aggregate, **suggests a total NPV of A\$5.90 per share. This is more than 6x the current share price.** The market is valuing Lake at just 12% of attributable post-tax NPV<sub>8</sub>; this looks incredibly undervalued.

Over the next few months, Lake is expected to move Kachi to DFS, pushed back by the decision to expand the project to 50,000 tpa. This will include completing the ongoing drilling that is aimed at expanding and upgrading the existing resource (final hole underway), publishing an initial Mineral Reserve, completing an Environmental and Social Impact Assessment (targeted for 2Q22), and undertaking brine extraction and reinjection tests. Discussions with Export Credit Agencies and regarding offtake agreements are ongoing. A final investment decision (FID) is expected in 3Q22 around the time of the DFS.

Timeframe	Valuation A\$/share	Methodology	Comments
One year	5.90	100% of NPV	Valuation reflects capacity increase to 50,000 tpa, faster ramp-up, tight lithium market, and environmental advantages of DLE
			Selling prices assumed to be US\$30,000/t LCE
			Projects other than Kachi still valued in aggregate at US\$100m
2026	12.70 to	15x to 25x	Line 1 coming on stream in 2H24 and Line 2 ramping up from
	21.47	EV/EBITDA	mid-2025; near full capacity reached in 2026
			Valuation multiples in line with current lithium producers
			Lithium market expected to be in deficit
			Technology switch from ponds to DLE in full swing
			Other projects still valued at US\$100m

#### Figure 3: Valuation framework and potential outcomes

#### Source: Orior Capital

As a general rule of thumb, companies at the DFS stage and near to financing and cash flows, can typically trade at 30-50% of NPV. Current valuations in the lithium sector are higher than this. This

reflects the unusually strong prospects for demand, and a sense that the sector is facing a critical supply crunch. **The lithium market is already showing signs of 'super-cycle' price outcomes; prices are expected to remain elevated for at least a decade.** Lithium companies will continue to be major beneficiaries of this and are likely to continue trading at premium valuations.

		Kachi	Lake	
		100%	75%	
Shares on issue, current	millions		1,227.2	
Options and rights	millions		186.3	
Fully diluted shares	millions		1,413.6	
Development				
NPV <sub>8</sub> , post-tax	US\$ m	7,901	5,926	Orior Capital estimate
NPV <sub>8</sub> , post-tax	A\$ m	10,943	8,207	
A\$:US\$ fx rate		1.385	1.385	
1-year valuation based on %	of NPV			
30%	A\$/share		1.77	All per share figures include a valuation
50%	A\$/share		2 <u>.9</u> 5	of US\$100m for Lake's other projects
75%	A\$/share		4.43	
100%	A\$/share		5.90	
Production				Projected start-up late 2024
Capex	US\$ m	940	705	Orior Capital estimate
Capex	A\$ m	1,302	976	
Debt	A\$ m	911	683	Assume 70% debt
Offtake financing	A\$ m	139	104	Assume U\$100m
Equity required	A\$ m	252	189	Lilac to finance A\$63m (US\$45m)
Cash position at FID	A\$ m		121	Orior Capital estimate
New equity	A\$ m		69	
New shares	millions		38	Assume at A\$1.80/share
Annual EBITDA	US\$ m	1,225	919	Full production, US\$30,000/t LCE
Annual EBITDA	A\$ m	1,699	1,272	
EV/EBITDA valuations				
10x	A\$/share		8.32	
15x	A\$/share		12.70	
20x	A\$/share		17.08	
25x	A\$/share		21.47	

Figure 4: Lake Resources valuation model

Source: Orior Capital

#### Production valuation of A\$12.70/share to A\$21.47/share

The project is expected to start-up in 4Q24 with production of 30,000 tonnes LCE in 2025 (Line 2 ramping up) and 48,750 tonnes LCE in 2026 (almost fully on stream). EBITDA earnings are estimated at US\$735m in 2025, US\$1,194m in 2026, and US\$1,225m pa thereafter until 2050.

Kachi is expected to be financed with 70% debt from UK Export Finance (UKEF) and 30% equity. The company already holds a substantial cash balance and should benefit from further conversions of outstanding options. Lilac Solutions, now well-funded, is expected contribute its 25% share of the equity. With new shares issued at A\$1.80/share (about 30% of attributable post-tax NPV<sub>8</sub>), and applying an EV/EBITDA multiple range of 15x to 25x, **Lake could be valued at A\$12.70/share to A\$21.47/share. This represents 14x to 24x the current share price.** Assuming the market only starts to factor in 2026 earnings early in 2026 (as Line 2 ramps up), **it would represent an annual return of 93% to 121% over the next four years.** 

These valuations look high in the context of the current share price, yet are based on an assessment of lithium supply-demand (dis)-equilibrium, conservative estimates of lithium prices drawing on experience from the Chinese 'super-cycle' of the 2000s, and normal industry valuation multiples.

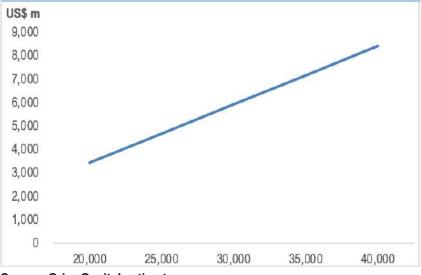
#### Financing

UK Export Finance (UKEF) has already provided indicative support for up to 70% of the total finance requirement for Kachi. UKEF is the operating name of the Export Credits Guarantee Department, the United Kingdom's export credit agency, and a UK government ministerial department. This is subject to completion of the DFS, environmental studies and suitable offtake agreements. At the project level, this could amount to US\$658m (A\$911m). Assuming a further US\$100m in offtake financing, the project would require another US\$182m (A\$252m), for which Lake would be responsible for 75%, or about A\$189m. Given the current cash position (A\$71m at the end of December), assuming conversion of the outstanding 75 cents options, and allowing for some costs, Lake is expected to have a cash position of about A\$121m by the time a final investment decision has to be made. This would leave a relatively small A\$69m to raise to complete the financing of Kachi.

UKEF financing is likely to be relatively cheap at about 2%. Even assuming there are 'add-ons' that bring the cost of debt up to say 3%, the annual cost of debt of about US\$20m would represent less than 2% of annual EBITDA.

#### Sensitivity

NPV is sensitive to lithium prices. A US5,000/t LCE increase in selling prices would raise estimated attributable post-tax NPV<sub>8</sub> by 21% to US7.2bn, and NPV per share to A7.03.





#### Other projects

In this model, Lake's four other lithium projects in Argentina are still only valued at US\$100m in aggregate. In February 2022, Lake announced its 'Target 100' strategy, aimed at expanding capacity and developing the Olaroz, Cauchari and Paso projects. An initial 4,000m 10-hole drill program has already commenced. Importantly, the development experience at Kachi through PFS and DFS, should enable Lake to accelerate these other projects. **There is plenty of scope for these projects to be revalued as they are developed.** 

Source: Orior Capital estimates

### Peer valuations driven by looming supply deficit

# The three 'pure play' lithium producers, Ganfeng Lithium, Livent and Tianqi Lithium, are trading at simple average EV/EBITDA multiples of 48x in 2021 and 21x in 2022.

Albemarle and SQM are both diversified companies that have lithium interests. Albemarle is also active in bromine and catalysts. It is trading at estimated EV/EBITDA multiples of 34x in 2021 and 20x in 2022. SQM has interests in speciality plants nutrition, iodine and derivatives, potassium and industrial chemicals. Historically, plants nutrition has generated greater revenues and profitability than lithium; in 2020, lithium accounted for just 18% of SQM's gross profit. SQM is trading at estimated EV/EBITDA multiples of 19x in 2021 and 11x in 2022.

Company	Code		EV	EBITDA (x)		
		2019	2020	2021	2022	2023
Albemarle	ALB	9.8	22.6	33.6	20.4	15.3
Ganfeng Lithium	002460.SZ	62.7	94.6	42.7	22.8	18.6
Lithium Americas	LAC	n.a.	n.a.	n.a.	210.0	37.4
Livent	LHTM	13.9	134.0	56.7	21.7	16.0
SQM	SQM	12.0	20.9	18.8	10.9	11.0
Tianqi Lithium	002466.SZ	n.a.	n.a.	43.5	17.4	17.6
Simple average		24.6	68.0	39.1	18.6	19.0

#### Figure 6: Lithium sector EV/EBITDA multiples

Note: "n.a." means company either made losses or was not in operations during the period, and the company is excluded from the averages. Lithium Americas is in start-up mode in 2022, and excluded from the average.

**Source: Orior Capital estimates** 

## Now Kachi looks even more compelling

- Management's decision to build Kachi to 50,000 tpa LCE, and soaring lithium prices, underpin a reassessment of Kachi's earnings potential
- The project is expected to generate average annual EBITDA attributable to Lake of US\$919m pa over the life of the project, and boast an IRR of 59%
- The project is set apart by the fact that all of Lake's production will be highpurity battery-grade product

Management's decision to develop Kachi as a 50,000 tpa project is underpinned by strong demand for high-purity lithium carbonate, an oncoming supply crunch, compelling financial metrics, the large resource, and substantial environmental advantages compared to evaporation ponds.

Production parameters	Units	PFS	PFS	Planned
		April 2020	March 2021	50,000 tpa
Annual production	Tonnes LCE	25,500	25,500	50,000
Annual production	Tonnes contained Li	4,801	4,801	9,393
Life of project production	Tonnes LCE	638,000	638,000	1,250,000
Project life	Years	25	25	25
Brines extracted and treated	Million m <sup>3</sup> per annum	23	23	45
Lithium grade to DLE plant	Mg/litre	250	250	250
Average recovery rate	%	83.2	83.2	83.2
Lithium carbonate grade	%	99.9	99.9	99.9
Indicated mineral resource	Million tonnes LCE	1.01	1.01	2.00*
Financial parameters				
Initial capital costs	US\$ m	544	544	940
Operating costs	US\$/t	4,178	4,178	3,198
All-in sustaining costs	US\$/t	5,100	5,100	4,570
Lithium carbonate price (99.9%)	US\$/t	11,000	15,500	30,000
Margin over C1 cash costs	US\$/t	6,822	11,322	26,802
Revenues, at full production	US\$ m pa	280	395	1,500
Revenues, life of project	US\$ m,	7,030	9,845	37,501
EBITDA, cumulative first 3 years	US\$ m, 2025-2027	442	743	3,154
EBITDA at full production	US\$ m pa	155	261	1,225
EBITDA, full prodn., attrib. to Lake	US\$ m pa	155	261	919
EBITDA, life of project	US\$ m	3,890	6,402	30,635
NPV <sub>8</sub> , pre-tax	US\$ m	1,050	2,170	11,605
NPV <sub>8</sub> , post-tax	US\$ m	748	1,580	7,901
NPV <sub>8</sub> , pre-tax, attributable to Lake	US\$ m	1,050	2,170	8,704
NPV <sub>8</sub> , post-tax, attributable to Lake	US\$ m	748	1,580	5,926
IRR, pre-tax	%	25	42	82
IRR, post-tax	%	22	35	59
Payback period from first production	Years	5	3	2.1
Note * = anticipated mid-2022				

Figure 7: Kov	noromotore (	of the K	achi DES	and undated	project of	stimatos
Figure 7: Key	parameters of	oi uie r	аст РГЭ	and updated	projectes	sumates

Source: Lake Resources, Orior Capital

Based on a selling price of US\$30,000/t LCE throughout the project life, Kachi is expected to boast:

- Attributable post-tax NPV<sub>8</sub> of US\$5.9bn to Lake (assuming 75% ownership)
- IRR of 59%
- Average annual EBITDA attributable to Lake of US\$919m (A\$1,272m) at full production
- Operating costs of US\$3,200/t, as outlined in Ready to charge, June 2021

#### Key assumptions

#### Capacity of 50,000 tpa

In January 2022, Lake announced its intention to base the upcoming DFS on capacity of 50,000 tpa LCE.

#### Timing

At this stage, it is assumed the plant will be built as two lines of 25,000 tpa capacity each. Site works for both lines would be completed together. It is likely a single chlor-alkali plant would be built. The assumption is that Line 1 comes on stream in 4Q24 at a start-up utilisation rate of 60%, and operates at an average of 85% through 2025, before reaching full production in 2026. Line 2 is expected to come on stream about 9 months after Line 1. Strong demand, and offtake financing could accelerate this.

#### Figure 8: Estimated ramp up and production profile

-		2024	2025	2026	2027	2028	2029	2030
Capacity, year end	Tonnes LCE	25,000	50,000	50,000	50,000	50,000	50,000	50,000
Production	Tonnes LCE	3,750	30,000	48,750	50,000	50,000	50,000	50,000
Line 1	Tonnes LCE	3,750	21,250	25,000	25,000	25,000	25,000	25,000
Line 2	Tonnes LCE		8,750	23,750	25,000	25,000	25,000	25,000

Source: Orior Capital

#### **Project life time**

Cash flows are modelled up to 2050, after which it is assumed, the operation terminates. This is conservative. Given the substantial current resource and the exploration target, management would hope to extend the project for several more decades.

#### Resources

The current resource comprises an indicated resource of 1.1Mt LCE located in the central area of the project, and an inferred resource of 3.4Mt LCE in the surrounding area. Brine bearing sediments remain open at depth and laterally. Management has an exploration target of 8Mt to 17Mt LCE. Lake is currently drilling at Kachi with a view to both expanding the resource, and providing an initial Mineral Reserve for the upcoming DFS.

The project is assumed to utilise about 1.5Mt LCE of resource. This is about one-third of the current inferred resource, but greater than the current indicated resource of 1.1Mt contained LCE.

#### **Capital costs**

Total project capital costs are estimated at US\$940m, including contingencies. This is based on the capital costs of US\$544m for 25,557 tpa capacity as set out in the PFS, March 2021, the 'six-tenths rule' for capacity expansion as explained in AusIMM Mongraph27 – The Cost Estimation Handbook (2<sup>nd</sup> Edition, 2012), and builds in cost inflation of 10% to reflect for example, higher structural steel costs and potential continued logistics delays. No adjustment is made to reflect the slightly smaller capacity compared to the previously modelled 51,200 tpa LCE. On this basis, unit capital costs would be US\$18,800/t. This is still about 12% less than envisaged in the PFS.

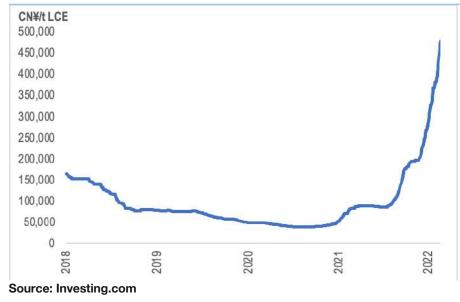
#### **Operating costs**

Operating costs are estimated at US\$3,200/t LCE, based on the PFS data and the six-tenths rule. The expectation is that Kachi will be one of the lowest cost producers globally. Earnings are far less sensitive to changes in operating costs compared to changes in lithium prices. A US\$1,000/t LCE increase in operating costs (31%) would have almost the same financial impact as a 3% reduction in estimated selling prices.

#### Lithium prices

Lithium prices have soared. Current China spot market prices for 99.5% purity product are around CN¥479,500/t LCE (US\$75,870/t). Lithium carbonate prices have risen by 805% since the beginning of 2021. Average prices in 2021 were three times the average price of a year earlier. **The belief is that the lithium market is entering a new super-cycle driven by a new and substantial structural driver of demand in EVs, and the lack of a sufficient supply response.** 

The March 2021 PFS was based on a lithium price of US\$15,500/t LCE. While management were sensibly conservative at the time, the simple fact is that spot market prices are now nearly five times this level. Whatever level prices reach in the near-term, prices look like being stronger than previously anticipated, and for a sustained period. The modelling herein is based on Lake achieving an average selling price of US\$30,000/t LCE. Lessons from the previous super-cycle in the early 2000s suggest this could very well turn out to be conservative.





#### Margins

One of the distinguishing features of the Kachi project, and one that sets Lake apart from current lithium producers, is that **all of Lake's product is expected to be high-purity, 'battery grade' product.** This cannot be said for current producers who sell a mixture of different grades. This 100% high-purity product is reflected in superior anticipated margins. **Lake is expected to achieve an average EBITDA margin over the life of the project of 82%.** 

#### **Taxes and royalties**

A 3% royalty is paid to the Province of Catamarca. Argentinian export taxes are 12%, but a cap on the Peso:USD exchange rate makes the effective rate about 5%. A change in the exchange rate cap could impact the effective export tax rate. Corporation tax is 25%.

		2024	2025	2026	2027
					to 2050
Production					
Brine extracted	million m <sup>3</sup>	3.4	27.1	44.0	45.2
Brine treated	million m <sup>3</sup>	3.4	27.1	44.0	90.3
Concentration	mg/L	250	250	250	250
Contained lithium in	Tonnes Li	847	6,773	11,006	11,288
brine treated	Tonnes LCE	4,507	36,052	58,585	60,087
Recovery		83%	83%	83%	83%
Recovered lithium	Tonnes Li	705	5,636	9,159	9,393
Recovered lithium	Tonnes Li <sub>2</sub> CO <sub>3</sub>	3,750	30,001	48,751	50,001
Lithium product sold	Tonnes Li	705	5,636	9,159	9,393
Lithium product sold	Tonnes Li <sub>2</sub> CO <sub>3</sub>	3,750	30,001	48,751	50,001
Profit and loss					
Selling price	US\$/t LCE	30,000	30,000	30,000	30,000
Revenues	US\$ m	112.5	900.0	1,462.5	1,500.0
COGS	US\$ m		95.9	155.9	159.9
Unit COGS	US\$/t LCE		3,198	3,198	3,198
Royalties, export tax	US\$ m	9.0	69.1	112.3	115.2
Royalty	US\$ m	3.4	24.1	39.2	40.2
Royalty		3%	3%	3%	3%
Argentine export tax	US\$ m	5.6	45.0	73.1	75.0
Argentine export tax		5%	5%	5%	5%
EBITDA	US\$ m	103.5	735.0	1,194.3	1,224.9

#### Figure 10: Kachi EBITDA estimate (100% basis)

Source: Orior Capital

## Lithium super-cycle just starting

- The lithium market looks to be in the early stages of a new super-cycle driven by a systemic change in demand and lack of an adequate supply response
- > The transition to electrified transportation could have an even bigger impact on the lithium market than China did on commodities from about 2003 onwards
- Lithium prices are likely to remain 'stronger for longer', probably for at least a decade

### Lessons from the super-cycle

The lithium market is showing the hallmarks of a new super-cycle in which prices are driven to previously unseen highs by a combination of a new, significant and structural, driver of demand and the lack of an adequate supply response. The lithium price action over the past year is reminiscent of the way commodities prices (iron ore, copper and others) reacted when the Chinese economic reforms of the late-1990s/early-2000s started to kick in. Indeed, the Chinese commodities supercycle of the 2000s may well provide a good proxy for how this current lithium cycle will unfold. If anything, the impact of electric vehicles on markets such as lithium may be even more dramatic.

#### A new growth engine...

By the early 2000s, China's "Three Reforms" of state-owned enterprises, the financial system, and administrative organizations, had started to underpin more rapid economic growth. The brakes were off. Chinese GDP growth reached 10.0% in 2003, and averaged 10.5% pa in 2003-2012. Although the State Council periodically tried to cool the economy for fear of it overheating, China saw a remarkable and sustained period of growth. Fixed asset investment, in US dollar terms, rose on average by a staggering 24% pa in 2001-2015. The impact on commodities markets was profound.

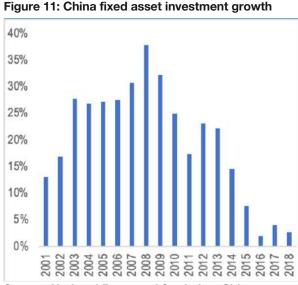
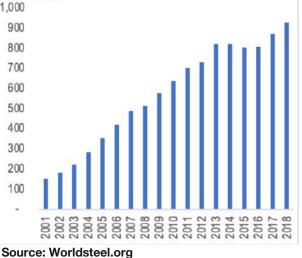




Figure 12: Chinese crude steel consumption



Source: National Bureau of Statistics, China



#### ...driving prices to previously unseen levels

Take crude steel consumption and iron ore prices as an example; Chinese crude steel consumption grew at an average pace of 15% pa in the period 2001-2015, more than 10x consumption growth in the rest of the world (1.4% pa in the same period). In 2001, China accounted for 18% of world crude steel demand. By 2013, this had grown to 50%, according to data from worldsteel.org.

Prior to this incredible period of economic expansion, spot iron ore prices were unexciting at best. Yet, by 2005-2006 prices had more than doubled, by 2007 they had quadrupled, and by 2008 they had quintupled. Other commodities prices, such as copper, reacted similarly.

Iron ore prices have never returned to pre-2003 levels. Prices did fall sharply during the global financial crisis to a trough of US\$60/t in April 2009, but they had bounced back above US\$100/t by the end of the year. Prices also reached a low of US\$40/t in December 2015 on fears of oversupply, but had doubled a year later. In fact, while iron ore prices averaged US\$29/t in 1994-2003, **in the 18 years from 2004 to 2021, they averaged US\$101/t, more than 3x the pre-super-cycle price.** 

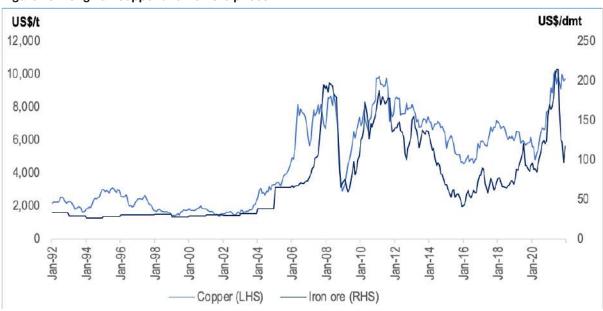


Figure 13: Long-run copper and iron ore prices

Source: indexmundi.com

#### The EV rollout could be even more impactful

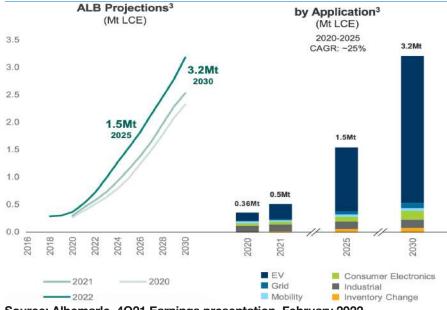
At this stage it looks like the global transition to electrified transportation, including the rollout of EVs, and developments in energy storage, will have an even bigger impact on the lithium market than China did on commodities markets such as iron ore.

- Global EV sales are expected to grow at a CAGR of 45% pa in 2020-2025, and by 25-30% pa through the decade; this is as much as twice the rate of Chinese steel consumption in 2001-2015
- EV penetration is expected to climb from 4.6% in 2020 to 39% in 2030 according to Albemarle
- EVs accounted for about 24% of lithium demand in 2024 and are expected to account for about 80% by 2030
- The lithium market is expected to grow 9x this decade; the global crude steel market merely doubled from 2001 to 2015









Source: Albemarle, 4Q21 Earnings presentation, February 2022

#### New supply takes time

In order to meet these demand expectations, and allowing for process losses and utilisation rates, lithium capacity will need to reach at least 4.0m tpa LCE by 2030. The increase in required capacity through the rest of this decade represents about 40x Albemarle's production of lithium products in 2021. **It represents about 70 Kachi projects at 50,000tpa LCE.** This is going to be challenging on a number of fronts:

**Technology:** Evaporation ponds are slow to establish, suffer from poor recoveries, and are subject to increasing environmental scrutiny, especially in Chile. The lithium industry is gradually shifting from 1<sup>st</sup> Century technology ponds to 20<sup>th</sup> Century chemical extraction, but this graduation will need to accelerate if demand is to be met. The best way, and perhaps the only viable way, for companies

operating on the Salar de Atacama to improve lithium recoveries and address environmental concerns is to invest in DLE processes.

Scale: Lithium capacity needs to increase by a factor of about 10 this decade to meet demand.

The expansion in iron ore and other commodities was initially held back by a lack of mine, rail and port infrastructure. In lithium, the issues are expected to revolve around ESG credentials and funding.

**ESG:** New lithium projects will be subject to stricter environmental hurdles. Environmental scrutiny is being increasingly legislated. For example, under the German Supply Chain Act, which comes into effect in 2023, companies will be held accountable on social standards across their entire supplier network.

**Funding:** Based on a capital intensity of say, US\$15,000/t, some US\$50bn needs to be in invested in new lithium capacity. This is for an industry that generated about US\$4.0bn in 2021. Commercial lenders, ever conservative, may find this challenging. Delaying financing will prolong the cycle. Funding issues will be further exasperated by the fact that many projects are held by junior companies who tend to face greater financing challenges.

In addition to higher prices, the super-cycle had other impacts on the commodities markets.

#### Shift in the cost curve

To meet demand, new and higher cost supplies started-up, including many marginal producers in Hebei province, China. Suppliers started to beneficiate low-Fe content magnetite ores. To satisfy China's need for nickel for stainless steel production, the 'nickel pig iron' industry was born. Inevitably, the 'back end' of the cost curve rose. Fortescue came on stream in 2008. By 2012, the company's cash costs were down to about US\$48/wmt. This is about US\$60/dmt on a 62% Fe-content, CFR China, basis, more than double the price of iron ore a decade earlier.

Not all new supply will be higher cost (nor was all new iron ore supply). Yet, sustained higher prices will tend to make projects that are considered marginal now more viable. This will tend to raise the top end of the cost curve.

#### Shift to short term contracts

Another change was that commodities markets shifted from being mostly one-year contract based to being mostly quarterly contract and spot based. One year (or longer) contracts work when prices hardly budge, but not in high-priced volatile markets. As new lithium projects come on stream, the expectation is that contracts will become quarterly with reference to the previous quarters' price. Buyers in China, Korea and Japan are all used to this pricing mechanism in other commodities.

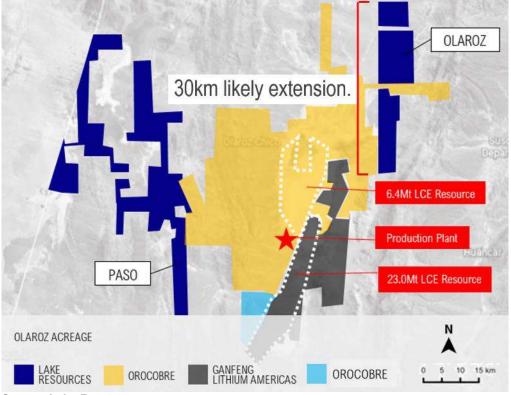
#### **Expect continued upgrades**

A common way to forecast commodities prices is to assume that prices return to a level around the top end of the cost curve at some stage. After a sudden run-up in prices there is a tendency to assume prices will retreat back to 'normal' levels relatively quickly. There are two issues with this. One is that the demand side is being legislated globally, somewhat subsidized, and supported by consumers. Another is that bringing new capacity to bear usually takes several years. **Analysts are likely to continue raising forecasts for lithium prices over the next several years as they gain confidence that the cycle is sustainable.** 

# Target 100

- Lake's aspirational target is to expand capacity to 100,000 tpa LCE; this would underpin the company's position as a leading producer globally
- An initial 4,000m 10-hole drill program targeting the Olaroz, Paso and Cauchari projects has already commenced
- Exploration success and other positive developments at any of these projects would be expected to significantly drive the share price

In addition to the Kachi project, Lake owns four other projects, three of which, Olaroz, Paso and Cauchari are located in Jujuy province, northwest Argentina. Together, Olaroz, Paso and Cauchari cover some 475 km<sup>2</sup>. In December 2021, Lake announced an initial 4,000m 10-hole drill program aimed at testing these projects, with the first drill holes targeting the northern parts of Olaroz. Seismic geophysical surveys have already been completed. These projects are likely, at least initially, to be drilled with rotary drills which are quick, will provide an understanding of grade, and importantly, sufficient brine to provide larger samples for testing with a number of parties, including Lilac.



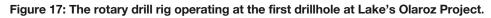
#### Figure 16: Location of Olaroz and Paso Projects in relation to other companies in the area.

Source: Lake Resources

### Olaroz

The Olaroz project, covering some 142 km<sup>2</sup>, is situated in close proximity to Ganfeng/Lithium Americas' Cauchari project, and adjoining Allkem's (formerly Orocobre) Olaroz production area. Lake believes that, based on the success of drilling on the basin margins under cover at Cauchari and Kachi, that similar brines will extend into Lake's Olaroz property. The leases extend along the eastern margin of Allkem's producing resource, for over 30km north-south, which is a similar length to Ganfeng/Lithium Americas' resource area. The first drill holes will be drilled in the Masa 15 tenement area.





Source: Lake Resources

### Paso

Once the initial holes at Olaroz are completed, management plans to drill test the Paso project. The project lies west of Allkem's Cauchari-Olaroz lease area and covers some 296 km<sup>2</sup>. Salt lakes in the area have shown elevated lithium results at surface.

### Cauchari

The Cauchari project covers some 37 km<sup>2</sup>. The licences are contiguous to brine deposits owned by Ganfeng/Lithium Americas, and Allkem. **Lake Resources drilled one hole at Cauchari in 2019, which returned compelling results, confirming a major discovery**, and supporting a new exploration model designed by Lake Resources that was to explore on the margins of lithium bearing basins under thin alluvial cover to locate similar brines as in the centre of brine bearing basins.

Lithium brines were intersected over 506m from a depth of 102m to the end of the hole at 608m. The results include 493 mg/L over a wide 343m intersection from 117m depth with a magnesium to lithium ratio of 2.9. The results are similar to those at the neighbouring Ganfeng/Lithium Americas

Cauchari project which has total resources of 24.6m tonnes LCE at 592 mg/L. Management is confident of advancing the project with further drilling.





Source: Lake Resources

Assay	Lithium:	Section Drillhole CW-01-D01	
Interval· (m)¤	(mg/L)¶ 1 <sup>st.</sup> Packer¤	0.0-11.00 meters: Sands fine gr   10   11.00-17.25 meters: Clays   20   17.25-21.50 meters: Clays   21.50-38.00 meters:	Brine Zone: 102-608m
PACKER	SAMPLE	40 50 38,00 - 61,00 meters: . Sands fino-mod gr	(506m zone)
102m¤	421¤	60 61.00 - 68.00 meters: , Clays	493 mg/L
121m¤	475¤	80 90 68,00 - 114,00 meters: - Sands coarse gr	ave. Lithium (117- 460m)
132m¤	422¤	100 421mg/L lithium (102m)   110 114.00 - 118.00 meters: Gravel fine gr	(421 - 540 mg/L) Li:Mg ratio 2.9
156m¤	509¤	120 130 130	475mg/L lithium (121m)
178m¤	506¤	140 130,00 - 154,00 meters: Clays + sands fine gr	509mg/L lithium (156m)
190m¤	509¤	160 154,00 - 172,00 meters: Sands fine gr + minor clays   170 172,00 - 178,00 meters: Sandy clay   180 172,00 - 178,00 meters: Sandy clay	506mg/L lithium (178m)
219m¤	461¤	190 178,00 - 193,50 meters: Gravel fine gr - Major Change   190 193,50 - 197,60 meters: Gravel + sands + clay base   200 197,00 - 200,00 meters: Gravel + sands + clay base	509mg/L lithium (190m)
231m <sup>2</sup>	452¤	203.00 - 207.00 meters:	461mg/L lithium (219m) 452mg/L lithium (231m)
247m¤	1000	230 207.00 - 258.00 meters: Sands coarse gr 240	522mg/L lithium (247m)
	522¤	250 260 258.00 - 261.00 meters: Clays	527mg/L lithium (256m)
256m¤	527¤	270 261,00 - 280,00 meters: Sands coarse gr   280 280,00 - 283,00 meters: Clays	540mg/L lithium (265m)
265m¤	540¤	290 283,00 - 300,50 meters: Gravel fine to coarse gr	500mg/L lithium (289m)
289m¤	500¤	310 300.50 - 313.00 meters: Clays   320 313.00 - 316.00 meters: / Sanda   320 316.00 - 326.00 meters: Clays	495mg/L lithium (307m)
307m¤	495¤	330	
367m¤	481¤	360	481mg/L lithium (367m)
387m- 460m¤	496¤	370	496mg/L lithium (387 - 460m)
132m- 608m¤	444¤	400 3 608m End of Hole	444mg/L lithium (132 - 608m)

Figure 19: Results from Cauchari drill hole CW-01-D01

Source: Lake Resources

# **Appendix 1: Lake Resources' assets**

Lake Resources is developing five lithium projects in Argentina. Four of these are lithium brines projects, and one is a pegmatite project. The company has the largest lithium lease holding in Argentina, amounting to more than 2,200 km<sup>2</sup>, all of which it currently owns 100%.

Area, km <sup>2</sup>	Province
744	Catamarca
37	Jujuy
142	Jujuy
296	Jujuy
98	Catamarca
904	Catamarca
2,221	
	744 37 142 296 98 904

Figure 20: Lake Resources lithium projects, Argentina	ake Resources lithium projects, Arge	ntina
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Source: Lake Resources

Figure 21: Lake Resources lithium projects



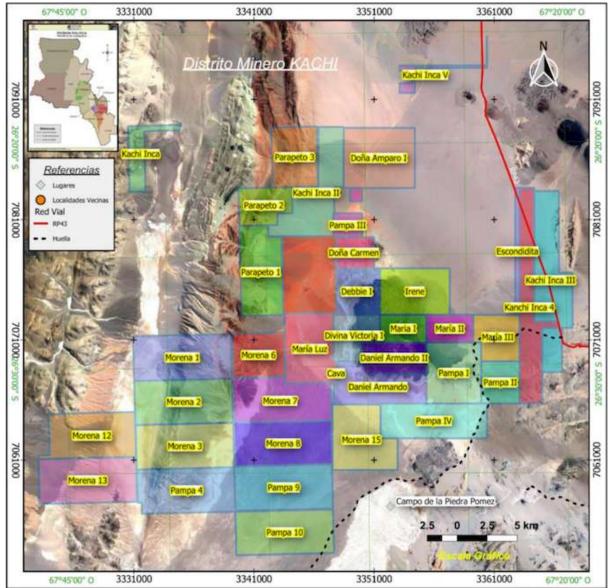
Source: Lake Resources

### Kachi

Kachi is most advanced of Lake Resources' projects. The company released a maiden resource at Kachi of 4.4 million tonnes lithium carbonate equivalent (LCE) in November 2018. The PFS was released in April 2020 and refreshed in March 2021.

The project is held under 39 mineral concessions covering 74,382 hectares that are 100% owned by Lake Resources through its wholly owned Argentine subsidiary, Morena del Valle Minerals S.A. In Argentina, mineral rights are awarded by provincial governments as either exploration or mining licenses. All tenements at Kachi are held under mining licenses. The mineral licenses have no expiry date provided (small) annual fees are paid, and all obligations are met under the national mining code.





Source: Lake Resources

#### Figure 23: Kachi mining concessions

Name	Role No.	Area, Ha	Status		
Kachi Inca	13-M-2016	858	Granted		
Kachi Inca I	16-M-2016	16-M-2016 2,881			
Kachi Inca II	17-M-2016 2,823 Granted				
Kachi Inca III	47-M-2016				
Kachi Inca V	45-M-2016	305	Granted Granted		
Kachi Inca VI	44-M-2016	110	Granted		
Dona Amparo I	22-M-2016	Granted			
Dona Carmen	24-M-2016	874	Granted		
Debbie I	21-M-2016	1,501	Granted		
Divina Victoria I	25-M-2016	1,266	Granted		
Daniel Armando	23-M-2016	2,116	Granted		
Daniel Armando II	97-M-2016	1,388	Granted		
Escondidita	131-M-2018	373	Granted		
Irene	28-M-2018	2,250	Granted		
Maria Luz	34-M-2017	2,425	Granted		
Maria I	140-M-2018	889	Granted		
Maria II	14-M-2016	888	Granted		
Maria III	15-M-2016	1,396	Granted		
Morena 1	72-M-2016	3,025	Granted		
Morena 2	73-M-2016	2,989	Granted		
Morena 3	74-M-2016	3,007	Granted		
Morena 4	29-M-2019	2,968	Granted		
Morena 5	97-M-2017	1,415	Granted		
Morena 6	75-M-2016	1,606	Granted		
Morena 7	76-M-2016	2,805			
Morena 8	77-M-2016	2,961	Granted		
Morena 9	30-M-2016	2,822	Granted		
Morena 12	78-M-2016	2,704	Granted		
Morena 13	79-M-2016	3,024	Granted		
Morena 15	162-M-2017	2,559	Granted		
Pampa I	129-S-2013	2,312	Granted		
Pampa II	128-M-2013	1,119	Granted		
Pampa III	130-M-2013	477	Granted		
Pampa IV	78-M-2017	2,569	Granted		
Morena 11	201-M-2018	815	Granted		
Parapeto 1	133-M-2018	2,504	Granted		
Parapeto 2	134-M-2018	1,259	Granted		
Parapeto 3	132-M-2018	1,892	Granted		
Gold Sand 1	238-M-2018	853	Granted		
39 Mining leases	Total	74,382			
Source: Lake Resou	Iroos				

Source: Lake Resources

The resource at Kachi is based on 15 drill holes totalling 3,150m, with depths of up to ~400m. Drilling revealed thick permeable sand dominated sediments that are believed to continue below the drilled levels, and beyond the surface dimensions of the salt lake.

The brine resource begins at a depth of 50m from the surface and continues to 400m depth; it is assumed to be a constant 350m thick throughout the resource area. The seismic geophysical survey shows the host sediments extend well beyond 400m depth in the west of the basin.

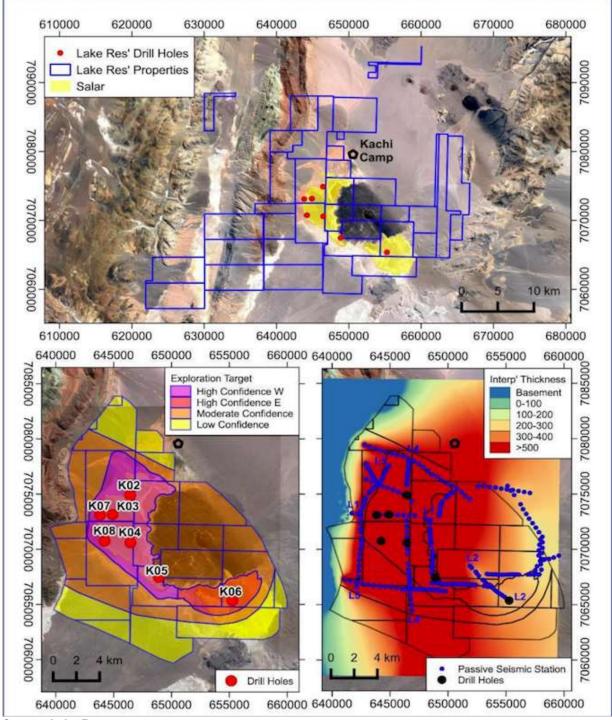
The total Mineral Resource comprises a brine volume of 3.8 km<sup>3</sup>, with an average drainable porosity of 8% and mean lithium grade of 211 mg/L, for a total lithium content of 826,000 tonnes, or 4.4m tonnes LCE. Of this, the Indicated Resource comprises 1.01m tonnes LCE at an average grade of 289 mg/L lithium. A diluted head grade of 250 mg/L is used in the PFS.

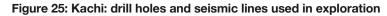
Drill hole	Туре	Total Interval		erval	Lithium	Magnesium	Potassium
		Depth	From	То	mg/L	mg/L	mg/L
		m	m	m			
Northern Area							
K07D01	Diamond	76	10	34	157	-	3,330
K03D02	Diamond	151	74	92	180	1,740	4,435
K03R03	Rotary	242	213	237	306	1,307	5,998
K03R12	Rotary	400	358	400	267	1,180	5,180
K02D13	Diamond	404	60	60	217	3,557	4,438
			64	108	182	2,884	3,620
			269	298	204	2,163	4,100
			313	343	252	1,411	4,987
Southern Area							
K06D04	Diamond	168	95	113	203	766	3,321
K06R05	Rotary	87	68	85	167	1,000	3,160
K06R06	Rotary	180	not	sampled			
K06R07	Rotary	189	159	179	191	1,009	961
K06D08	Diamond	405	69	70	194	958	3,171
			120	121	191	873	3,199
			165	166	170	880	3,650
			206	206	164	894	3,590
			258	259	164	888	3,560
			354	405	170	877	3,670
K05D09	Diamond	139	62	62	83	1,229	965
			108	108	222	1,325	4,360
K05D11	Diamond	391	157	157	95	1,460	1,926
			188	188	215	919	3,596
			224	248	175	876	3,065
			289	289	143	1,088	2,251
			301	301	116	1,035	1,782
			291	334	234	3,199	4,980
			349	391	185	1,955	3,892
K08R14	Rotary	364	301	361	326	1,232	6,038
K04R15	Rotary	350	290	350	265	1,154	4,993

#### Figure 24: Kachi drilling results

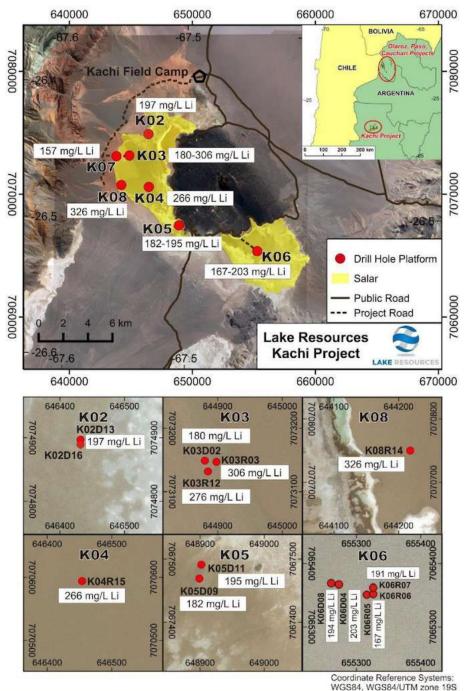
Note: Intervals shown as being 1m are point samples at that depth, taken with a downhole spear

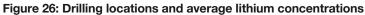
Source: Lake Resources





Source: Lake Resources



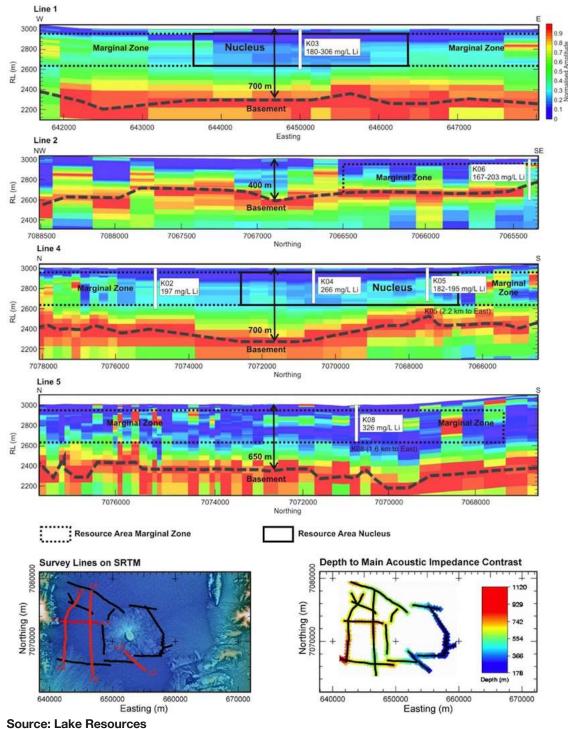




A passive seismic survey of the basin was undertaken to better understand the basin stratigraphy, geometry, and thickness of the sediments hosting the brine. This helped identify drill hole sites. The seismic information suggests the basin is 700-800 m deep in the western area. Interpretation of the seismic survey indicates that much of the basaltic volcanic material visible at surface forms a thin veneer overlying lake sediments, extending the bounds of the salar beyond the visible salt crust. This has led to the initial brine target area being expanded to the north, west and south of the observed salar with lake sediments evident in seismic lines to significant depths below alluvial fans and relatively thin ignimbrites. Based on this geological and geophysical interpretation the area of 295 km<sup>2</sup> has been applied to the exploration target. There is a significant volume of lake sediments below

the 400m depth of drilling, which is used as a cut off depth for the exploration target estimate and the base of the sedimentary basin over a large proportion of the project area.

Figure 27: Seismic Profiles showing location and depth to basement together with the depths used in the mineral resource estimate and exploration target calculation (thick dashed black line is the basement reflector)

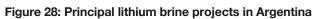


#### Adjacent properties

There a number of other lithium producers and developers in northwest Argentina. Two of these projects are in production. In 2020, Livent produced some 16,000 tonnes of lithium carbonate at its Salar de Hombre Muerto, and Orocobre and Toyota Tsushu produced 11,300 tonnes of lithium carbonate at Salar de Olaroz.

Ganfeng and Lithium Americas' Cauchari-Olaroz project is currently under construction. The project is expected to commence production in mid-2022. Eramet's Centenario project is on hold.





Source: Lake Resources

### **Other projects**

#### Catamarca

The project is located at the southern end of Catamarca province, south of the 'lithium triangle' in the Ancasti Ranges. The project covers some 904 km<sup>2</sup>. The area is known for small-scale production from lithium bearing spodumene pegmatites, mainly from the 1950s to 1990s. Lake Resources exercised its option to acquire the project in September 2018.

According to management, a combination of literature reviews, satellite imagery, and field work helped to identify a series of pegmatite swarms over a belt of 150 km. Outcropping pegmatites with coarse grained spodumene crystals measuring 30cm to 70 cm were identified in a number of locations. **The Catamarca project represents an enormous target, with compelling geology, and historical production in the area.** Opportunities exist to locate new lithium bearing spodumene deposits among pegmatite swarms by using modern exploration technologies.

Latin Resources previously held the adjoining leases (now private). Latin Resources announced, 14 June 2016, the results of 4 samples taken from spodumene exposures in old mine workings, with grades ranging from 4.9% Li<sub>2</sub>O to 7.1% Li<sub>2</sub>O. In April 2017, the company announced the results of a drill program in which four holes intercepted the down dip extension of outcropping pegmatite that was subject to historical drilling. Results included 3m at 2.98% Li<sub>2</sub>O including 1m at 4.61% Li<sub>2</sub>O from drill hole LCRC004, 4m at 2.03% Li<sub>2</sub>O from drill hole LCRC002, and 6m at 1.62% Li<sub>2</sub>O from drill hole LCRC001.

#### Figure 29: Outcropping pegmatites, Catamarca



Source: Lake Resources, 2018

Latin Resources, ASX announcements June 2016 and April 2017 https://www.asx.com.au/asxpdf/20160614/pdf/437wn4ljbfjvqb.pdf https://www.asx.com.au/asxpdf/20170426/pdf/43hqzwdv84lws4.pdf

# **Appendix 2: Companies mentioned**

Company	Stock code		
Lake Resources	LKE.AX		
Albemarle	ALB		
Allkem (formerly Orocobre)	AKE.AX		
Ganfeng Lithium	002460.SZ		
Latin Resources	LRS.AX		
Lithium Americas	LAC		
Livent	LTHM		
Schlumberger	SLB.PA		
SQM	SQM		
Suez	SEV.PA		
Tianqi Lithium	002466.SZ		
Veolia Environnement	VIE.PA		

#### Figure 30: Companies mentioned in this report

Source: Company data

#### The author

Simon Francis is a UK qualified chartered accountant with significant experience in the natural resources and minerals sector. Simon led research in the sector in various roles at major financial institutions including Macquarie, Samsung and HSBC, in a career spanning more than 20 years. He has been involved in approximately US\$4bn of capital raising, for a number of natural resources companies. Simon has been engaged in the financing of early stage companies using production agreements, and has privately funded exploration companies in various metals and jurisdictions. Simon seeks to deploy capital in undervalued mining and resources opportunities that have been missed by the market.