

ASX Announcement ([ASX: AXE](#))

19 April 2021

Third Quarter Activities Report

For the three months ending 31 March 2021

Significant Activities

- The Company is well capitalised with approximately \$6.6 million cash and no debt.
 - Japanese patent granted for Archer's ¹²CQ[®] quantum computing chip technology.
 - ¹²CQ[®] chip patent applications progress in the US and China.
 - ¹²CQ[®] chip development milestone achieved with single-qubit electronic transport.
 - Archer CEO delivers Keynote on Quantum Computing at IBM Think Summit.
 - Biochip nanofabrication capabilities strengthened, aligning with national strategic manufacturing priorities[†].
 - Further progress on the divestment of all remaining mineral exploration tenements, with Archer advancing as a pure-play deep technology company.
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Archer Materials Limited ("Archer", the "Company", "[ASX: AXE](#)") is pleased to report on its activities for the three-month period ending 31 March 2021 ("Quarter").

Commenting on the third quarter activities Greg English, Executive Chairman of Archer, said, "The grant of the Japanese patent for the ¹²CQ quantum computing chip technology means that our quantum computing chip intellectual property is now well protected in Japan. The grant of the Japanese patent gives Archer access to the high-value Japanese market for the ¹²CQ chip and should streamline the process for the grant of patents in other international jurisdictions, including the US and China."

"During the Quarter, we successfully achieved electronic transport in a single qubit at room temperature. This significant achievement showed that a single qubit could be used to build gated semiconductor devices. The work represents a significant technical achievement because the electronic transport measurements were performed on a single qubit – only a few hundred atoms across – and at room temperature."

"As previously reported, we have been growing our technical teams, and we have recently brought on additional permanent staff to accelerate the development of the biochip technology. During the Quarter, we were able to successfully demonstrate that we could fabricate nanosize biosensor components of 100-150 nanometre features on silicon wafers."

"Our stated ambition has been to divest our mineral tenements and focus on the growth of our Advanced Materials business. We have progressed to the next stage of the sale of the two Eyre Peninsula tenements and in April announced the conditional sale of our remaining tenements."

[†] <https://www.industry.gov.au/data-and-publications/medical-products-national-manufacturing-priority-road-map/road-map-at-a-glance>

Quarterly Activities to 31 March 2021

Archer operates within the semiconductor industry. The Company is developing and commercialising innovative deep tech in quantum technology, human health, and reliable energy. The Company is progressing the development of its ¹²CQ[®] quantum computing qubit processor chip (“chip”) and biochip technology (“biochip”), while continuing to divest its mineral exploration projects.

During the Quarter, the Company informed shareholders (ASX ann. [11 Jan 2021](#)) that the Office of the NSW Chief Scientist & Engineer published a comprehensive [independent report](#), titled *Australian Semiconductor Sector Study: Capabilities, opportunities and challenges for NSW’s meaningful participation in the global semiconductor value-chain*[‡] (“Scoping Study”). Archer contributed to the development of the Scoping Study, together with other semiconductor sector leaders.

The Scoping Study identifies the largest areas of opportunity for the scaleup of companies, such as Archer, in the global semiconductor industry. These areas include enhancing domestic capability in semiconductor design, fabrication and prototyping. In particular, as it relates to the commercial translation of advanced materials.

The Scoping Study presents a positive long-term outlook for the potential of increased participation by companies such as Archer in the global semiconductor sector. Archer’s current areas of strength and strategic significance across the semiconductor value chain is reported to include chip development and securing high-impact intellectual property in global markets.

Semiconductors are commonly referred to as ‘chips’, and enable almost all technology applications. The Scoping Study values the global market for manufacturing chip devices at US\$400+ billion and by some estimates is forecast to reach US\$1 trillion by 2030. Chips currently address end markets valued at US\$4+ trillion, that include processor, memory, and sensor devices.

Advanced Materials

Quantum Technology

The ¹²CQ[®] chip is a world-first technology that Archer is building for quantum computing operation at room-temperature *and* integration onboard modern electronic devices.

Archer recently achieved a key technological milestone in the development of its ¹²CQ[®] chip (ASX ann. [22 Feb 2021](#)) related to electronic transport in a single qubit (Image 1). The work represents a significant technical achievement because the electronic transport measurements were performed on a single qubit – only a few hundred atoms across – and at room temperature.

The achievement of single-qubit electron transport is fundamental to the successful development of the ¹²CQ[®] chip. The Company utilised over \$150 million of semiconductor research and prototype foundry facilities and some of the most advanced instrumentation in the world to complete its most recent validation of the ¹²CQ[®] chip technology.

[‡] <https://www.chiefscientist.nsw.gov.au/independent-reports/australian-semiconductor-sector-study>

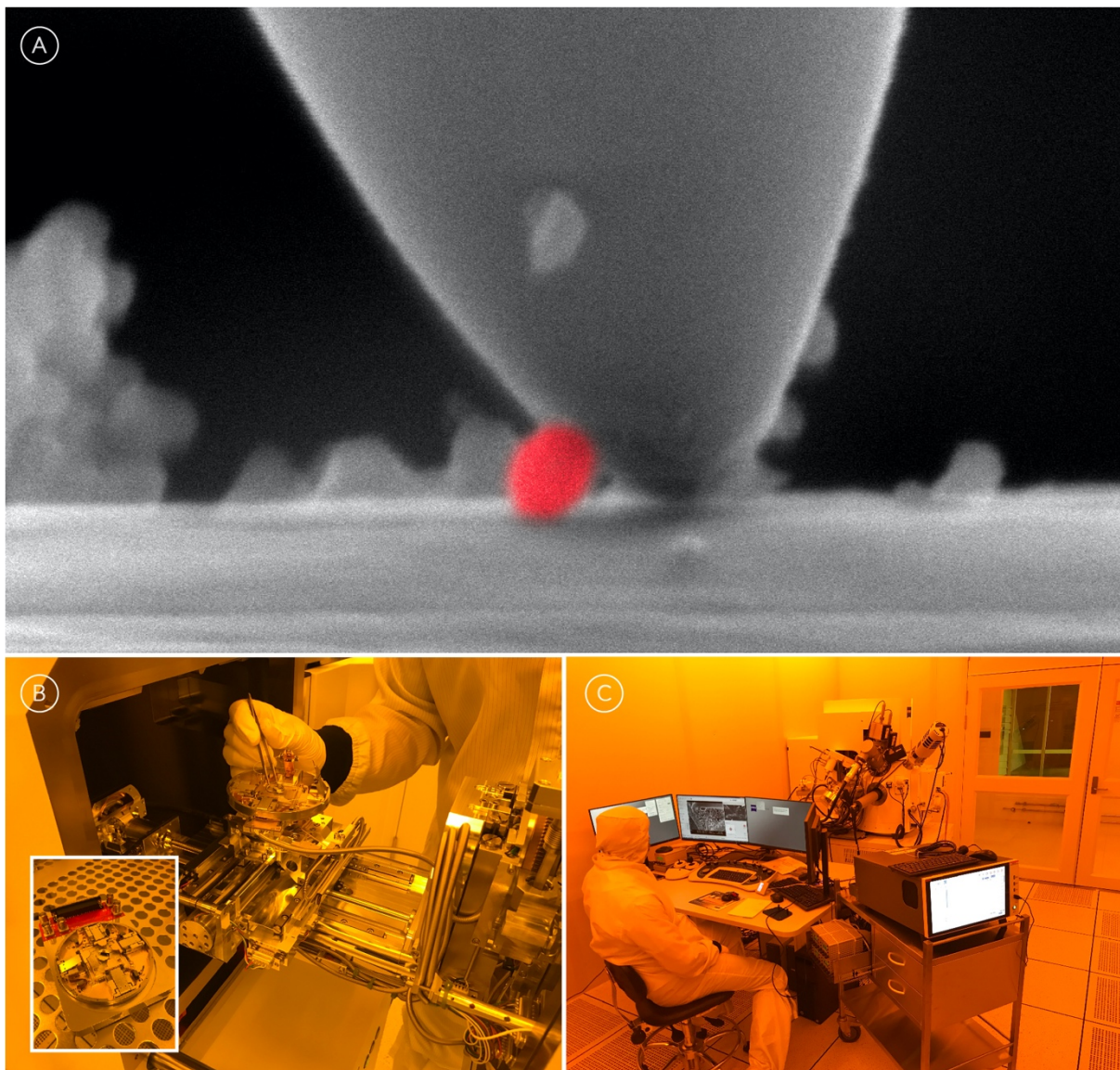


Image 1. Electronic transport measurements of a single qubit. **A** Microscopy image of an individual isolated qubit (identified by false colouring in red) of about 50 nanometers in size (where 1 nanometre is a billionth of a metre) positioned with extreme accuracy between two probe tip surfaces only a few hundred atoms apart, which then serve as electrical contacts to perform the electronic transport measurements. The sophisticated measurement set up, instrumentation, and analysers are shown in **B** with a high-precision tool shown in the *inset* in **B**. The Archer team and collaborators assembled and customised the instrumentation and hardware to address a number of technological challenges in order to successfully perform the measurements at room temperature, which were all carried out in a [research and prototyping semiconductor foundry](#) with a cleanroom environment and sterile protocols, **C**.

The work unambiguously showed that a single qubit – the fundamental quantum information containing material component of the $^{12}\text{CQ}^{\circledR}$ chip – could be used to build ‘gated’ semiconductor devices. This represents a significant commercial advantage over competing qubit chip device proposals. The information obtained from the electronic transport measurements is in excellent agreement with the quantum mechanical theory of the qubit material developed by the Company (ASX ann. [12 Oct 2020](#)) and the measurement of qubit conductivity (ASX ann. [15 Jun 2020](#)).

Furthermore, the single-qubit electronic transport verified claims in the registered Japanese patent (“JP Patent”) (ASX ann. [20 Jan 2021](#)), international patent applications (“IPAs”) (ASX ann. [1 Mar 2021](#)) (Exhibit 1), and scientific publication[§] underpinning the ¹²CQ[®] chip technology.

The JP Patent ([Patent No. 6809670](#)) is the first granted patent protecting the ¹²CQ[®] chip. The grant of the JP Patent represents a significant commercial milestone in Archer’s development of the ¹²CQ[®] chip. The grant of the JP Patent gives Archer access to the high-value Japanese market for the ¹²CQ[®] chip and is the first step in the Company’s efforts to access global markets.

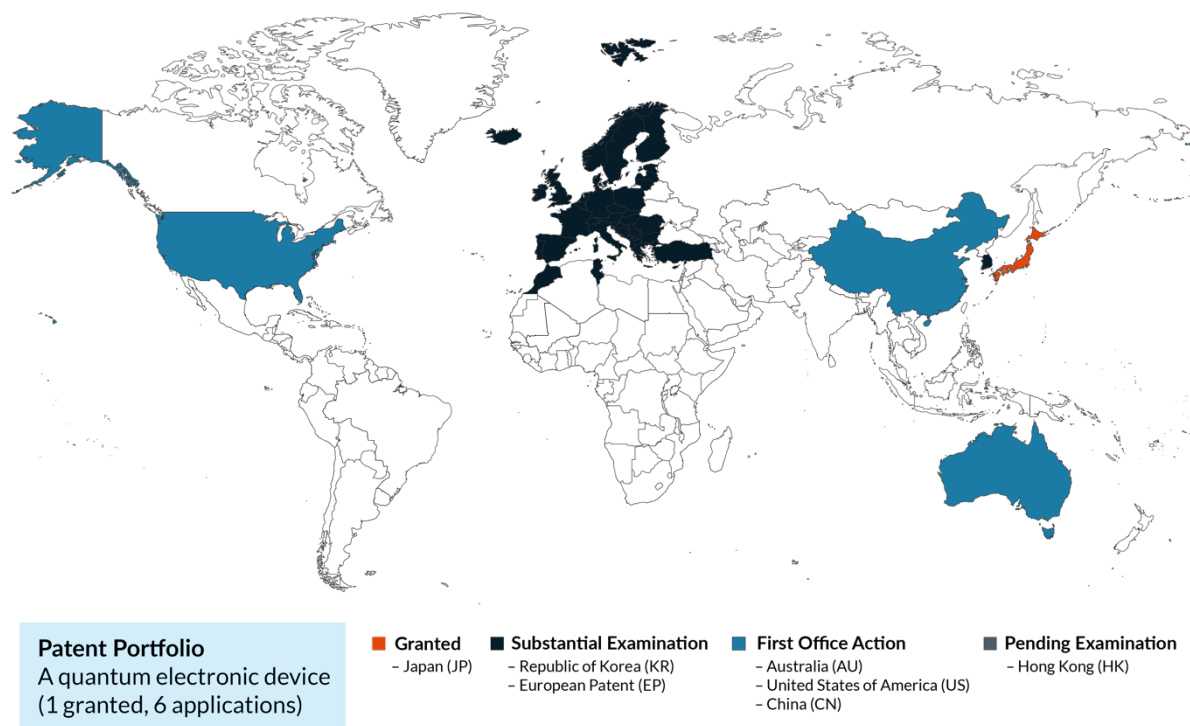


Exhibit 1. Map of the geographic coverage of ¹²CQ[®] chip IPAs as of Mar 2021. IPAs formally titled “A quantum electronic device”. JP IPA entered substantial examination in [Jun 2020](#) and the subsequent patent granted in [Jan 2021](#). EP and KR IPAs entered substantial examination in [May](#) and [Aug 2020](#) respectively and are advancing in this prosecution stage. IPAs in AU, CN, and the US have recently progressed. HK IPA is pending examination.

The JP Patent application successfully underwent substantive examination procedures in Japan by the Japan Patent Office^{**}, which is one of the world’s largest patent offices.

The success in the grant of the JP patent streamlines the patent granting process and procedures for the additional six international patent applications in the jurisdictions of Australia, South Korea, Hong Kong, China, Europe, and the US (ASX ann. [1 Mar 2021](#))

The Company considers Japan as a critical strategic jurisdiction to protect and commercialise its IP. Japan is a major global economy^{††} and according to the [World Economic Forum](#), ranks amongst the top 5 economies in the world for global competitiveness and GDP.

[§] <https://www.nature.com/articles/ncomms12232>

^{**} <https://www.jpo.go.jp/e/system/patent/gaiyo/patent.html>

^{††} <http://reports.weforum.org/global-competitiveness-report-2018/country-economy-profiles/#economy=JPN>

Human Health

Archer's biochip design principles involve using proprietary graphene-based materials in integrated circuits, to form the key sensing elements in its lab-on-a-chip technology. The largest technological barriers to commercialising such devices involve nanofabrication. This is the current focus of Archer in its biochip development (ASX ann. [22 Mar 2021](#)).

The Company successfully demonstrated the fabrication of nanosized biosensor components of 100-150 nanometer features on silicon wafers (Image 2). This is significant, as in [Aug 2020](#), prior to the Company utilising local semiconductor foundry fabrication techniques, it was limited to one sensor per $\sim 1 \text{ cm}^2$; the Company has now, with its in-house capability, miniaturised key biosensor components to chip-formats on silicon by nanofabrication, translating to approx. over 1 million sensor components within a 1 cm^2 area.

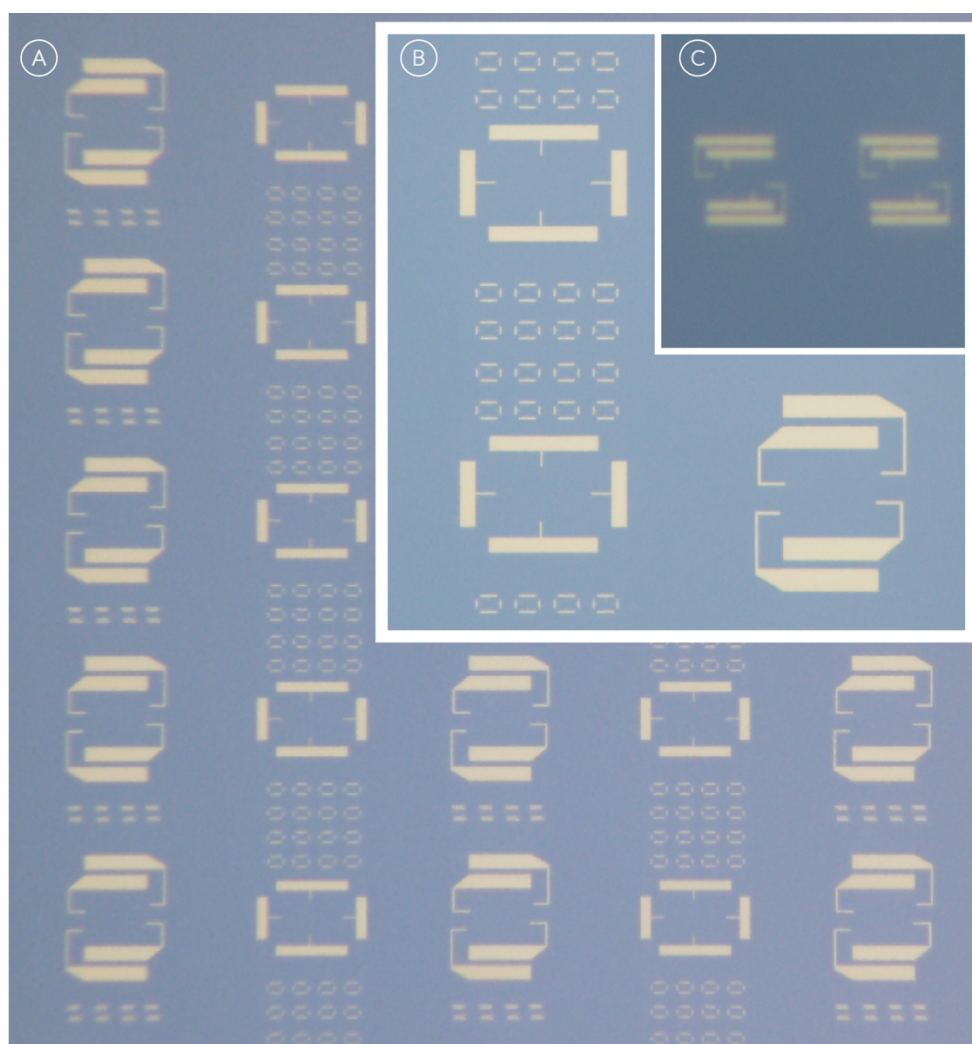


Image 2. Nanofabricated biochip electrode componentry. A-C Microscope image looking directly down onto a silicon wafer containing patterns of metallic electrodes at various feature sizes down to ca. 100-150 nm, as shown in **C**, and are only a few hundred atoms 'thick', which could be used to connect to single and few-sheets of graphene (i.e. single and few-atoms 'thick'). This would allow the creation of biosensor componentry on the biochip based on graphene transistors, using Archer's proprietary intellectual property involving methods to pattern the graphene, new materials, processes, and sensing components the Company is currently developing locally at a world-class [Research and Prototype Foundry](#).

The Company is aiming to miniaturise key biosensor components of its biochip technology (i.e. to reduce the size to nanoscale) on silicon wafers; a technology development milestone required prior to validating commercial advantages of ultra-sensitivity and device integration. Nanofabrication of the biochip sensor components on silicon wafers would also enable high volume chip production – required for any future retail applications of the biochip.

The sophisticated processes employed by Archer and its collaborators to locally manufacture high-value medical diagnostic technology at world-class facilities like the [Research and Prototype Foundry](#), directly aligns to the Australian Government's strategic manufacturing priorities[†], and facilitates Archer's scale-up in the global semiconductor industry[‡].

During the Quarter, the Company brought on permanent staff to pursue areas of highest value-added activities in its biochip development. Archer's team has grown to include expertise spanning semiconductor device fabrication, nanoscience and technology, advanced materials engineering, and molecular biology.

Cross-functional skills capability now exists within the Archer team, i.e. team members are able to contribute to both the biochip technology and ¹²CQ[®] chip development. Archer has expanded on its commercial access-and-use of some of the best instrumentation in the world to address future biochip development milestones and accelerate commercialisation.

Mineral Exploration

Sale of Two Eyre Peninsula Tenements

The Company has previously stated its intention to divest or otherwise commercialise its mineral tenements. Funds raised from the divestment of exploration projects will be used to progress the ¹²CQ[®] chip and biochip technology development and commercialisation.

The Company had signed a legally binding sale agreement ("Agreement") with private company Baudin Minerals Pty Ltd ("Buyer") for the sale of mineral exploration licences EL 5815 and EL 5920 ("Tenements") (ASX Ann. [22 Dec 2020](#)).

During the Quarter, the Company confirmed that it had received a Notice to Proceed from the Buyer and that the required amount of \$100,000 had been paid to Archer (ASX ann. [15 Mar 2021](#)). Archer subsequently lodged with the South Australian government the appropriate forms for the grant of Ministerial consent.

Archer and the Buyer also agreed to amend the original sale and purchase agreement by:

- extending the Cut-Off date by two months from 30 June 2021 to 31 August 2021; and
- changing the two Cut-Off date extension periods from three months per extension (i.e. to 30 September 2021 and 31 December 2021) to two months per extension (i.e. to 31 October 2021 and 31 December 2021).

The Buyer intends to list on the ASX later this year.

Other Projects

No work was undertaken during the Quarter at Archer's other project areas not mentioned in this report.

Corporate

Cash Balance

The Company's cash balance at the end of the Quarter was \$6,619,000.

Exercise of Unlisted Options

During the Quarter, the Company received \$173,610 from the exercise of unlisted options.

Shareholder Events and Outreach

Archer CEO Dr Mohammad Choucair delivered the Quantum Computing keynote presentation at IBM Think Summit Australia & New Zealand ("[IBM Think Summit](#)"). IBM Think Summit is IBM's flagship digital event experience and an award-winning, virtual event featuring some of the technology industry's greatest pioneering minds, focusing on building a better future.

IBM Think Summit hosted more than 2000 business leaders, policy advisors, educators, innovators, artists, athletes, media and industry analysts. Dr Choucair discussed the Company's vision on how quantum computing technology can address complex global challenges.

Dr Choucair also published '[Why quantum deserves your attention](#)' on the IBM website, including a [Quantum 101 video](#) with IBM which has been shared with over 50 million people.

The Company electronically distributed a number of Newsletters and News Spotlights to shareholders during the Quarter, including:

- + [A Quantum Advantage in Fighting Climate Change](#)
- + [CEO Keynote at IBM Think Summit](#)
- + [The Era of Quantum Computing](#)
- + [Archer and Max Kelsen strengthen collaboration](#)
- + [Quantum Computing in the Spotlight](#)
- + [Biochip Development - Strategic Alignment To Global Best Practices](#)

Archer CEO, Dr Mohammad Choucair, also gave interviews with Proactive Investor, a [Broker Briefing](#) 'Technology of Tomorrow' Investor Webinar (250+ attendees), and a Corporate Presentation on-site and in-person at the Research and Prototype Foundry:

- + [Corporate Presentation](#)
- + [Archer Materials secures first patent for its quantum computing chip](#)
- + [Archer Materials CEO talks latest achievement of electronic transport in a single qubit](#)
- + [Archer Materials successfully fabricates nanosize biosensor components for its biochip](#)

Appendix 5B Disclosures

Archer's accompanying Appendix 5B (Quarterly Cashflow Report) includes amounts in item 6.1 which were executive and non-executive director fees paid as salaries and wages. During the Quarter the Company spent \$33,000 on exploration activities, primarily being direct expenditure on tenure licence related fees. This amount does not include any costs associated with the Quantum Computing, Human Health and Reliable Energy projects, nor does it include other corporate salaries and other associated overheads.

Issued Capital

Date	Shares	Options	Performance Rights
Start of Quarter	225,136,546	16,888,277	Nil
New issues during Quarter	Nil	Nil	Nil
Exercised/forfeited during Quarter	900,000 ⁽¹⁾	900,000 ⁽¹⁾	Nil
End of Quarter	226,036,546	15,988,277	Nil
Date of this Report	226,036,546	15,988,277	Nil

(1) 900,000 unlisted options, exercisable at \$0.1929 each on or before 31 March 2023, were exercised into shares. The unlisted options were previously issued under an employee incentive scheme.

Subsequent Activities

In April, the Company announced the sale of its remaining mineral tenements to iTech Minerals Pty Ltd ("Buyer") (ASX ann. [12 April 2021](#)) (the "Transaction"). Under the Transaction, the Buyer will purchase all of the shares in the three subsidiary companies that hold Archer's mineral tenements, namely Pirie Resources Pty Ltd, SA Exploration Pty Ltd and Archer Pastoral Company Pty Ltd (the "Subsidiary Companies").

Upon completion of the sale of the three wholly-owned subsidiary companies, Archer will no longer hold any mineral exploration licences, mining leases or any other type of mineral tenement. However, Archer will keep the 2.0% NSR royalty granted on the sale of the Eyre Peninsula tenements to Baudin Minerals Pty Ltd (ASX ann. [22 Dec 2020](#)).

Completion of the sale and purchase of the Subsidiary Companies ("Completion") is subject to the satisfaction or waiver of certain conditions precedent, including NSW Government approval to the change in control of SA Exploration Pty Ltd; the Buyer raising at least \$5.0 million and listing on ASX; Archer receiving ATO Demerger relief and Archer shareholder approval.

At Completion, Archer will receive 50 million Consideration Shares. The Archer board intends to distribute all of the 50 million Consideration Shares to Archer shareholders by way of a pro-rata in-specie distribution, subject to the receipt of favourable tax advice and regulatory and Archer shareholder approval.

Archer will hold an extraordinary general meeting ("Meeting") to seek shareholder approval of the Subsidiary Companies' sale and the Consideration Shares' in-specie distribution. Further information about the Transaction, the Buyer, and the in-specie distribution of the Consideration Shares (including the record date for eligible Archer shareholders to receive their Consideration Shares) will be included in the notice of Meeting to be distributed to Archer shareholders in June/July 2021.

Detailed information on the Buyer, the offer of securities under the proposed initial public offering, ASX listing and an indicative timetable will be included in a prospectus to be prepared by the Buyer. The Buyer has informed Archer that it expects to lodge the prospectus by the end of July 2021.

List of Archer Tenements

Tenement ⁽¹⁾	Location	Commodity	Jurisdiction
<i>Tenements sold to Baudin Minerals Pty Ltd⁽²⁾</i>			
EL 5815	Waddikee	Graphite	SA
EL 5920	Carapsee Hill	Graphite	SA
<i>Tenements sold to iTech Minerals Pty Ltd⁽³⁾</i>			
EL 6363	North Cowell	Graphite	SA
EL 5791	Cockabidnie	Graphite	SA
EL 5804	Wildhorse Plains	Graphite	SA
EL 5870	Carpie Puntha	Graphite	SA
EL 6351	Burra North	Base Metals	SA
EL 5769	Napoleons Hat	Copper / Gold	SA
EL 5794	Blue Hills	Copper / Gold	SA
EL 5935	Whyte Yarcowie	Cobalt / Copper	SA
EL 6000	Pine Creek	Copper / Gold	SA
EL 6029	Altimeter	Copper / Gold	SA
EL 6160	Franklyn	Copper / Gold	SA
EL 6287	Peterborough	Copper / Gold	SA
EL 6354	Bendigo	Copper/Gold	SA
EL 6478	Caralue Bluff	Kaolin	SA
ML 6470	Campoona Shaft	Graphite mining	SA
MPL 150	Sugarloaf	Graphite and graphene processing	SA
MPL 151	Pindari	Process water for Sugarloaf	SA
EL 8894	Stanthorpe	Tungsten / Tin	NSW
EL 8871	Crowie Creek	Copper/Gold	NSW

Notes

- (1) All tenements are 100% owned by Archer.
- (2) Refer to ASX announcement [22 Dec 2020](#).
- (3) Refer to ASX announcement [12 April 2021](#).

West Australian tenement E53/1926 (Albion Downs) was relinquished during the Quarter.

About Archer

A materials technology company developing innovative deep tech in quantum computing, biotechnology, and reliable energy. The Company has strong intellectual property, world-class in-house expertise, a unique materials inventory, and access to Tier 1 technology development infrastructure.

The Board of Archer authorised this announcement to be given to ASX.

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For more information about Archer's activities, please visit our:

Website:

<https://archerx.com.au/>

Twitter:

<https://twitter.com/archerxau?lang=en>

YouTube:

<https://bit.ly/2UKBBmG>

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