Archer Exploration Limited
ABN 64 123 993 233
Level 1, 28 Greenhill Road
Wayville, SA 5034
Australia
Telephone +61 (0)8 8272 3288
Facsimile +61 (0)8 8272 3888
info@archerexploration.com.au
www.archerexploration.com.au

For personal use only

19th November 2013

ASX ANNOUNCEMENT / MEDIA RELEASE

GRAPHENE READILY EXTRACTED FROM CAMPOONA GRAPHITE

- **Product development research as part of ongoing collaboration between Archer and the University of Adelaide, School of Chemical Engineering (Prof Dusan Losic Nano Research Group) has successfully produced a wide number of graphene and intercalated graphite products from raw Campoona graphite and from Campoona medium-grade (92% C) graphite concentrates. Key products produced were:**
    - **graphene oxide sheets.**
    - **graphene sheets.**
    - **graphene based composites.**
    - **intercalated graphite.**
- **The ability of Campoona graphite and Campoona graphite concentrates to deliver a wide spectrum of graphene and graphene-related products greatly enhances the probability of Archer being able to deliver two 15-20 year business streams:**
    - **high grade to ultra-pure fine natural flake graphite; and**
    - **the manufacture of high tech high-value graphene products.**
- **Graphene is a one-atom thick layer of carbon that has outstanding mechanical, electrical, optical, thermal and chemical properties. Many have dubbed graphene as The New Age material.**
- **Graphene's uses include as conductive formulations and inks, in composite materials, in energy storage materials, in catalysis, as transparent conductive layers, in carbon semi-conductors, in bio-related applications and for waste and water treatment. Graphene is predicted to revolutionize the 21st Century.**

Archer is pleased to announce that a wide range of graphene and graphene-related products have been readily produced from raw Campoona graphite samples as well as from medium-grade (92% C) graphite concentrates. The product development research is part of ongoing collaboration between Archer and the University of Adelaide, School of Chemical Engineering (Prof Dusan Losic Nano Research Group).

For personal use only

The key graphene products produced from the Campoona graphite were:

- Graphene oxide sheets
- Graphene sheets
  - Graphene nanosheets with controllable size (20 nm to 1,000 nm)
  - Functionalised graphene nanosheets
  - Graphene powders
  - Graphene films
  - Graphene membranes
  - Graphene electrodes
  - Graphene nanocarriers
- Graphene based composites
  - Graphene aerogel composites
  - Graphene conductive hydrogels
  - Graphene/carbon nanotube aerogels
  - Graphene magnetic aerogels
- Intercalated graphite

Graphene has been known since the 1940s. However, it was not until 1994 that two researchers, Geim and Novoselov from the University of Manchester, were able to isolate graphene. Geim and Novoselov were awarded the Nobel Prize for Physics in 2010 in recognition of their work.

Graphene has many attributes that gives rise to multiple applications that can be applied across a range of commercial areas.

Table 1. Graphene Applications by Commercial Area.

Commercial Area	Applications
Conductive formulations and Inks	Printable electronics
	E-textiles
	Coatings
Composite Materials	Mechanical reinforcement
Energy Storage	Lithium-ion batteries
	Supercapacitors
Transparent Conductive Films	Organic photovoltaic cells
	Organic light emitting diodes
	Display/touchscreens
Carbon Semi Conductors	Field effect transistor
	Spintronics
	Integrated circuits
Bio-Related	Targeted drug carrier
	Si-RNA carrier
	Sensors for single molecule detection
Water treatment	Capacitance de-ionization
	Filtration

For personal use only

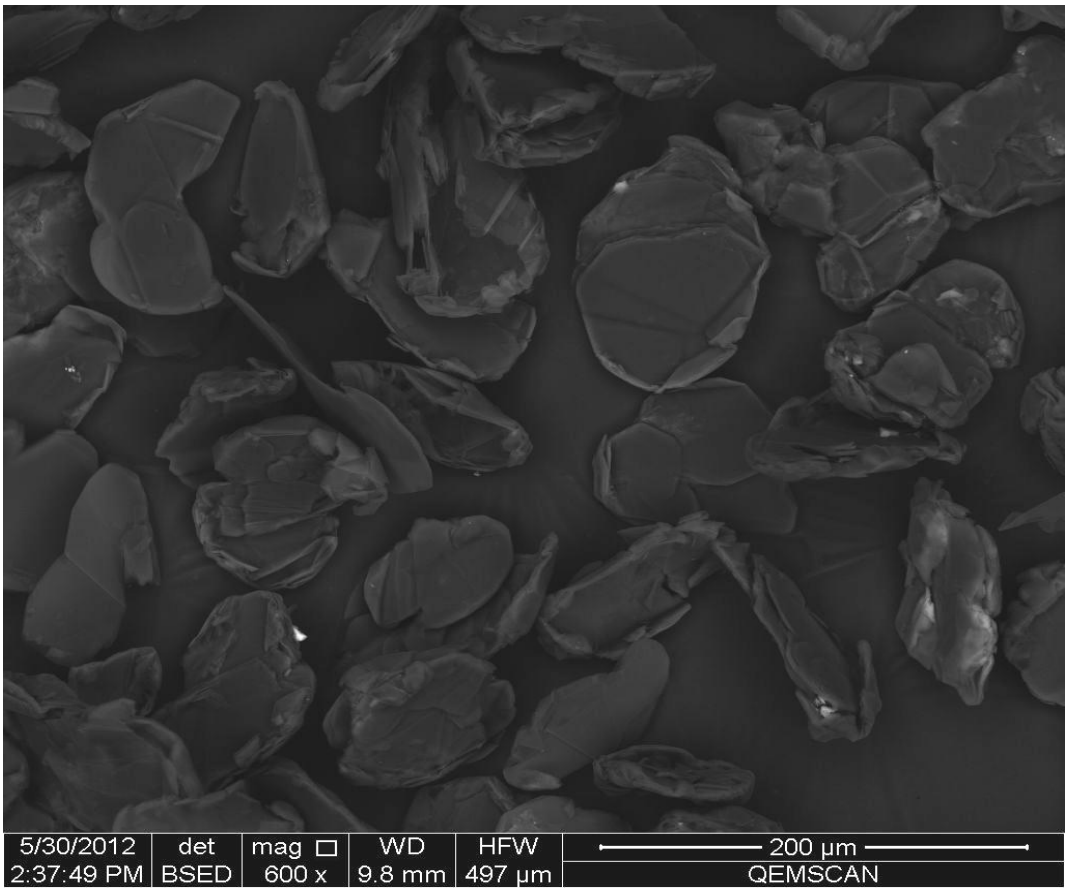

Plate 1. Morphology typical of the ultrafine highly crystalline graphite concentrate (-75 micron) showing high grade to ultra pure crystalline fine graphite flake. Such concentrate is easily reprocessed to remove trace contaminants to achieve grades >99%C

Archer's Managing Director Mr Gerard Anderson said *"Archer's business plan is to produce the highest quality natural graphite concentrates in the world that can rival synthetic graphite in terms of grade but potentially have superior performance characteristics due to the highly crystalline nature of Campoona graphite."*

Mr Anderson added "*the traditional natural graphite industry will be with us for a long time however, there are enormous changes taking place brought about by the rapid emergence of research into graphene. That research has already identified numerous applications and that number will only increase over time. Many predict that graphene will revolutionize the 21st century."*

"It is an imperative, given the projected very long life of the Campoona project, that Archer invests in research into developing new products and potentially new commercial applications. Archer's plan is to be a manufacturer of high value graphite and graphene products. The ongoing research tells us we are going in the right direction and quickly."

For personal use only

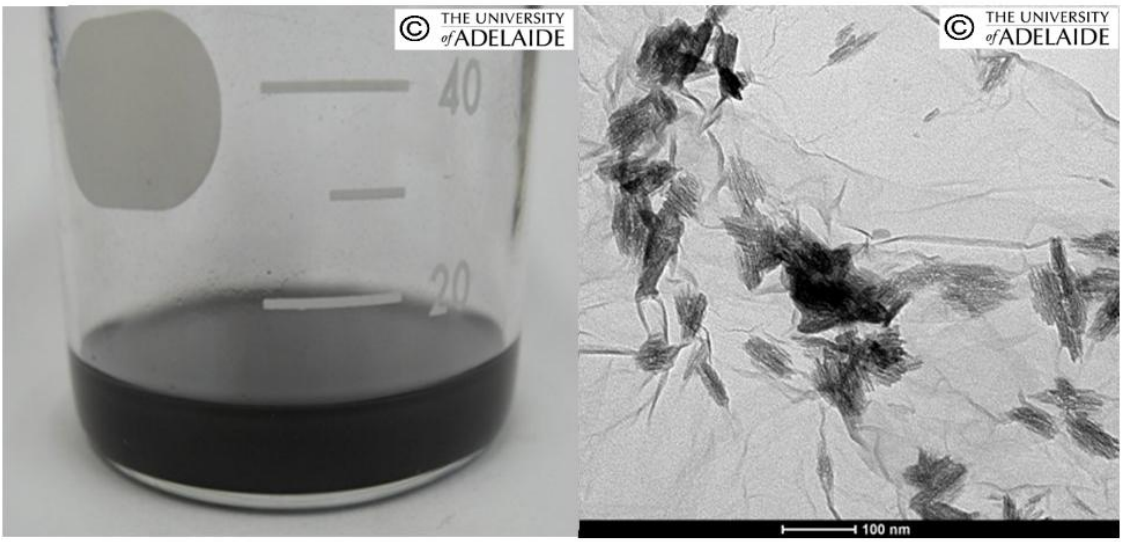

Plate 2. **Prepared graphene nanosheets in solution from raw Archer Campoona graphite. (Left is TEM image)**

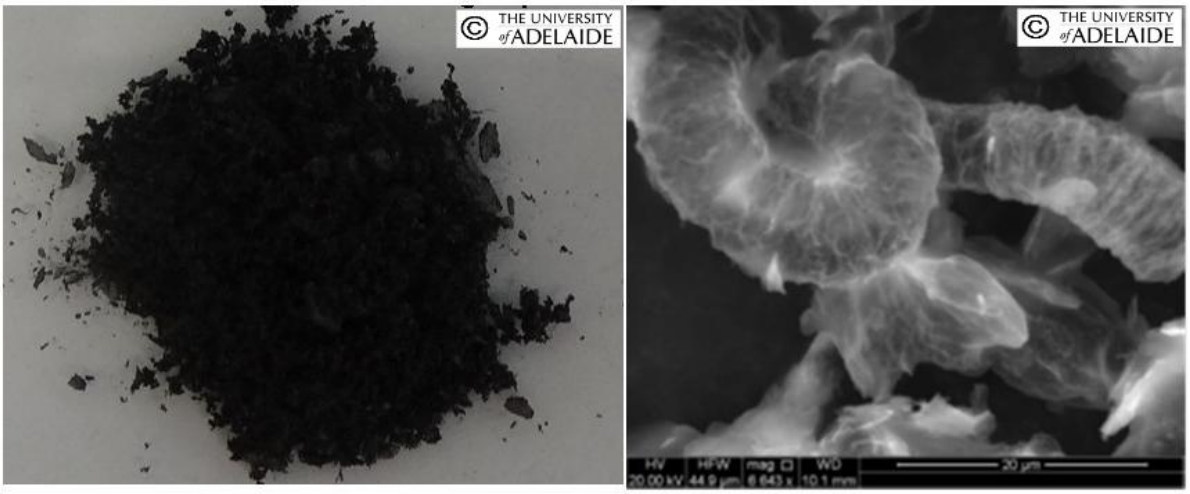

Plate 3. **Prepared intercalated graphite microparticles (left) with characteristic worm-like structure (right) from 92% C concentrate**

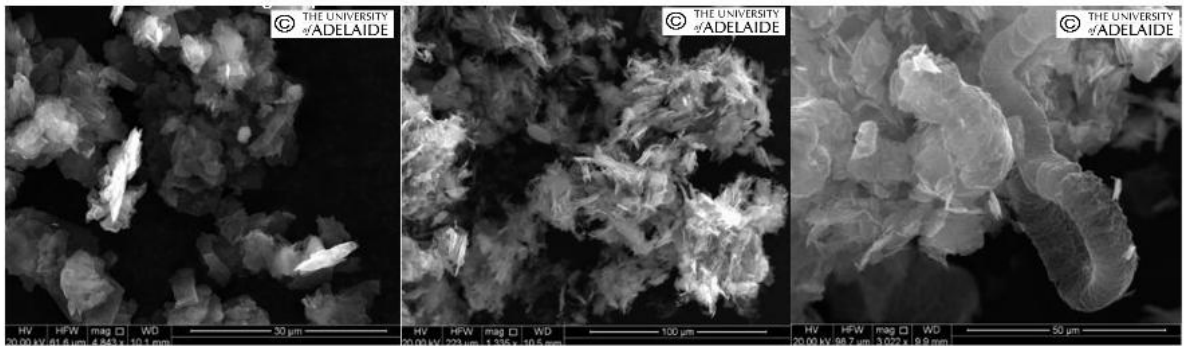

Plate 4. **SEM images of Archer Campoona graphite flakes (92% C) (left) used for preparation of chemical and electrochemical prepared intercalated graphite microparticles (middle and right)**

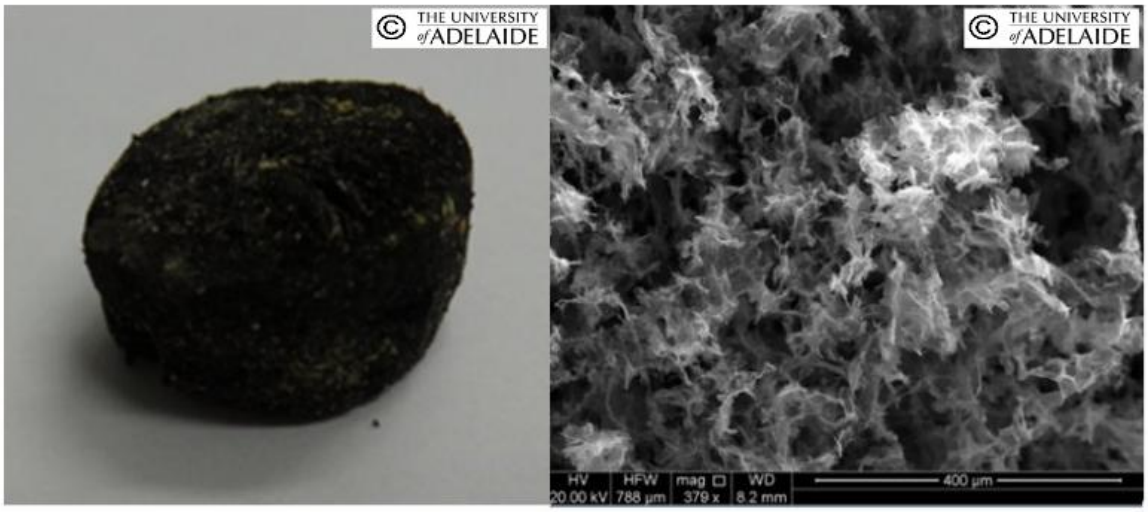

Plate 5. **Prepared graphene aerogel filters for water and air purification from raw Campoona graphite**

For personal use only

For personal use only

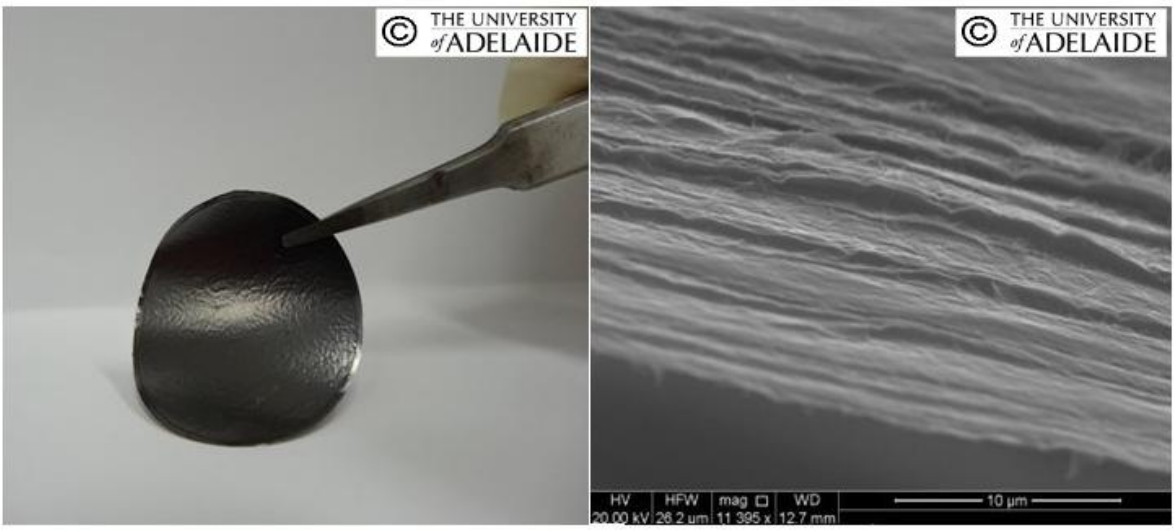

Plate 6. Prepared filtration membrane of graphene sheets extracted from raw Campoona graphite. This electroconductive membrane can be used for filtration separation and as an electrode for batteries and supercapacitors.

These few selected examples of new materials and processing technologies developed by the Losic Nano Research Group show the enormous potential of the Campoona graphite in the development of new highly valuable materials and devices across a broad range of applications.

The following short summary of current worldwide research highlights the myriad of potential uses for graphene. Such uses include:

- Display screens in mobile devices - graphene can replace indium-based electrodes in organic light emitting diodes (OLED).
- Faster charging Lithium-ion batteries - graphene is placed on the surface of the anode surface resulting in faster recharging than conventional lithium-ion batteries.
- High performance Ultracapacitors - the large surface of graphene enables increased electrical power that can be stored and also reducing the recharge time to minutes.
- High strength composite materials – graphene appears to bond better to polymers and could result in the manufacture of components with high strength to weight ratio for such uses as windmill blades or aircraft components.
- Storing hydrogen for fuel cell powered cars – graphene layers have been found to increase the binding energy of hydrogen to the graphene surface in a fuel tank, resulting in a higher amount of hydrogen storage. This could help in the development of practical hydrogen fueled cars.
- Lower cost fuel cells - researchers has shown that halogenated nanoplatelets could be used as a replacement for expensive platinum catalytic material in fuel cells.
- Water desalination - nanometer sized holes in graphene can be used to remove ions from water and result in lower costs of desalination.

For personal use only

- Lightweight containers - researchers have produced composite material using plastic and graphene nanoribbons that blocks the passage of gas molecules opening up applications ranging from drink bottles to lightweight natural gas tanks.
- More efficient solar cells - researchers have developed a honeycomb like structure of graphene in which the graphene sheets are held apart by lithium carbonate. This graphene replaces platinum in a dye sensitized solar cell to achieve improved conversion of sunlight to electricity.
- Electrodes with very high surface area and very low electrical resistance - Researchers at Rice University have developed electrodes made from carbon nanotubes grown on graphene.
- Lower cost solar cells - researchers have built a solar cell composed only of carbon which could potentially eliminate the need for higher cost materials.
- High frequency transistors – graphene can be used to make high speed transistors because electrons move faster in graphene compared with usually used silicon.
- Integrated circuits - Researchers are developing lithography techniques that can be used to fabricate integrated circuits based on graphene.
- Sensors to diagnose diseases.
- Graphene membranes - these membranes are made from sheets of graphene in which nanoscale pores have been created to greatly aid gas separation.

Archer is looking to have a mining lease application lodged by Q3 calendar 2014 and first production during 2015. Informal capital cost estimates point to around $15 million for a small size mine and about $25 million for a medium size mining enterprise.

For further information please contact:

Mr Greg English
Chairman
Archer Exploration Limited
Tel: (08) 8272 3288

Mr Gerard Anderson
Managing Director
Archer Exploration Limited
Tel: (08) 8272 3288

The exploration results reported herein, insofar as they relate to mineralisation, are based on information compiled by Mr. Wade Bollenhagen, Exploration Manager of Archer Exploration Limited. Mr. Bollenhagen is a Member of the Australasian Institute of Mining and Metallurgy who has more than eighteen years experience in the field of activity being reported. Mr Bollenhagen has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity that he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" relating to the reporting of Exploration Results. Mr. Bollenhagen consents to the inclusion in the report of matters based on his information in the form and context in which it appears.

For personal use only

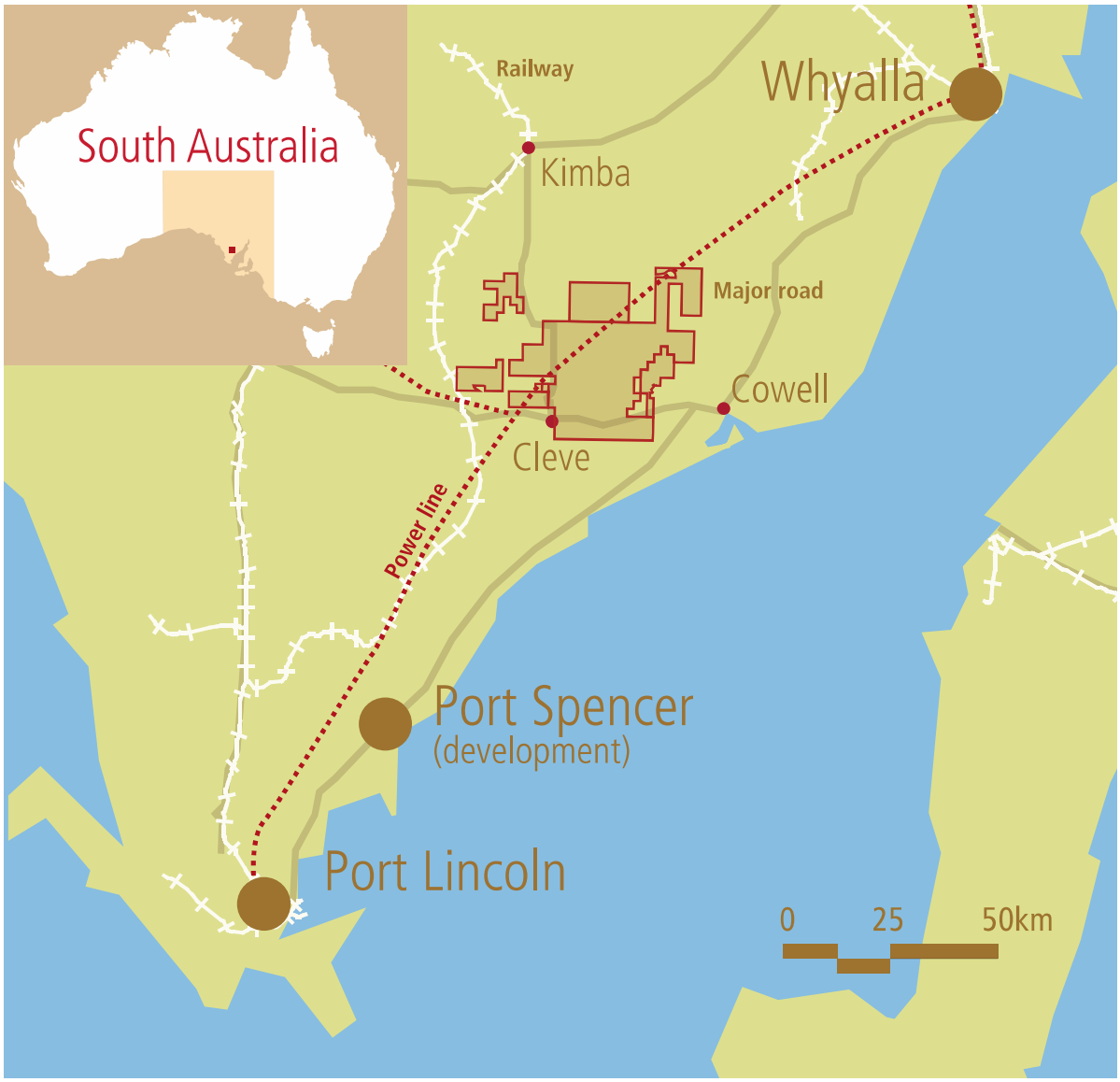

Figure 1. Location map showing Archer's Eyre Peninsula graphite tenements