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ASX Announcement

4<sup>th</sup> July 2018

# Ardmore Phosphate Rock Project

## Fertiliser Conversion Test Work Confirms High Quality of Ardmore Phosphate Rock



**CAPTION:** Concentrating phosphoric acid produced from Ardmore phosphate rock at KemWorks in the US.

## Highlights

- ▶ KemWorks completes independent 72-hour phosphoric acid conversion pilot test for Ardmore phosphate rock in the US
- ▶ Pilot plant demonstrates high quality of Ardmore phosphate rock
- ▶ Excellent average 98%  $P_2O_5$  recovery achieved
- ▶ Low sulphuric acid consumption (less input costs to manufacturers) and high filtration rates relative to other benchmark rocks
- ▶ Little corrosion or scaling observed due to low contaminant levels in the phosphate rock
- ▶ Low minor element ratio of resulting phosphoric acid well suited to producing granular fertilisers such as diammonium phosphate ("DAP")
- ▶ KemWorks single superphosphate test work results due imminently

## Summary

Centrex Metals Limited ("Centrex") today announces that an independent pilot plant trial has been completed for the production of phosphoric acid from its premium 35%  $P_2O_5$  grade low cadmium phosphate rock concentrate from its Ardmore Phosphate Rock Project ("Ardmore") in North West Queensland. The 72-hour trial was completed in the US by phosphate fertiliser specialists KemWorks. Results of the pilot run confirm the phosphate rock concentrate to be of high quality, showing an excellent 98%  $P_2O_5$  recovery, relatively low sulphuric acid consumption, good filtration, little scaling or corrosion and a low minor element ratio in the phosphoric acid product. KemWorks concluded that the phosphoric acid produced from the Ardmore rock is well suited to the production of granular fertilisers such as diammonium phosphate ("DAP").

Globally, phosphoric acid is the main end-use of phosphate rock. Phosphoric acid is used as a feedstock to fertilisers such as DAP. Centrex plans to export high grade phosphate rock from its Ardmore project to Asian fertiliser producers that operate phosphoric acid plants for fertiliser production, in addition to Australian and New Zealand importers who use phosphate rock directly in the production of single superphosphate

The results from KemWorks have been forwarded to the numerous potential customers that produce phosphoric acid, including Gujarat State Fertiliser & Chemical Company ("GSFC") which Centrex has already signed a non-binding MOU with for 300,000 tonnes per annum long-term off-take from the project. GSFC and Centrex are now negotiating the full terms of the binding off-take agreement.

KemWorks have also completed single superphosphate ("SSP") trials for the Ardmore phosphate rock concentrate, with the full analysis and report due imminently. Centrex recently shipped two 400 tonne samples of run of mine ore to two customers in the local region for trial in their SSP plants.

The fertiliser conversion test work by KemWorks will aid in Centrex's marketing efforts for the phosphate rock concentrate and feed into the Feasibility Study for the project currently targeted for completion in August 2018.

## Phosphoric Acid Pilot Plant Trial

A 125 kg sub-sample of phosphate rock concentrate from previously reported bulk beneficiation pilot plant runs in Adelaide was provided to KemWorks in the US for independent fertiliser conversion test work.

For full details of the beneficiation pilot runs see the announcement 27<sup>th</sup> March 2018:

<https://www.asx.com.au/asxpdf/20180327/pdf/43srn9ton41y3m.pdf>

The results were all reported in accordance with the provisions of the JORC Code 2012 and Centrex is not aware of any new information or data that materially affects the information contained within the previous releases. All material assumptions and technical parameters underpinning the estimates in the previous announcements continue to apply and have not materially changed.

The rock sample from the beneficiation pilot plant was nominally, 100% -2mm and 100% +38µm. The sample was further ground by KemWorks to 98% passing 300µm to simulate the grinding circuit in an industrial phosphoric acid plant. KemWorks reported the ground rock to have a narrow size distribution which would be a positive for process control in an industrial plant. The major element analysis of the phosphate rock concentrate is shown below. 87% of the silica in the concentrate was determined to be unreactive, a positive for many customers.

**TABLE:** Major element chemistry of phosphate rock concentrate by KemWorks.

Element	Value (mass %)
P <sub>2</sub> O <sub>5</sub>	35.05
CaO	48.20
SiO <sub>2</sub> (Total)	4.35
SiO <sub>2</sub> (Reactive)	0.58
Al <sub>2</sub> O <sub>3</sub>	0.82
Fe <sub>2</sub> O <sub>3</sub>	2.06
SO <sub>3</sub>	1.18
MgO	0.12
F	4.07
Na <sub>2</sub> O	0.41
K <sub>2</sub> O	0.15
CO <sub>2</sub>	1.72
Total Organic Carbon	0.02

KemWorks ran a 72-hour pilot run for phosphoric acid using the di-hydrate process (most commonly used) in a 10 litre reactor. Target reaction conditions are provided below. Every 4 to 6 hours a slurry sample was taken from the reactor for a timed filtration test using a Buchner filter. The filter produced acid, return acid, and gypsum cake. Concentration tests on the product acid were performed using a bath evaporator.

The pilot plant trial achieved 28.4% P<sub>2</sub>O<sub>5</sub> concentration in acid by the 72-hour mark with a minor element ratio ("MER" = % Al<sub>2</sub>O<sub>3</sub> + % Fe<sub>2</sub>O<sub>3</sub> + % MgO / % P<sub>2</sub>O<sub>5</sub>) of 0.050 to 0.054. KemWorks reported phosphoric acid with a

MER ratio of less than 0.085 is required to produce diammonium phosphate with acid produce from the Ardmore rock well below this.  $P_2O_5$  recovery during the trial averaged an excellent 97.5%.

Filtration rates on a 90 second cycle simulating a belt filter averaged 8.7 tonnes  $P_2O_5$ /d/m<sup>2</sup>. KemWorks noted this rate to be better than other common phosphate rocks on the market. Sulphuric acid consumption was reported at 2.44 tonnes  $H_2SO_4$  (100%) per tonne of  $P_2O_5$  produced. KemWorks noted this to be lower than the standard benchmark phosphate rocks, meaning potential input cost savings to customers.

Corrosion testing with the acid produced was done using four differing composition blades made from alloys commonly used in phosphoric acid plants. Each agitator blade was measured for weight loss after the test and the result converted to a nominal corrosion rate. Corrosion rates on all materials tested were low.

**TABLE:** Target pilot run reaction conditions.

Condition	Units	Target
Rock Feed Rate	g/h	699
Specific Volume	m <sup>3</sup> /t/d $P_2O_5$	1.8
Nominal Residence Time	h	4.8
$P_2O_5$ Concentration	wt. %	28
Reactor % Solids	wt. %	35
Reactor Temperature	°C	80
Free Sulphate	wt. %	1.8 – 2.2

Gypsum cake from the trial was a golden colour, well-formed, and released easily from the filter. The best filtration rates were achieved prior to the addition of filter aids. An average of 4.47 tonne of gypsum per tonne of  $P_2O_5$  was produced during the trial.



**CAPTION:** Gypsum cake.

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#### Competent Persons Statement

*The information in this report relating to Exploration Results is based on information compiled by Mr Steve Klose who is a Member of the Australasian Institute of Mining and Metallurgy. Mr Klose is the GM Projects of Centrex Metals Limited. Mr Klose has sufficient experience, which is relevant to the style of mineralisation and type of deposit under consideration and to the activity, which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Mr Klose consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.*

#### Ardmore Phosphate Rock Project JORC Table 1 Report

##### SECTION 1: Sampling techniques and data.

Criteria	JORC Code explanation	Commentary
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Sampling techniques	<ul style="list-style-type: none"> <li>• Nature and quality of sampling.</li> <li>• Sample representivity.</li> <li>• Determination of mineralisation.</li> </ul>	<p>Sampling for beneficiation pilot runs has been previously reported. For full details of the beneficiation pilot runs see the announcement 27th March 2018:</p> <p><a href="https://www.asx.com.au/asxpdf/20180327/pdf/43srngton41y3m.pdf">https://www.asx.com.au/asxpdf/20180327/pdf/43srngton41y3m.pdf</a></p> <p>The results were all reported in accordance with the provisions of the JORC Code 2012 and Centrex is not aware of any new information or data that materially affects the information contained within the previous releases. All material assumptions and technical parameters underpinning the estimates in the previous announcements continue to apply and have not materially changed.</p> <p>A 125kg sub-sample of homogenised concentrate (cone and quartered) from the second beneficiation pilot run was sent to KemWorks in the US for a phosphoric acid pilot trial. The material was 100% -2mm and 100% +38µm, targeting average nominated customer sizing specifications for phosphate rock exports. The as supplied material was ground by KemWorks to 98% passing 300µm and re-homogenised (cone and quartered).</p> <p>Two 1kg sub-samples were taken for head sizing, assays and de-foamer testwork.</p>
Drilling techniques	<ul style="list-style-type: none"> <li>• Drill type.</li> </ul>	<p>The bulk composite used for the beneficiation pilot trials to produce the phosphate rock concentrate was from three excavations across the Southern Zone of the deposit.</p> <p>For full details of the beneficiation pilot runs see the announcement 27th March 2018:</p> <p><a href="https://www.asx.com.au/asxpdf/20180327/pdf/43srngton41y3m.pdf">https://www.asx.com.au/asxpdf/20180327/pdf/43srngton41y3m.pdf</a></p> <p>The results were all reported in accordance with the provisions of the JORC Code 2012 and Centrex is not aware of any new information or data that materially affects the information contained within the previous releases. All material assumptions and technical parameters underpinning the estimates in the previous announcements continue to apply and have not materially changed.</p>
Drill sample recovery	<ul style="list-style-type: none"> <li>• Method of recording and assessing sample recoveries.</li> <li>• Measures taken to maximise sample recovery.</li> </ul>	<p>No drilling undertaken, only excavations with all material taken.</p>

Logging	<ul style="list-style-type: none"> <li>Geological and geotechnical logging.</li> <li>Whether logging is qualitative or quantitative.</li> <li>Total length and percentage of the relevant intersections logged.</li> </ul>	Excavations were qualitatively logged in the field, using nearby drill hole logs as a guide. Flitch samples were taken from the top contact of the phosphorite seam.																																
Sub-sampling techniques and sample preparation	<ul style="list-style-type: none"> <li>Nature, quality and appropriateness of the sample preparation technique.</li> <li>Quality control.</li> <li>Sample representivity.</li> <li>Sample sizes.</li> </ul>	<p>Sampling for beneficiation pilot runs has been previously reported. For full details of the beneficiation pilot runs see the announcement 27th March 2018:</p> <p><a href="https://www.asx.com.au/asxpdf/20180327/pdf/43srn9ton41y3m.pdf">https://www.asx.com.au/asxpdf/20180327/pdf/43srn9ton41y3m.pdf</a></p> <p>The results were all reported in accordance with the provisions of the JORC Code 2012 and Centrex is not aware of any new information or data that materially affects the information contained within the previous releases. All material assumptions and technical parameters underpinning the estimates in the previous announcements continue to apply and have not materially changed.</p> <p>A 125kg sub-sample of homogenised concentrate (cone and quartered) from the second beneficiation pilot run was sent to KemWorks in the US for a phosphoric acid pilot trial. The material was 100% -2mm and 100% +38µm, targeting average nominated customer sizing specifications for phosphate rock exports. The as supplied material was ground by KemWorks to 98% passing 300µm and re-homogenised (cone and quartered).</p> <p>Two 1kg sub-samples were taken for head sizing, assays and de-foamer test work.</p>																																
Quality of assay data and laboratory tests	<ul style="list-style-type: none"> <li>Nature of quality control procedures.</li> </ul>	<p>Major element assays reported were undertaken by KemWorks using the following methods for major elements</p> <table border="1"> <thead> <tr> <th>Analysis</th><th>Test Method</th><th>Standard No.</th></tr> </thead> <tbody> <tr> <td rowspan="4">P<sub>2</sub>O<sub>5</sub></td><td>Total</td><td>Gravimetric (1)</td></tr> <tr> <td>CI</td><td>Ext + Spectrophotometric</td></tr> <tr> <td>CS</td><td>Calculated</td></tr> <tr> <td>WS</td><td>Ext + Spectrophotometric</td></tr> <tr> <td rowspan="2">SO<sub>4</sub></td><td>Solid sample: Gravimetric</td><td>Solid sample: AFPC - IX.19.A (2)</td></tr> <tr> <td>Liquid sample: Digestion / ICP</td><td>Liquid sample: AFPC - XI.14.B</td></tr> <tr> <td>CaO</td><td>Digestion / ICP</td><td>AFPC - IX.3.D.2</td></tr> <tr> <td>MgO</td><td>Digestion / ICP</td><td>AFPC - IX.3.D.2</td></tr> <tr> <td>Al<sub>2</sub>O<sub>3</sub></td><td>Digestion / ICP</td><td>AFPC - IX.3.D.2</td></tr> <tr> <td>Na<sub>2</sub>O</td><td>Digestion / ICP</td><td>AFPC - IX.3.D.2</td></tr> <tr> <td>K<sub>2</sub>O</td><td>Digestion / ICP</td><td>AFPC - IX.3.D.2</td></tr> </tbody> </table>	Analysis	Test Method	Standard No.	P <sub>2</sub> O <sub>5</sub>	Total	Gravimetric (1)	CI	Ext + Spectrophotometric	CS	Calculated	WS	Ext + Spectrophotometric	SO <sub>4</sub>	Solid sample: Gravimetric	Solid sample: AFPC - IX.19.A (2)	Liquid sample: Digestion / ICP	Liquid sample: AFPC - XI.14.B	CaO	Digestion / ICP	AFPC - IX.3.D.2	MgO	Digestion / ICP	AFPC - IX.3.D.2	Al <sub>2</sub> O <sub>3</sub>	Digestion / ICP	AFPC - IX.3.D.2	Na <sub>2</sub> O	Digestion / ICP	AFPC - IX.3.D.2	K <sub>2</sub> O	Digestion / ICP	AFPC - IX.3.D.2
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		Fe <sub>2</sub> O <sub>3</sub>	Digestion / ICP		AFPC - IX.3.D.2
		SiO <sub>2</sub>	Total	Gravimetric	AFPC - IX.5.A
			Sol.	Gravimetric	AFPC - IX.5.A (mod)
		F	Ion Specific electrode		Solid sample: AFPC - IX.14.B
					Liquid sample: AFPC - XI.18.B
		Cl	Titrimetric		Volhards
		CO <sub>2</sub>	Gasometric		AFPC - IX.13.B
		U <sub>3</sub> O <sub>8</sub>	Digestion / ICP		AFPC - XI.14.B
		As	Digestion / ICP		AFPC - XI.14.B
		Sr	Digestion / ICP		AFPC - XI.14.B
		Cd	Digestion / ICP		AFPC - XI.14.B
		Th	Digestion / ICP		EPA – 6010 b
		H <sub>2</sub> O	Gravimetric		AFPC - IX.2.B
		TOC	Titrimetric - Redox		AFPC - IX.17.A
		N	Digestion / Titration		AOAC - 978.02
		Free Acidity	Titration		AFPC – XI.17.A
<p>1-10kg sub-samples of the same phosphate rock concentrate were sent to numerous customers for testing, with similar results reported to KemWorks. It was noted Centrex’s own assay technique of lithium borate fusion followed by ICP provided slightly lower measured P<sub>2</sub>O<sub>5</sub> than by KemWorks and most customers.</p> <p>Time based sampling was undertaken by KemWorks throughout the trial with relatively consistent results shown.</p>					
Verification of sampling and assaying	<ul style="list-style-type: none"><li><i>The verification of significant intersections by either independent or alternative company personnel.</i></li><li><i>The use of twinned holes.</i></li><li><i>Documentation of primary data, data entry procedures, data verification, data storage protocols.</i></li><li><i>Any adjustment to assay data.</i></li></ul>	Results reported are for a single pilot plant test run. Time based sampling was undertaken by KemWorks throughout the trial with relatively consistent results shown. All test work was undertaken by KemWorks.			
Location of	<ul style="list-style-type: none"><li><i>Accuracy and</i></li></ul>	Bulk excavation locations were recorded by handheld GPS.			



<i>data points</i>	<i>quality of surveys.</i> <ul style="list-style-type: none"> <li>• <i>Specification of the grid system used.</i></li> <li>• <i>Quality and adequacy of topographic control.</i></li> </ul>	
<i>Data spacing and distribution</i>	<ul style="list-style-type: none"> <li>• <i>Data spacing for reporting of Exploration Results.</i></li> <li>• <i>Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource.</i></li> <li>• <i>Whether sample compositing has been applied.</i></li> </ul>	Three bulk excavations were completed using a 23t excavator to provide further material for additional pilot plant optimisation. The excavations were planned close to existing resource drill holes with the intention to provide a range of ore types and grades in order to be able to form varying composite grades as required. The flitches were used to form a bulk composite approximating the modelled selectively mined feed grade of the Southern Zone.
<i>Orientation of data in relation to geological structure</i>	<ul style="list-style-type: none"> <li>• <i>Whether the orientation of sampling achieves unbiased sampling.</i></li> </ul>	Excavations were completed vertically, roughly perpendicular to the flat lying phosphorite ore seam.
<i>Sample security</i>	<ul style="list-style-type: none"> <li>• <i>The measures taken to ensure sample security.</i></li> </ul>	Phosphate rock concentrate samples were transported from Bureau Veritas in Adelaide to KemWorks in the US in sealed containers.
<i>Audits or reviews</i>	<ul style="list-style-type: none"> <li>• <i>The results of any audits or reviews of sampling techniques and data.</i></li> </ul>	Only a single phosphoric acid pilot plant trial was run. No audits or reviews beyond those by KemWorks have been undertaken on the results reported.

## Ardmore Phosphate Rock Project JORC Table 1 Report

## SECTION 2: Reporting of Exploration Results.

Criteria	JORC Code explanation	Commentary
<i>Mineral tenement and land tenure status</i>	<ul style="list-style-type: none"> <li><i>Type, reference name/number, location and ownership including agreements.</i></li> <li><i>The security of the tenure held at the time of reporting.</i></li> </ul>	<p>The project is held on Mining Lease ML5542 held by Centrex Phosphate Pty Ltd, a 100% subsidiary of Centrex Metals Limited. A 21 year renewal terms was granted in 2017. Southern Cross Fertilisers Pty Ltd holds a 3% revenue royalty on production.</p> <p>Compensation agreements for exploration and mining with all relevant landowners over the Mining Lease are in place.</p>
<i>Exploration done by other parties</i>	<ul style="list-style-type: none"> <li><i>Exploration by other parties.</i></li> </ul>	All exploration was by Centrex.
<i>Geology</i>	<ul style="list-style-type: none"> <li><i>Deposit type, geological setting and style of mineralisation.</i></li> </ul>	<p>The Ardmore phosphate deposit was discovered in September 1966 and is located within the 'Ardmore Outlier' of the Georgina Basin.</p> <p>The Cambrian aged sedimentary phosphate deposit consists predominantly of pelletal phosphorites with small bands of collophane mudstone. The small (approx. 100-200 micron) sized pellets of carbonate-fluorapatite probably formed in a shallow shelf environment.</p> <p>Within the Ardmore Outlier the single phosphate bed occurs within the Simpson Creek Phosphorite Member (SCPM) of the Beetle Creek Formation.</p> <p>The SCPM is essentially flat lying with a gentle to moderate dip (&lt;20 degrees) to the east and occurs spatially within two main separate areas: the Northern Zone and the Southern Zone.</p> <p>The SCPM has an approximate average thickness of 5 m in the Southern Zone and is located from surface to greater than 15 m depth.</p> <p>The Northern Zone has an approximate average thickness of 3 m and is deeper than the Southern Zone, with depths starting from near-surface in the west before dipping away to the east and extending to depths greater than 20 m.</p>
<i>Drill hole Information</i>	<ul style="list-style-type: none"> <li><i>A summary of all information material to the understanding of the exploration results.</i></li> </ul>	No drilling results are reported, the results relate to bulk metallurgical test work only.
<i>Data aggregation methods</i>	<ul style="list-style-type: none"> <li><i>Weighting averaging techniques and grade cuts.</i></li> <li><i>Aggregation procedure.</i></li> <li><i>The assumptions used for</i></li> </ul>	Results reported for the pilot run are reported on a weighted average basis from the time based sampling over the trial.

	<i>any reporting of metal equivalent values should be clearly stated.</i>	
<i>Relationship between mineralisation widths and intercept lengths</i>	<ul style="list-style-type: none"> <li><i>Geometry of the mineralisation with respect to the drill hole angle.</i></li> </ul>	All excavations were vertical and roughly perpendicular to the ore seam.
<i>Diagrams</i>	<ul style="list-style-type: none"> <li><i>Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.</i></li> </ul>	<p>See previously reported results for the bulk composite formation in the announcement 27th March 2018:</p> <p><a href="https://www.asx.com.au/asxpdf/20180327/pdf/43srngton41y3m.pdf">https://www.asx.com.au/asxpdf/20180327/pdf/43srngton41y3m.pdf</a></p> <p>The results were all reported in accordance with the provisions of the JORC Code 2012 and Centrex is not aware of any new information or data that materially affects the information contained within the previous releases. All material assumptions and technical parameters underpinning the estimates in the previous announcements continue to apply and have not materially changed.</p>
<i>Balanced reporting</i>	<ul style="list-style-type: none"> <li><i>Representative reporting of both low and high grades and/or widths.</i></li> </ul>	The reporting of results is considered to be balanced and all relevant results have been reported.
<i>Other substantive exploration data</i>	<ul style="list-style-type: none"> <li><i>Other exploration data.</i></li> </ul>	No other exploration data is available at this time.
<i>Further work</i>	<ul style="list-style-type: none"> <li><i>The nature and scale of planned further work.</i></li> </ul>	Single superphosphate trials are nearing completion at KemWorks and results are expected soon. Two customers are currently trialing 400 tonne run of mine ore samples in their SSP plants.