

## VANADIUM UPDATE

### **Australian Securities Exchange Announcement**

15 October 2018

King River Copper Limited (ASX: KRC) is pleased to provide this update on its 100% owned Vanadium-Titanium-Iron Project at Speewah, located in the East Kimberley of Western Australia.

### **Highlights**

- Vanadium Scoping Study due for release in October.
- Vanadium metallurgical testwork has continued on several fronts to identify the most optimum and commercially practical process routes to pursue.

### **Vanadium Metallurgy Update**

Metallurgical testwork and research have been ongoing on a number of fronts into the production of high purity Vanadium Pentoxide powder (>99.5  $V_2O_5$ ) and standard grade Vanadium Pentoxide flake (>98%  $V_2O_5$ ), as well as Titanium Dioxide products (pigment grade and high purity >99% TiO<sub>2</sub>), iron oxide hematite and Vanadium Electrolyte (used in vanadium flow batteries):

- Nagrom completed a bottle roll sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) leach test on a 252.1g sample of a new P<sub>80</sub> 106 micron magnetite-ilmenite concentrate from metallurgical diamond core hole SDH08-06 42.66-59.45m.
  - $\circ$  Concentrate sample assayed 1.7% V<sub>2</sub>O<sub>5</sub>, 15.37% TiO<sub>2</sub> and 60.04% Fe<sub>2</sub>O<sub>3</sub>, with 14.49% SiO<sub>2</sub>, 4.02% Al<sub>2</sub>O<sub>3</sub>, 3.77% CaO and 2.35% MgO.
  - Bottle roll test conditions were 20% H<sub>2</sub>SO<sub>4</sub>, 20% pulp density, ambient temperature (~15°C), and agitation; the acid was recharged when the concentration dropped to about 100g/L.
  - After 58 days, leach efficiencies were 92% V, 76% Fe, 19% Ti, 49% Al, 44% Mg, 14% Ca and <1% Si. Acid consumption was 1090 kg/t concentrate. Mass loss was 52%. The leach rates of V, Al, Mg and Ca are plateauing, but Ti continues to leach more rapidly possibly as more acid is now available to dissolve ilmenite.</p>

This initial bottle roll test was designed to provide:

- baseline data on what metals leach under the best conditions (acid concentration, fine grain size, agitation, high metal mineral content and relatively low acid robbing minerals) and to assess the suitability of this sulphuric acid leach for column or vat leach tests on lump material and concentrate types (with or without agglomeration).
- o a leach solution for vanadium electrolyte testwork, initially producing a high purity vanadyl sulphate. This refining testwork has yet to commence on this solution.

Bottle roll tests are currently underway on 500g samples of three lump sizes of magnetite gabbro ( $P_{100}$  10mm, 5.6mm and 3.35mm) from metallurgical diamond core hole SDH11-09 21-37.5m (High Grade Zone).

- $_{\odot}$  The core sample assayed 0.36% V<sub>2</sub>O<sub>5</sub>, 3.65% TiO<sub>2</sub>, 21.37% Fe<sub>2</sub>O<sub>3</sub>, and 44.75% SiO<sub>2</sub>, 12.74% Al<sub>2</sub>O<sub>3</sub>, 8.36% CaO, 4.33% MgO, 2.32% Na<sub>2</sub>O and 1.12% K<sub>2</sub>O.
- o Bottle roll test conditions were the same as for the concentrate sample above.
- o After 12 days the V and Ti are leaching slowly, with high leach rates for Fe, Al and Mg.
- The bottle roll leaches will be continued into October when a decision will be made to continue the leaches and/or start a leach of a coarse grained concentrate.



- Nagrom is producing additional magnetite-ilmenite concentrates by magnetic and gravity separation methods from metallurgical core hole SDH11-09 6-16m (Low Grade Zone) and 21-37.5m (High Grade Zone) in the Central deposit, for use in the hydrometallurgical tests. These include:
  - concentrates from both the High Grade and Low Grade zones of the magnetite gabbro; and
  - concentrates of different grind sizes suitable for different process routes.
- TSW Analytical is undertaking the following laboratory testwork using two leach methods:

### Hydrochloric Acid Leach

- Leach LT42 targeted producing standard +98% V<sub>2</sub>O<sub>5</sub> flake by a modified Ammonium Metavanadate (AMV) process route.
  - Leach efficiencies were 54.6% Ti, 99% V and 96% Fe. Low Ti due to extended leach time.
  - Thermal Hydrolysis generated an 89.26% TiO<sub>2</sub> product at 99% precipitation efficiency. This step also recovered 50% of the HCl acid at 6.0M (19.9%) concentration. Recovery of HCl at this stage requires distillation rather than evaporation.
  - Evaporation of the Ti-depleted leachate recovered 17.3% of the Fe as a hydrated iron chloride. Recovery of HCl at this stage requires distillation rather than evaporation.
  - Chemical precipitation-AMV process precipitated 91.3% and 93.1% V<sub>2</sub>O<sub>5</sub> products.
  - A new leach is underway to optimise the caustic leach and AMV purification recoveries and increase the final V2O5 grade based on improvements identified in LT42.
- Leach LT43 trialled a new direct precipitation route to produce V<sub>2</sub>O<sub>5</sub>.
  - Leach efficiencies were 88.7% Ti, 99.1% V and 96.4% Fe. Shorter leach time improved Ti.
  - Thermal Hydrolysis generated a 94.27% TiO<sub>2</sub> product at 99% precipitation efficiency, the best result for a crude precipitate obtained to date. The main contaminant was Fe, a little V, and very low silica, Ca and Al. 50.5% of the HCl was recovered by distillation.
  - The apparatus used to precipitate V<sub>2</sub>O<sub>5</sub> directly required further modification.
  - The Ti-depleted and V and Fe bearing leachate is currently undergoing initial ion exchange (IX) tests using resins to extract vanadium and iron. This work is ongoing.
- Testwork to recover more HCl acid and produce Fe<sub>2</sub>O<sub>3</sub> (hematite) is planned.

#### Sulphuric Acid Leach

- Leach LT44 is TSW's first sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) leach of the same magnetite-ilmenite concentrate used in the HCl acid leach testwork. 140.05g of concentrate was leached in 45% sulphuric acid at 10% pulp density, heated to 90°C and stirred for 4 hours.
  - It reported 97% V and 86.6% Fe leach efficiencies but lower titanium (58.1%).
  - The sulphuric acid leachate is currently undergoing Thermal Hydrolysis to extract TiO<sub>2</sub>.
  - The Ti-depleted liquor will be used to produce vanadyl sulphate trialling solvent extraction and ion exchange methods. Vanadyl sulphate is used to produce vanadium electrolyte.
- O ALS Metallurgy has been appointed to complete salt roast-water leach-AMV process testwork to produce vanadium pentoxide by this conventional process route. In addition, they will undertake HCl acid leach-solvent extraction testwork to produce vanadium pentoxide, titanium dioxide and iron oxide products. Both these process routes were successfully trialled by KRC in 2011-2012 and will provide new comparative data on the process options.



KRC is conducting these diverse metallurgical tests and studies with the objective of assessing which of the process routes, or which combination of these processes, may prove the most prudent direction to be taking to develop the vanadium-titanium-iron deposits at Speewah. This work on different process routes will provide data for a trade-off analysis to demonstrate a clear path forward as part of a future Prefeasibility Study on the Speewah Vanadium Project.

#### **Directors Comment**

The evaluation of the best processing path to be taking to develop and/or market the Speewah deposits relies on the detailed process routes and studies currently being undertaken. Development planning may include the option to export portions of concentrate production.

While bottle roll sulphuric acid leaching testwork is at a very early stage, KRC plans to examine the opportunity to heap or vat leach lump material, or a coarse grained concentrate, to extract  $V_2O_5$ ,  $Fe_2O_3$  and  $TiO_2$ . Other potential by-products include processing the dumps to extract the residual ilmenite to produce  $TiO_2$ , and possibly extract the Al and Mg from the leach solutions to make High Purity Alumina (HPA) and Magnesium products.

The Board is very focussed on maximising the key strategic variables of the Speewah deposits, namely, their massive size, the outcropping flat lying geometry, the overall consistency of grades amenable to large scale mining methods and the unique tenor of the magnetite that enables the generation of a higher  $V_2O_5$  grade concentrate compared to most peers.

#### **Background on the Speewah Vanadium Project**

KRC's Vanadium Project is based on the largest vanadium-in-magnetite deposit in Australia with the highest vanadium grade in the magnetite-ilmenite concentrate. KRC's vanadium deposit is 100% owned and located at Speewah in the East Kimberley of Western Australia. The deposit comprises a Measured, Indicated and Inferred Mineral Resource of 4,712 million tonnes at 0.3%  $V_2O_5$ , 2% Ti and 14.7% Fe (reported at a 0.23%  $V_2O_5$  cut-off grade from the Central, Buckman and Red Hill deposits). This combined resource total comprises Measured Resources of 322 million tonnes at 0.32%  $V_2O_5$ , 2% Ti and 14.9% Fe, Indicated Resources of 1,054 million tonnes at 0.33%  $V_2O_5$ , 2% Ti and 14.9% Fe, and Inferred Resources of 3,335 million tonnes at 0.29%  $V_2O_5$ , 2% Ti and 14.6% Fe (Refer to KRC ASX announcement 26 May 2017 for the full resource statement details).

KRC envisages an open cut mining operation based on the Central Vanadium deposit (Figure 1) which outcrops and has shallow dipping geometry (refer KRC ASX announcement 20 June 2018 for an initial conceptual pit modelling study). KRC's Vanadium Concept Study is examining a process flow sheet to produce vanadium pentoxide, titanium dioxide and iron oxide products (KRC ASX release 20 June 2018). Initially a magnetite concentrate grading 2.11-2.15% vanadium pentoxide ( $V_2O_5$ ) is produced by crushing, grinding and magnetic separation methods (KRC ASX announcements 21 August 2017 and 21 March 2018). The vanadium and titanium enriched concentrate is then leached in hydrochloric acid to release the V, Ti and Fe metals into solution for separation by hydrothermal and chemical precipitation methods followed by purification steps to produce high purity vanadium pentoxide ( $V_2O_5$ ) and titanium dioxide (TiO<sub>2</sub>) products (KRC ASX announcements 30 January 2018, 27 February 2018, 25 June 2018 and 23 July 2018).



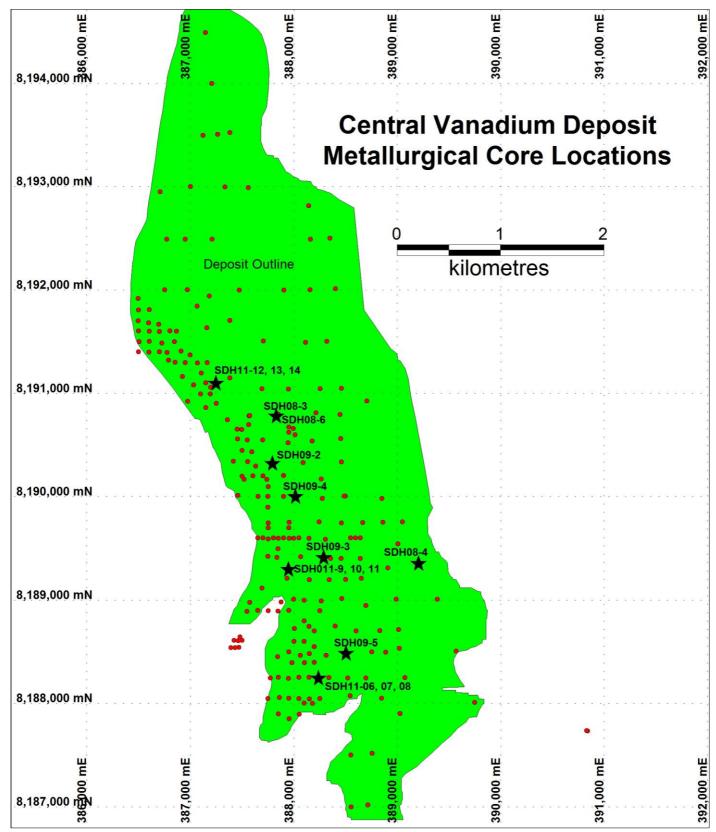


Figure 1: Diamond core hole locations (black stars) and Reverse Circulation drill holes (red dots) within the Central Vanadium Deposit, including metallurgical core holes SDH08-06 and SDH11-09 referred to in this announcement. Diamond core hole collar data given in Table 1.



Table 1: Diamond core holes drilled in the Central deposit

Hole_id	Deposit	East_GDA	North_GDA	RL	Depth	Dip	Azimuth	Tenement
		m	m	m	m	degrees	degrees	
SDH08-3	Central	387830.42	8190778.6	197.037	80	-90	0	E80/2863
SDH08-4	Central	389203.71	8189358.8	190.014	75	-90	0	E80/2863
SDH08-6	Central	387831.84	8190783.9	197.187	450.5	-90	0	E80/2863
SDH09-2	Central	387793.53	8190327.7	196.267	50	-90	0	E80/2863
SDH09-3	Central	388287.08	8189417.5	189.987	70.5	-90	0	E80/2863
SDH09-4	Central	388016.74	8190007.5	194.698	42.1	-90	0	E80/2863
SDH09-5	Central	388502.3	8188487.8	186.4	57.1	-90	0	E80/2863
SDH11-06	Central	388234.08	8188240.6	188.018	39.4	-90	0	E80/2863
SDH11-07	Central	388234.04	8188243.7	187.999	41.6	-90	0	E80/2863
SDH11-08	Central	388234.08	8188246.9	187.941	40.9	-90	0	E80/2863
SDH11-09	Central	387946.28	8189294	191.676	40.9	-90	0	E80/2863
SDH11-10	Central	387945.75	8189295.9	191.643	39.4	-90	0	E80/2863
SDH11-11	Central	387945.33	8189297.8	191.706	40.9	-90	0	E80/2863
SDH11-12	Central	387243.47	8191101.7	212.529	41	-90	0	E80/2863
SDH11-13	Central	387242.63	8191101.2	212.467	41	-90	0	E80/2863
SDH11-14	Central	387241.65	8191100.6	212.457	40.1	-90	0	E80/2863



### **Statement by Competent Person**

The information in this report that relates to Metallurgy and Mineral Resources is based on information compiled by Ken Rogers (BSc Hons) and fairly represents this information. Mr. Rogers is the Chief Geologist and an employee of King River Copper Ltd, and a Member of both the Australian Institute of Geoscientists (AIG) and The Institute of Materials Minerals and Mining (IMMM), and a Chartered Engineer of the IMMM. Mr. Rogers has sufficient experience of relevance to the styles of mineralisation and the types of deposits under consideration, and to the activities undertaken, to qualify as a Competent Person as defined in the 2012 Edition of the Joint Ore Reserves Committee (JORC) Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Mr. Rogers consents to the inclusion in this report of the matters based on information in the form and context in which it appears.



254 Adelaide Tce Perth WA 6000

PO Box Z5518, Perth WA 6831

PHONE: +61 (0)8 9221 8055 FAX: +61 (0)8 9325 8088 WEB: <u>www.kingrivercopper.com.au</u>



# Appendix 1: King River Copper Limited Speewah Project JORC 2012 Table 1

## SECTION 1: SAMPLING TECHNIQUES AND DATA

Criteria	JORC Code explanation	Commentary
Sampling Techniques	Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.  Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.  Aspects of the determination of mineralisation that are Material to the Public Report. In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	This ASX Release dated 15 October 2018 reports on further metallurgical testwork on samples from the Central Vanadium deposit at KRC's Speewah Project.  **RC* and Diamond Core Samples**  134 Reverse Circulation (RC) holes (5,268 metres) and 30 diamond (DD) core holes are within the modelled mineralisation envelopes of the Mineral Resource estimates. RC chip samples were used in previous beneficiation and variability metallurgical testwork completed in 2006-2011.  A 28.42kg composite of 12 RC holes was used in the initial beneficiation and microleach tests reported in 2017 (RRC ASX announcement 21 August 2017).  16 HQ DD core holes were drilled in the Central Vanadium deposit (see Figure 1 and Table 1 for locations). Two of these core holes have been used in the beneficiation and hydrometallurgical metallurgical tests reported in this announcement.  **Metallurgical Concentrate Samples**:  TSW Analytical testwork used subsamples from a 1kg sample of a 120 micron vanadiferous titano-magnetite concentrate previously produced by Nagrom the Mineral Processor from the high grade zone interval of diamond core hole SDH08-06 42.66m-59.45m (refer KRC ASX announcement 21 March 2018).  Nagrom bottle roll test used a 252.1g subsample of a 1.2kg sample of 106 micron vanadiferous titano-magnetite concentrate produced by Nagrom from the high grade zone interval of diamond core hole SDH08-06 42.66m-59.45m, using the same staged grinding method but a modified LIMS cleaner-MIMS scavenger magnetic separation circuit. This increased metal recoveries to 85% V, 81% Ti and 53% Fe and increased mass yield to 19.6%. Concentrate sample assayed 1.7% V <sub>2</sub> O <sub>5</sub> , 15.37% TiO <sub>2</sub> and 60.04% Fe <sub>2</sub> O <sub>3</sub> , with 14.49% SiO <sub>2</sub> , 4.02% Al <sub>2</sub> O <sub>3</sub> , 3.77% CaO and 2.35% MgO.  **Metallurgical Leach Samples**:  TSW Leach LT42 used 200.03g of concentrate leached in 9M (28.73%) HCl for 5 hours at 90°C, 10% pulp density and with agitation. Leach efficiencies were 84.6% Ti, 99.0% V and 96.0% Fe.  TSW Leach LT44 used 200.05g of concentrate leached in 9M (28.73%) HCl



		Nagrom bottle roll tests used 252.1g of concentrate leached in 20% H2SO4 for 58
		days at ambient temperature, 20% pulp density and with agitation.
Sampling		Metallurgical Hydrometallurgical Samples:
Techniques (continued)		TSW heated the leachates under evaporative and reflux to reduce the volume and promote the precipitation of a crude Titanium Dioxide which was filtered for later purification to high purity TiO <sub>2</sub> . The Ti-depleted leachate was used in the Vanadium extraction testwork
Drilling techniques	Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).	RC using a 5.75" hammers and diamond (NQ and HQ3 size) drilling were completed to support the preparation of the Mineral Resource estimate.  Metallurgical testwork completed on ¼ HQ3 core composite samples from two metallurgical diamond drill core holes (Figure 1 and Table 1):  SDH08-06 42.66m-59.45m (High Grade Zone), and  SDH11-09 6-16m (Low Grade Zone) and 21-37.5m (High Grade Zone).  Holes drilled vertical.
Drill sample recovery	Method of recording and assessing core and chip sample recoveries and results assessed.	No qualitative recovery data was recorded. Qualitative examination and photography suggested RC and diamond recoveries are very high. Good ground conditions exist which suggests recovery is likely to be very high.
	Measures taken to maximise sample recovery and ensure representative nature of the samples.	HQ3 (triple tube) drilling was used to maximise diamond sample recovery.
	Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	No relationship between grade and recovery has been identified.
Logging	Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.	DD core and RC chips were geologically logged, with descriptions of mineralogy and lithology noted.
	Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.	Logging was generally qualitative in nature. DD core photographed wet.
	The total length and percentage of the relevant intersections logged.	SDH08-06 - 0-450.5m, 100% logged. SDH11-09 – 0-40.9m, 100% logged.
Sub- sampling	If core, whether cut or sawn and whether quarter, half or all core taken.	DD core was cut in half with a core saw. Some half sections sawn in quarters. ¼ core used in testwork.
techniques and sample	If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.	Not applicable as samples used in the reported testwork were DD core.
preparation	For all sample types, the nature, quality and appropriateness of the sample preparation technique.	Whole continuous lengths of DD ¼ core samples collected, composited and used in testwork. These were collected to represent the composite intervals of both the High Grade and Low Grade Zones.
	Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.	Subsampling is performed during the preparation stage according to the metallurgical laboratories' internal protocol.
	Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.	Use of DD core in metallurgical testwork gives a continuous insitu sample. HQ3 triple tube ensures high recovery rates. DD core twinned previous RC drill holes. Whole sample interval used in testwork.
	Whether sample sizes are appropriate to the grain size of the material being sampled.	Sample sizes are considered appropriate to the grain size of the material being sampled.



Quality of assay data and laboratory tests The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.

#### TSW Testwork

Titanium Oxide (TiO2) product generation testwork was undertaken by thermal hydrolysis without the addition of any reagents. The leach liquor was heated under reflux and distillation conditions to promote the hydrolysis of Titanium.

Vanadium Pentoxide (V2O5) product generation testwork was undertaken trialling selective chemical precipitation using various precipitating agents and controlling acidity (pH), redox potential (Eh) and temperature.

Further TiO<sub>2</sub> and V<sub>2</sub>O<sub>5</sub> production tests are underway and planned.

TSW Analytical is a well-established analytical service provider that has developed a reputation for producing accurate analyses for complex samples. The company's expertise has assisted with the development of hydrometallurgical flow-sheets for multi-element ore concentrates.

The titaniferous vanadiferous magnetite concentrate (supplied by the client) and leach residues have been assayed using ICP-AES and ICP-MS. Samples were fused in a lithium borate flux, the resultant glass bead was dissolved in hydrochloric acid and suitably diluted for either ICP-MS or ICP-AES analysis. Loss on Ignition (LOI) at 1000 °C was performed for completeness of the analytical data and to give a better indication of the total analytical percentage approximation to 100%.

The leach solutions and wash liquors have been analysed using ICP-AES and ICP-MS. The samples were diluted suitably for the appropriate ICP based analysis. Dilutions are used to bring the analyte concentration into the optimum analytical range of the ICP instrument used and to reduce matrix interference complications during quantification.

Leach efficiency has been determined using the mass of the total analyte in the leach residue divided by the mass of the total analyte in the initial titaniferous vanadiferous magnetite concentrate used. The resulting fraction is multiplied by 100 to give a percent leach efficiency.

TSW Analytical uses in-house standards and Certified Reference Materials (CRMs) to ensure data are "Fit-For-Purpose".

#### Nagrom Testwork

Nagrom produced a magnetite-ilmenite concentrate by a combination of Medium Intensity Magnetic Separation (MIMS) and Low Intensity Magnetic Separation (LIMS) tests to be used for hydrometallurgical tests.

All solid samples have been analysed via XRF. The prepared sample is fused in a lithium borate flux with a lithium nitrate additive. The resultant glass bead is analysed by XRF. Loss on Ignition (LOI) is also conducted to allow for the determination of oxide totals.

All solution samples are diluted and then analysed by ICP. Dilutions bring the concentration level to within the analytical range of the ICP instruments. Diluents are matched to sample matrix.



	For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.	No geophysical data was collected.
	Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	TSW Analytical Concentrations are reported as micrograms per gram (µg/g) in the solid unless otherwise stated, Instrumental response is measured against AccuTrace High Purity multi-element standards (Choice Analytical) to achieve quantitation. Data are subjected to in-house QA and QC procedures where an independent analyst recalculates instrumental output and compares the newly generated data set with the original. Lack of equivalence between the two data sets triggers an internal review and if necessary re-analysis of the entire data set. Under these circumstances a third independent analyst will assess all generated data prior to sign off. Initial equivalence between the two data sets, generated by the analyst and reviewer, will clear data for remittance to the customer. All reports are reviewed by an independent analyst prior to submission to the customer and where necessary relevant changes, such as wording that may give rise to possible ambiguity of interpretation, will be modified prior to the final report being sent to the customer.
		Nagrom is certified to a minimum of ISO 9001:2008.
Verification of sampling and	The verification of significant intersections by either independent or alternative company personnel.	Significant intersections have been verified by alternative company personnel.
assaying	The use of twinned holes.	All metallurgical DD core holes twinned previous RC holes. SDH08-06 was drilled twice. SDH11-09 has been twinned by SDH11-10 and SDH11-11 (see Figure 1 and Table 1) which will be used in future testwork.
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	Templates have been set up to facilitate geological logging. Prior to the import into the central database, logging data is validated for conformity and overall systematic compliance by the geologist. Assay results are received from the laboratory in digital format. Assays, survey data and geological logs incorporated into a database.
	Discuss any adjustment to assay data.	No adjustments or calibrations will be made to any primary assay data collected for the purpose of reporting assay grades and mineralised intervals.
Location of data points	Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.	Almost 90% of the collars used in the resource estimate have been surveyed using a differential global positioning system (DGPS) instrument, with the remaining surveyed using a hand-held GPS. Downhole deviations have been measured by downhole survey instruments on 3 holes only using a Globaltech Pathfinder digital downhole camera. All but four holes are vertical. All metallurgical holes are vertical. The vertical and shallow nature of the drilling means that the absence of downhole surveys is not considered a material risk.



	Specification of the grid system used.	The adopted grid system is GDA 94 Zone 52.
	Quality and adequacy of topographic control.	A topographic file provided by KRC was calibrated for use in the Mineral Resource estimate using DGPS and GPS collar data. The Competent Person considers that the topography file is accurate given the use of DGPS data in the Mineral Resource area.
Data spacing and distribution	Data spacing for reporting of Exploration Results.	RC drill spacing is mostly 250 m by 250 m at the Central deposit, closing down to 100 m by 100 m in the western area (see Figure 1).  Metallurgical DD core holes are spaced about 500 m apart (see Figure 1).
	Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	The Competent Person believes the mineralised domains have sufficient geological and grade continuity to support the classification applied to the Mineral Resources given the current drill pattern.
	Whether sample compositing has been applied.	Metallurgical samples were composited to represent the High Grade and Low Grade Zones within the magnetite gabbro and within the resource envelope. This was considered appropriate given the metallurgical testwork was designed to test the lower and high grade zones of the mineralisation and it provided for a bulk sample suitable for the testwork.
Orientation of data in relation to geological	Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.	All metallurgical DD core holes are vertical. This allows the holes to intersect the mineralisation at a high-angle as the magnetite gabbro has a very shallow dip to the east.
structure	If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	The relationship between the drilling orientation and the orientation of key mineralised structures is not considered to have introduced a sampling bias.
Sample security	The measures taken to ensure sample security.	Chain of Custody is managed by the Company until samples pass to a duly certified metallurgical laboratory for subsampling, assaying, beneficiation and hydrometallurgical test work. The RC assay pulp bags are stored on secure sites and delivered to the metallurgical laboratory by the Company or a competent agent. The chain of custody passes upon delivery of the samples to the metallurgical laboratory.
Audits or Reviews	The results of ay audits or reviews of sampling techniques and data.	No external audits have been completed.



## SECTION 2: REPORTING OF EXPLORATION RESULTS

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.  The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.	The Speewah Project comprises 12 Exploration Licences, three Mining Leases and two Miscellaneous Licences. Details are listed in Table 1 Schedule of Tenements held at 30 June 2018 reported previously in the June Quarterly Report. The Speewah test work reported in this announcement are from samples collected entirely within E80/2863. The tenements are 100% owned by Speewah Mining Pty Ltd (a wholly owned subsidiary of King River Copper Limited), located over the Speewah Dome, 100km SW of Kununurra in the East Kimberley. The tenements are in good standing and no known impediments exist. No Native Title Claim covers the areas sampled and drilled. The northern part of the tenements (but not E80/2863) is in the Kimberley Heritage Area.
Exploration done by other parties	Acknowledgment and appraisal of exploration by other parties.	No exploration completed by other parties is relevant for the metallurgical testwork and Mineral Resource estimates reported herein.
Geology	Deposit type, geological setting and style of mineralisation.	The ferrovanadium titanium (Ti-V-Fe) deposits represent part of a large layered intrusion (the Hart Dolerite), which was intruded c1790 Ma into the Palaeo-Proterozoic sediments and minor volcanics of the 1814 Ma Speewah Group in the East Kimberley Region of Western Australia.  The deposits occur within the Speewah Dome, which is an elongated antiform trending N-S. The dome is about 30 km long and attains a maximum width of about 15 km. The Hart Dolerite sill forms the core of the dome.  Since the deposit discovery in 2006, at least two distinct types of felsic granophyres and three mafic gabbros have been identified in the Hart Dolerite as follows:  K felsic granophyre (youngest)  Mafic granophyre (youngest)  Magnetite gabbro (host unit)  Felsic gabbro (oldest).  The vanadium-titanium mineralisation is hosted within a magnetite bearing gabbro unit of the Hart Dolerite, outcropping in places and forming a generally flat dipping body that extends over several kilometres of strike and width. The layered sill is up to 400m thick containing the magnetite gabbro unit which is up to 80m thick. Given the mode of formation, mineralisation displays excellent geological and grade continuity which was considered when classifying the Mineral Resource estimate. Exposure is limited and fresh rock either outcrops or is at a shallow depth of a few metres.  Ti-V-Fe mineralisation occurs as disseminations of vanadiferous titano-magnetite and ilmenite.  Within the tenements the vanadium deposits have been divided into three deposits – Central, Buckman and Red Hill. The test work reported in this announcement was sampled from the Central vanadium deposit (Figure 1).



Drill hole Information	<ul> <li>A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:</li> <li>easting and northing of the drill hole collar</li> <li>elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar</li> <li>dip and azimuth of the hole</li> <li>down hole length and interception depth</li> <li>hole length.</li> <li>If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.</li> </ul>	New exploration results are not being reported.  Locations of diamond (DD) core holes, including metallurgical core holes used in this announcement, are shown on Figure 1 and Table 1.
Data aggregation methods	In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.	Exploration results are not being reported.
	Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.	Continuous lengths of ¼ core composited for metallurgical samples from the Low Grade and High Grade Zones.
	The assumptions used for any reporting of metal equivalent values should be clearly stated.	No metal equivalent values are used for reporting.
Relationship between mineralisation widths and intercept lengths	These relationships are particularly important in the reporting of Exploration Results. If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').	Due to the very shallow dip of the mineralisation, the vertical metallurgical DD core holes represent almost the true width of the mineralisation.
Diagrams	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.	Figure 1 shows the location of diamond core holes within the Central Vanadium deposit referred to in this announcement.
Balanced reporting	Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.	Reports on previous metallurgical results can be found in ASX Releases that are available on our website, including announcements 1 April 2010, 15 July 2010, 9 November 2010, 8 February 2012, 21 April 2017, 21 August 2017, 9 October 2017, 4 December 2017, 30 January 2018, 27 February 2018, 21 March 2018, 25 June 2018 and 23 July 2018.
Other substantive exploration data	Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	Updated vanadium resource estimates in accordance with the JORC 2012 guidelines were reported in KRC ASX announcement 26 May 2017.
Further work	The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling). Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	Further metallurgical tests are planned to increase metal recoveries, shorten leach times and reduce acid consumption, and trialing selective chemical precipitation, thermal hydrolysis, ion exchange and solvent extraction methods to precipitate vanadium pentoxide and titanium dioxide, and make vanadium electrolyte.