# ASX MEDIA RELEASE

Havilah Resources
A New Mining Force in South Australia

11 September 2018

# Kalkaroo PFS Metallurgical Program Update

## HIGHLIGHTS

- **Three large diameter core holes for new metallurgical samples recently completed.**
- **Long ore grade intercepts of typical Kalkaroo replacement style mineralisation reported for each hole.**
- **Additional program of metallurgical testing using these samples has commenced.**

**Havilah Resources Limited** (**Havilah**) is pleased to report that a three-hole metallurgical drilling program has recently been completed at Kalkaroo. The large (83 mm) diameter PQ3 drillcore will provide the required samples for additional metallurgical test work. This work forms part of the ongoing pre-feasibility studies (**PFS**) currently being funded and managed by Havilah, following on from the Wanbao Mining sponsored PFS studies.

***Figure 1:*** *Diamond drilling in progress at Kalkaroo to obtain large diameter PQ core samples for metallurgical test work.*

The hole locations were selected to be representative of the overall Kalkaroo deposit and in particular, of the four main styles of mineralization and as such do not represent new mineralisation (**Figure 2**). All drillholes have been logged, photographed and sampled, with a quarter of the drill core sent for assay. Long, continuous copper and gold mineralized intersections in each case are typical of the Kalkaroo deposit, as summarized below:

KKDD486: 85 metres @ 2.73 g/t gold from 75 - 160 metres
73 metres @ 1.17 % copper from 87 - 160 metres
39 metres @ 261 ppm cobalt from 121 - 160 metres (in sulphide zone only)
KKDD488: 68.3 metres @ 1.29 % copper and 148 ppm cobalt from 121 - 189.3 metres
60.3 metres @ 0.48 g/t gold from 129 – 189.3 metres.
KKDD487: 16 metres @ 1.16% copper and 0.59 g/t gold from 114 – 130 metres

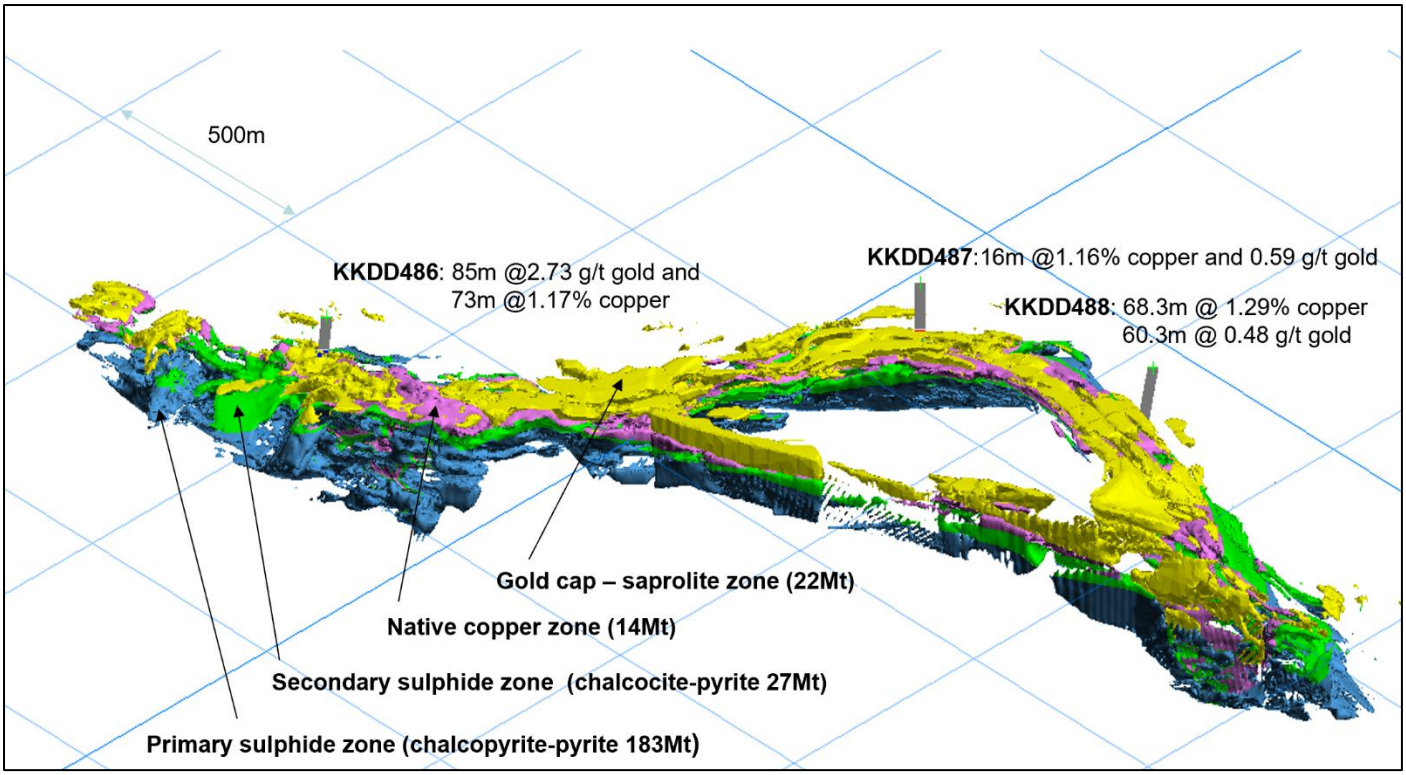


***Figure 2*** *Oblique view of the Kalkaroo ore shells showing locations of the three new metallurgy holes.*

It is important to note that these are composite intersections that are comprised of more than one ore type, as illustrated for drillhole KKDD486 (**Figure 3**). The 11 metre saprolite gold interval for example carries comparatively high grade gold (12.5 g/t) but only minor non-visible copper. This hole is somewhat unusual in containing an interval of malachite (14 metres of 2.65% copper and 3.5 g/t gold) apparently at the expense of a lower than normal grade intersection of native copper (20 metres of 0.55% copper and 0.58 g/t gold). As is typical, the chalcocite zone contains higher than average grades of copper and gold than the primary chalcopyrite zone. This is more pronounced in drillhole KKDD488, which includes 21 metres @ 2.3% copper from 121 - 142 metres in the chalcocite zone.

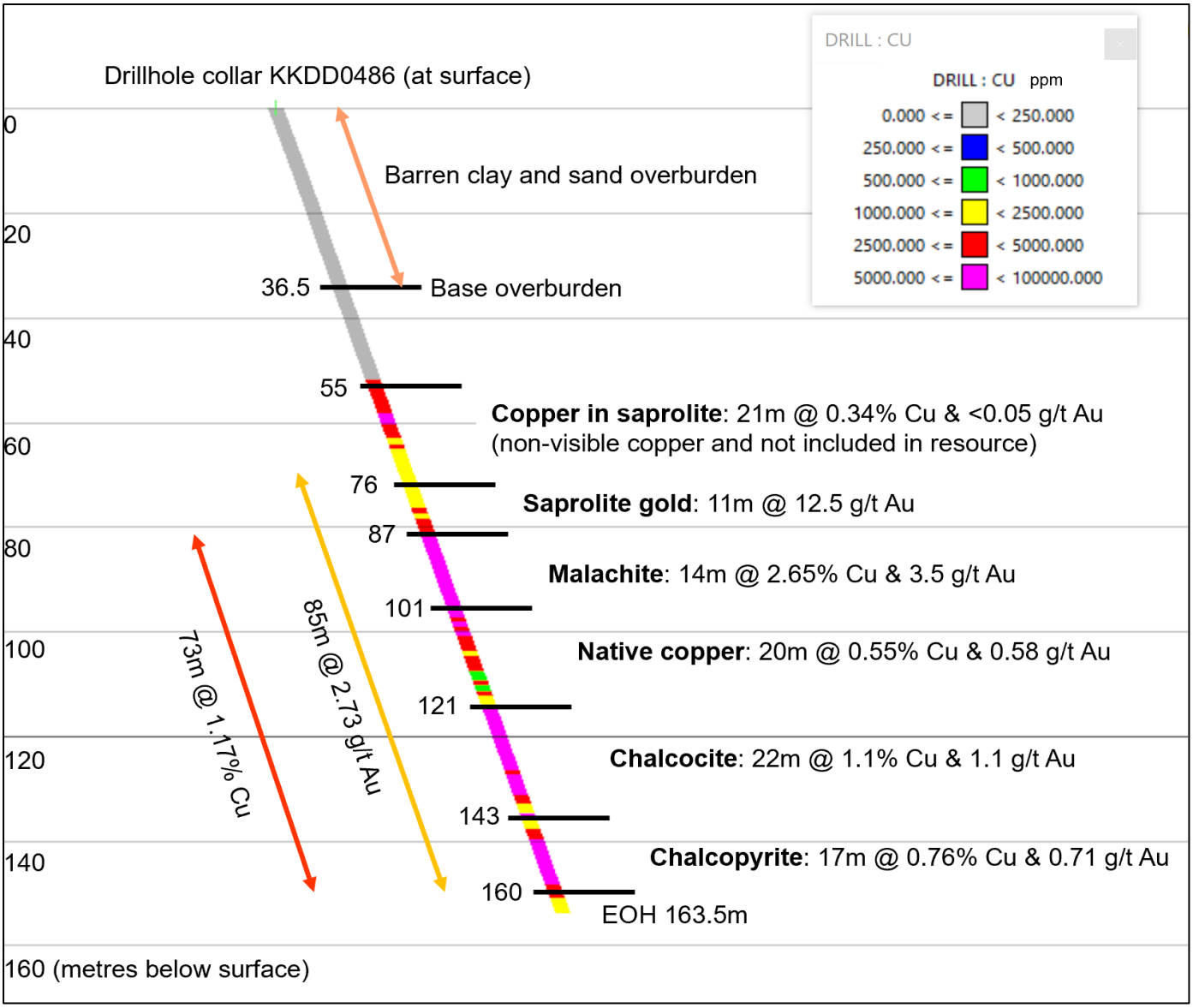


***Figure 3*** *Different ore zones in Drillhole KKDD0486 that make up the composite assays reported here.*

The metre interval assays have been used to generate composite samples of the required representative grade for the metallurgical test work.

As foreshadowed in an earlier announcement (refer to ASX announcement of 2 July 2018), the additional metallurgical testing program being undertaken by Havilah has three main objectives:

1. Demonstrate improved gold recoveries in the saprolite gold cap. In the PFS, RPMGlobal tested gold recovery by flotation methods to avoid issues associated with copper in solution, at the expense of gold recovery. Earlier cyanide bottle roll tests conducted by Havilah indicated >95% gold recoveries in the saprolite gold zone and this recovery method will be revisited with particular attention to methods of suppressing the effects of copper on gold doré production. A potential 30 - 40% improvement in gold recovery if achievable, would substantially boost project revenues.
2. Demonstrate improved gold recoveries in the native copper zone by essentially following the methodology outlined above, preceded by screening to remove all coarse native copper. Improved gold recoveries to >90% level has a dramatic positive impact on project revenues. It is important to

note that for both the saprolite gold and native copper ore types the gold is not refractory, but is entirely present as fine to very fine discrete particles, and the objective is to determine the optimum recovery method with the lowest level of loss for this fine gold.

3. Confirm the indicated cobalt, copper and gold grades in bulk pyrite concentrates. It has previously been reported that almost all cobalt in the Kalkaroo deposit occurs in pyrite, which can be recovered as a separate flotation concentrate, after copper concentration. The average assays for several pyrite concentrate samples show appreciable levels of copper (1.5 - 1.7%), cobalt (0.2 - 0.3%) and gold (2.7 - 3.5 g/t), making this a potentially valuable by-product that could add substantial revenue to the project. With the excess sulphide samples generated by the current drilling, Havilah plans to prepare several bulk pyrite concentrate samples from both the chalcocite ore and the chalcopyrite ore, in order to confirm the levels of contained copper, cobalt, and gold. In addition, these samples will provide suitable feed for future leaching and/or roasting studies to be conducted. It is important to note that the grades of copper, cobalt and gold make this a potentially saleable direct shipping product.

**Commenting on the metallurgical sampling, Havilah CEO, Mr Walter Richards said:** "Obtaining the fresh drillcore metallurgical samples is a very important part of Havilah's planned additional Kalkaroo PFS work.
"The drilling was well planned and executed and we obtained adequate quantities of good quality sample that we required.
"Establishing with certainty the best processing route to maximise gold recoveries is essential to confirming Kalkaroo's project economics and supplementing the previously completed metallurgy work.
"We are encouraged by the latent value of copper, cobalt and gold in the pyrite concentrate, which potentially can be recovered for very little additional expense, which we intend to demonstrate by obtaining larger samples of pyrite concentrate from bulk sulphide ore samples.
"This metallurgical work has the potential to add significant value to Kalkaroo over and above the already favourable economics," he said.

***Figure 4:*** *Malachite (copper carbonate) representing secondary, supergene copper mineralisation hosted by weathered and oxidised bedrock (saprolite).*

***Figure 5:*** *Seams of native copper (copper metal) representing secondary, supergene copper mineralisation hosted by weathered and oxidised bedrock (saprolite).*

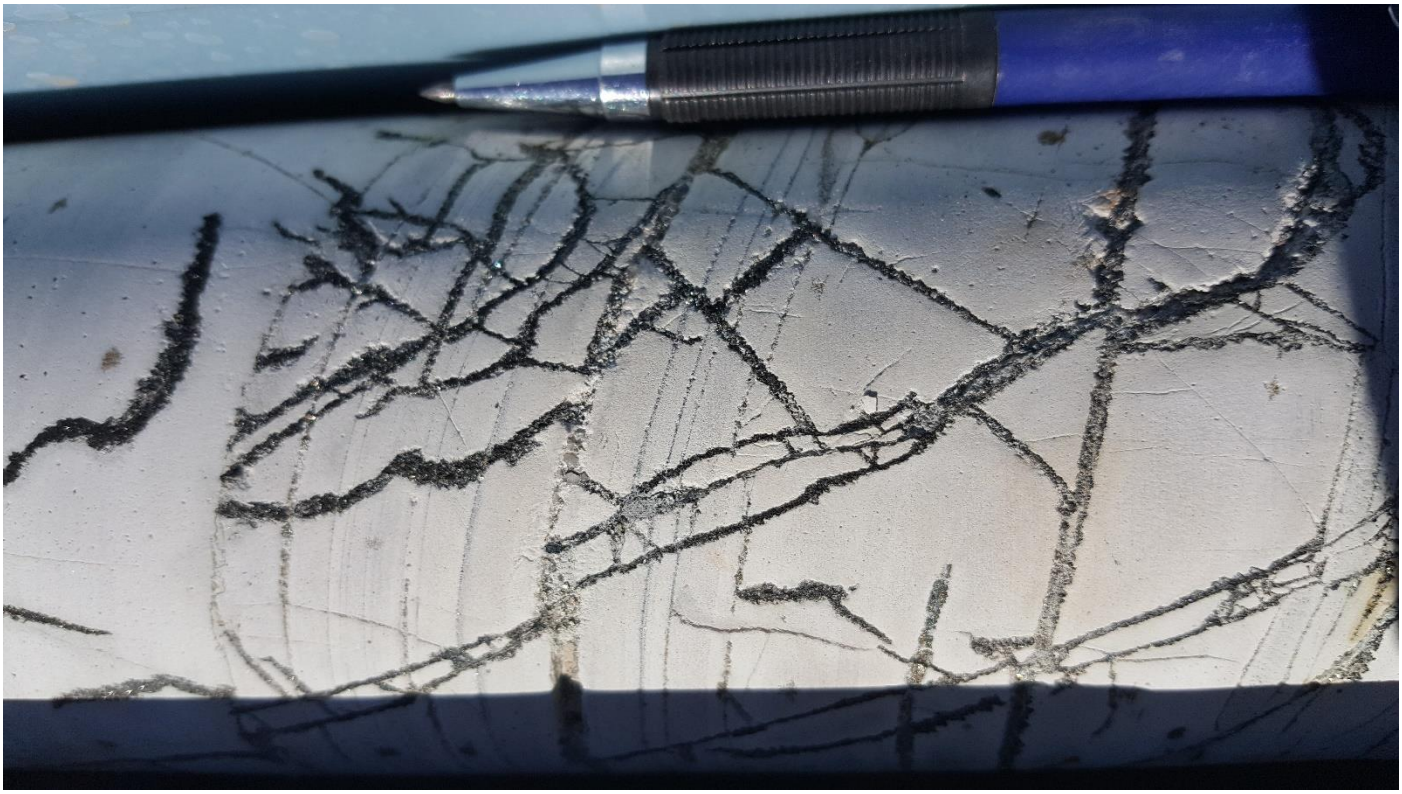

***Figure 6:*** *Vein and fracture filling black chalcocite (copper sulphide) representing secondary, supergene copper mineralisation hosted by weathered bedrock (saprock).*

***Figure 7:*** *Bedding replacement chalcopyrite (copper sulphide) and pyrite (iron sulphide) mineralisation representing primary sulphide mineralisation in fresh host rock.*

**Table 1. Data for the three drillholes referred to in the text**

| Hole ID | Area | Grid System UTM Zone 54 (AGD 66 datum) | | | | Dip (degrees) | Depth (m) |
|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | RL (m) | Azimuth (degrees) | | |
| KKDD0486 | Kalkaroo | 454437 | 6488713 | 120.1 | 154.5 | -70.0 | 163.2 |
| KKDD0487 | Kalkaroo | 455180 | 6489644 | 117.7 | 146.0 | -75.0 | 130.9 |
| KKDD0488 | Kalkaroo | 455703 | 6489784 | 117.7 | 193.0 | -75.0 | 189.3 |

**Cautionary Statement**

This announcement contains certain statements which may constitute "forward-looking statements". Such statements are only predictions and are subject to inherent risks and uncertainties which could cause actual values, performance or achievements to differ materially from those expressed, implied or projected in any forward looking statements. Investors are cautioned that forward-looking statements are not guarantees of future performance and investors are cautioned not to put undue reliance on forward-looking statements due to the inherent uncertainty therein.

**Competent Persons Statement**

The information in this announcement that relates to Exploration Targets, Exploration Results, Mineral Resources or Ore Reserves is based on data and information compiled by geologist, Dr Chris Giles, a Competent Person who is a member of The Australian Institute of Geoscientists. Dr. Giles is Technical Director of the Company and is employed by the Company on a consulting contract. Dr. Giles has sufficient experience, which is relevant to the style of mineralisation and type of deposit under consideration and to the activities being undertaken to qualify as a Competent Person as defined in the 2012 Edition of 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr. Giles consents to the inclusion in the announcement of the matters based on his information in the form and context in which it appears. This information was prepared in accordance with the JORC Code 2012.

# APPENDIX 1: TABLE 1 OF THE 2012 EDITION OF THE JORC CODE

The table below is a description of the assessment and reporting criteria for the saprolite gold resource and supergene sulphide copper-cobalt-gold resource at Kalkaroo, in accordance with Table 1 of The Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves

## Section 1 Sampling Techniques and Data

| Criteria | Commentary |
|---|---|
| Sampling techniques | • PQ3 diamond drillcore quartered by diamond saw and 1 metre quarter core samples submitted to ALS Global assay lab in Adelaide. Thin lapidary saw blades were used to cut the saprolite and saprock, to minimise loss and breakage.<br>• At ALS assay lab the samples are crushed in a jaw crusher to a nominal 6mm (method CRU-21) from which a 3 kg split is obtained using a riffle splitter. The split is pulverized in an LM5 to 85% passing 75 microns (method PUL-23). These pulps are stored in paper bags.<br>• All samples are then analysed for a 33 element package using ALS's ME-ICP61 suite, whereby samples undergo a 4 acid digest and analysis by ICP-atomic emission spectrometry and/or ICP mass spectrometry. Over limit Cu, Pb and Zn are re-assayed using method ME-OG62.<br>• Thirty seven 1m intervals with observed native Cu were assayed for Cu using method ME-SCRPH22. The quarter core is crushed & pulverised as above in total. Pulverisers are cleaned with barren quartz flush between samples. A 1.5kg split is then sieved to 500um to separate coarse fragments, which are assayed in entirety using large aliquot aquaregia digest. A ~100g sample of the -500um fraction is wet screened to 106um. The entire +106um fraction is digested using large aliquot aquaregia. The -106um fraction is assayed in duplicate by ore grade method ME-OG62. A Cu assay is obtained using the combined weighted results of all 3 fractions.<br>• Gold is analysed by 50g fire assay, with atomic absorption spectrometry finish, using ALS method Au-AA26.<br>• Handheld XRF readings may be collected from certain intervals and used as a guide but are not reported here. |
| Drilling techniques | • Diamond drilling of PQ3 size (83mm diameter) using triple tube to maximize recovery.<br>• MJ Drilling of Jamestown S.A. were contracted to drill the holes, which were completed in a very professional and timely manner, without incident of any kind.<br>• Orientation marking was only partially successful in the soft saprolite material, but accurate where marks were obtained. It was generally very good in saprock and fresh rock. |
| Drill sample recovery | • Triple tube coring was employed to maximize core recoveries.<br>• Sample recoveries were continuously monitored by the geologist on site in order to effect adjustments to drilling methodology to optimize sample recovery and quality if necessary.<br>• On occasions core fell out of the barrel, but in almost all cases it was recovered and modifications were made to minimize this occurrence.<br>• In general, core recoveries were very good, given the clayey nature of the material being drilled. Overall core recoveries were 99.8% for KKDD0486, 99.1% for KKDD0487 & 98.3% for KKDD0488. |
| Logging | • The drill core was logged in detail by an experienced geologist directly into a digital logging system with data uploaded directly into an Excel spreadsheet.<br>• Logging is semi-quantitative and 100% of reported intersections have been logged and photographed.<br>• Logging is of a sufficiently high standard to support any subsequent interpretations, resource estimations and mining and metallurgical studies. |
| Sub-sampling techniques and sample preparation | • Quarter core was submitted for assay in order to obtain results that would allow selection of representative half core samples for metallurgical studies.<br>• Sample preparation and assaying methods are summarized above.<br>• Quality control procedures include the insertion of standards, blanks and duplicates into the regular sample number sequence (1 in 25 samples). If any blank, standard or duplicate is out of spec, re-assay of retained samples is requested of the laboratory as a first step.<br>• Sampling size is considered to be appropriate for the style of mineralisation observed. Assay repeatability for gold and other metals has not proven to be an issue.<br>• Where very coarse native Cu is present, the sample size was maximised and the sample prep and |

| Criteria | Commentary |
|---|---|
| | assaying techniques employed were designed to minimise the 'nugget effect'. The accuracy of the native Cu results will generally be less than for the 'normal' samples. |
| Quality of assay data and laboratory tests | • All samples are prepared at ALS Global laboratory in Adelaide and assayed interstate. The total assay methods are standard ALS procedure and are considered appropriate at the exploration reporting stage.<br>• All gold was determined by fire assay with AAS finish. Higher grade samples were check re-assayed as described below.<br>• Other elements were analysed by multi-element digest methods with ICP finish.<br>• Quality control procedures include the insertion of standards, blanks and duplicates into the regular sample number sequence (1 in 25 samples). If any blank, standard or duplicate is out of spec, re-assay of retained samples is requested of the laboratory as a first step. ALS also insert their own QC/QA samples into the sample sequence. |
| Verification of drilling sampling and assaying | • Rigorous internal QC procedures are followed to check all assay results.<br>• All data entry is under control of a specialist database geologist, who is responsible for data management, storage and security.<br>• Repeat assays of a number of high grade (>3g/t) Au results showed insignificant variation.<br>• No adjustments to assay data are carried out. |
| Location of drillholes | • Down hole surveys were conducted routinely every 30m, using a Reflex electronic survey camera.<br>• Drillhole collars were located using tape and compass from previous nearby holes that were surveyed in UTM coordinates using a differential GPS system with an x:y:z accuracy of 20cm:20cm:40cm and are quoted in AGD66 datum coordinates. |
| Data spacing and distribution | • The objective of this 3 hole PQ diamond coring program was to obtain representative samples for metallurgical test work.<br>• Hence drill spacing was not a consideration but placing of holes to obtain representative samples from the deposit was the main consideration.<br>• Sample compositing was not used. |
| Orientation of data in relation to geological structure | • The drillhole azimuth and dip was chosen to intersect the mineralized zones as nearly as possible to right angles and at the desired positions to maximize the value of the drilling data.<br>• At this stage, no material sampling bias is known to have been introduced by the drilling direction. |
| Sample security | • The quarter core samples were placed directly into pre-numbered calico bags by trusted Havilah personnel.<br>• Several calico bags were placed into each polyweave bag which were then sealed with cable ties. The samples were transported to the assay lab by Havilah personnel at the end of each field stint.<br>• There is minimal opportunity for systematic tampering with the samples as they were not out of the control of Havilah until they are delivered to the assay lab.<br>• This is considered to be a secure and reasonable procedure and no known instances of tampering with samples have occurred since drilling commenced. |
| Audits, reviews | • Ongoing internal auditing of sampling techniques and assay data has not revealed any material issues. |

## Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

| Criteria | Commentary |
|---|---|
| Mineral tenement and land tenure status | • Drilling took place on Havilah Resources 100% owned Kalkaroo Exploration Licence EL 5800. |
| Exploration done by other parties | • Significant aircore, rotary mud, reverse circulation (RC) and diamond drilling was carried out on the prospect between 1990 and 2003, by previous explorers Placer, Newcrest and MIM. |

| Criteria | Commentary |
|---|---|
| Geology | • Structurally controlled, stratabound primary Cu-Au sulphide deposit, overlain by supergene enriched Cu-Au sulphide zone and oxidised Native Cu and Au cap in saprolite. Overlain by a cover sequence of 15 to 50m of Tertiary clay with minor sand layers, then by ~15m of Quaternary-Recent sands, clay and gravel. |
| Drill hole Information | • See separate table in this report. |
| Data aggregation methods | • Intercepts are calculated using the length-weighted averages of individual samples. Minimum grade truncations are applied. Local geology is also used as an input.<br>• Where much higher grades exist, a separate high grade sub-interval may be reported. |
| Relationship between mineralisation widths and intercept lengths | • Down-hole lengths are reported. Drillholes are always oriented with the objective of intersecting mineralisation as near as possible to right angles, and hence down-hole intersections in general are as near as possible to true width.<br>• For the purposes of the geological interpretations and resource calculations the true widths are always used. |
| Diagrams | • Figure showing the location of the drillholes in relation to the deposit and a table of drillhole data. |
| Balanced reporting | • Only meaningful potentially economic grade intervals are reported. |
| Other substantive exploration data | • Relevant geological observations are reported in this and previous announcements. Other data not yet collected or not relevant. |
| Further work | • These holes were drilled specifically to obtain representative core samples for metallurgical test work.<br>• At this stage no further drilling is planned. |