Range Analysis of the Size Frequency of Diamonds Recovered from BK16 LDD Samples

23 January 2018
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• Readers are cautioned not to place undue reliance on these forward looking statements.
Executive Summary

• BK16 has been sampled to produce diamonds:
  • Discovery of higher quality diamonds (Type 2a)
  • Parcel demonstrates good shapes
  • Size frequency gives indications of a coarse diamond distribution

• Due to small size of samples, and coarse SFD, coarse stones not yet recovered

• Potential Size frequency and $/ct has been modelled:
  • Using a combination of simulation and extrapolation
  • Comparison to similar deposits- Karowe’s AK6 deposit

• Models of grade, size and value suggests:
  • This deposit has potential to host a coarse size distribution
  • This deposit has potential to have high value stones
  • If both can be demonstrated through next phase of sampling BK16 could become a valuable asset

• Additional work is ongoing to define the parameters of the sampling required to demonstrate viability.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unit of Measure</th>
<th>BK16 Sample</th>
<th>BK16 Published (Lawless 2018)</th>
<th>Current BK16 SFD Study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>P20</td>
<td>P80</td>
</tr>
<tr>
<td>Grade</td>
<td>Cphit</td>
<td>3.8</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Diamond Value</td>
<td>US$/carat</td>
<td>177</td>
<td>281</td>
<td>290</td>
</tr>
<tr>
<td>Kimberlite Value</td>
<td>US$/tonne</td>
<td>6.6</td>
<td>11</td>
<td>15</td>
</tr>
</tbody>
</table>

**Table:**

- **Variable:** Grade, Diamond Value, Kimberlite Value
- **Unit of Measure:** Cphit, US$/carat, US$/tonne
- **BK16 Sample:** 3.8, 177, 6.6
- **BK16 Published (Lawless 2018):** 8 to 10, 386 to 710, 30 to 78
- **Current BK16 SFD Study:** 4, 281, 11
- **Min, P20, P80, Max** values are provided for each variable.
Sample Size, Diamond Grade and Size Modelling

- Diamonds are particles that exist in very low concentration and difficult to sample.
- As sample size gets larger:
  - More diamonds are recovered in each sample.
  - Sample grades become more representative of the spread in the deposit.
  - The ratios of larger stones to smaller stones becomes more similar to the in-situ values.
- Results from small samples require modelling to account for these effects.
Sampling Strategy - Methodology

**Sample Analysis**
- Sample Stone Concentration Model
- Sample Diamond Size Distribution Model
- Model for Diamond Damage and Breakage
- Sample Diamond Values - $/ct Model
- Sample Grade & Size Ranges

**Global Model**
- Macro Grade & Size Content Models
- Moderation with Comparable Mine Data
- Extrapolated $/ct Models
- Global $/Tonne Model

**Spatial Model**
- Stone Concentration Simulation
- Grade and Size Simulation
- Design and Test Sampling Plans
- Selection of Optimal Strategy

**Current Analysis**:
- Analyse sample data to determine plausible ranges for inputs into global models
- Use these values to set parameters for global models
- Simulate outputs of global models based on sample ranges

**Phase 2**:
- Spatial model will allow for design and testing of multiple sample strategies
- This will lead to the selection of the best approach to the next phase of sampling
Geological Model for BK16

- The Kimberlite has two main phases:
  - VK2 and VK3
- Several breccia phases
- Dyke extends from pipe, open to boundary
- BK16 has been dated and shown to be marginally older than AK1, the kimberlite that is mined at Orapa
- Overlain with ~25m of overburden

Source: De Wit et al., 2017
Recent Sample Results

<table>
<thead>
<tr>
<th>Descriptive Statistic</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holes</td>
<td>14 each</td>
<td></td>
</tr>
<tr>
<td>Total Volume</td>
<td>835.3 m³</td>
<td></td>
</tr>
<tr>
<td>Average Density</td>
<td>2.5 tonnes per m³</td>
<td></td>
</tr>
<tr>
<td>Tonnes Kimberlite</td>
<td>2077 tonnes</td>
<td></td>
</tr>
<tr>
<td>Number of Samples</td>
<td>243 each</td>
<td></td>
</tr>
<tr>
<td>Average Volume per Sample</td>
<td>3.4 m³</td>
<td></td>
</tr>
<tr>
<td>Average Tonnage per sample</td>
<td>8.55 tonnes</td>
<td></td>
</tr>
<tr>
<td>Diamond Mass total</td>
<td>77.94 cts</td>
<td></td>
</tr>
<tr>
<td>Stones in Samples</td>
<td>503 each</td>
<td></td>
</tr>
<tr>
<td>Average Diamond Size</td>
<td>0.15 cts/stone</td>
<td></td>
</tr>
<tr>
<td>Stones per sample</td>
<td>2.1 stones/sample</td>
<td></td>
</tr>
<tr>
<td>Stones per m³ including bare samples</td>
<td>0.604 Stones/m³</td>
<td></td>
</tr>
<tr>
<td>Stones per m³ excluding bare samples</td>
<td>0.77 Stones/m³</td>
<td></td>
</tr>
<tr>
<td>Average Sample Grade</td>
<td>3.75 ct/h</td>
<td></td>
</tr>
<tr>
<td>Total Assessed Value</td>
<td>13,780 US $</td>
<td></td>
</tr>
<tr>
<td>$/Carat</td>
<td>178.80 $/ct</td>
<td></td>
</tr>
<tr>
<td>$/Tonne</td>
<td>6.63 $/tonne</td>
<td></td>
</tr>
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</table>
Diamond Damage Assessment

- Diamonds were individually assessed for damage by two Experts
- Approximately 60% of the stones did not display any signs of fresh damage
- 20% showed minor chipping and the remainder had mixed degrees of severity
- Most of the movement of stones between classes in SFD following reconstitution occurs in the -1 to +3 sieve sizes
- Applying the average reconstitution factors to the $/ct per sieve class results in an increase of ~7% to the bench $/ct
- Applying 100% recovery assumption to the chips, the change reduces to less than 2%
- The impact on SFD models are not material
- This outcome reflects the benefits of the implementation of best practice drilling and diamond recovery Techniques
Sample Stone Concentration Model

- Distribution fitted to the observed stone concentrations in stones per m³ (SPM³)
- 100 iterations of 243 simulated LDD samples to assess uncertainty of stone concentration
- Plot shows iterations ranged by average grade lowest to highest to give a percentile plot
- These simulated stone concentrations are used as inputs in the grade and size range analysis model
Macro Content SFD Model

- Based on the grade size relationships observed in many kimberlites,
- Uses of a curve to a stone grade model (Same procedure is used for macro-micro modelling)
- Size classes with no stones are not included in the model
- The parameters that result in the “Best fit” curve can be found by minimising the difference between the actual and model results in each size class
- There are several approaches to using this model in a simulation, but in this case the range of the model was tested using parameter sensitivity given the small parcel size
In Situ Grade and Size - Macro Content Model Sensitivity

- Simulation of different a, b and c parameters fitted to model to assess model sensitivity
- Most variation in grade is a function of the ‘B’ parameter which drives fines content
- The models suggests that the grade could vary between 5 and 8 cpht
$/ct Models

• Raw data: 177 $/ct
• Model 1 (orange line):
  • Conservative extrapolation of maximum observed values into upper classes
  • Average diamond value of 298 $/ct
  • ~70% of the value coming from extrapolation.
• Model 2 (grey line)
  • Extrapolation increase highest populated size classes,
  • Average diamond value of 453 $/ct
  • ~80% of the value coming from extrapolation
• Model 3 (yellow line)
  • An optimistic model extends observed quality assortment into the upper size classes,
  • This model returned an average diamond value of 792 $/ct
  • ~84% of the value coming from extrapolation
Comparative Grade and Size Models

- Figure shows relationship between diamond size on x-axis and the Diamond grade (cpht) on the y-axis.
- Sample (LDD) Grade-Size curves will always differ from full scale production curves.
- BK16 LDD results (Red) are coarser but similar shape to the rescaled AK6 LDD results (Green).
- Rescaled production distribution from AK6 (Orange) shows an expected shift from fine LDD results to coarse production results.
- Coarse and fine content models were developed for BK16.
- The BK16 models straddle the AK6 north production distribution.
- These can be used in combination to assess the range of potential outcomes.
BK16 Models Overlayed on AK6 Production

- BK16 Coarse SFD model tracks centre pipe diamond model to +9, but then becomes coarser than all three lobes

- Revenue curve follows that of North lobe
• Production valuation of AK6 can be compared to the models for BK16
• The sample valuation is higher in the smaller size class than AK6
• The extrapolated models straddle the AK6 production results
• Combinations of the actuals, extrapolation and AK6 values were used to determine feasible ranges for BK16
The options presented thus far include over 30 combination of size, grade, and $/ct to derive a range of $/tonne values.

These can be shown as a cumulative distribution.

This suggests a P20 to P80 range from 15 $/tonne to 38 $/tonne.
Summary Model Results

- Sample grades are low with indications of a coarse size distribution
- $/ct models suggest a high quality component is present
- Models for size and grade suggest BK16 could support a viable operation if the large size diamonds reflect the quality of diamonds observed in the sample parcel
- Additional sampling will be designed to validate the plausible ranges of the coarse end of the diamond size distribution and the quality assortment of these larger goods.

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