Range Analysis of the Size Frequency of Diamonds Recovered from BK16 Bulk Samples.

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Executive Summary

Tsodilo Resources (TSD) approached Interlaced (ILCD), to review the diamond data of the bulk sample acquired from BK16. TSD has used drilling data and core logs to model the pipe to a depth of 450m and is expected to contain approximately 18-20Mt of kimberlite (Bruchs et al.,2018). The recent LDD drilling campaign produced 2077 tonnes of chips that were treated to recover 502 diamonds (stones) weighing 77.94 carats (cts).

The primary objective of this study was to determine plausible ranges for the recoverable in-situ diamond size frequency and average target grade for the BK16 kimberlite to scope further target definition work. The methods used to assess the potential values for this target included a combination of SFD extrapolation, stone simulation and comparison with other similar deposits. The analysis combined different lithotypes so the summary values presented should be considered as aspirational global averages and not used for spatial estimation.

Diamond damage during sampling was limited by application of best practice drilling and treatment procedures. Modelling suggests that, at most, the reconstitution might add ~ 6% by value to the recovered parcel, but when using conventional reconstitution methods difference less than 2% . The impact of reconstitution was immaterial on the modelling of the SFD.

Analysis of the values for stone concentration suggest good continuity and the associated grade uncertainty is considered low. The analysis of the size distribution of the diamonds recovered indicates there may well be a coarse component to the distribution. Several approaches were used to generate a plausible envelope for the diamond size distribution, these will have to be validated by acquiring additional diamonds.

The diamonds have been individually valued and classified by assortment. The samples contain several high quality Type2 diamonds and the parcels have a substantial proportion of good shapes. This information was used to develop estimates for the revenue that might be achieved for larger goods, assuming the assortment in larger sizes reflects the quality of the assortment observed in the smaller size fractions. These models were applied to the size distribution models to produce a range of average $/ct values.

The models for global grades, global $/ct and extrapolated size distribution outcomes were combined to calculate the range of potential $/tonne values. The results have produced feasible ranges for the variables required to design and optimise the ongoing evaluation strategy (Table 1).

Table 1. Summary comparison of Sampled, Published and Current Study Ranges for the BK16 deposit.

Variable	Unit of Measure	BK16 Sample	BK16 Published (Lawless 2018)	Current BK16 SFD Study			
				Min	P20	P80	Max
Grade	Cpht	3.8	8 to 10	4	5	7	8
Diamond Value	US$/carat	177	386 to 710	281	290	600	792
Kimberlite Value	US$/tonne	6.6	30 to 78	11	15	38	67

Future sampling should focus on acquisition of large samples to demonstrate both the coarse size distribution and to produce a large enough parcel of diamonds to demonstrate that the diamond quality observed in smaller size fractions continues into the large diamond sizes. Several recommendations for optimising this future work are contained in the body of the report.

These models presented here have been derived from a combination of real data and extrapolation and should be considered as aspirational targets. The described potential quantity and grades are conceptual in nature, there has been insufficient exploration to define a mineral resource and it is uncertain if further exploration will result in the BK16 target being delineated as a mineral resource.

Caution Regarding Forward-Looking Statements

This report contains forward-looking statements as defined by certain securities laws, including the "safe harbour" provisions of Canadian securities legislation and the United States Private Securities Litigation Reform Act of 1995. Forward-looking information is often, but not always, identified by the use of words such as "anticipate", "believe", "expect", "plan", "intend", "forecast", "target", "project", "guidance", "may", "will", "should", "could", "estimate", "predict" or similar words suggesting future outcomes or language suggesting an outlook. In particular, statements regarding future operations, future exploration and development activities or other development plans constitute forward-looking statements. By their nature, statements referring to exploration targets, mineral reserves, mineral resources, PEA or TFFE constitute forward-looking statements.

Forward-looking statements contained or implied in this document include, but are not limited to, disclosure regarding the economics and project parameters presented in the report, including, without limitation, IRR, NPV and other costs and economic information, carats of diamonds to be recovered, after-tax payback period, tonnes of kimberlite to be mined, carats per tonne to be recovered (grade), diamond prices ($/ct), project life, life of mine, capital costs, and length of pre-production period, as well as statements with respect to environmental permitting and approvals and objectives for and scope of future bulk sampling and/or Brownfields programs.

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Acknowledgments

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Terms and Abbreviations

Definition /Term/Abbreviation	Description
~	Approximately
Cpht	Carats per hundred tonnes
Dilution	Material that is not diamond bearing. Can be defined as external to the mineralised body, or internal to the mineralised body.
DMS	Dense Media Separation, a process that uses the density differential between kimberlite and diamonds to generate a diamond rich concentrate
Exploration Target	An Exploration Target is a statement or estimate of the exploration potential of a mineral deposit in a defined geological setting where the statement or estimate, quoted as a range of tonnes and a range of grade (or quality), relates to mineralisation for which there has been insufficient exploration to estimate a Mineral Resource
Grade - Wet raw diluted recovered grade	The grade calculated, by dividing the recovered carats, by the tonnage of wet headfeed measured at the bulk sample plant.
Grade - Dry raw diluted recovered grade	The grade of the sample, calculated by dividing the recovered carats, by the mass treated, less the mass of moisture that has been determined by sampling the headfeed material.
Grade - Dry Raw Undiluted recovered grade	An adjusted grade of the sample, derived by dividing the recovered carats by the total dry sample mass, less a reasonable assumption for the mass of non-diamond bearing material, that contaminated the sample.
Grade - Raw Grade	Grade reported, recovered without modelling of the size frequency.
Grade - In Situ Modelled Grade	A derived diamond content that is based on a mathematical or statistical relationships - for instance between diamond size and abundance, a log normal model can be used (see Coward, Ferreira 2003).
LDD	Large Diameter Drillhole - a drilling method used to acquire larger samples of kimberlite.
Ln	Natural logarithm, the logarithm of a number to base of the mathematical constant e which is approximately equal to 2.17182
Ma	Millions of Years
Mt	Million tonnes
SFD	Size Frequency Distribution.
SPM^3	Stones per cubic meter, a volumetric measure of diamond particle concentration.

Xenolith	a piece of rock within an igneous mass, which is not derived from the original magma, but has been introduced from elsewhere, especially the surrounding country rock.

Introduction

Tsodilo Resources Limited (TSD) approached Interlaced (ILCD), to review the diamond data of the bulk sample acquired from BK16. The BK16 target is a kimberlite pipe situated in Northern Botswana. It has a surface area of ~5.9 ha and has been dated at 102 Ma using uranium-lead radiometric dating of five samples containing perovskite grains (Tappe, 2018).

Based on information supplied by the client, drilling data has been used to model the pipe to a depth of 450m, that is expected to contain approximately 18-20Mt of kimberlite (Bruchs et al.,2018). The recent LDD drilling campaign produced 2077 tonnes of chips that were treated to recover 502 diamonds (stones) weighing 77.94 carats (cts). LDD drilling is considered an industry standard for diamond project evaluation, and the use of reverse flood air assist would be considered best practice. The tonnage estimate is based on the product of average domain density and the calipered volume of the drill holes from which the samples were extracted. Domain densities are derived from density measurements, made on cores from pilot holes that are twinned with the LDD holes(Jeffcoate & Hiyoveni, 2016).

The process of sample acquisition and processing to recover diamonds is complex and cannot be considered an 'assay,' as is the case for many types of metallic mineral sampling. This often results in material differences, between the raw diluted recovered grade from a set of samples and the true in-situ grade of the target. The differences can often arise from:

- The low, and dispersed, concentration of diamonds in most kimberlitic deposits;
- Different levels of internal and external dilution;
- The wide size distribution of diamonds which often results in under representation of coarse diamonds in small samples;
- Damage and breakage during diamond acquisition;
- Loss as a result of lock up; and
- Loss to undersize.

These aspects of diamond project evaluation have been accepted by the mineral resource reporting codes and is one of the reasons the codes have a specific diamond section.

This brief report covers an analysis of the data provided by TSD. It describes the relationships between various aspects of bulk sampling (acquisition, treatment), the impacts that they can have on the differences between the descriptive statistics of the samples (grade, diamond size frequency, diamond concentration etc.) and the plausible range for the same statistics for the targeted kimberlite from which the samples were extracted.

An important distinction is made, between **the raw recovered grade, in-situ sampled grade** and the **in- situ modelled grade**.

The dry raw diluted recovered grade has been determined by using the actual weight of the diamonds recovered, divided by the calculated mass of kimberlite material that was extracted. In this case, the mass of kimberlite is calculated as the product of the volume of the drilling cavity, multiplied by the average density of the kimberlite for that sample. The average density is based on the measurements made on the subsections of pilot hole core (NQ) that was extracted adjacent to the LDD sample (Jeffcoate & Hiyoveni, 2016). Provided the pilot hole, and the subsample that is measured, is representative of the geology in the LDD hole (usually a reasonable assumption) then density measurements made on the drill core would be a good measure of the true density. The pilot hole approach is further evidence for the application of industry standard/best practice.

The calculation of the **in-situ sampled grade,** is based on an appropriate factorisation of the individual sample grade results, to account for differences between the measured and extracted mass of kimberlite and potential diamond loss due to diamond damage. It is specified at the size cut-offs used in the sampling and treatment process to account for the inefficiencies of the process near the bottom cut off size, and loss of diamonds below this size.

The **in-situ modelled grade** is derived by using a model size frequency distribution to derive a range for the total in-situ content. It uses assumptions associated with diamond distributions to extrapolate diamond content into sizes (both larger and smaller), that would not normally be recovered in a bulk sample of this size and type. Aspects of the fitted models are tested using simulated stone sampling. The in-situ modelled grade would have to be scaled, most often downward depending on the full-scale process technologies that are envisaged for mining and recovering the diamonds.

It is important to note that the data presented here do not constitute a mineral resource estimate as the data have not been spatially modelled in any way. The objective is to derive global deposit scale (as opposed to per lithology or estimation domain) indications of potential value ranges for variables that can be used to inform additional sampling that will be required to evaluate this deposit. These values should be considered as aspirational projections.

Objectives and Methodology

TSD supplied several documents containing information related to sample acquisition and processing (See Appendix 1 for document list). Interlaced has used this information based on the assumption that it is true and that it correctly represents the actions taken during, and results derived from, the sampling programme.

The primary objective of this report is to determine the plausible ranges for the recoverable in-situ diamond size frequency and average target grade for the BK16 kimberlite. The method used to assess the potential values for this target included the following steps :

Sample Analysis

- Use of the provided information, to assess the range of possible stone concentrations in 243 samples of 3.4 m^3, by modelling and simulating the stone concentration, based on results of the treatment of samples acquired by Large Diameter Drilling (LDD);
- Assessment of potential diamond losses that might be attributed to diamond breakage, quantification of the potential impact this may have had on the observed diamond size distribution and hence the resulting SFD model;

- Review of the recovered size distribution and simulation of samples of 502 stones from this distribution to determine the plausible range for the sampled grades;
- Review of sample $/ct to assess relationships between size and value

Global Modelling:

- Use of the model size frequency with the recovered size grade distribution to develop a plausible range for the in-situ grade-size model;
- Moderation of the derived grade size model and $/ct models through comparison with other producing operations;
- Use the diamond sales value ranges with grade size distribution models to obtain an indication of the plausible global range of in-situ recoverable $/tonne.

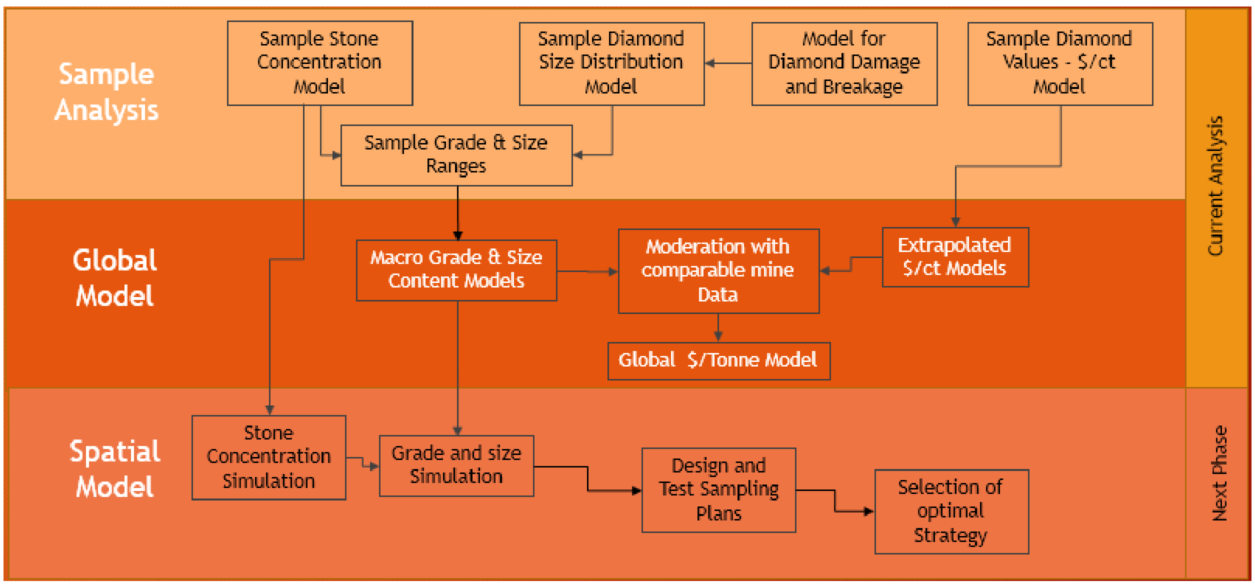


Figure 1: Schematic of methodology used in the analysis.

The analysis presented in this report has two main components, the first is an assessment of the ranges of values that the sampling may have returned due to the nature of diamond mineralisation. The second is the use of these ranges to generate plausible so called 'Global' values for the deposit.

The next phase of work will aim to extend the analysis to a spatial model. This will allow the impact of the spatial aspects of the variables to be analysed and incorporated in the ongoing design and development of an optimal evaluation strategy for BK16.

Geology

The deposit is a kimberlite pipe with a surface area of ~5.9 ha and is located in the Orapa Kimberlite Field of Botswana approximately 10km East of Letlhakane town (De Wit et al , 2017). The kimberlite has intruded through Archean granites and upwards through overlying sedimentary rocks and basalts of the Karoo Supergroup (Field, 2008). The pipe is overlain by some 25 m of Kalahari Group sediments. The pipe has been dated using uranium-lead radiometric analysis of 5 samples containing perovskite grains (Tappe, 2018) and has been shown to be to be slightly older (102 Ma) than the largest pipe AK01 (93.1 Ma) which is the source for the Orapa mine (Field et al., 2008). A model of the deposit is shown in Figure 2.

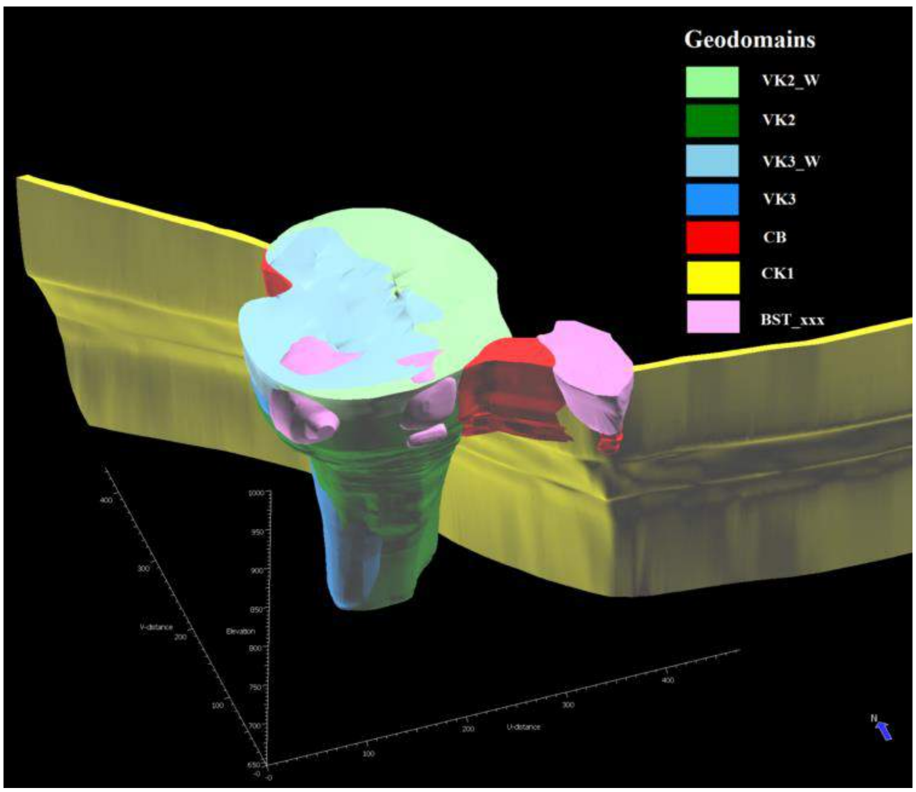


Figure 2: A perspective of the current model of the BK9 deposit (De Wit et al., 2017).

There are five main lithotypes that have been identified although two VK2 and VK3 are the largest by volume. The lithotypes are described by De Wit et al. (2017) as follows:

1. CB = Country Rock Contact Breccia. CB is highly diluted by country rock xenoliths. Bulk Density = 2.52 g/cm3.

2. VK2 = Volcaniclastic Kimberlite (Phase 2). VK2 phase is almost black when fresh and occupies the eastern part of the pipe. It has a magmaclastic texture and is a highly serpentinised volcaniclastic kimberlite with variable amounts of relatively unaltered basalt xenoliths. Bulk Density = 2.51 g/cm3, although when weathered is reduced to 2.31 g/cm3 (on average).

3. VK3 = Volcaniclastic Kimberlite (Phase 3). VK3 is generally a grey kimberlite when fresh and forms the western part of the pipe. It is a distinctively speckled volcaniclastic kimberlite due to common but relatively small (<10 cm) totally altered grey basalt xenoliths. Bulk Density = 2.54 g/cm3, although when weathered is reduced to 2.28 g/cm3 (on average).

4. VKxxx = Volcaniclastic Kimberlite. VKxxx is a basalt xenolith dominated (up to 88 % by volume) volcaniclastic kimberlite and occurs dominantly in the central upper part of the pipe. Bulk Density = 2.51 g/cm3.

5. CK1 = Coherent Kimberlite. CK1 is a minor part of the intrusion located in the southeast part of the pipe. It is a macrocrystic opaque-rich, and monticellite-phlogopite rich kimberlite phase. CK1 is interpreted as an early stage kimberlite dyke. Bulk Density = 2.40 g/cm3.

There are a number of marginal wall rock breccias including the BSTxxx phase. This phase is part of the kimberlite suite but at this stage has been excluded from the mineralised model due to its very high degree of dilution, its low volume and presumed very low grades.

LDD Sampling and Treatment

This section describes the drilling that was carried out and the treatment process used to recover diamonds. Several of the processes used can influence the range of diamond recovery and or loss that is experienced. This section describes the assumptions that have been made in the calculations, and also explains the sensitivity of forecasts to these assumptions.

Drill Chip Acquisition

Tsodilo resources have carried out an LDD program which commenced in 2016. This program has collected a calculated 2077 tonnes of material from 14 large diameter drillholes and achieved a total of 3120m of drilling. The deepest hole extended to over 368 m below surface. The top 25m of each hole were Kalahari Group sediments which was drilled but not retained for sampling.

The holes were drilled using the reverse flood air assist method, an industry best practice method designed to limit diamond damage. The extracted material was passed over a vibrating screen fitted with apertures measuring 1 mm x 1mm. 1441 tonnes of wet material were collected and weighed in the field, this suggests approximately 30% of the material was screened out to undersize. Undersize material was regularly sampled and screened to check for oversize; none of these samples reported +1mm contamination.

The volumes of the holes were determined by using the readings taken from a 3-arm calliper, with samples of the size of the hole taken every 1cm. Two holes LDD_026 and LDD_028 were not calipered. Volumes for these holes have been determined using a nominal hole diameter based on measurement of the drill bit diameter.

Density for each lift , approximately 12m intervals was based on facies averages derived from core holes. The density of approximately 30cm length of core was measured using a water displacement method (Jeffcoate & Hiyoveni , 2016.)

Figure 3 presents a schematic that shows the layout of LDD holes

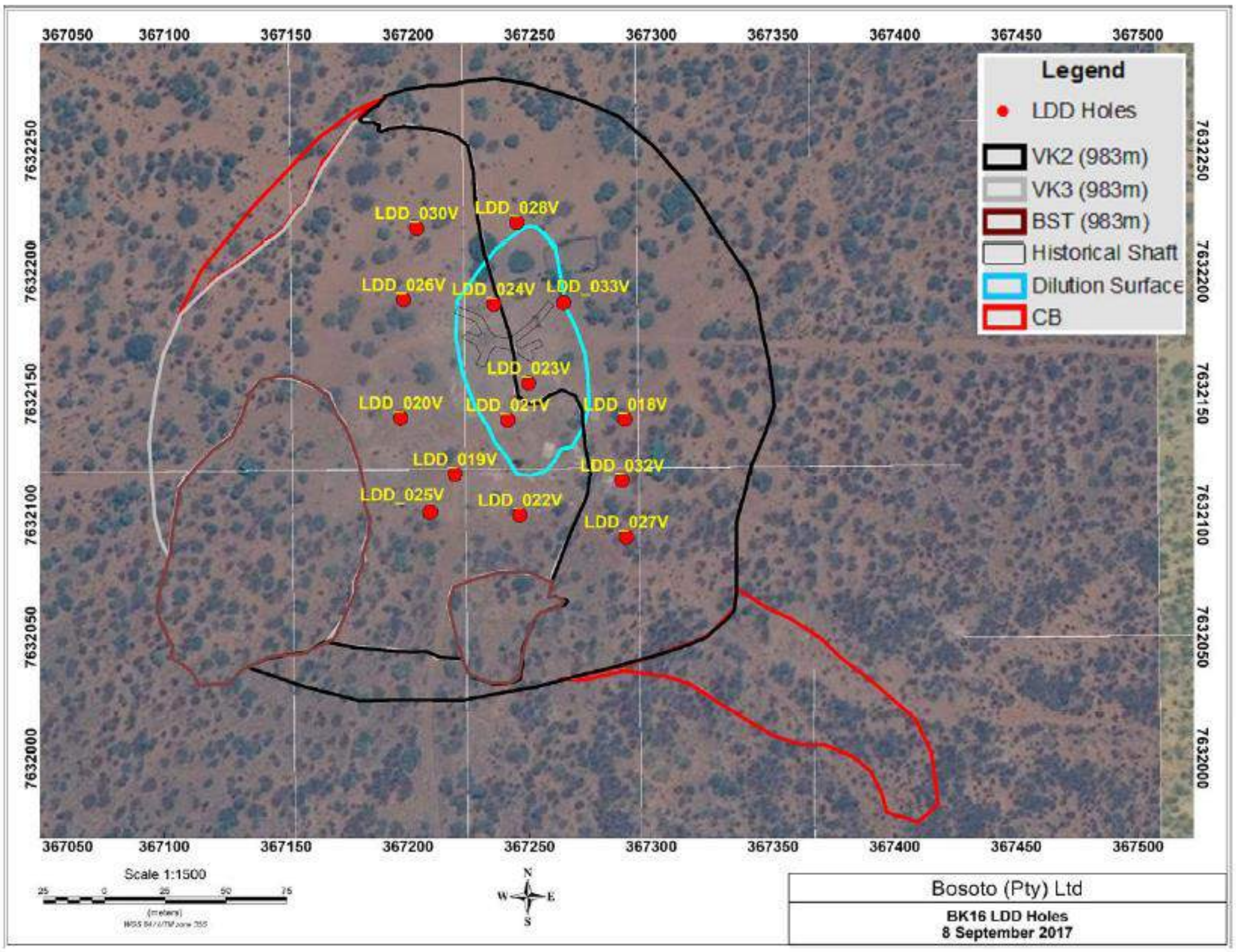


Figure 3:Schematic showing location of LDD Collars.

The summary descriptive statistics for the samples collected are shown in Table 1. Downhole traces of the raw diamond grade (in carats per hundred tonnes, or cpht) and $/ct are shown in appendix 3.

The volumetric ratios of dilution determined by logging of the pilot hole geology would be expected to exhibit a direct relationship to the recovered grade. This is only true of the breccia facies. This suggest that it would be very useful to distinguish types, and size distribution of diluting rock fragments in addition to the average magnitude of dilution.

Table 1: List of pertinent sampling statistics.

Descriptive Statistic	Value	Units
Holes	14	each
Total Volume	835.3	m3
Average Density	2.5	tonnes per m^3
Tonnes Kimberlite	2077	tonnes
Number of Samples	243	each
Average Volume per Sample	3.4	m3
Average Tonnes per sample	8.55	tonnes
Diamond Mass total	77.94	cts
Stones in Samples	503	each
Average Diamond Size	0.15	cts/stone
Stones per sample	2.1	stones/sample
Stones per m3 including baren samples	0.604	Stones/m^3
Stones per m3 excluding baren samples	0.77	Stones/m^3
Average Sample Grade	3.75	ctpht
Total Assessed Value	13,780	US $
$/Carat	176.80	$/ct
$/Tonne	6.63	$/tonne

Sample Processing

The process flow and summary of the sequence of treatment is shown in Figure 4.

In order to determine the dry mass of the bulk sample, samples were weighed on arrival and then a sub-sample was collected and dried under controlled conditions to determine the moisture content of the delivered sample. Readings from a weightometer on the headfeed to the process plant, were also taken prior and post the processing of each sample. (Jonker, 2018). Although this data has not been made available at this stage, it is recommended that it be cross checked against the tonnages derived from applying a sampled density to the excavated volume.

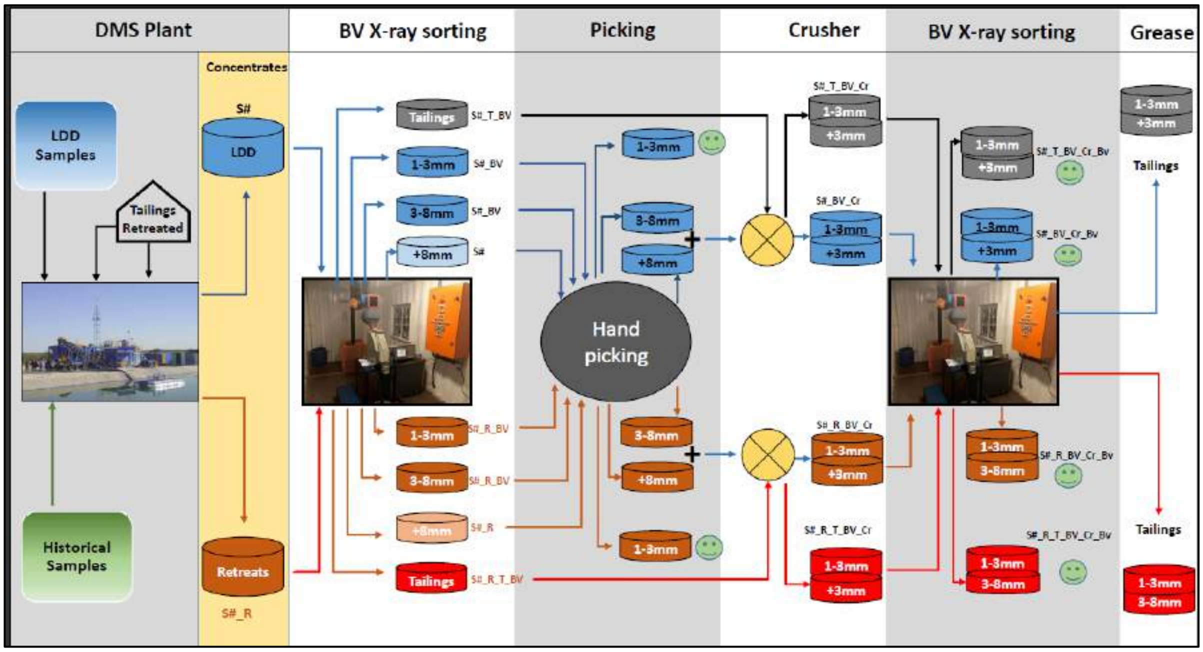


Figure 4: Schematic showing sequence of sample treatment (provided by TSD).

The feed preparation and primary crushing section operated in closed circuit with bottom cut size screen decks with an aperture of ~1mm by 13 mm. This circuit aimed to produce an effective cut point of ~1mm, equivalent to a +2-diamond sieve. Comminution was achieved via a jaw crusher with a 22mm closed side setting and a cone crusher with a 10mm close side setting. All of the product to the DMS was crushed to a size less than 12mm, the effective cut point of the 16mm x 16mm trommel that was used on the end of the scrubber, and no oversize material has been discarded (Jonker,2018)

In order to understand and track the degree of liberation that has been achieved, samples of the DMS tails and undersize could be collected, sized and analysed for kimberlite and waste content. It would be possible to use this information, with the mass balance, to assess the total grind of the kimberlite that has been processed, to verify the range in diamond liberation. At this stage no granulometry data has been made available.

The potential risk with deep LDD drilling is that the diamonds are well liberated and can potentially be exposed to the rigours of processing earlier in the process plant and hence more susceptible to damage and breakage. This impact is addressed in the analysis of damage section.

Final diamond recovery, weighing and sizing

The concentrates generated by the Dense Media Separation process were treated through a combination of X-ray recovery methods and finally audited with a grease recovery to detect slow rise time or low luminescent diamonds.

Planned subsequent audits and ongoing work on the concentrate will provide data to generate reasonable expected recoveries for both of these circuits by sequential analysis of samples from all tailing's streams. This data can be used to determine the potential losses that should be added back to determine the in-situ sample grade.

Discussion on Sample Collection and Processing

Each of the processes described above can have an impact on the number and size range of diamonds that were recovered, missed, lost, damaged or broken. This in turn will have an impact on the range of grade that could have been contained within these samples. Table 2 summarises these impacts and reflects on the ranges experienced at similar operations.

Table 2: List of possible impacts in each process area on diamond recovery and/ or loss.

Area	Variations to Quantify for Recovery Estimation	Data to Consider	Comments and Benchmarks
Geology	Definition of kimberlite contacts Internal dilution measures Selection of Volume of kimberlite Extracted vs Volume of Waste	Core logs, Facies definition, Contact identification, Wireframes Geology Samples, internal dilution measurements	Number of pierce points, average area per pierce point, variance due to contact interpretation is possibly of order ~5%
Sample Extraction	Extraction Loss Sorting Efficiency Mass Ingress to sample due to hole collapse Diamond 'smearing' between samples due to wall instability	Estimation of drilled out volume Cavity Mapping and models Samples of Discard undersize and Concentrate chips	Good control of LDD intervals. Limited indication of smearing of diamonds using comparison of downhole grades.
Treatment	Mass measurement Moisture Content -> Dry Mass Effective Bottom cut off Total Grind ->Liberation vs Lock-up Free loss to DMS Tails due to separation efficiency Damage in comminution	Delivered moisture content Slurry or Grits size samples Plant mass balance DMS Feed size distribution DMS feed rock type analysis DMS Tails Density Distribution	Bottom cut off~1mm, with some slotted screens Benchmark liberation ~85% to 95% Recovery Efficiencies DMS function of EP- good control reported. Audit process well defined and executed
Recovery	Grease Efficiency X-ray Losses Hang up Contamination Diamond Sieving Efficiency Diamond Weighing Accuracy	Comparison of DSF for each recovery stream Large stones in Audit Ct/Stn per lithotype vs Average	Expect 95% Rec of Recoverable on first pass X-Ray. Recovery still to be validated with audits that are ongoing

In this analysis a substantial proportion of range of the estimated diamond distribution is driven by the observed ratios of diamonds in sizes below 1ct that have been recovered from these samples. These ratios can be interpreted to suggest that the in-situ diamond distribution is coarse, and hence it would be likely that there would be an underrepresentation of the coarse diamond population in the treated samples. Any unaccounted-for loss of fine diamonds that is a result of sample extraction and processing could have a material impact on the derived range of values for the derived in-situ diamond SFD.

The assumption that there is a predictable diamond SFD in this kimberlite is based on prior studies (Davy, 1989, Ferreira, 2013). However, there are some kimberlites, e.g. Letšeng, where a predictable SFD may have been disturbed by loss of fines. (Bowen, 2009). It has been suggested that this is due to resorption of the smaller diamonds by the kimberlite magma. In Letšeng this idea is supported by the almost complete absence of sharp edged octahedra. The range of shapes that have been assessed in the samples from BK16 would appear to suggest that there is no evidence to reject the assumption of a predictable diamond SFD.

There is also an emerging evidence that the different energy regimes during emplacement may lead to local variations in diamond size frequency, that may be related to clast size through a principle of hydraulic equivalence (Field, 2009). The collection of twinned core suggests that it will be possible to review class size information for the samples collected to date. This may be particularly pertinent for the analysis of the geological context for the zero samples, as these may merely be a function of:

- small sample size;
- related to areas of far coarser diamond distribution; or
- exceptionally high dilution.

Anecdotal evidence suggests that in some deposits coarser diamonds may concentrate near the boundaries of coherent and breccia lithologies. This further emphasizes the need for careful geological interpretation of existing sample results and inclusion of as much geological insight as possible when planning for the next phase of sampling for this deposit.

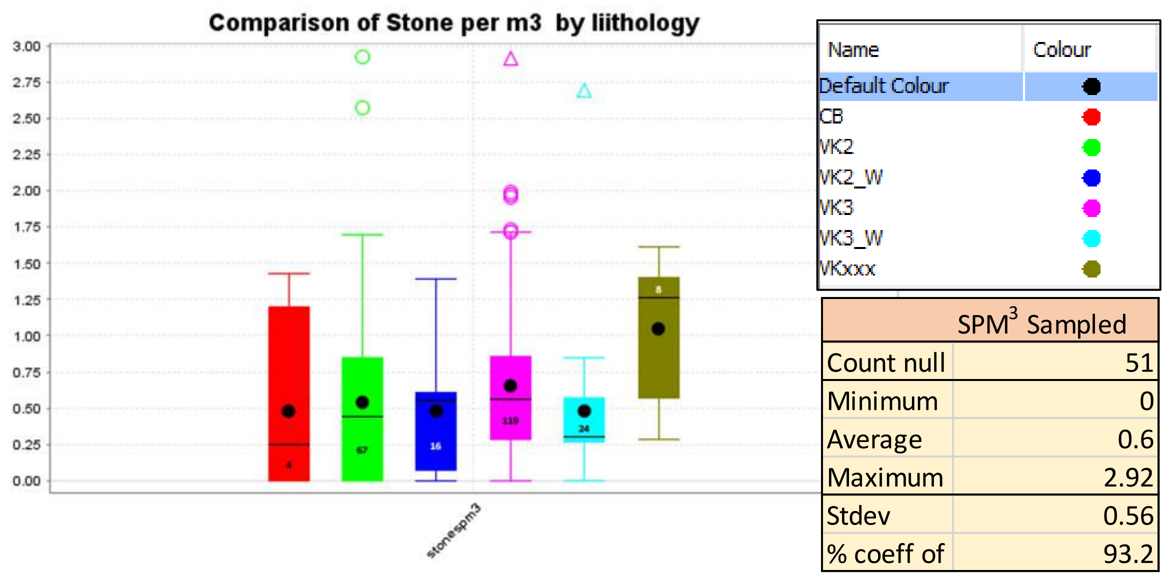
Sample Diamond Content Analysis

It is not the intent here to develop a classified reportable resource or reserve grade. It is however possible to use the SFD of the recovered diamonds to give some indication of the potential size frequency and grade range of this deposit, to support the development of an appropriate ongoing exploration strategy. The analysis begins with an assessment of the stone concentration variable in the samples and then moves onto assess the range of stone sizes in the samples.

The review of the processing of samples suggests that there has been good control on sample acquisition and treatment. Losses due to collection and processing of samples are expected to be minor (Jonker, 2018). Interlaced assumes that sampling has been conducted to industry standards and that the data generated are reliable. This section covers the use of sensitivity analysis and simulation methods, that can be applied to the diamond size distribution information, to form the basis for deriving a plausible range for the contained diamond distribution model.

Analysis of Sample Diamond Concentration

By dividing the count of number of stones in a sample by the volume of the sample, it is possible to express diamond concentration as the count of “stones per cubic meter" (SPM^3).



SPM^3 Sampled	
Count null	51
Minimum	0
Average	0.6
Maximum	2.92
Stdev	0.56
% coeff of	93.2

Figure 5: Box and whisker plot showing distribution of stone concentration grouped by lithology.

As shown in Figure 5, the distribution of SPM^3 values range from a low of zero to a maximum of 2.9.

A total of 51 samples returned values of zero (just over 20% of the samples), with the overall average across all lithologies being 0.6 SPM^3. Even though the samples with zero recoveries are most likely the function of the small sample support coarse diamond distribution and low grade, these samples may represent areas of low concentration and higher dilution. If these intersections are spatially coherent and size and location can be reliably modelled in space, it may be possible to evaluate the grade bearing areas/lithologies separately and reduce the total tonnes of contained kimberlite appropriately. The exclusion of these samples raises the stone concentration grade to 0.77 SPM^3 and increase of just over 27%. To do this reliably will require much closer spaced core sampling to be able to isolate large volumes of high dilution, and care should be taken to not exclude diamond bearing kimberlite.

The data also shows that the correlation between the dilution measured on twinned holes only correlates with grade in the CB facies, in the other facies the lack of correlation should be investigated further, for example by logging the waste type and size distribution.

The coefficient of variation of 93% for the SPM^3 variable suggests that at this sample support there is still a high variability between the samples. The samples were plotted spatially to assess the degree of spatial continuity. The downhole semi-variogram seems to suggest a very low nugget effect and a range of around 45m. This might be interpreted to imply that the SPM^3 variable is relatively continuous at short ranges (Figure 6).

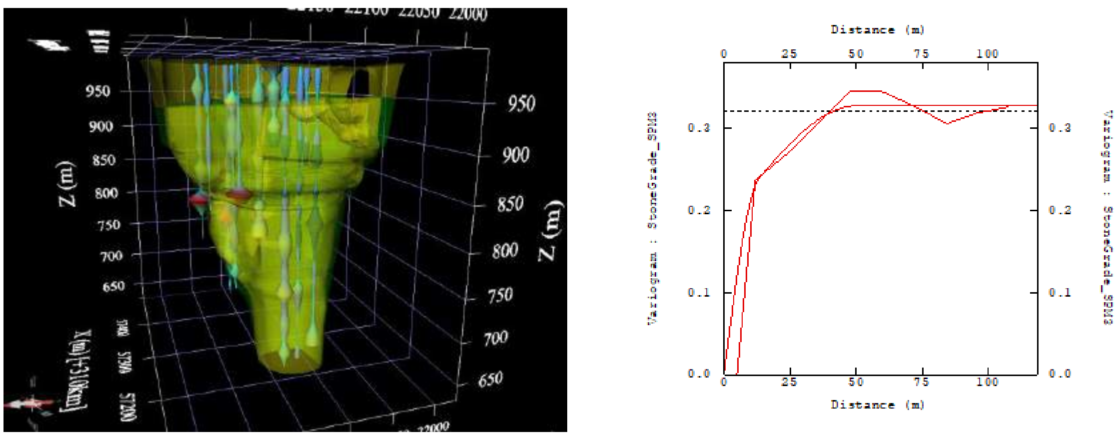


Figure 6: Layout of holes (left) and semi-variogram for the SPM^3 variable (right) with the diameter of hole traces indicating SPM^3 grade.

In order to assess the potential impact of this degree of variability on potential concentration variation, the distribution of stone concentration was modelled using a two-part Weibull distribution to accommodate the skew nature of this variable.

This distribution was then used to simulate the extraction of groups of 243 samples, the same number as already extracted from the BK16 deposit, one hundred times. The resulting average stone concentrations were sorted from lowest to highest and are plotted in Figure 7. This cumulative distribution plot can be used to determine the probability limits for the stone concentration range solely as a function of sample size. In this specific case the simulation suggests that the twentieth percentile (P20) to eightieth (P80) for stone concentration lies between 0.57 and 0.63 SPM^3.

Additional work on investigating the degree of spatial continuity that can be achieved with this support, can be carried out to improve the definition of the size and geometry of the next phase of sampling.

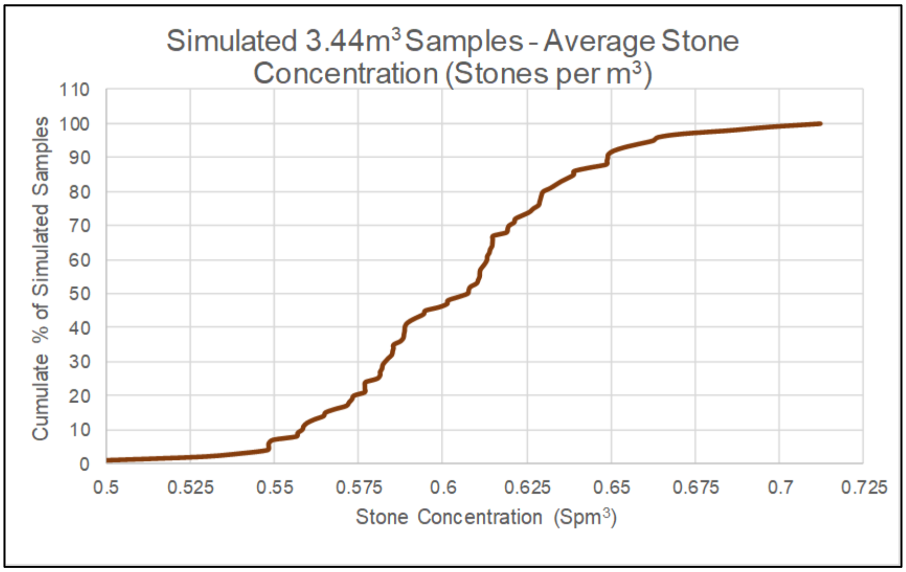


Figure 7: Cumulative distribution of stone concentration and model fitted.

Description of Sample Diamond Size Distribution

The distribution of sampled stone size is shown as a box and whisker plot for each lithology in Figure 8. In this representation east and west components of the VK2 and VK3 lithologies have been combined.

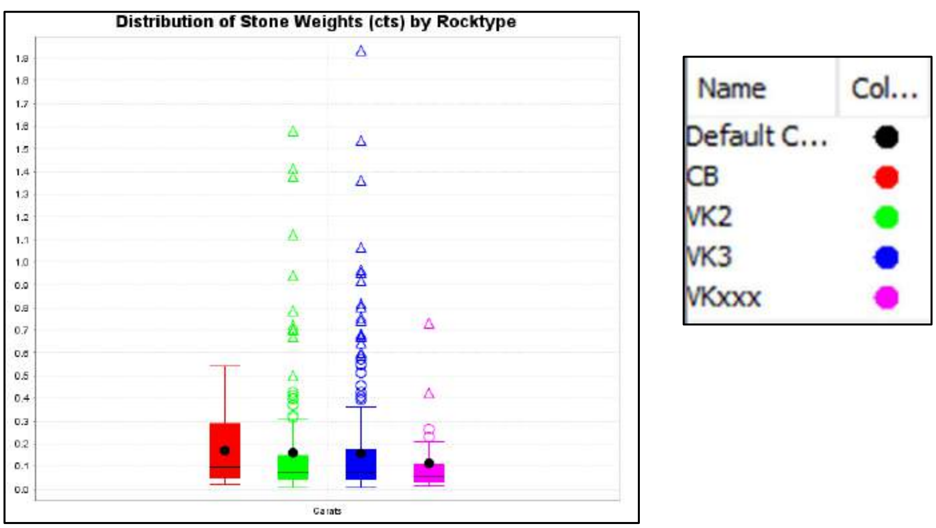


Figure 8: Box and whisker plot showing distribution of stone size grouped by lithology.

The VK2 and VK 3 lithologies display far more large stones than either of the breccia facies (CB and VKxxx) but this may also be a function of the higher mass of material that has been sampled from the VK2 and VK3 lithologies.

Clear geological delineation of the interface between the centre low grade core of the deposit, and the higher-grade bearing kimberlites, means that the sample results for VK2, VK3, CB and Vkxxx can be combined. This approach preserves the number of stones used in the analysis. Future work could target facies specific analysis.

It was noted that the proportion of good shapes (high makables and high sawables - see revenue analysis section) might have an impact on the distribution of mass within each sieve class. Figure 9 shows the plot of the stones as sieved vs a 'virtual' sieving that applies a strict stone mass cut off. As expected, the actual sieving reports a lower average stone size in each sieve than that achieved using a strict size cut off for each sieve class. By plotting the difference between the Standard DTC pool values (Davy, 1979) it is possible to detect differences of average stone size distribution within the size class. Although there are relatively small numbers of stones in each size class the chart suggests that the population in the +5 to +7 diamond sieves may exhibit an anomalous shape mix.

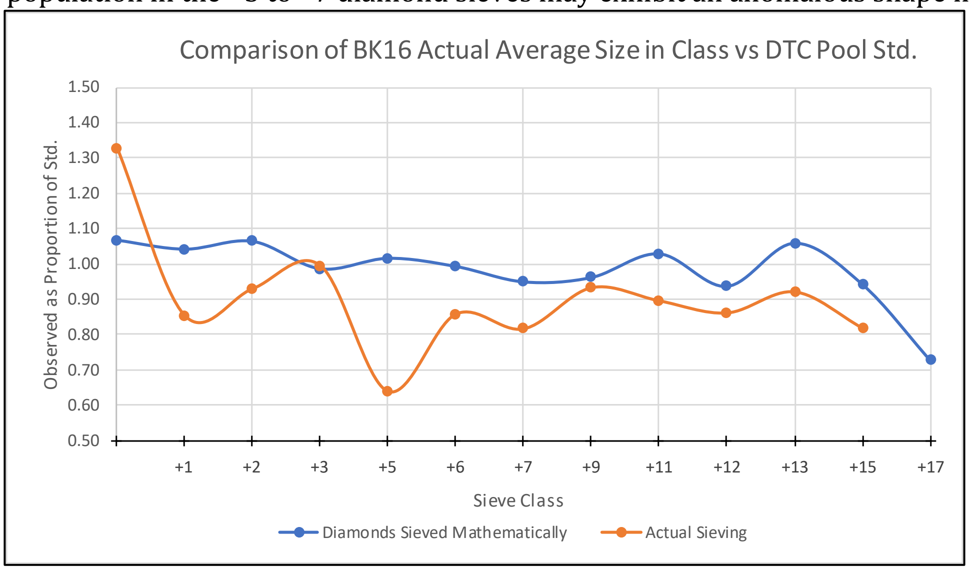


Figure 9: A plot comparing the Ratio of Actual sieved ct/stone on each sieve class (orange line) with a strict mathematical sieving (blue line).

The diamond size distribution can be represented in several ways; One is to plot a histogram of the % of cts reporting to each size class as shown in Figure 10.

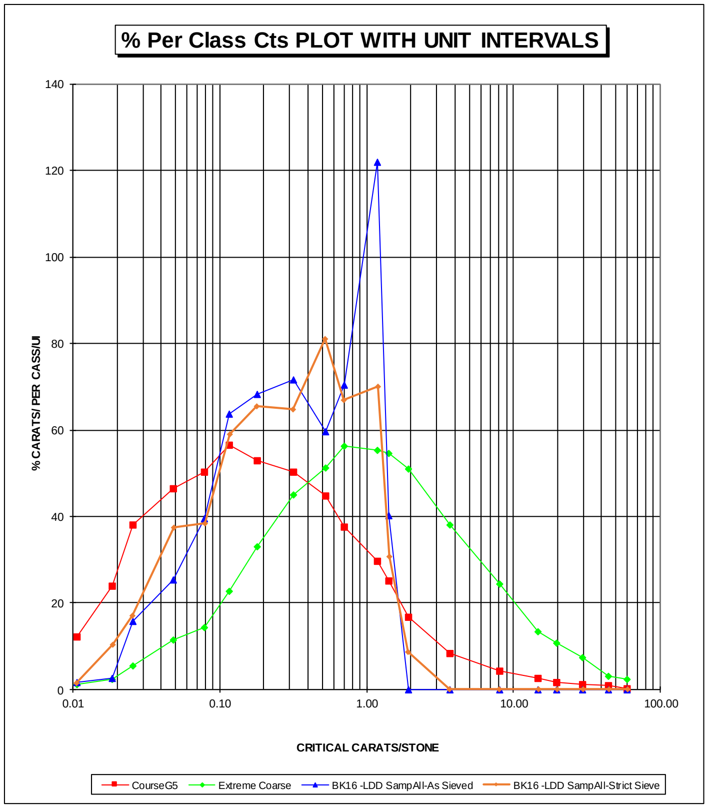


Figure 10:A plot of the percent of carats in each sieve class for BK16 samples (Blue and Gold) compared to a coarse (red)and very coarse parcel (Green).

Note that as a result of the use of unit intervals, the % in each class no longer sum to 100. It is evident that the sample distribution, as sieved shown in Blue, and the mathematical sieving in gold has a midpoint that lies between that of the two comparative distributions. The comparative coarse distribution is a production parcel from Premier Mine (Davy,1989) and the extreme coarse distribution is a size frequency model for Mothae (Telfer,2017) It is also possible to compare this distribution to other such as those demonstrated by Bosma(2015) and Telfer(2017) which is carried out later in this report. This comparison shows how the sample results from BK16 appear to decrease rapidly above a size of 1 ct. This is most likely a function of the low sample support /size.

It is possible to display the relationship between grade and diamond size by plotting the size of each sieve class against the recovered grade in that class. The traces shown in Figure 11 represent the distribution of production parcels from a coarse producer (red) and extremely coarse model (green). In this plot the recovered distribution (blue) for BK16 is still rising at 0.8cts/stone, suggesting that there could be a coarse population present. The assumption is made that the absence of larger stones is a function of the small sample support.

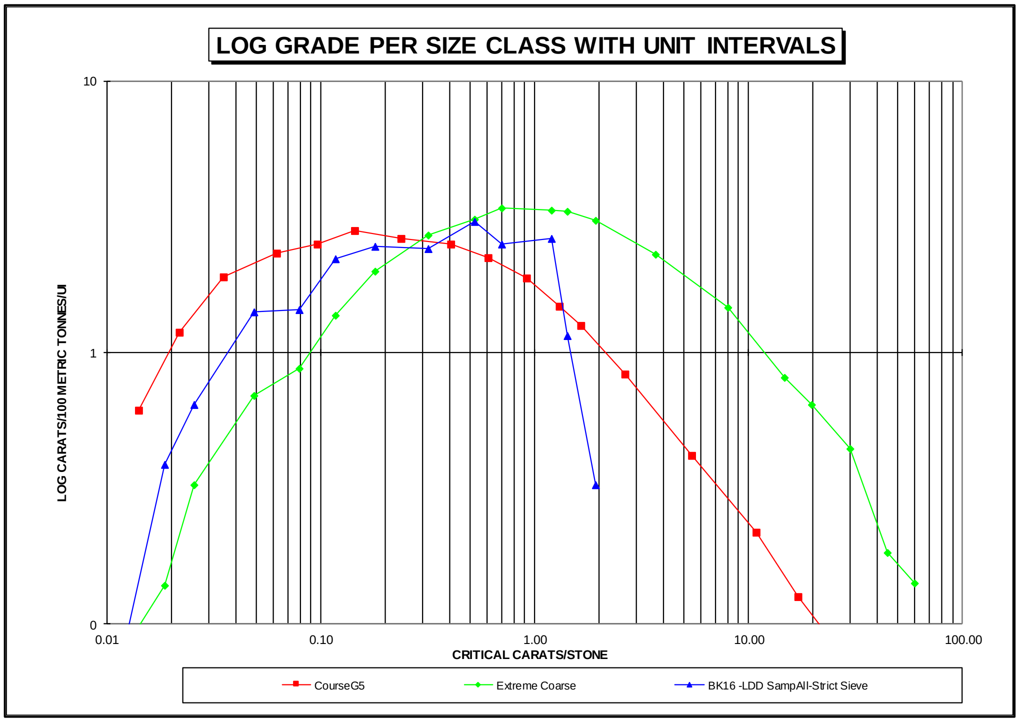


Figure 11: Size distribution of BK16 samples (Blue) compared to a course (Red)and very coarse producer(Green).

The largest recovered stone from BK16 LDD sampling weighs 1.935 cts (and may have weighed 1.99 cts without damage). In order to model the size distribution beyond this size requires extrapolation into higher size classes. Although the form of these SFD's are generally known (Ferreira, 2013), using other producers to constrain the size grade relationship provides a plausible approach to extrapolation of the recovered size distribution. This approach is also demonstrated below in the section where a comparison with Karowe mine is drawn.

Impact of Damage on Sample Diamond Size Distribution

The diamonds were valued and assed for damage during their valuation in Gaborone. Two assessors, Ferraris (2018) and Lawless (2018), assigned each stone to a damage class based on an interpretation of surface and internal features. This data was provided in the form of a spreadsheet without a description of the method.

The data can be displayed in several ways to show how the damage might be different across diamond sizes and types. Figure 12 shows a scatter plot for the diamond size on the x axis and the assessed value on the y axis. The observations are coloured and sized by the damage class with more severe damage in warmer colours and larger icons. As can been seen in this plot the larges degree of damage was incurred on stone sizes below 0.2cts.

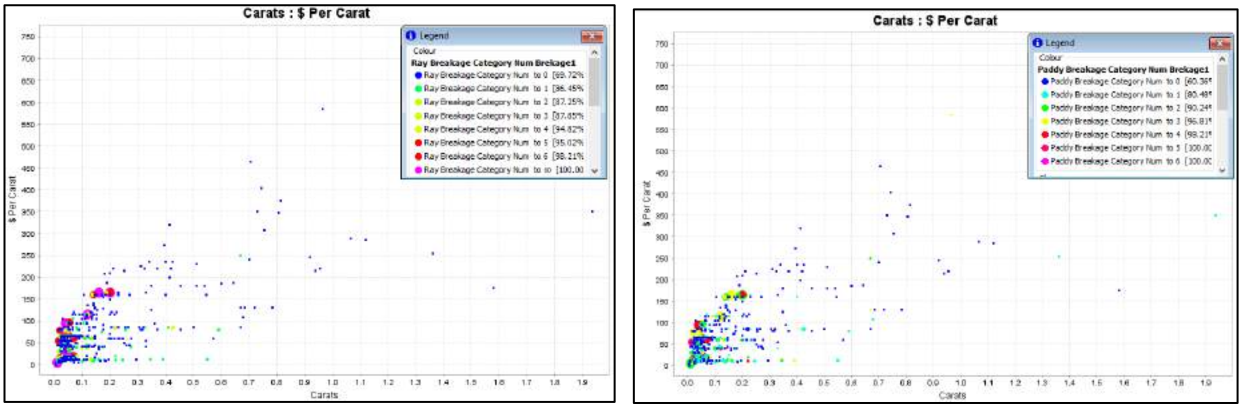


Figure 12: A plot comparing the damage assessments, of size vs $ per ct coloured by Ferraris damage class(Left) and the Lawless damage class (Right)

The Lawless data was also provided with a mapping to a reconstitution factor for mass. To determine the impact that the breakage might have had on the recovered diamond size frequency, the reconstitution factors were applied to each stone. This has the effect of increasing the total stone mass by 7 cts or roughly 9% of the recovered mass. The impact of value can be assessed by multiplying the new mass of each damaged stone by the average valued $/ct in each class. This increases the parcel value by just under 6% in total dollar terms.

However, as the total number of stones remain the same the stone distribution is only affected when there are stones that moved to a larger size fraction. The impact of stones that would be reallocated to different size fractions is depicted in Figure 13.

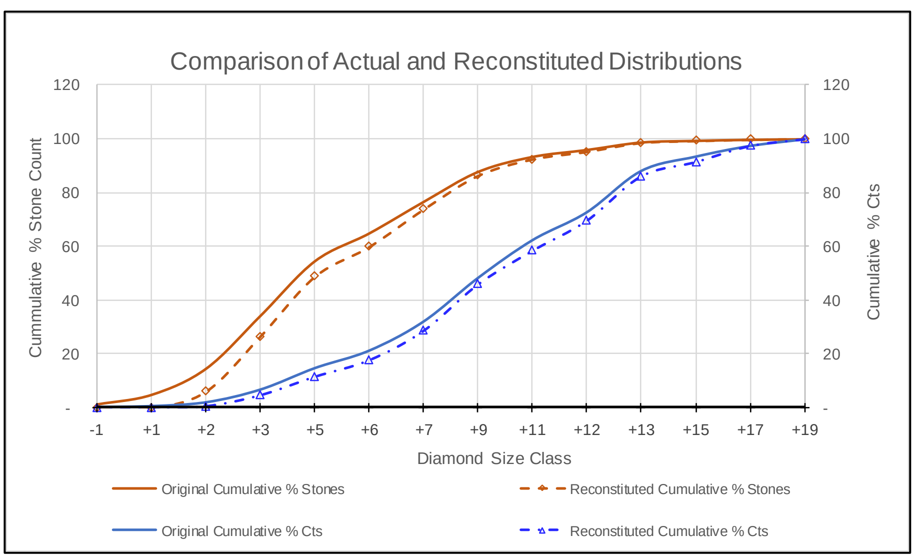


Figure 13: A plot comparing the change in carat distribution (blue) and stone distribution (orange) following application of reconstitution factors.

As can be seen from this plot the ct distribution increases in coarseness, and the change to the stone distribution is minimal, and concentrated in the smaller size fractions. This suggests that the damage that was assessed to have been incurred during sample acquisition and processing has a relatively limited impact on the models used to derive the recoverable in-situ diamond size distribution, a result of the good diamond sampling and recovery practices.

Sample SFD Modelling

A sample simulation model was developed to understand the impact of the small sample size and the relatively low abundance of stones of greater than 1ct in this sample. This model requires that the grade and size frequency of the distribution is represented using a skewed distribution function (Ferreira, 2013). The fitted function can then be used in the simulation of diamond recovery, to quantify a plausible range for the in-situ distribution and grade.

Sampled Stone Size Model

The size distribution model uses a base 10 log normal function that is fitted through the recovered sample size distribution to generate an assumed population size distribution. The fit is optimised by minimising the sum of square errors between the observed cumulative distribution and the model.

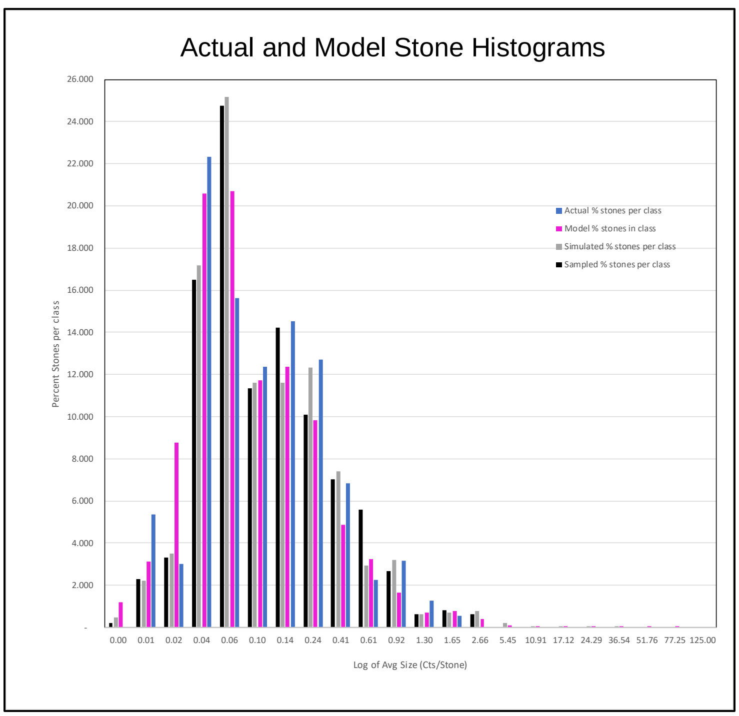


Figure 14: A histogram comparing the actual (blue) vs the model (pink) distribution fitted to the recovered diamond distribution, a simulated large sample distribution (Grey) and a small sample distribution (Black).

Following the initial fit the parameters are used to seed a 50 000 stone simulation, the results of this simulation are used to assess the sensitivity of the coarse end of the model to the input parameters.

The parameterised distribution is used to generate independent samples with a predetermined number of stones, in this case 502. Figure 14 presents histograms that include the actual observed size frequency, the fitted model, and distributions from 50 000 stone and 502 stone parcels.

Each simulated sample run will return a slightly different sample distribution, with the small samples containing a markedly finer SFD than the population model. The simulated samples can then be analysed to determine the range of the proportion of stones that are likely to be recovered in each size fraction distribution. These simulated samples can be analysed to determine the confidence intervals for the percentage of diamonds that are expected to be recovered in each size class as shown in Figure 15.

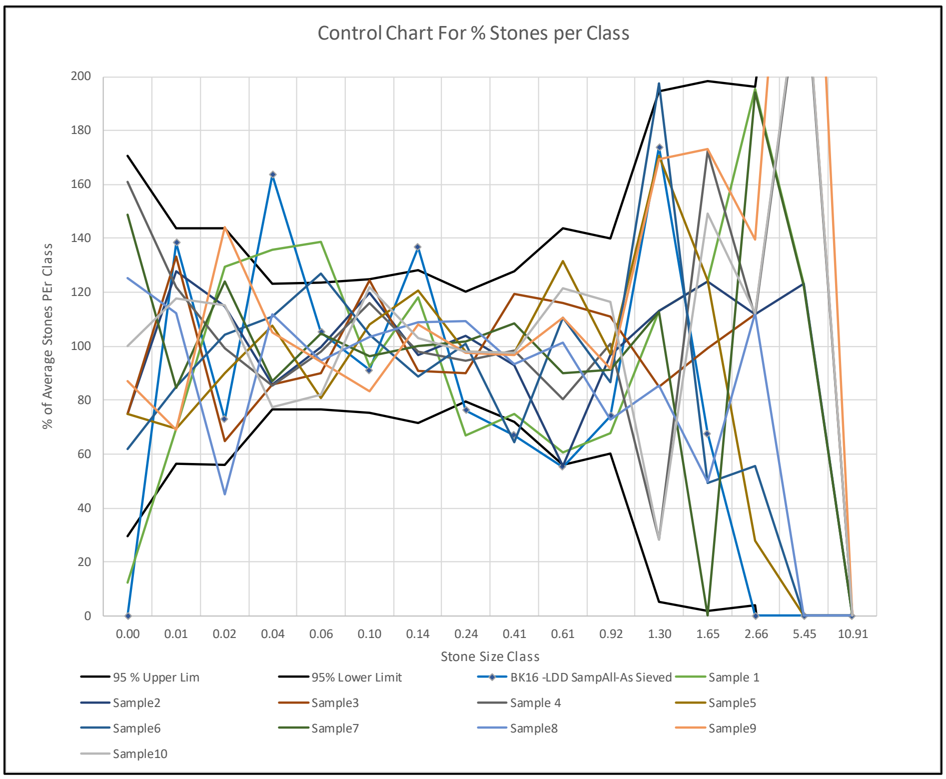


Figure 15: A control chart (Black) showing the range as a % of the average that can be expected in each size class, with individual samples shown in different colours.

The control chart shows how the distribution is constrained to within a range of ~ 20% per class for the middle size fractions (Figure 15). The variance increases appreciably above 0.24 cts and widens out to beyond 100% of the mean beyond 1ct.

A random set of 300 samples containing 502 stones from the model sample size distribution were simulated, to give some appreciation of the impact that the variation in the size distribution of the recovered stones might have on sample grade. The cumulative grades of the simulated samples have been plotted in Figure 16. This suggests that the grade could vary between a p20 of just over 4 cpht and a p80 of 5cpht.

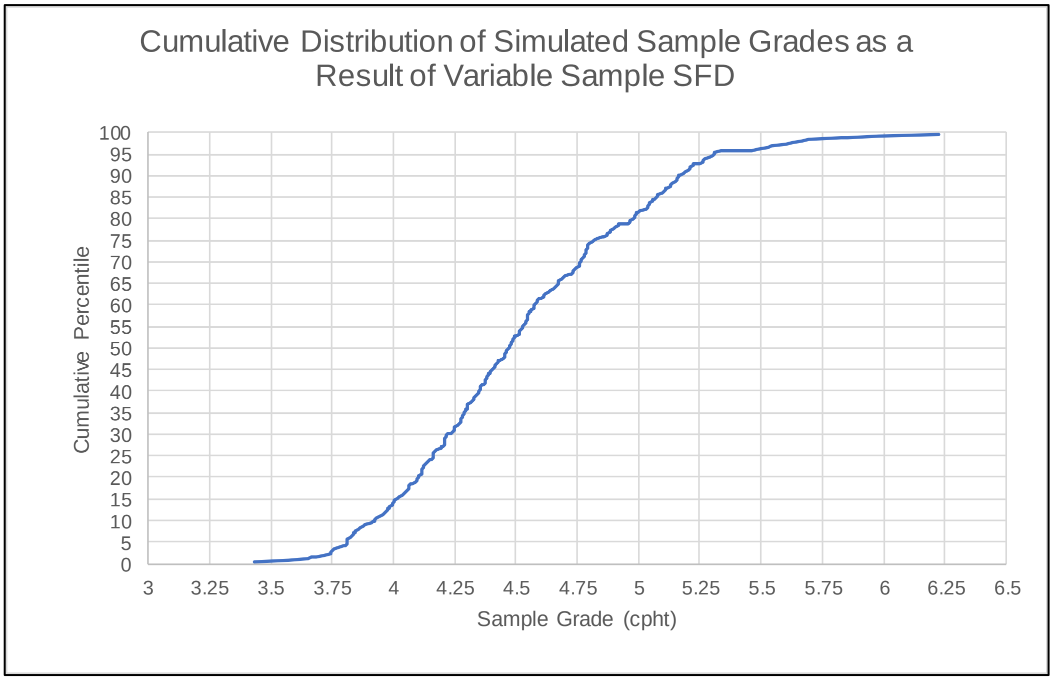


Figure 16: Cumulative distribution of simulated sample grades using the sample SFD.

Global Grade Size Modelling

It is possible to approximate the so called 'total content diamond distribution' by application of a curve fitting procedure to the recovered diamond distribution. Its output is based on the relationships that have been shown to exist between the size and concentration measures of diamonds in many kimberlite deposits (Ferreira, 2013). In this case 'stones per hundred tonne per size fraction' variable is used to combine size and grade. Although there has to date been no micro-diamond sampling at BK16, it is possible to apply a similar methodology to the macro-diamonds that have been recovered. The model is based on the fitting of a log normal function to the recovered stone grade distribution, by making some assumptions about the proportional loss of stones of sizes near the effective bottom cut off size.

It has been shown (Ferreira, 2013) that in many deposits that the grade size relationship can be modelled with a parameterised log function of the form shown in equation 1:

$$y = ax^2 + bx + c \qquad \text{Equation 1}$$

Where;
x is the natural log of the average weight retained in a given diamond size class; and
a, b, c are parameters fitted to the function.

The sample diamonds are plotted in natural log space and the parameters of the curve adjusted till the square of the errors between the observed grade per size class and modelled grade pers size class are minimised. The results of the curve fitting procedure to the results of the BK16 LDD samples is shown in Figure 17.

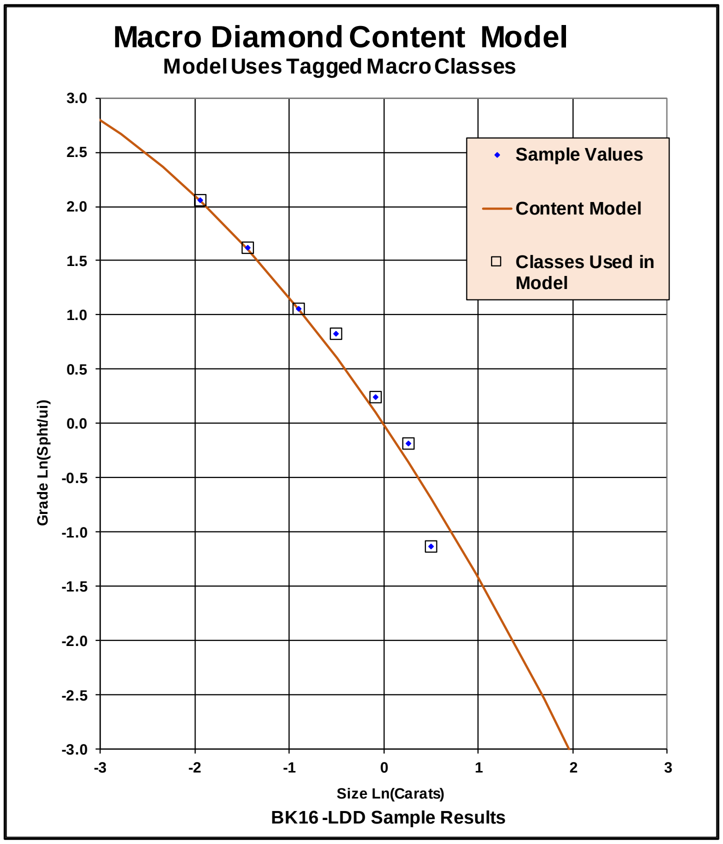


Figure 17: A plot of diamond size vs stone grade (SPHTUI) for the actual recovered diamonds and the fitted model.

The parameters used in the model are sensitive to the inclusion of size classes with low stone representation, the sizes where recovery of stones is impacted by lock up and lower cut off.

Several refinements to this model were made to the large size tail of the model distribution by comparing the model distribution to other size distributions. Figure 18 shows a fine and coarse model distributions compared to two alternative models. Note how the grade in larger sizes decreases in both comparison parcels. The BK16 model was manually adjusted to replicate this feature.

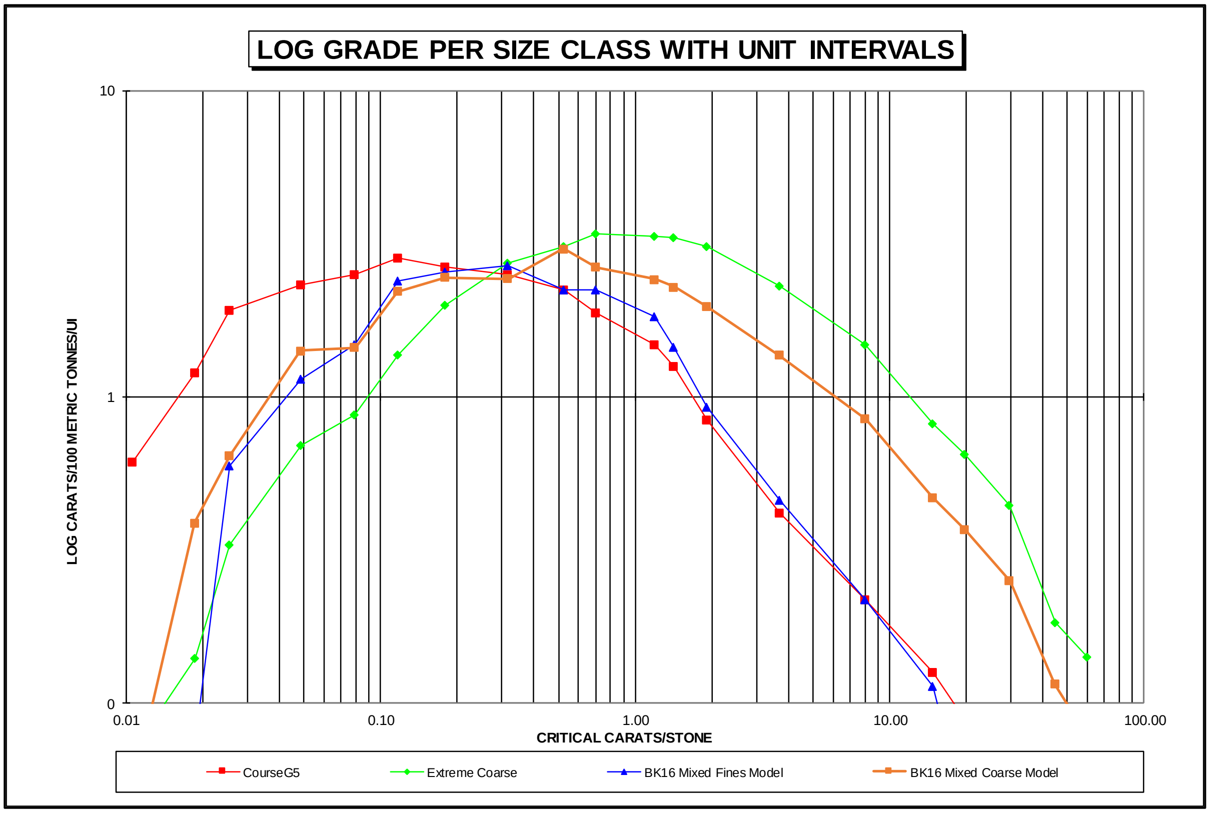


Figure 18: A plot of grade size showing the Mixed fine model(Blue),Mixed Coarse model (gold) for BK16 and a course (Red) and extremely coarse (Green) distribution.

It should be noted that it would also be possible to repeat the modelling using different weighted combinations of similar producer size distributions, as demonstrated in the section on Karowe mine. The selected distribution that is used in further analysis should be considered a coarse option which should provide an upper limit to the contained distribution. This distribution is considered appropriate for generating future sample designs but should be considered optimistic and not used for estimation.

To assess the sensitivity of the macro diamond content model to the parameters used, one hundred permutations of different combinations of the parameters were used as inputs to the model.

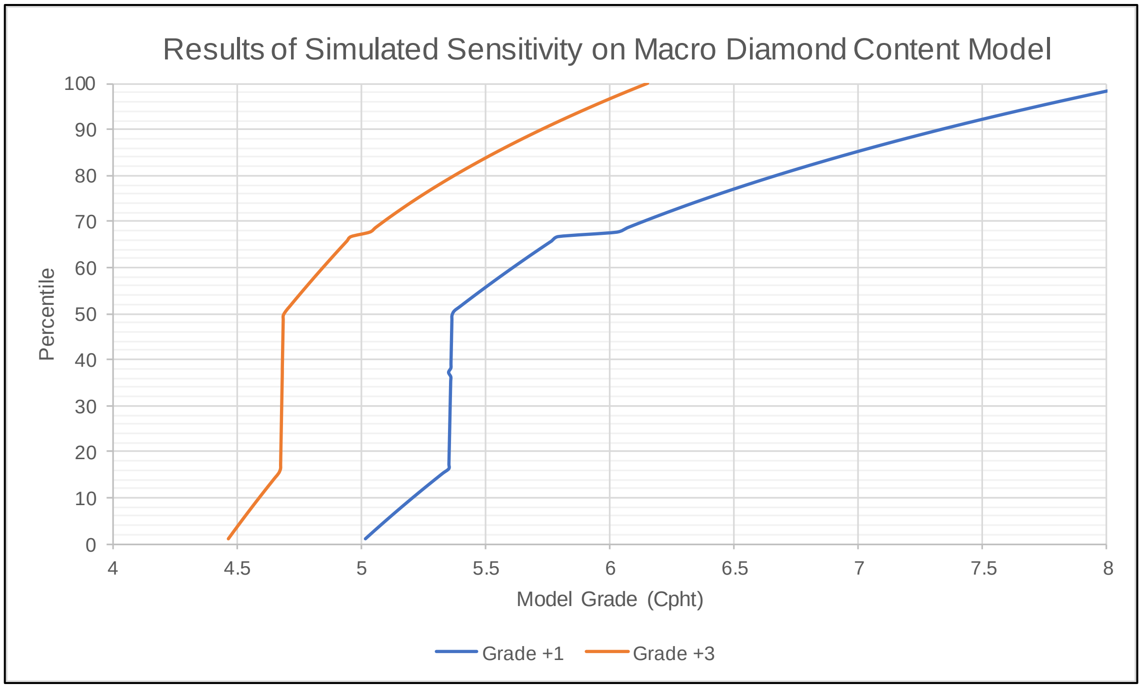


Figure 19: A plot of grade above cut off of +1 diamond sieve (Blue) and +3 diamond sieve (Orange) for 100 iterations of grade size model parameters.

This sensitivity analysis indicates that the fitted model uncertainty could result in a range of grade outputs from 4.6 cpht to 5,6cpht above+3 sieve cut-off , and range from 5,2 to 7,5 cpht above +1 sieve.

Revenue Distribution Analysis

The diamonds were sent to Gaberone where they were valued by Ray Ferraris of Kristal Dynamica (Ferraris,2018) and evaluated for damage by Dr. Paddy Lawless (Lawless, 2018)

The summary of the distribution of stone value, grouped by lithology is shown in Figure 20. The average value of the parcel is 177$/ct, with the highest value of 755 $/ct which was a for a stone acquired from the VK3 lithology. From these plots it is suggested that the range of values from the VK2 and VK3 lithologies has a higher spread than that from either of the two breccia facies CB and VKxxx, although this may be a function of the low numbers of samples acquired from the breccia facies.

At the same time as the diamonds were valued, the fresh damage to stones was also assessed, the results of that work have been presented in the analysis of the impact of damage section.

Ideally the value analysis would be carried out within each lithology, but in this case too few diamonds are available to assess the assortment by facies and so a global assessment has been carried out. In the next phase of sampling it is recommended that enough stones be acquired from each lithology for this purpose.

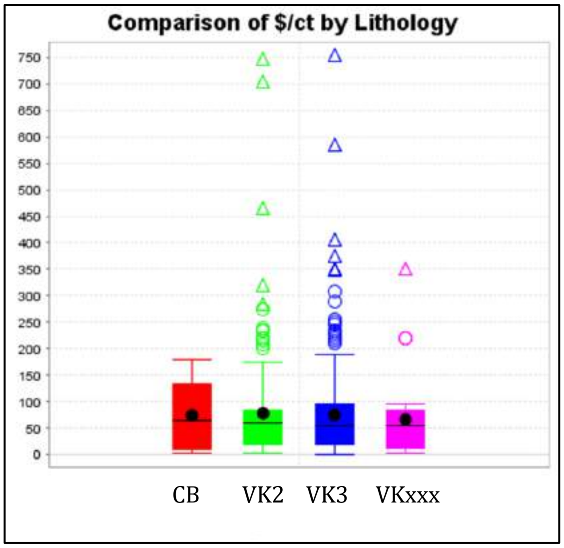


Figure 20:Box and whisker plot showing distribution of $/ct grouped by lithology.

The range of values can be ordered by size and plotted as a distribution of value within each size class. The percentile values can be joined across size classes. This allows a comparison of the spread of revenue changes with increasing diamond size. Figure 21 shows a plot of the diamonds with size on the x axis and value on the y axis. Both scales are converted to natural logs. The labels on the axes can be read directly and each line represents a percentile for a given size class.

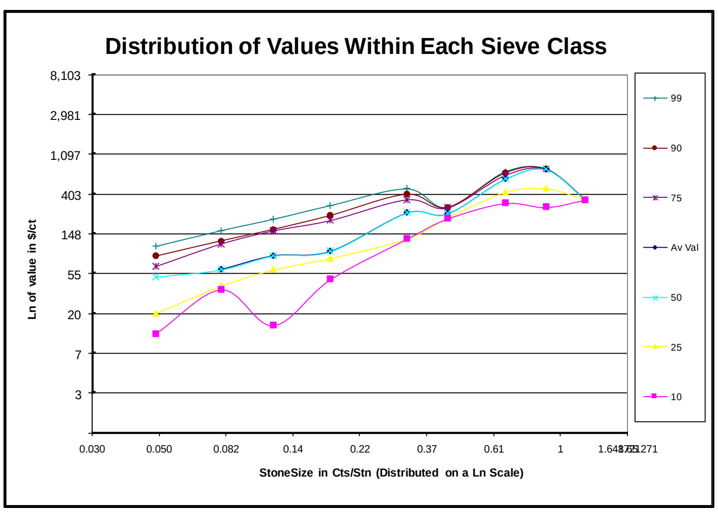


Figure 21: A natural log-log plot of size vs value per class for the sampled diamonds, showing the percentiles for value in each class.

The plot shows that in the finer size ranges,0.05cts to 0.3 ct/stone show a reasonable spread of values within size class and that beyond one carat the spread is greatly diminished. It is encouraging to note the constant upward trend in value across the finer sizes.

As the diamonds had been individually valued and described in detail (Ferraris, 2018) it is possible to plot the diamond assortment by main article groups.

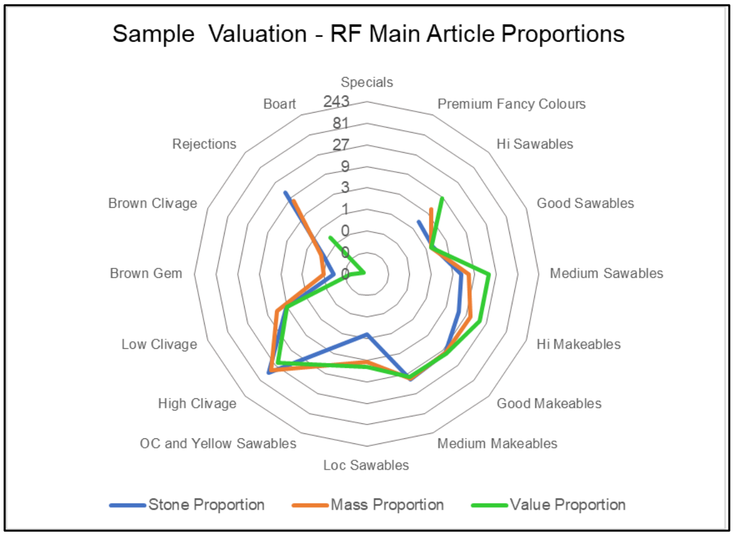


Figure 22: A radar plot of the sample diamonds grouped by RF main article proportions.

A large portion of the value in the distribution lies in the 'high and low clivage' and 'medium sawables' and 'hi makables' areas (Figure 22). It is worth noting that there is a diminishing proportion of low-quality rejections in the recovered sample above sieve size +13.

To model the revenue distribution would normally require the fitting of the distribution for revenue within each size class. In this case however there are too few stones to do this with any reliability. Hence an extrapolation model of the average within class $/ct is a possible approach to derive a range of plausible values for stones that are greater in size than those observed in the sample. **NB:** It must be noted that this is an aspirational method of arriving at a potential valuation and will have to be treated with due caution until enough stones have been recovered to validate or invalidate any of the projections made.

Three methods of extrapolating value have been used:

- Model 1 – Traditional conservative extrapolation of maximum observed value into upper classes in which the value of the highest observed $/ct is kept constant into the higher size fractions;
- Model 2 – Incremental model based on increment of value across last few populated size classes, this proportional increment is then extended into the higher classes; and
- Model 3 – Optimistic model based on the assortment remaining the same into upper classes, this assumes that the relationship of between value and size is unaffected in the larger categories, this is a very optimistic assumption.

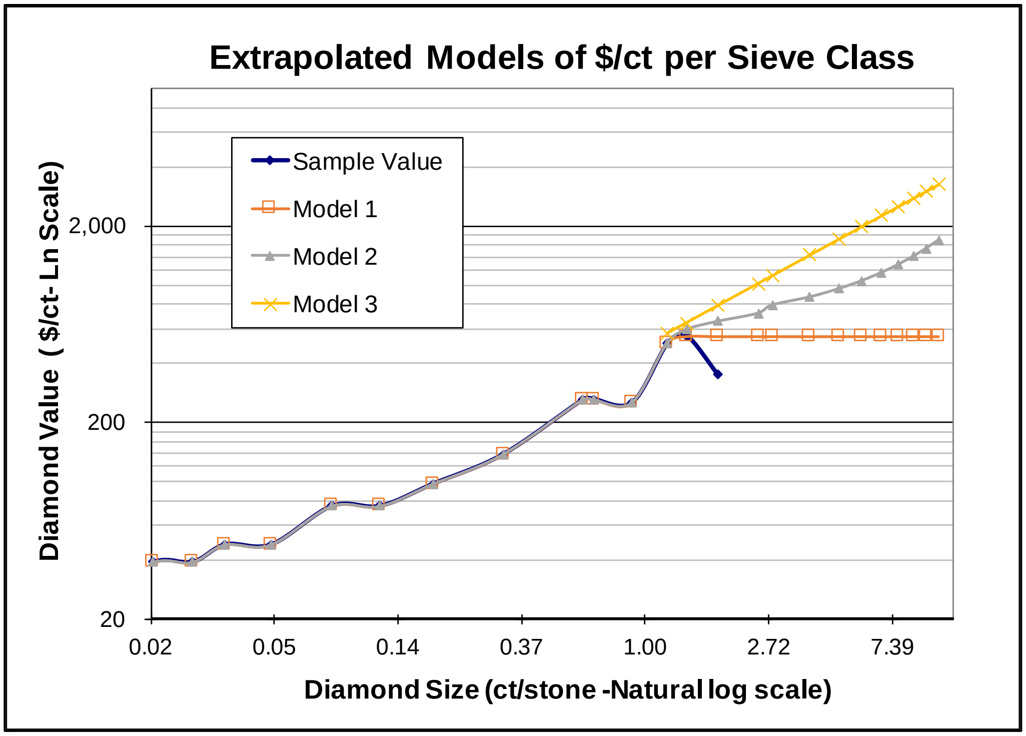


Figure 23: Plot of average $/ct per sieve class overlain with the three Extrapolated models for value in classes that have no diamonds.

These diamond values can then be applied to the coarse model of the Size Frequency distribution to determine the average overall $/ ct value that might be possible should these values be observed.

The average modelled $/ct for each model are as follows:

- Model 1 – This model returns a value of 298 $/ct average with 70% of revenue coming from extrapolation;
- Model 2 –This model returns a value of 453 $/ct with 80% of the revenue from extrapolation.
- Model 3 – 792 $/ct with 84% of revenue coming from extrapolation, in this model it is also interesting to note that removing the value from the +10.8 ct size fraction will reduce the total revenue by over $26,000, and that this model is very sensitive to the fitted parameters especially the slope of the distribution.

It is likely that the actual revenue will plausibly lie somewhere in between these limits if the large diamond component is present and there are not underlying factors that reduce the quality of the larger diamonds, in a linear fashion with increasing size. e.g., increasing inclusions, internal faults etc.

Comparison to Karowe

Karowe operates in the vicinity of this deposit. This mine has operated for several years and has publicly reported recovered grades and revenues. These grades and their variability can provide insight into the potential relationships that exist between sample results and production outcomes.

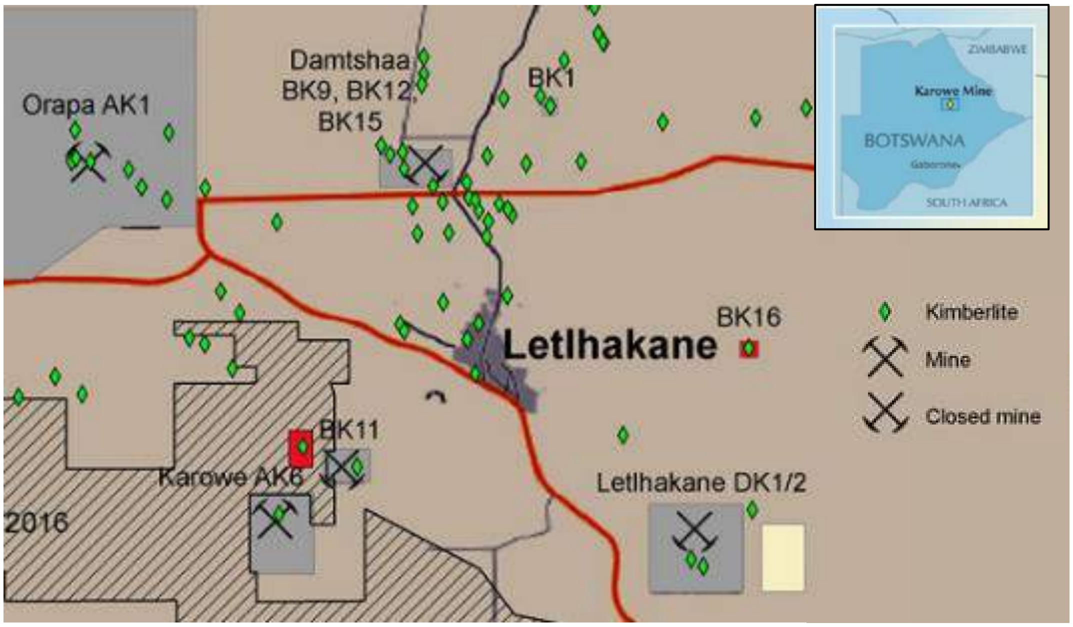


Figure 24: Location map of BK16 and Karowe mine (adapted after Campbell and Jooste, 2017 and Bruchs, 2018).

The Karowe Mine mines the AK6 deposit. The deposit was initially evaluated by De Beers and subsequently brought to production by Boteti (Campbell et al., 2017). A feasibility study in underway to assess an underground development for this operation to extend its life by several years (Oberholzer et al., 2017). In this study information is presented that facilitates the comparison of the LDD results with production.

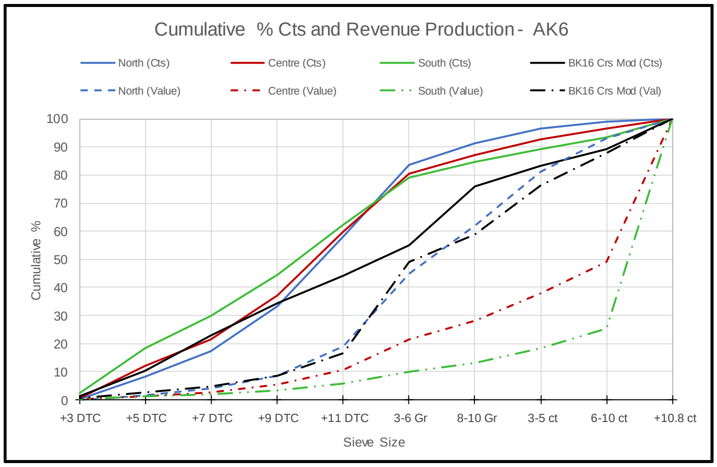


Figure 25: A plot of the Cumulative percentage cts (Solid lines) and the cumulative % value for Karowe mine production for 2013 grouped by lobe (adapted after Oberholzer 2017).

The carat and revenue distributions from 2013 production (Figure 25) shows how the carat mass cumulates far quicker than the revenue with increasing size. Note that the ct distributions show that just over 80 % of the cts lie below 3gr with a very small spread in ct size distribution. At this point however only 10% of the south lobe revenue is realised, whereas over 40% of the North lobe revenue has been recovered. This spread in revenue increases above 10cts. Only 8% of revenue for the north lobe, 50% for the centre lobe and almost 75% for the South lobe lies above this size. In ct terms the spread is far smaller.

The BK16 Model for size (black solid line) and revenue (dotted black line) are also shown in this figure. The size distribution tracks the centre lobe till around +9 sieve, and thereafter becomes coarser than the AK6 distributions. The revenue model tracks quite closely to the North lobe values for AK6.

The same document presents size distributions for the diamonds recovered from LDD samples. The results of sampling programmes on each lobe are displayed in Table 3: LDD statistics from Karowe Mine, compared to BK16 (adapted after Oberholzer et al. 2018)..

Table 3: LDD statistics from Karowe Mine, compared to BK16 (adapted after Oberholzer et al. 2018).

Statistic	Unit	AK6				BK16
		North	Centre	South	Total	
Volume	m^3	145	369	1,309	1,823	835
Weight of sample	tonnes	384	978	3,469	4,831	2,077
Stones	Count	856	2,647	10,535	14,038	503
Diamond weight	Cts	94	239	809	1,143	78
Stone Concentration	Stones/m^3	5.90	7.17	8.05	7.70	0.60
Average stone size	Cts/stone	0.11	0.09	0.08	0.08	0.15

It is evident from these figures that the north lobe sampling has a similar order of magnitude to BK16 current status, although the stone concentration is greater. The total programme however included almost 5000 tonnes to deliver 14 thousand stones.

It is possible to compare the size distributions derived from the AK6 sampling and production with the BK16 sample data (Figure 26). In this plot the BK16 LDD distribution (Red) can be compared with the AK6 North pipe LDD results (Green). The two sets of samples show a similar form and spread with the BK16 samples having a similar coarse range to the AK6 north samples. At 1 ct the two sample curves show that approximately 15%of cts are above 1ct.

The Coarse BK16 model (Blue) tracks relatively closely to the reported North (Purple) and South lobe (Black) production curves up to 0.1cts. At 1 ct the LDD samples contain roughly 15% of their mass above this size, however the observed production data from AK6 shows that almost 30% of the carats are recovered are above this size.

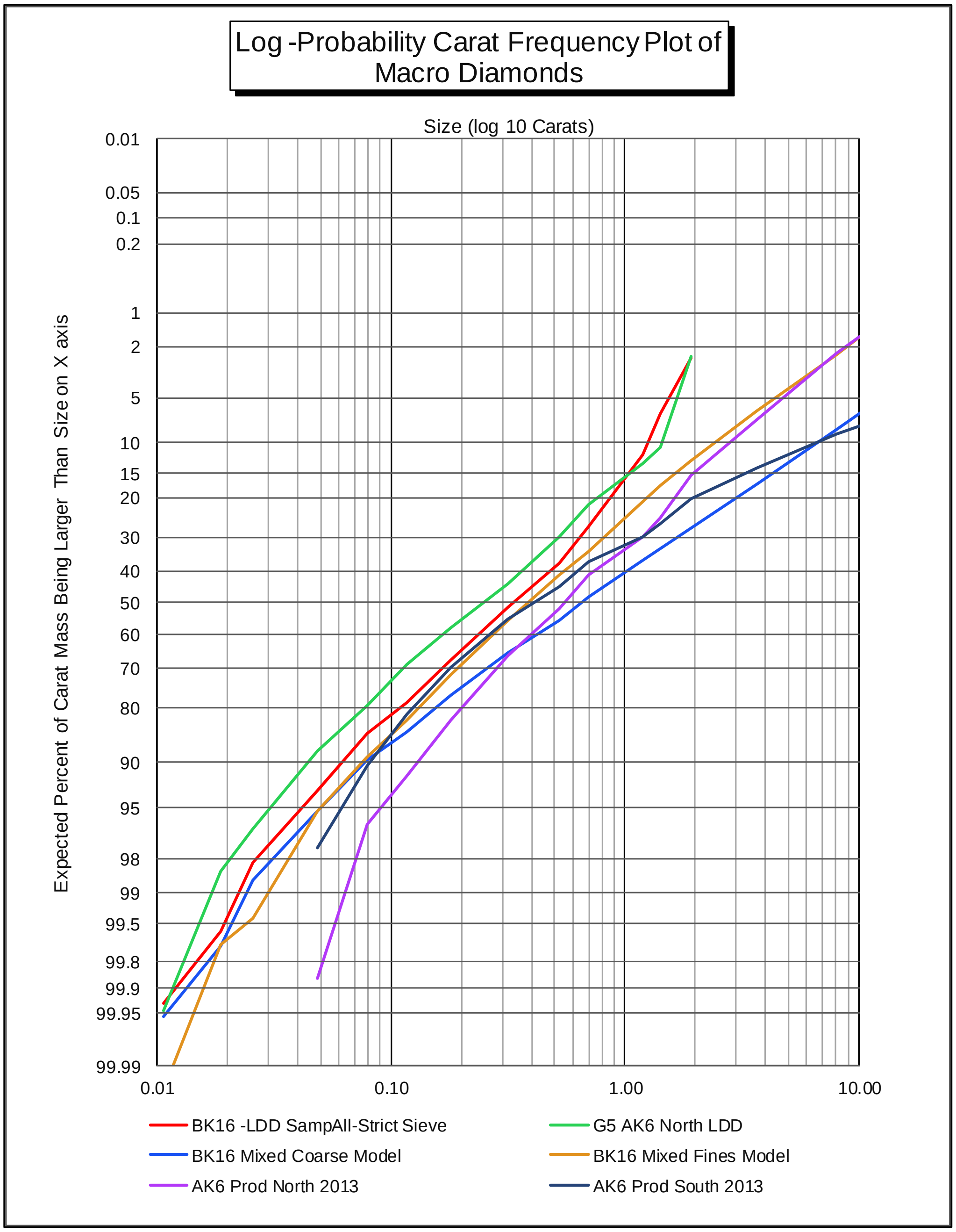


Figure 26: A plot of Size Distribution of BK16 LDD samples (Red) with AK6 North lobe Samples (Green), the mixed coarse model (blue) and mixed fines model (brown) and 2 production parcels for AK6 (purple and black).

This data can also be plotted as a grade size plot. In Figure 27 a comparison is made between the BK16 mixed coarse model and the AK6 production adjusted to a grade of 5cpht in order to assess the similarity in the shape of the diamond distributions.

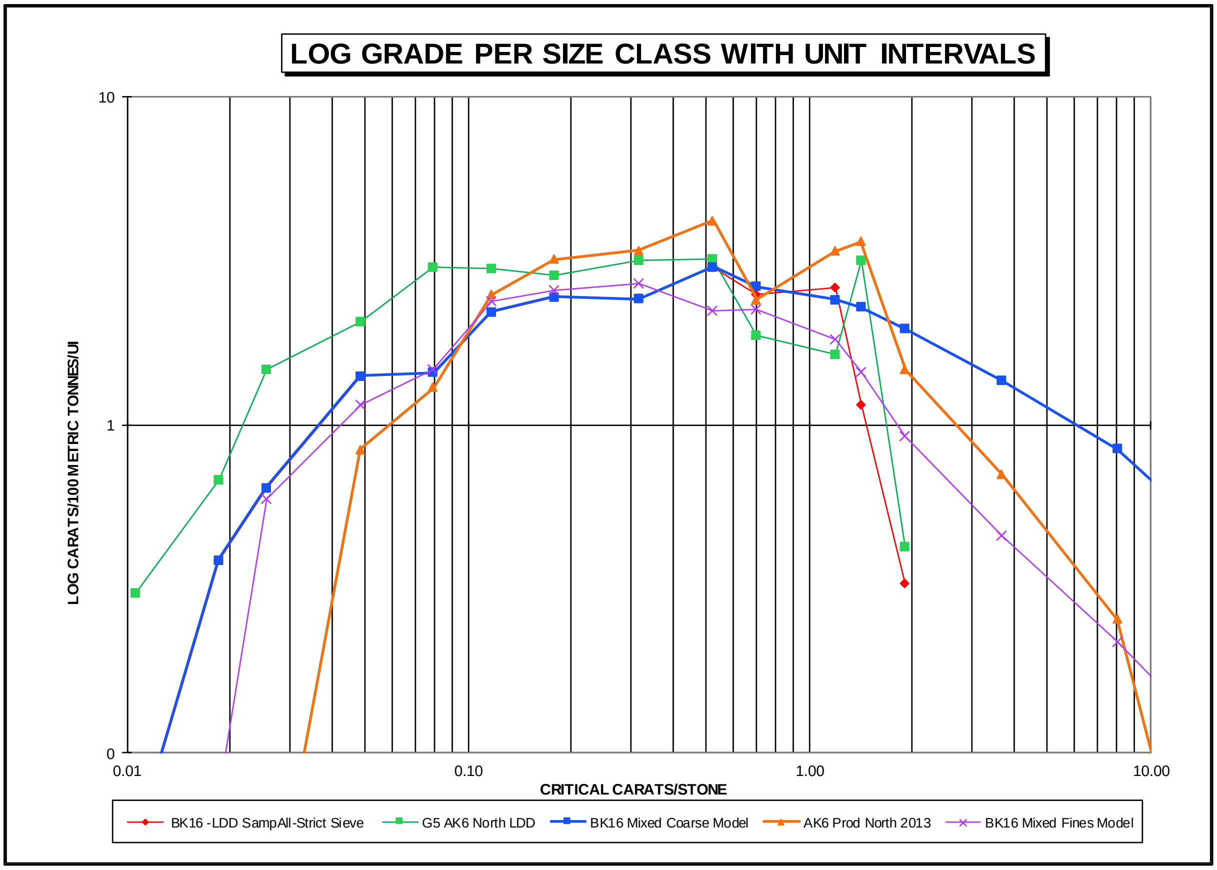


Figure 27: A plot of grade vs size for BK16 samples(Red) and AK6 samples at a grade of 5cpht(Green), as well as the BK16 coarse model (Blue), and BK16 fine model (Purple), and AK6 North production(Gold).

The LDD results suggest that the spread of grade across diamond size for BK16(Red) is limited but the peak seems almost the same as that for AK6(Green) The modelled mixed coarse distribution for BK16 (Blue) follows a similar shape to the AK6 production north (Gold) overall but is slightly coarser in the +1ct range, the fine model matches more closely with the AK6 production from the north lobe. This reinforces the sense that the fitted "Mixed Coarse BK16" distribution should be considered an optimistically coarse fit.

These two grade size distributions can be used with the $/ct models to compare the revenue curves with the AK6 production values. At this stage it has not been possible to quote original bench valuations for AK6. These may be useful to investigate which aspects of the qualities of stones were initially observed and to model the change in assortment as more stones became available.

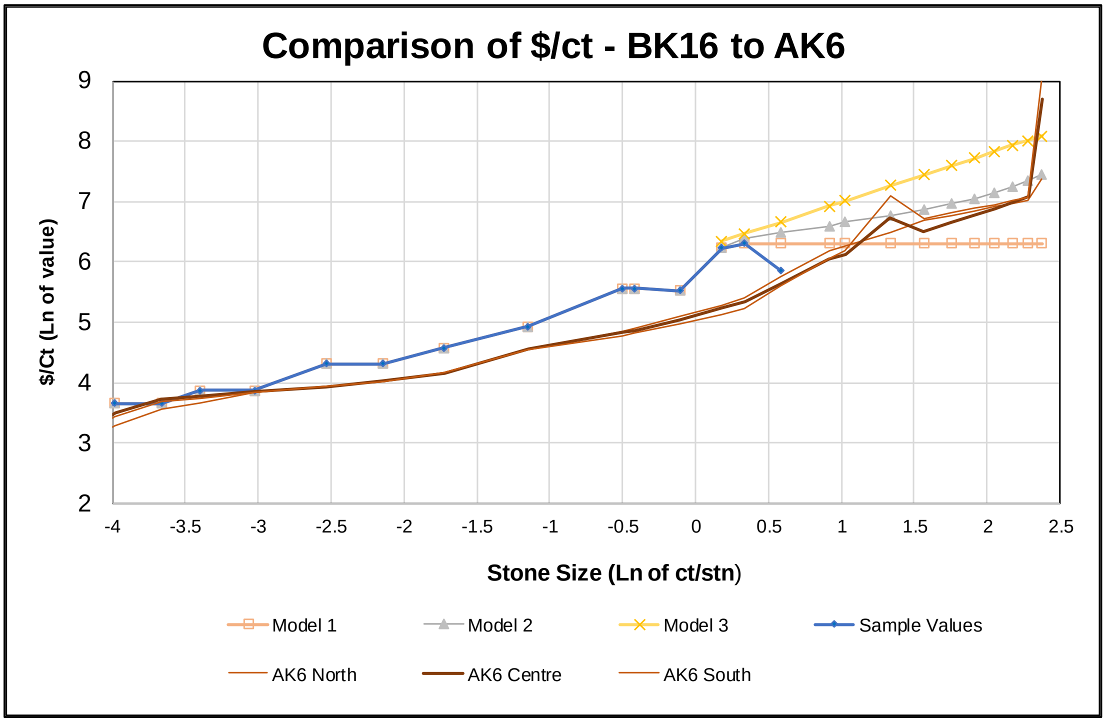


Figure 28: A plot of $/ct per sieve class vs stone size comparing the models developed for BK16 vs the production $/ct/sieve class for AK6.

The sample values and models generated from BK16 seem to be higher than that for Karowe in the fine size range. Above one carat however the revenue per ct seems to increase in slope for Karowe and has a large jump in the stones above 10cts. Alas no exceptionally large high values stones of this size have been recovered from BK16. At this stage it is not possible to predict the shape of the value curve beyond the application of extrapolations already presented and even these should be treated with due caution.

Given the coarse diamond proportion at Karowe, published data can be used to show how the relationship between tonnage treated and representivity in the coarse diamond size fraction cumulates.

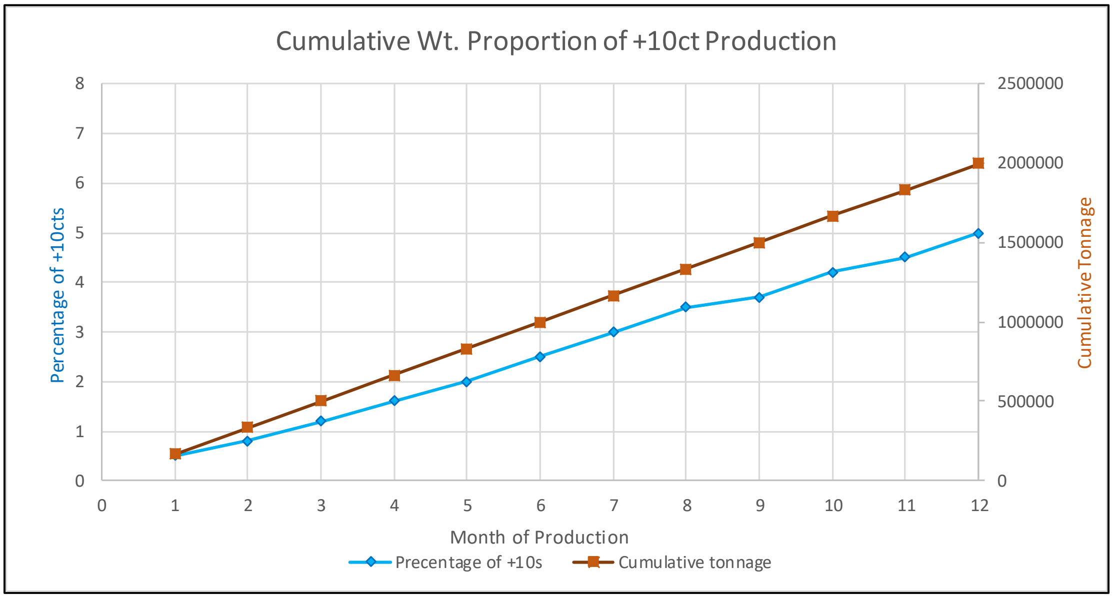


Figure 29: A plot of Month of production vs cumulative weight proportion of +10 diamonds recovered at Karowe.

This chart suggests that even at production scale tonnages the representivity of +10ct stones takes several hundreds of thousands of tonnes, around 8 months of treatment (1.6 Mt), to become stable and begin to approximate the model proportion. This presents a substantial sampling and modelling challenge for the BK16 deposit but suggests that by tracking the rate of appearance of large high value stones with increasing sample size it may be possible to predict the possible range of coarse stones.

It is possible to use the AK6 size distribution and large stone values and overlay these on the BK16 Sample $/ct values to derive and estimate of the potential $/tonne. The results of this approach are displayed in Table 4 below.

Models 5 to 7 are based on using the coarse BK16 size distribution with the AK6 pricing for goods greater than 8 gr. Interestingly the pricing differences between the three lobes give similar order of magnitude spreads to the average $/ct to that of the different methods of extrapolation used in models 2 to 4.

In models 8 to 10 the sample data is used up to the 8gr size fraction. The fractions larger than this use the AK6 North size distribution model and the 3 different pricing models that Lucara has published. This approach yields a much more conservative outcome with the $/ct ranging from 281 to 363 $/ct.

This modelling approach demonstrates how different the values for $/ct can be in the coarse size range and emphasizes the need for due caution when making assumptions about the contained value of the target.

Table 4: Use of AK6 data to moderate BK16 revenue models.

Model Num	Model name	SFD model	$/Ct pricing	Value
1	Raw data model	BK16 Sample	BK16 Sample	177
2	BK16 Coarse Mod1	BK16 Coarse	Flat line	298
3	BK16 Coarse Mod2	BK16 Coarse	Increasing	453
4	BK16 Coarse Mod3	BK16 Coarse	Continued growth	792
5	Mixed Value Mod1	BK16 Coarse	AK6 North	320
6	Mixed Value Mod2	BK16 Coarse	AK6 Centre	603
7	Mixed Value Mod3	BK16 Coarse	AK6 South	764
8	Mixed value and Size Model	BK16 Sample and AK6 North	AK6 North	281
9	Mixed value and Size Model	BK16 Sample and AK6 North	AK6 Centre	325
10	Mixed value and Size Model	BK16 Sample and AK6 North	AK6 South	363

Discussion

The LDD program has collected a calculated 2077 tonnes of material from a set of 14 large diameter drillholes. Density was inferred from measurements on twinned core holes and used with calipered volumes to derive extracted tonnage.

The diamonds were recovered via a bulk sample process plant that included two stages of crushing, DMS, x-ray and grease recovery. The process plant had an effective top cut size of 12mm, and a bottom cut off size of 1mm. It appears the process was well controlled with ongoing retreatment of the tailings to determine the recovery efficiency of each stage of treatment.

The recovered diamonds were acid washed, screened and individually valued in Gaberone. Each stone was individually analysed for damage and scanned in a colorimeter. This work showed that there has been relatively little damage to the diamonds during mining and recovery, and that there are type II diamonds present in the sample.

The samples returned relatively low grades, though higher than historical sampling exercises. No diamonds were recovered from 20% of the samples. The small size and low grade may have been the primary driver of this result. Detailed geological investigation of these sample intervals is warranted to ensure that these do not represent a "barren" component in the target. If it is shown that these samples are from areas that can be modelled, then the 'barren tonnage' can be excluded from the target and the remaining kimberlite tonnage and grade adapted accordingly.

It must be born in mind that at this early stage in the project, that the values presented here are only indicative of the ultimate estimate that might be derived. It is informed to a large degree on extrapolation of trends observed in the composite of all the samples treated to date. This compositing across lithology types may bias the results and hence not give a clear picture of the true values for grade and revenue in each of the lithotypes. As more data becomes available the assessment should be repeated for each individual lithotype and carried out in a spatial context.

Data from Karowe has shown that even with several hundred thousand tonnes of material processed it takes substantial time to build up a representative parcel of + 10ct stones. The AK6 results were used in combination with the sample data from BK16 to produce a range of potential $/tonne values (Figure 30)

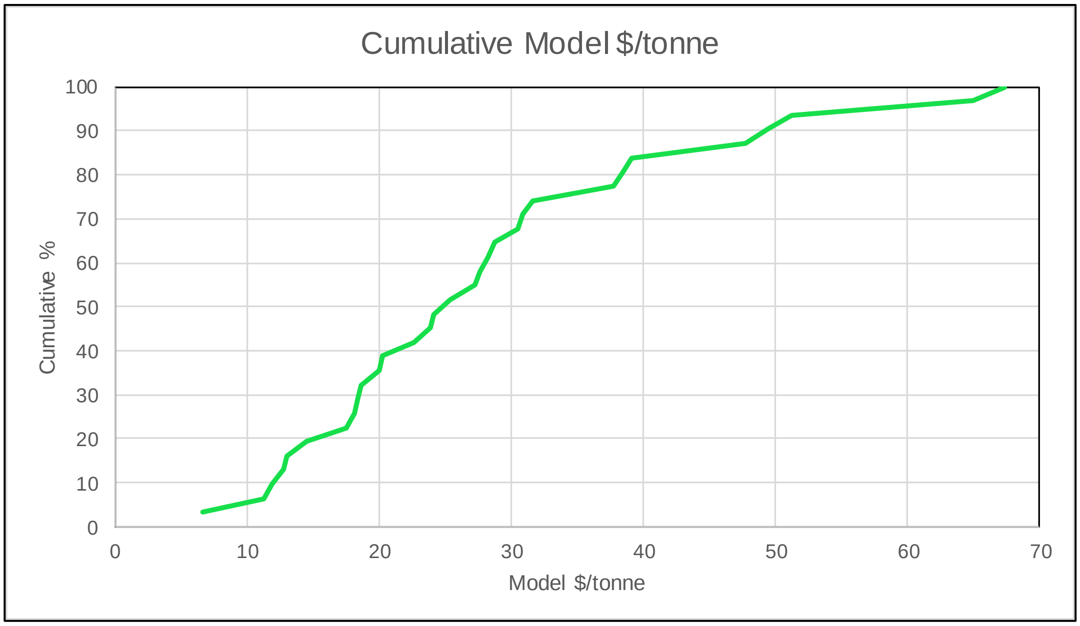


Figure 30: A cumulative distribution of potential derived $/tonne values for the BK16 project.

This range of $ /tonne will only be realised if the following assumptions hold:

a) There is a reasonable large diamond component in the diamond size distribution, and

b) The coarse stones have a quality assortment that is similar to that observed in the finer size fractions.

The original sample results, recent published results and the ranges resulting from the methods applied in this document are given in Table 4. Values presented for Karowe are based on a comparison of reported reserves as at 2018 (Nowicki, Armstrong, & Fourie, 2018)..

Table 4. Summary comparison of Sampled, Published and Current Study Ranges for the BK16 deposit.

Variable	Unit of Measure	Current BK16 SFD Study				*Karowe (AK6)		
		Min	P20	P80	Max	North	Centre	South
Grade	Cpht	4	5	7	8	13	14	12
Diamond Value	US$/carat	281	290	600	792	222	367	716
Kimberlite Value	US$/tonne	11	15	38	67	29.68	53.46	91.22

Conclusion

The BK16 evaluation program has produced 243 samples, amounting to 2077 tonnes of material sampled from BK16. This program has yielded 77.94 cts of diamonds, to produce a grade of 3.75 cpht at an average stone size 0.15cts/stone.

Use of industry best practice drilling techniques and tight control of sample management and treatment procedures has limited diamond damage. It is expected that if the damage as assessed had not been incurred, and all the chips lost, the recovered stone mass would increase by 7 cts or roughly 9% of the recovered mass. The impact of value can be assessed by multiplying the possible unbroken mass of each damaged stone by the valued $/ct. This increases the parcel value by just under 6% in total dollar terms. In reality however, it is likely that some of these chips would have been recovered minimising the corrections for size and grade modelling. The impact of the assessed damage on the models used in the simulation of sampling and modelling of the overall size frequency distribution was not material.

The samples weighed on average 8.5 tonnes, with an average grade of 0.6 stones per cubic meter, producing on average 2 stones per sample. The shape of the diamond distribution of the composite sample suggests that there could be a coarser diamond component in this deposit.

A model fitted to the sample data and extrapolated into the coarse diamond sizes was used to simulate the sampling. This approach gave ranges in grade and revenue as presented in Table 4.

Recommendations

The analysis of recent sample data suggests that BK16 could be a low-grade producer of coarse diamonds. If the, as yet unobserved, coarse component of the diamond size distribution displays similar quality characteristics as the smaller size fractions, these are likely to have a high value per carat.

The characteristics of the diamond size and quality distribution presents substantial challenges for sample design, execution, and project evaluation. The strategy for the next phase of sampling should focus on acquiring sufficient stones to validate assumptions of coarseness and diamond quality. This would suggest relatively large bulk samples, a minimum of the order of 80 to 100 tonnes for each sample to ensure that there are representative numbers of stones in each sample. The total number of samples will need to be taken will be driven by the required number of carats to achieve a robust valuation, especially stones in the 3 to 10 ct range, and will most likely be of the order of many 10's of thousands of tonnes. The exact definition of the number, size and location of these samples should be optimised using a combination of techno-economic modelling and spatial analysis of the distribution of BK16's grade (i.e., spatial simulated block models of the deposit).

Finding suitable proxies to ratify the potential for large high value diamonds should also be pursued. This may include additional geological work to find relationships between kimberlite textures and diamond size (Field et al., 2009), and perhaps a study of diamond origins and their relationship to large stones as has been done by Motsamai et al., (2018) for Karowe.

Ongoing audits of the existing samples material should continue, assessment of the nature of the additional diamonds to understand reasons for their loss could be very useful and help inform the design of the recovery processes for additional sampling and eventual production

Use of the sample process data to validate sample masses, assess liberation and create a basis for predicting treatment requirements for the next phase of sampling should continue.

The low stone counts in individual samples mean that it is difficult to compare and contrast recoveries, either between sample or between lithotypes. An exercise to determine an ideal, yet feasible minimum sample size should be carried out. The design logic should focus on providing sufficient stones to validate the extrapolated SFD and $/ct models with a range where the mine has an acceptable probability of being viable. This would possibly be a global kimberlite value of the range of 20-30 $/tonne. Low cost options for acquiring this data should be explored, e.g. contract mining with upside sharing and potential toll treatment.

Using global grade may be misleading as it may detract from the potential mineable grades and values that might be achieved with a more focussed mining approach. The ongoing effort should aim to include work to understand the potential for segregation of areas of high dilution e.g., mega xenoliths in the breccias, and or focussed mining of higher value areas.

The range of values presented here are based on independent simulation of a number of variables that are related to the ultimate value of the deposit. The simulations have independently sampled from a parameterised seed distributions for each variable. The method does not take account of the impact of spatial variability nor the correlations that exist between stone concentration, grade and value. Development of a spatial model of this deposit would be a useful addition to the assessment of the range of plausible value for BK16. This method is appropriate given the degree of geological constraint on the volumetric model, and would also facilitate the design, planning and optimisation of the ongoing evaluation strategy for BK16.

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Appendices

Appendix 1

#	File name	type	Description
1	Grade_26th October 2018_all In_Consistent Weights	Xlsx	Sample grade calculations spreadsheet
2	Parcel 1=2=3 Valuation and Breakage_Corrected	Xlsx	Diamond valuation of combined sample parcels
3	Historical Stones and Historical Tailings Breakage and Valuation	Xlsx	Details of previous diamonds collected from BK16
4	BK16 LDD End of Drilling Report_09Jan_2018	Docx	Document detailing drilling activities
5	LDD_Bulk sample compilation 2017_Samples	Xlsx	List of LDD samples collected and treated
6	BK16_MasterTreatmentReport_Rev1_20180226	Pdf	Summary of Sample Treatment
7	Fig 2 - Geomeodel	BMP	Image of the orebody
8	Grade_26th October 2018_All In_Consistent Weights	Xlsx	List of diamonds recovered from samples
9	LDD Holes 8Sept2017	Pdf	Summary of LDD holes drilled to the end of September 2018
10	Process_flowchart_17Aug2018	Pdf	Flowchart of treatment of LDD samples

Table 5: List of Documents provided

Company	Expert	Area
QTS – Kristal Dynamica Rough Diamond Services	Mr R. Ferraris	Diamond Valuation and Damage assessment
Dr. Paddy Lawless & Associates CC.	Dr. P Lawless	Diamond Valuation and Damage assessment

Table 6: Reliance on other experts

Appendix 2

Reference for Critical and Average stone size used for graphing and models developed is shown in Table 7 . The relationships between sieve screen aperture and average and critical stone sizes retained on each sieve interval are based on an average of South African central mines producers as reported by Davy (1989), and Ferreira (2013) and Clement(1989).

Sieve Class Name	Low er Limit (ct/stone)	Average Size (ct/stone)
150+	149.8	
100+	99.8	122
60+	59.8	77
45+	44.8	52
30+	29.8	37
20+	19.8	24
15+	14.8	17
+23	8.04	11
+21	3.69	5.4
+19	1.92	2.7
+17	1.42	1.7
+15	1.20	1.3
+13	0.70	0.92
+12	0.52	0.61
+11	0.32	0.41
+ 9	0.18	0.24
+ 7	0.12	0.14
+ 6	0.079	0.096
+ 5	0.049	0.062
+ 3	0.026	0.035
+ 2	0.019	0.022
+ 1	0.011	0.014

Table 7: Average and critical sizes retained on DTC diamond sieve stack

Appendix 3

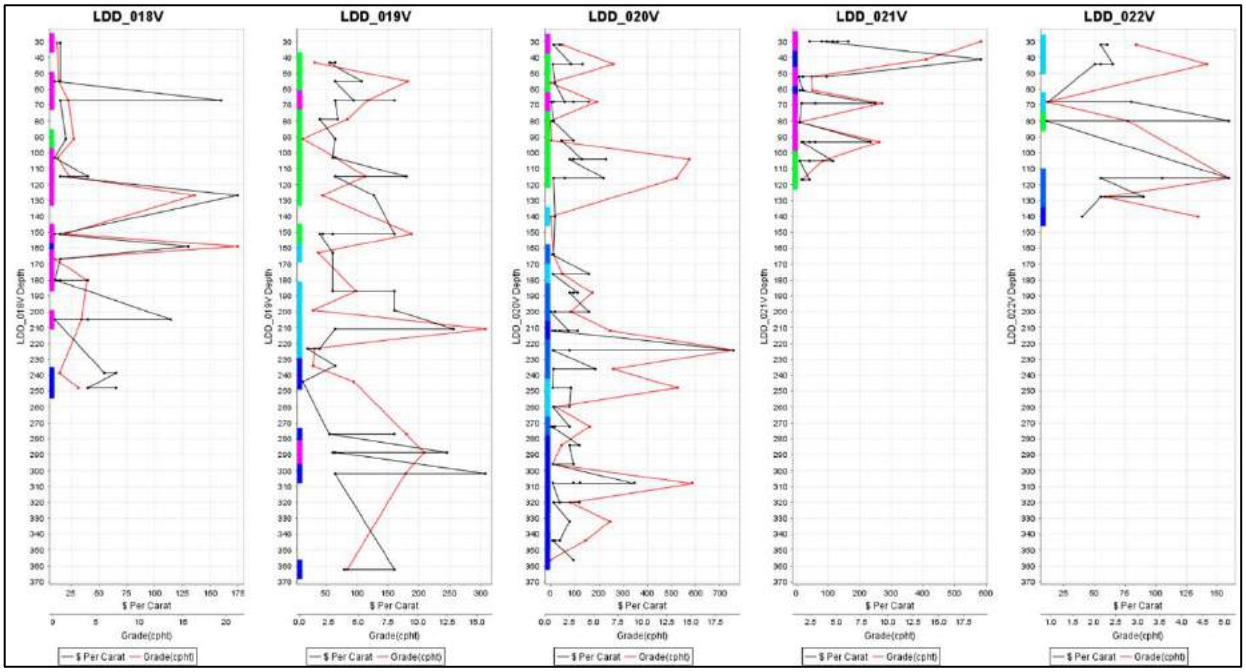

Figure 31: Downhole traces of $/ct and Grade for LDD_018 to LDD_022

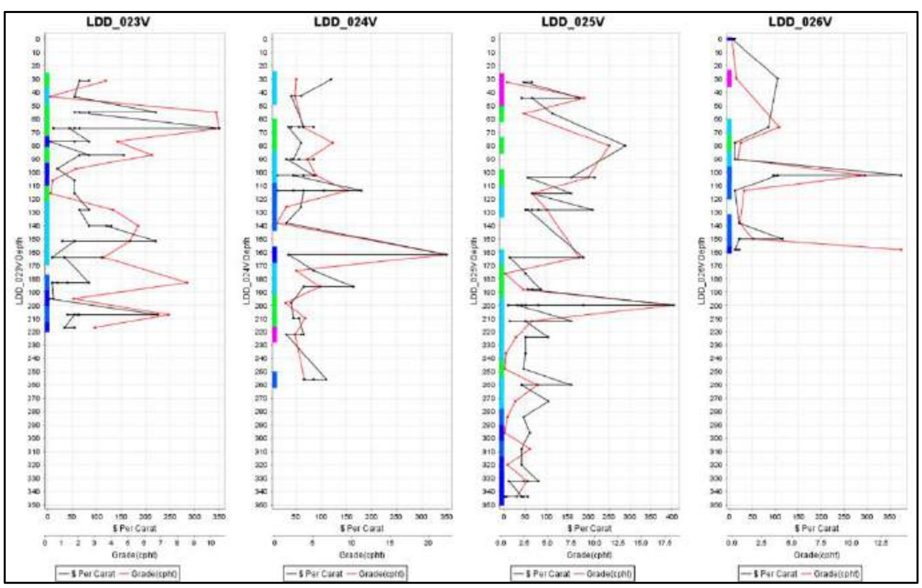

Figure 32: Downhole traces of $/ct and Grade for LDD_023 to LDD_026

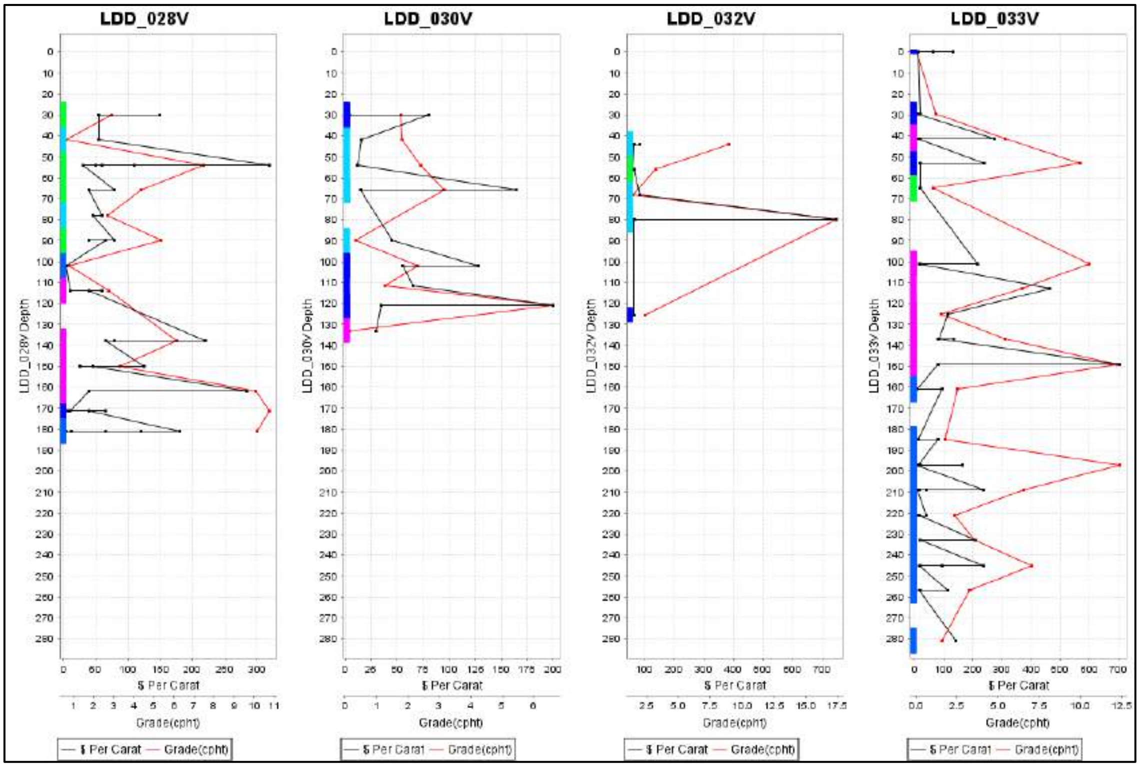

Figure 33: Downhole traces of $/ct and Grade for LDD_028 to LDD_033