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Diamond Exploration

Bright future for Peregrine's crown jewel

Exploration Program Builds on Predecessors' Work at Tli Kwi Cho

By Rob Robertson

Site Visit

Tli Kwi Cho, Northwest Territories -- If Peregrine Diamonds (PGD-V) can demonstrate that the infamous Tli Kwi Cho kimberlite complex in Canada's Far North carries enough tonnage grading around 1 carat per tonne, it will not only show the project has the potential to be a standalone operation, but it could provide potential milling feed for the nearby Diavik and Ekati diamond mines.

BHP Billiton (BHP-N) is currently trucking kimberlite ore some 25 km to the Ekati mine site from the Misery open-pit satellite operation, which lies just a couple of kilometres off from Diavik. Misery was estimated at the end of 2000 to contain 6 million tonnes of ore grading 3.5 carats per tonne at US$34 per carat, which is equivalent to US$119-per-tonne rock.

"People were very skeptical in the beginning that would really pay," notes Rod Davey, Peregrine's engineering consultant. Davey spent most of his career with Kennecott Corp. and served as president of Diavik Diamond Mines from 1996 to 1999.

"The name of the game for us though, as shareholders, is to figure out what we want to do with this project; do we want to sell it to them or do we sell it to the highest bidder, or do we want to build it ourselves," says Eric Friedland, Peregrine's president. "As long as diamond prices remain strong and if our grades and values hold up, I think our future is quite bright. We haven't seen a fatal flaw yet."

Tli Kwi Cho, which consists of diamondiferous kimberlite pipes DO-27 and DO-18, occupies the WO claims in the Lac de Gras camp of the Northwest Territories, 300 km north-northeast of Yellowknife and 23 km southeast of the Diavik diamond mine. The kimberlite complex consists of multiple vents or kimberlite phases and intervening dykes or sills.

It was discovered by Kennecott Canada, a division of Rio Tinto (RTP-N) in the early days of the Lac de Gras diamond rush while drilling a twin magnetic high anomaly in 1993 on ground optioned from Dentonia Resources (DTA-V, DRSEF-O), Horseshoe Gold Mining (HSX-V, HSSHF-O) and Kettle River Resources (KRR-V, KRRSF-O). The original WO claims were staked on behalf of DHK Diamonds, a company owned equally by the three juniors, in 1992 on the heels of the Point Lake diamond discovery by BHP and Dia Met Minerals. Today, the WO property covers 151 sq. km and hosts nine known kimberlites.

DO-27 is the main southern pipe of Tli Kwi Cho and covers a surface expression of roughly 9 hectares under a small lake, whereas DO-18, at 3.5 hectares, is a land-based satellite body sitting some 700 metres

to the north in a topographic bowl. The lake partially covering DO-27 has an average depth of 4 metres and is about 1 sq. km in size.

"We have a fairly significant pair of bodies with a tremendous resource potential," says Peter Holmes, project manager. "DO-27 is one of the largest kimberlites in the Northwest Territories."

Early exploration

Kennecott intersected up to 12 metres of diamond-bearing pyroclastic kimberlite in the first two holes on DO-27 before hitting the main body of the pipe with the third hole. That hole cut 52 metres of pyroclastic kimberlite, which delivered 64 microdiamonds from a 60-kg sample, including 16 stones exceeding 0.5 mm in at least one dimension. A 91-kg sample from the fourth hole, which intersected 105 metres of kimberlite, held 133 microdiamonds, including 33 stones larger than half a millimetre.

In a rush to advance the project in fall 1993, Kennecott chose to bypass a crucial mini-bulk sampling stage and proceeded directly to an underground, 5,000-tonne bulk-sampling program on the DO-27. At the time, only 38 holes had been completed, with microdiamond counts released to the public from only nine holes. Kennecott would eventually drill just 43 core holes into DO-27, extending to an average depth of 150 metres, with the deepest drill intercept being 236 metres.

"What Kennecott came away with from the delineation program was actually a good handle on the outline of the kimberlite but still left a big question mark at depth," said Holmes.

The logical step would have been to take a 10- to 200-tonne mini-bulk drill sample to provide a rough estimate of grade and quality, and guide future exploration. But Kennecott, likely feeling pressure to keep up to the furious exploration pace set by the Dia Met-BHP camp next door and highly encouraged by the quantity of microdiamonds being recovered, decided to skip this stage and instead go underground for a 5,000-tonne bulk sample.

The $10-million underground gamble proved costly for Kennecott and its partner. When disappointing bulk-sample results were announced to an unsuspecting market in August 1994, hundreds of millions of dollars were wiped off the stocks of Lac de Gras diamond players.

Dentonia Resources, which currently holds a 6.7% stake in the project through its one-third ownership of DHK Diamonds, has long argued that Kennecott failed to properly test the potential of the large, multi-phase DO-27 pipe. A re-interpretation of the geology suggests that the DO-27 pipe consists of two pulses or vents: a smaller, lower-grade northeastern lobe and a main vent or lobe. Kennecott's drilling shows a higher-grade core in the main lobe, with lower grades along the periphery.

Dentonia has always believed that the underground bulk-sample was limited in scope and restricted almost entirely to the northeastern subsidiary lobe. The bulk sample, collected from a Y-shaped drift starting from the eastern outer edge of the lower-grade lobe at about 95 metres below lake elevation, failed to sample the main vent of DO-27, which alone measures an estimated 400 by 200 metres, or roughly 6 hectares. Peregrine contends Kennecott was racing the clock. It faced technical challenges while driving the decline, including bad ground conditions and leaking water, which impeded its progress. DO-27 is covered by as much as 23-50 metres of overburden and is mostly covered by Tli Kwi Cho Lake.

"They went shallow and they were barely under the till," Davey says. "I can tell that probably wasn't the plan as I walked the decline. I think they originally intended to go deeper, but they were running out of time, so they just went for it."

Disappointing grades

A 3,003-tonne sample of pyroclastic kimberlite extracted from the northeast lobe returned 1,079 carats of rough diamonds grading just 0.36 carat per tonne. What proved worse than the lower-than-expected grade was that the diamonds were valued at only US$22 per carat. The diamonds were described as one-third gem, one-third "cheap gem" and one-third industrial, with again one-third white or pique, one-third brown and one-third industrial in colour. The size distribution was described as very fine, meaning fewer diamonds of larger size than might be expected. The largest gem-quality stone recovered weighed 3.6 carats, while the biggest industrial-grade diamond came in at 9.8 carats.

The diatreme or hypabyssal facies, represented by some 1,258 tonnes of material, yielded just 16.4 carats, for an implied grade of 0.01 carat per tonne.

"A study of Kennecott's work shows that the majority of their bulk sample was in the hypabyssal and from pyroclastic kimberlite in the peripheral northeastern lobe, and only peripherally into pyroclastic rock that might be part of the main southern crater," says a recent independently prepared technical report. "Indeed, Kennecott bulk samples became significantly higher grade at the ends of their sample drifts."

Discouraged by the results, Kennecott abandoned the DO-27 pipe. Plans to extract a 10-tonne mini-bulk sample from the neighbouring DO-18 pipe were aborted in 1996, when a reverse-circulation (RC) rig failed to cut through the overlying till and boulders, which varies from 5 to 20 metres thick. The discovery hole into DO-18 had yielded 78 microdiamonds from 265 kg of kimberlite core, with 16 of the diamonds exceeding 0.5 mm in at least one dimension. At Kettle River's 1993 annual shareholder meeting, past-president George Stewart described the largest diamond recovered as a clear 0.35-carat, indicating the pipe's promising potential for commercial-sized stones.

Kennecott tested the DO-18 portion with 13 holes, recovering 677 microdiamonds, including 102 stones greater than 0.5 mm in at least one dimension, from 1,349 kg of sampled kimberlite core.

Kennecott would later relinquish its interest in the WO claim block that held the Tli Kwi Cho complex in exchange for a 1% gross overriding royalty on any future diamond production.

Peregrine

Led by Eric Friedland, Peregrine Diamonds was formed in early 2003 as an exploration vehicle with exclusive use of BHP Billiton's proprietary Falcon gravity airborne geophysical system. The 3-year contract, which is up for renewal in September 2006, covers at least 40,000 line-km per year for all of North, Central and South America.

Peregrine had been a private company up until its merger with Dunsmuir Ventures at the start of 2006 when it obtained a listing and, at the same time, completed a $50-million special warrant financing priced at $5.00 apiece. The financing was placed by a syndicate led by Canaccord Adams and included Dundee Securities, Orion Securities, TD Securities and Westwind Partners. Each unit consisted of one common share and half a warrant, with each whole warrant entitling the purchase of an additional share at $7.00 over an 18-month period. Peregrine sits with 48.9 million shares outstanding, or 65 million on a fully diluted basis.

In 2004, Peregrine acquired BHP Billiton's 38.5% interest in the WO claims, with the objective of further assessing the potential of the DO-27 kimberlite pipe, in particular, the main vent. Peregrine increased its interest to just shy of 54.5% after spending $4 million to take a mini-bulk drill sample from the interpreted main core of DO-27 during the first quarter of 2005.

Peregrine extracted a 151-tonne sample from the southern lobe of the DO-27 pipe by drilling six large-diameter RC holes to varying depths of up to 209 metres. In total, 136 carats of rough diamonds were recovered, for an overall grade of 0.9 carat per tonne based on a cutoff of 1 mm. Five of the holes sampled a layered sequence of green lapilli pyroclastic tuff in the heart of the pipe; these were rich in chrome diopsides and pyrope garnets, with lesser amounts of fresh olivine. The implied grade of these five holes averaged 0.98 carat per tonne. The southernmost hole of the program, RC-3, intersected a slightly different pyroclastic facies containing high concentrations of fresh olivine. This hole showed the lowest grade: 0.7 carat per tonne.

Twenty-one of the recovered diamonds weighed greater than half a carat. The four largest stones were described as: a light brown 2.93-carat, flattened octahedron; an off-white 2.66-carat tetrahexahedron; a clean white 1.85-carat octahedron; and a clean white 1.62-carat complex tetrahexahedron.

Separate valuations were carried out on this small parcel of diamonds in summer 2005 by three major diamond producers: BHP Billiton Diamonds, Rio Tinto Diamonds and Aber Diamond (ABZ-T, ABER-Q). The average value of the 136-carat parcel, based on what the diamonds would actually command on the market without any adjustment or modelling, ranged between US$53 and US$67 per carat. The 1.85-carat stone was worth the most at between US$1,590 and US$2,060.

Peregrine's results contrast sharply with those obtained from Kennecott's bulk sampling, suggesting that the south lobe of DO-27 was never properly tested in 1994. The average grade of Kennecott's underground bulk sample from the northeast lobe was 0.36 carat per tonne, versus Peregrine's implied grade of 0.9 carat for the southern lobe of DO-27.

As part of the valuation exercise, Peregrine had Kennecott's original 1994 parcel of diamonds revalued. The same valuators were used as for the Peregrine 2005 sample. The Kennecott goods were split into two parcels: KCI-1 represented 723.7 carats of diamonds recovered from higher-grade pyroclastic kimberlite grading better than 0.3 carat per tonne; and KCI-2, consisting of 249.3 carats recovered from lower-grade pyroclastics grading less than 0.3 carat per tonne.

The higher-grade parcel was valued by two of the valuators at between US$38 and US$43 per carat, while the lower-grade parcel averaged between US$33 and US$42 per carat. The two parcels were then sent to Antwerp and re-valued after the diamonds were cleaned by deep acid boiling. It was originally noted in 1994 that a few of the diamonds had skins or were coated, making them difficult to grade.

"Cleaning the 1994 parcel, during October 2005, significantly improved its overall appearance by reducing the amount of brown goods," says Peregrine's 2005 year-end technical report.

The two parcels of cleaned diamonds were valued at about US$54 per carat, significantly higher than the original US$22-per-carat valuation in 1994.

"We are extremely encouraged by both the grades and the preliminary valuations that we have received thus far from the southern lobe of DO-27," Friedland says. "These results are a vindication of our original thoughts on the pipe, and we are optimistic that values will continue to increase as we collect ever-larger samples, and therefore improve our chances of recovering more rare and high-value diamonds."

"The price of a parcel of run-of-mine diamonds is affected by the size/weight distribution and the size/colour/quality distribution," notes Rio Tinto Diamonds' valuation report. "Small parcels suffer from truncated and irregular size, colour and quality distributions; in fact these effects are only eliminated in production-sized parcels or in parcels comprising hundreds of thousands of carats. High-quality large diamonds are naturally rare and, unfortunately, it is these high-priced diamonds that can make a significant contribution to the run-of-mine price."

The DO27/DO18 project is a joint venture held 54.47% by Peregrine, 20% by DHK Diamonds, 13.27% by Archon Minerals (ACS-V, AHNMF-O), 7.35% by Aber, and 4.9% by SouthernEra Diamonds (SDM-T, SDMFF-O). DHK Diamonds, in turn, is owned equally by Dentonia, Horseshoe Gold and Kettle River. Aber also owns a 0.3% gross overriding royalty on future diamond production.

Peregrine holds 92.65% of the diamond marketing rights for the first five years of commercial production on any mine on the WO property, while Aber has the exclusive right to market its proportionate share of production.

Recent exploration

This past winter, Peregrine went back in for a much larger, second bulk sample from DO-27. Using two large-diameter RC rigs perched atop the ice-covered lake, the company managed to collect 566 tonnes of kimberlite from 12 holes totalling 2,424 metres before drilling was shut down due to unsafe ice conditions caused by the spring thaw. The 2006 program sampled the DO-27 pipe to a depth of up to 403 metres, nearly twice as deep compared with the 2005 sample. The entire 2006 bulk sample has been delivered to the Ekati mine for diamond recovery processing, scheduled for sometime in June or July.

"With the addition of the roughly 560 carats plus that we hope to get, we will have close to 700 carats and then we can begin some (value) modelling," Friedland explains.

In addition, Peregrine completed an additional 12 core holes into DO-27 this past winter and has now drilled a total of 24 core holes totalling 5,233 metres in 2005-2006. The deepest hole, drilled to a depth of 460 metres, ended in kimberlite.

The main vent shows an infilling of well-bedded pyroclastic kimberlite, with lesser olivine microcrystal kimberlite of likely pyroclastic origin. Caustic fusion microdiamond results from last year's core drilling suggest that all the pyroclastic kimberlite (PK) units encountered in the main vent are strongly diamondiferous and may grade better than 1 carat per tonne based on the diamond distribution plots. Hole 05-2, which intercepted 403 metres of kimberlite, contained 1,171 microdiamonds exceeding a 0.106-mm cutoff in 588.5 kg of core, including a 0.12-carat stone caught on a 1.7-mm-sq. sieve screen.

A 537-kg sample from hole 05-3, which was drilled to 230 metres depth, held 1,114 microdiamonds greater than a 0.106-mm cutoff, including a 0.42-carat diamond trapped on the 3.35-mm screen, in addition to the recovery of 0.22 and 0.11-carat stones.

The geology of the northeast lobe is more complex than the main vent, containing a thin, discontinuous upper volcaniclastic (VK) unit, a pyroclastic unit similar to the main vent, and a lower, highly variable volcaniclastic unit that is underlain by a variety of volcaniclastic microbreccias and hypabyssal kimberlite rocks.

The seven holes that tested the northeast lobe of DO-27 last fall revealed microdiamond counts in the lower VK subunits that are both higher and lower than those of the PK unit. The recovery of two large diamonds -- 0.59 and 0.18 carat -- in relatively small-diameter (4.7 cm) core samples of the lower VK unit is highly encouraging and bodes well for the recovery of commercial-sized stones.

"The microdiamond counts in the northeast lobe indicate to us that part of that lobe is going to grade even higher than the PK," Friedland says.

An initial scoping study of DO-27, completed before this year's drilling, assumed a limited 6-million-tonne core at a "wickedly" high stripping ratio would need US$78-per-tonne rock to break even as a standalone operation based on a rough US$400-million capital cost.

"The numbers are kind of meaningless now because we're already looking at over 20 million tonnes just in the PK based on this most recent drilling, and it's completely open-ended," Friedland says. The 20 million tonnes includes neither the northeast lobe nor DO-18.

"If this doesn't get to 40 million tonnes, I will be personally surprised," he says. "The wall rock looks like it is competent enough to withstand the kind of fifty- to fifty-five-degree pit slopes."

Kennecott originally estimated DO-27 contained 22.7 million tonnes of pyroclastic kimberlite (PK) to a 300-metre depth, supplemented by 8.8 million tonnes of diatreme or hypabyssal material.

A revised scoping study will be completed by the fall.

"It's just a question of how many tonnes we're going to add into that study," says Friedland.

There are plans to continue the delineation and geotechnical core drilling through the spring thaw by moving the rig onto DO-27's northeast lobe, which is land-based, and to poke some holes into the area between DO-27 and DO-18 where historic drilling intersected narrow dyke or sill-like features at depth.

"They drilled three holes and they all cut kimberlite, and it was never followed up," says Peregrine CEO Alan Carter.

Falcon geophysical data suggests the two pipes may be connected at depth.

Large-diameter RC drilling on the land-based portion of DO-27's northeast lobe is scheduled to begin later in August. The plan is to collect 150-175 tonnes of bulk sample before moving onto the DO-18 pipe in October, with the aim of recovering a similar amount. Peregrine completed seven core holes totalling 1,353 metres on DO-18 in 2005. It's found to contain re-sedimented volcaniclastic kimberlite, kimberlite breccia and possible pyroclastic kimberlite, with locally complex mixing of mud and kimberlite. Peregrine has sub-divided the body into four distinct kimberlite units based on lithology.

The volcaniclastic unit, labelled KMB-1, is estimated to comprise 70% of the pipe infill and is located primarily in the northern and central part of the pipe. An aggregate 703-kg sample of KMB-1 held 1,175 microdiamonds exceeding 0.106 mm in size. The largest stone weighs 0.05 carat and was caught in the 1.7-mm-size fraction.

The KIMB-2 unit is observed primarily in the southern end of the pipe and accounts for roughly 20% of the overall volume. This unit is similar in appearance to KIMB-1 but contains significantly more mud in the matrix, giving the kimberlite a brown colour. In total, 409 microdiamonds larger than 0.106 mm were recovered from 241 kg of samples. No stones larger than a 1.18-mm sieve-size classification were recovered.

Peregrine hopes to gain a better understanding of the grade and diamond quality by extracting a larger bulk sample from DO-18, which could possibly contain as much as 11 million tonnes of kimberlite material should the pipe extend to a 400-metre depth.

Friedland notes that it has been pretty tough collecting only 600 to 1,000 tonnes of kimberlite sample a year from drilling.

"As we get closer to feasibility, we are going to have to consider going underground at some point, sooner than later; maybe even possibly buy a used five- to ten-tonne-per-hour DMS (dense media separation) plant and start producing our own diamonds as part of test mining," he says. "Maybe that should be the major focus for us next year, a combination of drilling and going underground."

For that to happen, the exploration permit covering the surface bulk sampling would have to be amended, which requires consultation with the northern people.

T.N.M. Nugget

PEREGRINE DIAMONDS' WO PROJECT

OWNERSHIP:

Joint venture held 54.47% by Peregrine Diamonds, 20% by DHK Diamonds, 13.27% by Archon Minerals, 7.35% by Aber Diamond, and 4.9% by SouthernEra Diamonds. DHK Diamonds, in turn, is owned equally by Dentonia Resources, Horseshoe Gold Mining and Kettle River Resources.

PROPERTY:

151 sq. km and host to nine known kimberlite bodies, including the Tli Kwi Cho (DO-27/DO-18) complex, 300 km north-northeast of Yellowknife, N.W.T.

EXPLORATION

Extracted 566-tonne mini-bulk drill sample from the DO-27 kimberlite pipe in 2006; diamond results expected late summer. Core and large-diameter drilling continuing through the summer and into the fall.

ECONOMICS

Revised scoping study scheduled to be completed in 2nd half of 2006.

ROB ROBERTSON

An aerial view of the camp and drills at the Tli Kwi Cho kimberlite complex.

PEREGRINE DIAMONDS

Drills continue to test Peregrine Diamonds' Tli Kwi Cho kimberlite complex in the Northwest Territories.

Tli Kwi Cho consists of diamondiferous kimberlite pipes DO-27 and DO-18 in the Lac de Gras camp, 300 km north-northeast of Yellowknife and 23 km southeast of Rio Tinto and Aber Diamonds' Diavik diamond mine.

PEREGRINE DIAMONDS

A plane is loaded with samples from the Tli Kwi Cho kimberlite complex in the Northwest Territories. The samples were headed for analysis at a lab.

PEREGRINE DIAMONDS

The modular huts at Peregrine Diamonds' WO diamond property.

Rob Robertson