The Riddle resolved: the discovery of the Partridge gold zone using sonic drilling in glacial overburden at Waddy Lake, Saskatchewan

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ABSTRACT

In 1960, prospector Eric Partridge panned visible gold from "alluvials" near Waddy Lake, northeastern Saskatchewan. Attemps to locate a bedrock source failed, and the occurrence was designated the "Riddle".

A 1983 re-evaluation showed that the alluvials were till and that gold particle size and shape were consistent with a nearby source. Follow-up sonic drilling outlined a strong dispersion train grading 1 ounce/ton near source and diverging 15 degrees from known striae. The source location, strike, type (shear zone) and mineralogy (native gold, gold-silver and copper, chalcocite, galena and pyromorphite) were all established from the till samples.

Introduction

From Prospect to Discovery

The present paper is an exploration story that spans a quarter of a century. The story begins in 1960 with the identification by prospector Eric Partridge of gold in glacial overburden at Waddy Lake, Saskatchewan, and ends in 1983 with the discovery of the source of the gold using technology developed between 1970 and 1983. Happily, Partridge's involvement is continuous from prospect to discovery. Partly in recognition of his perseverance on the Waddy Lake project, Mr. Partridge was honoured with the 1984 "Prospector of the Year" award by the Canadian Prospectors and Developers Association.

Property Location and Geology

The Waddy Lake property is located 160 km northeast of La Ronge, Saskatchewan, in the La Ronge Domain (Fig. 1), a belt of metavolcanics and felsic intrusive plugs. Access to the property is by a 20 km improved bush road that connects to Highway 102.

The metavolcanic rocks that underlie the area belong to the Churchill Structural Province of the Precambrian Shield. They are of Lower Proterozoic to Archean age and were metamorphosed to the upper greenschist facies during the Hudsonian orogeny.

On the central part of the property, where exploration has been concentrated, both intermediate-mafic and felsic metavolcanics are common (Fig. 2). These units were referred to as andesite/greenstone and rhyolite, respectively, in the past (Asbury; 1983, 1984) and the authors prefer to retain this terminology.

The andesite and rhyolite were forcefully intruded by the Round Lake granodiorite pluton, and the volcanic stratigraphy is now essentially parallel to the margins of the granodiorite.

The area was repeatedly glaciated in Pleistocene time, resulting in undulating terrain comprising numerous small outcrops with intervening areas of swamp and muskeg. Maximum overburden thickness is 10 to 15 metres. All known Quaternary strata are from the final glaciation and were deposited either directly from the ice (till) or in Glacial Lake Agassiz (sand and clay) following ice withdrawal. Glacial striae on outcrops consistently strike 195 degrees ± 5 degrees.

Exploration History

Early Exploration: 1958-1973

The Waddy Lake property dates to 1958 when prospector Partridge panned free gold from glacial till and staked 28 claims to protect his find. The gold-bearing till was thin and well exposed, allowing Partridge to trace the gold to source in what is now known as the Komis deposit (Fig. 2).

Ventures Limited optioned the property in 1959 (Charteris, 1959, 1960, 1961). An important condition of the agreement was that a company — Waddy Lake Mines Limited — be formed to hold the property, and in the event of termination of the agreement the company and its property would revert to Partridge.

Ventures drilled several holes on the Komis zone and noted that the gold mineralization occurred in and adjacent to quartz-filled tension fractures in andesite flanking the Round Lake granodiorite. Adjoining rhyolite was found to be unfractured and unmineralized. The strike of individual veins was 170 degrees, and the vein system plunged to the northwest. Good grades and widths were intersected but correlation between holes was difficult as the structural control pattern could not be deciphered.

Ventures conducted additional drilling and surface exploration on other parts of the property. Much of the surface work was performed by prospector Partridge who relied heavily on the soil panning technique that had led him to the Komis deposit. Partridge found that a few gold colours could be panned from most till samples collected in a 5 by 7 km area. Bedrock trenching revealed that scattered gold-bearing veins in all rock types on the property were contributing gold to the till. The high frequency of free gold in the overburden and bedrock was enticing but at the same time impeded differentiation of significant from insignificant occurrences.

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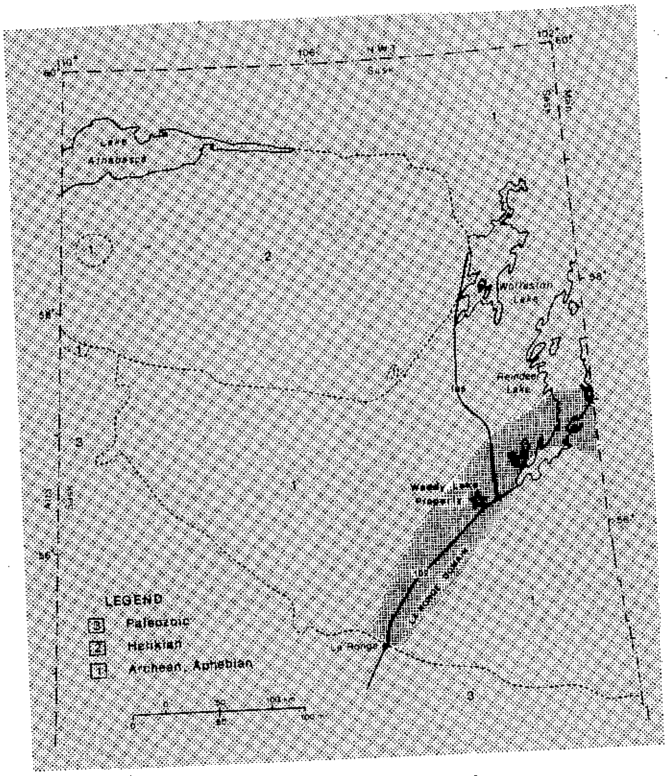

FIGURE 1. Property location and regional geology.

In 1960, Partridge outlined an area 200 metres northeast of the Komis where more than 100 gold grains could be obtained from a standard pan of overburden sample. Ventures (Charteris, 1960) described the occurrence as a placer gravel, although the term "boulder till" was used to describe similar but lower grade occurrences elsewhere on the property. Also, reference was made to the need for tracing the gold "up-ice" rather than upstream. Three diamond drill holes were collared in the up-ice area. One of these, No. V-15, intersected a strong shear zone adjacent to a diorite dyke, but core recovery was poor and no follow-up was done.

In 1961, a light auger drill was used in an unsuccessful attempt to trace the auriferous "gravel" northward under a swamp. At the same time, disappointing results were being obtained from diamond drilling on the Komis zone. Ventures decided to terminate the option agreement, and the property together with Waddy Lake Mines was returned to Mr. Partridge.

1973 Exploration

From 1961 to 1972, only limited work was done on the property. In 1973, a major soil panning and B-horizon soil sampling program was undertaken by Partridge, with some follow-up trenching and diamond drilling (Partridge, 1974).

On the enigmatic 1960 overburden occurrence, which had since been designated the "Riddle", gold was found associated with galena in a small quarz boulder. This was an important discovery, as it precluded derivation of the Riddle gold from the Komis deposit which contained no galena.

Partridge continued to refer to the Riddle as a gravel or alluvial occurrence, although it is clear from his descriptions that he knew he was dealing with till. He remarked that the high gold content of the overburden indicated a source "either sizable or quite rich", and that on comparing the Riddle to till down-ice from the low-grade Komis zone where he had found much less gold, he was "disposed to consider the difference most likely to be grade rather than size". Partridge added that the source would be "quite local", and after logging the pebbles and finding 85 per cent andesite, concluded that the source would be in andesite rather than in the "unfavourable" (at Komis) rhyolite on which the Riddle overburden had been deposited.

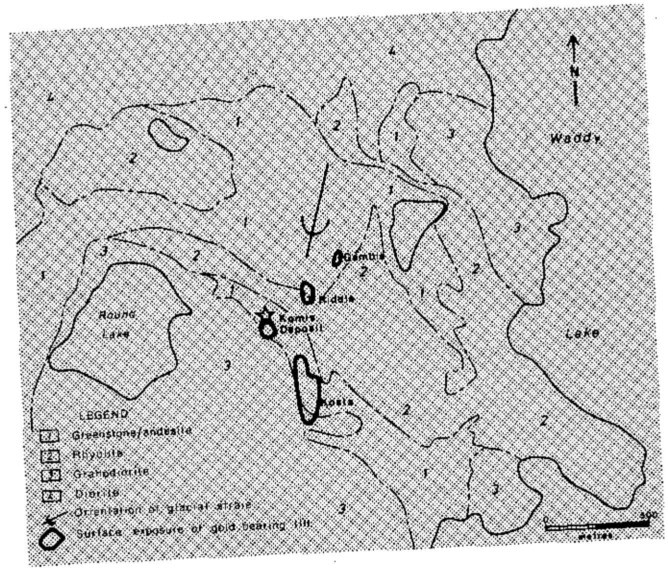

FIGURE 2. Property geology.

Three hundred metres south of the Riddle, a second major overburden gold occurrence called the Kosta was identified. The surface exposure of the Kosta was much larger than that of the Riddle but of somewhat lower grade, leading Partridge to reason that the Kosta source would be of lower grade than the Riddle source but "several times larger than the Komis deposit". Trenching to bedrock on the Kosta revealed a small showing of gold in quartz adjacent to a topographic linear that could conveniently be projected to the northwest through the Komis. Partridge suggested that the source of the Kosta would lie in this structure and recommended diamond drill follow-up.

The B-horizon soil sampling program met with some success. The Riddle and Kosta tills were readily identified but could not be traced northward through swamp-covered areas.

Recent Exploration: 1980-1983

In 1979, Waddy Lake Mines Limited was reorganized as Waddy Lake Resources Incorporated, and a new period of active exploration began on the property. One program completed was a deep overburden sampling test using the Wacker percussion system (Partridge, 1981). This equipment drives a small-diameter tube sampler to the till-bedrock interface where a till sample is collected (in practise, the sampler was often stopped by obstructions such as boulders or dry sand horizons). The Wacker results were erratic, with gold values in the -80 mesh fraction ranging from 2 to 680 ppb and averaging 48 ppb. In holes drilled over and immediately north of the Riddle, assays from adjacent holes regularly varied by two orders of magnitude. Gold values similar to those at the Riddle were obtained from all test areas on the property.

Some new diamond drilling was done both in the search for the source of the Riddle and to further develop the Komis zone. The Riddle drilling was unsuccessful but the Komis drilling extended the known zones and more importantly proved that the mineralization was systematic (Asbury, 1983), being controlled simultaneously by structure (a specific fracture system related to intrusion of the Round Lake granodiorite) and lithology (magnetite-rich andesite catalyzed the precipitation of gold and pyrite from granodiorite distillates). Drill-indicated and "probable" reserves to 180 m were calculated at 1.46 million tonnes grading 3.8 g/t (cut) and 5.0 g/t (uncut), with repetitive ore geometry suggesting additional potential at depth.

Despite the repeated failure to locate its source, the Riddle occurrence remained an attractive target and J.R. Zimmerman, a Waddy Lake director, suggested using the recently developed overburden drilling/gold grain discrimination method to trace the mineralization. Overburden Drilling Management Limited (ODM) was contracted to design and supervise a program.

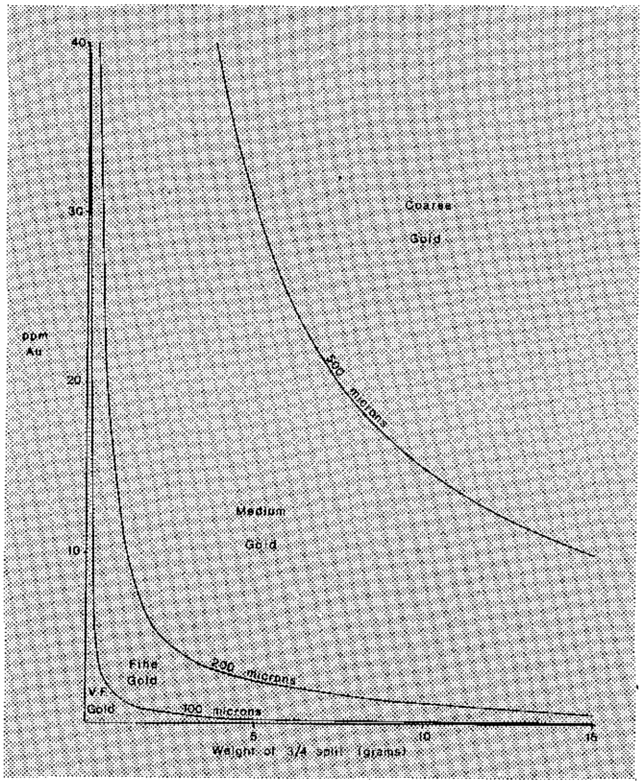

FIGURE 3. Gold anomalies produced by a single particle of various size in an analytical split of various size.

Resolving the Riddle

General Methodology

Clifton *et al.* (1967) established the need for preparing heavy mineral concentrates from large samples to overcome the problem of meaningless gold analysis that occurs due to the "particle sparsity effect" or "nugget effect" if one analyzes a small split of a sediment sample that contains free gold. Particles of free gold are scattered through all tills over Archean greenstone belts in Canada. ODM has adapted the heavy mineral method for use in isolating significant gold dispersion trains from background nugget noise as follows:

1. Till samples weighing approximately 8 kg are collected from pits or from holes drilled with reverse circulation or rotasonic rigs that have the capacity to provide accurate Quaternary stratigraphic information.
2. The samples are screened to -10 mesh and the fines are fed to a specially modified shaking table where a heavy mineral preconcentrate is prepared.
3. All gold particles that separate from magnetite and the other heavy minerals are picked from the table and placed under a binocular microscope. Simple gold flakes coarser than 125 microns separate cleanly from magnetite on ODM's tables but very fine or equidimensional gold particles are only marginally visible. If **any** gold is sighted on the table the concentrate is panned using an ODM process that rapidly isolates all of the gold, thus ensuring that dispersion trains with only fine or equidimensional gold are not missed. Gold pathfinder minerals such as arsenopyrite and galena are also readily concentrated by panning. Significant till dispersion trains normally contain more than 10 gold particles per sample.
4. The gold particles are measured to determine:
   (a) The size population, with a common size normally indicating a common source.
   (b) The contribution that each particle will make to the eventual assay of the concentrate.

ODM has established that for gold flakes of 100 to 1000 microns diameter, the thickness is related to the diameter by the following equation:

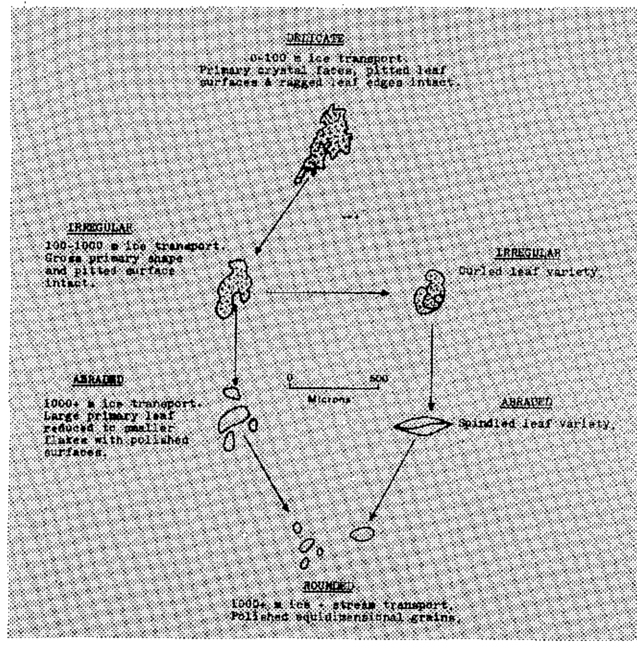

FIGURE 4. Effects of glacial transport on gold particle size and shape.

$$t = 0.2d \quad 0.01 \frac{(d \quad 100)}{100} d$$

Using this relationship to calculate the volume of the flake, the geochemical contribution of any flake to a concentrate of specific size can be determined as shown in Figure 3. Strong geochemical "nugget" anomalies that are caused by one or two coarse background gold particles in 10 to 15 per cent of ODM's till concentrates can thus be discounted.

5. Each gold particle is classified (Fig. 4) as:
   (a) Delicate, indicating transport of 100 m or less.
   (b) Irregular, indicating transport of 100 to 1000 m.
   (c) Abraded, indicating transport of more than 1 km.
   (d) Rounded, indicating fluvial rather than ice transport.

   It should be noted that the above distances of transport are accurate only if most gold particles in the sample are of the same class, as occasional particles can survive in the delicate or irregular state over long distances.
6. The gold particles are returned to the preconcentrate, which is then refined in methylene iodide (specific gravity 3.3). A magnetic separation is performed on the iodide concentrate to remove drill steel and magnetite. A $^3/_4$ split of the non-magnetic heavies, typically weighing 10 to 20 g, is analyzed for gold and pathfinder metals. A $^1/_4$ split of the concentrate is retained for future reference.

Pit Sampling

The first step in the Riddle program was to sample the auriferous "till" exposures to determine their character (till or gravel) and to establish the relationship, if any, of the till gold to the known Komis deposit.

As suspected, the Riddle and Kosta exposures were both found to be till. The surface of the basal till has been reworked on the shores of Glacial Lake Agassiz, leaving a stony lag deposit on high ground and immature beach sands capped by clay in low areas (Fig. 5). Gold is present in both the basal till and the stony phase of the reworked till.

Pit samples of till were collected from the Riddle and Kosta occurrences and from a third till occurrence 50 m south of a small zone of bedrock mineralization known as the Gamble in the area northeast of the Riddle (Fig. 2). Samples were also collected south of the Komis zone.

Tabling confirmed the concentration of gold colours that had been described by Partridge. More importantly the Riddle, Kosta and Gamble grains were found to be of a common size population (Fig. 6) and to be much coarser than those near

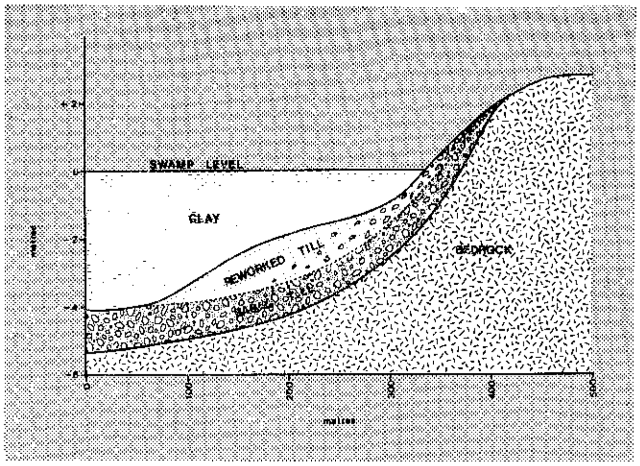

FIGURE 5. Typical Quaternary section, Waddy Lake property.

the Komis. It was inferred that the Riddle, Kosta and Gamble tills were exposures of a single, intermittently buried dispersion train. The degree of abrasion of the gold grains was found to increase systematically southward from near-delicate at the Gamble to irregular at the Riddle and near-abraded at the Kosta (Fig. 7), suggesting a source near the Gamble. The known Gamble mineralization was considered too small to explain the number of gold grains in the till, and a source further to the northeast was predicted. Assuming a south-southeast strike as at the Komis, a mineralized source 200 m in length was needed to explain the apparent width of the dispersion train as measured perpendicular to the 195 degree striae.

In the Komis area, the gold grains were found to be abraded (Fig. 8), indicating long transport. It was later established that the sample area was not directly down-ice from the Komis deposit, and the gold grains simply represented the regional till background.

Sonic Overburden Drilling

Following the successful pit sampling program, the need for an overburden drilling program to trace the Riddle-Kosta-Gamble till dispersion train to source and to evaluate the train for possible placer exploitation became obvious. A drill capable of providing continuous recovery of large samples from surface into bedrock was essential. The widely-used reverse circulation method was rejected because sample wash-out would occur in areas where the till was not capped by clay. A suitable alternative was found in the Hawker-Siddeley rotasonic coring method as applied by Midwest Drilling of Winnipeg. With the rotasonic drill, resonant vibrations are used to effect bit entry with minimal sample disturbance, producing an essentially continuous core sample of 9 cm diameter. At Waddy Lake, core recovery was greater than 90 per cent after correcting for matrix compaction below boulders. Bedrock cores of 0.3 to 0.5 metres were obtained from more than 95 per cent of the holes.

An area extending 1 km northeastward from the Riddle occurrence across favourable andesite to a diorite intrusive was selected for testing. Drill fences were 100 m apart and were positioned along the 120-degree crosslines of an existing grid (Fig. 9). As a result, the drilling was skewed 15 degrees to the east of the 015 degree up-ice corridor, but this was not a major concern as a 200-metre long, southeast-trending target was anticipated. Holes were drilled at 30 m intervals along each fence.

One hundred holes averaging 4 m in depth were drilled in the target area, with productivity building to 8 holes per working shift. Drilling progressed northward from the Gamble occurrence to the diorite, and then southward from the Gamble to the Riddle occurrence.

Samples were processed immediately to guide the drilling, and it quickly became apparent that the high-priority area north of the Gamble was non-anomalous. The Gamble dispersion itself was found to be weak and of very limited extent, matching the known small mineralized zone. In the southwest corner of the drill area, however, a strong dispersion train through the Riddle occurrence was identified. Surprisingly, the strike of this train was due north-south, or at an angle of 15 degrees to the striae on outcrops that protrude through the train. With the drilling skewed a further 15 degrees to the east due to the orientation of the control grid, the dispersion train was almost missed by the sonic program.

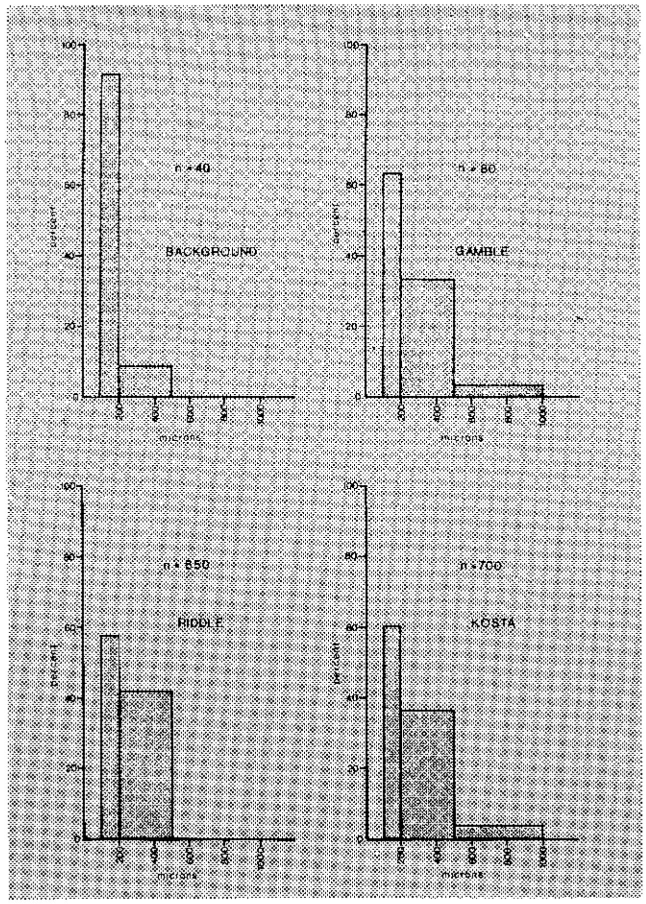

FIGURE 6. Frequency distribution of fine (100-200 microns), medium (200-500 microns) and coarse (500-1000 microns) gold grains (very fine gold under 100 microns not shown) in background till samples and samples from the Gamble, Riddle and Kosta occurrences.

Next, with the assumed link between the Riddle and Gamble tills disproved, a fence of holes was added to the south between the Riddle and Kosta occurrences. This drilling confirmed that the Riddle and Kosta are indeed linked by a strong north-south dispersion train defined by: (a) more than 100 gold particles per sample; and (b) concentrate assays of more than 100 ppm.

A second major surprise, considering the simple gold-pyrite mineralogy of the Komis deposit, was the finding that a complex suite of minerals is associated with the Riddle-Kosta gold. These minerals, which were readily destroyed by post-glacial surface oxidation and therefore were not present in the pit samples from the till exposures, include abundant native copper, galena, and sooty chalcocite-galena plus traces of pyromorphite, bornite, molybdenite and a gold-silver alloy (Fig. 10). Several of the minerals including native copper are characteristic of supergene deposits.

The drilled-off segment of the Riddle-Kosta dispersion train was 100 m wide, narrowing to 40 m at its northern extremity. The narrow width of the train, together with the extreme concentration of gold and related minerals in the till, suggested a source trending sub-parallel to glaciation rather than perpendicular to glaciation as in the original Riddle-Kosta-Gamble pit

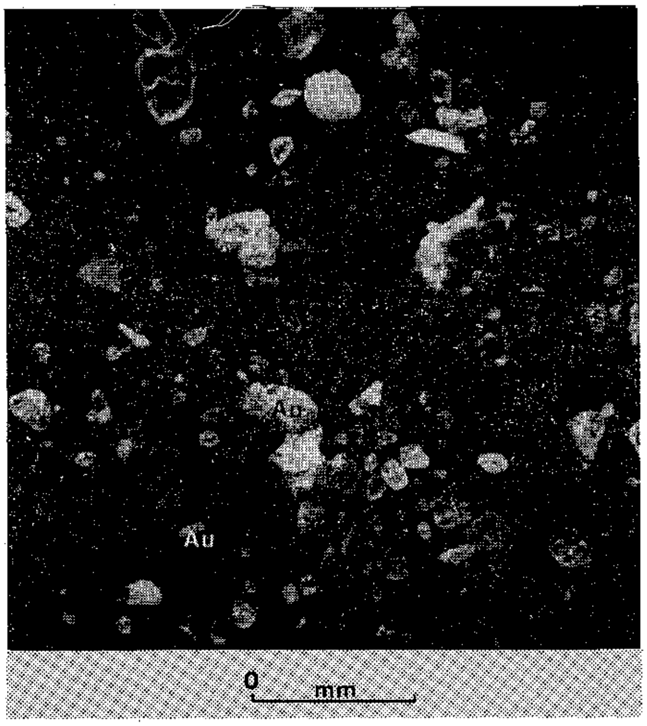

FIGURE 7. Binocular photomicrograph of Kosta gold, irregular variety (Au; approximately 18 particles).

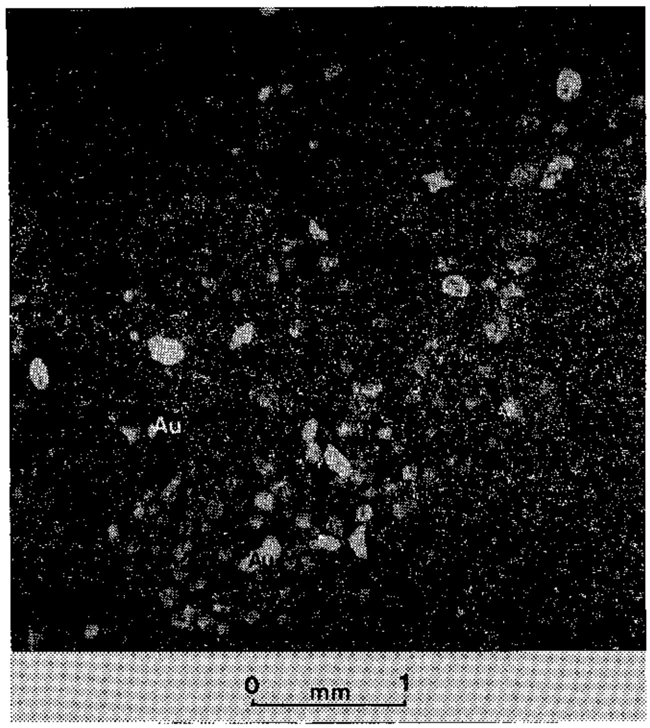

FIGURE 8. Binocular photomicrograph of background till gold, abraded variety (Au; approximately 13 particles).

sampling model. Non-anomalous holes 120 m north of the train provided an apparent up-ice cut-off. A 56-hole program of detailed sonic follow-up drilling was planned for the intervening area to pinpoint a diamond drill target.

The follow-up drilling provided an absolute cut-off of the dispersion 200 m north of the original Riddle occurrence (Fig. 9) in a north-northeast-trending buried valley where the till is covered by up to 10 metres of clay and sand. It also showed that the grade of the train is remarkably consistent, commonly varying by as little as $1.00/m^3 (gold at $15.00 Cdn./g) in adjacent holes and in consecutive samples within the hole. This allows recognition of a high-grade core zone and low-grade marginal zones extending from the head of the train to the Kosta occurrence. The core zone grades approximately $15.00/m^3 *recoverable* matrix gold and the marginal zones grade $2.00-$5.00/m^3. Recovery rates of about 80 per cent were attained despite a gold particle size averaging only 100 microns. Within the core zone at the head of the train is a high-grade pay streak where, on the basis of two intersections, the till grades a remarkable $1800/m^3. The northern cut-offs of the pay streak and marginal zones were inferred to define the axis of bedrock mineralization, giving the source a strike of 015 degrees.

Samples from the pay streak yielded up to 10,000 gold particles, most of which are of the delicate variety (Fig. 10). Similar concentrations of native copper, galena and sooty chalcocite-galena are present, plus traces of pyromorphite and native gold-silver. No oxidation of either the till or bedrock was evident in the sonic drill intersections but the base metal assemblage suggested a supergene source, possibly capped by a gold-rich residuum.

Comparative assays of the till clasts and matrix revealed that most of the gold was in the matrix, indicating that the source mineralization was sufficiently soft to be instantly comminuted by glacial ice. One pebble of chloritic gouge containing gold and native copper was found. All other mineralized pebbles were of more resistant vein quartz.

Diamond Drilling

It was recommended to Waddy Lake Resources that a fence of diamond drill holes be bored from east to west to intersect the 015-degree trending axis of mineralization. However, Waddy Lake opted for a Komis-type target and drilled the initial holes to the southwest. Little encouragement was obtained, and drilling was switched to the recommended pattern. Again, little encouragement was obtained, although a strong east-dipping shear structure was intersected. This was the same structure that Ventures had intersected in 1960 Hole V-15. In each case, a few metres of core were lost.

At this juncture, drawing on the analogy that the glacial ice had instantly freed most of the gold grains from their soft gangue, it was reasoned that the zone of lost core was the source of the till gold. Sludge samples had been collected from one hole, and analysis of the sludge confirmed the theory. A switch from uncontrolled BQ coring to controlled HQ coring resulted in good recovery of the shear zone mineralization. The new deposit was designated the EP zone in honour of prospector Partridge.

The EP zone dips to the east at a surprisingly low angle of 15 degrees, following the base of a 3 to 7 m thick diorite dyke. It is suspected that the small Gamble mineralized zone, which lies to the east of the EP subcrop and contributed EP-sized gold grains to the Gamble till occurrence, is a vertical offshoot of the down-dip extension of the EP zone. A second undiscovered zone of the Gamble type probably produced the small dispersion train (Fig. 9) east of the Riddle-Kosta train.

No gold-rich residuum has been identified over the EP zone but a residuum must have been eroded and incorporated into the till because the grade of the overburden pay streak is considerably higher than that of the bedrock mineralization. Other factors contributing to the high gold content of the till and the length of the dispersion train are:

1. The low dip of the EP source, resulting in a wide subcrop.
2. The parallelism of the EP mineralization to the path of glacial advance.
3. The extreme softness of the chloritic shear that hosts the mineralization.

Exploration of the EP zone is still in the preliminary stages and reserve estimates are not possible. However, this zone and its associated dispersion train have already made a significant contribution to the mineral inventory of the property, and have enhanced the potential for near-term development of the Komis deposit.

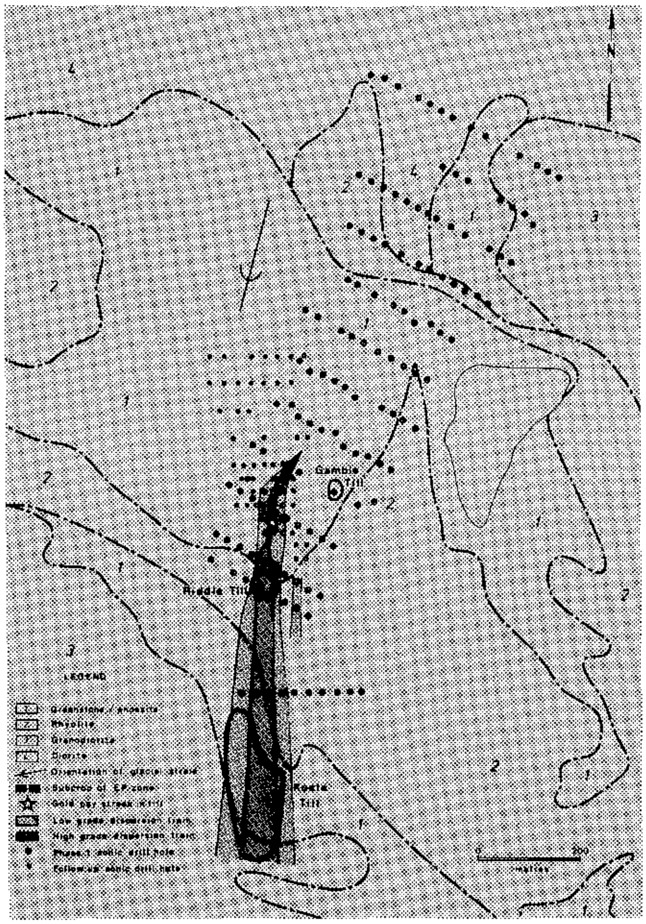

FIGURE 9. Sonic drill hole locations.

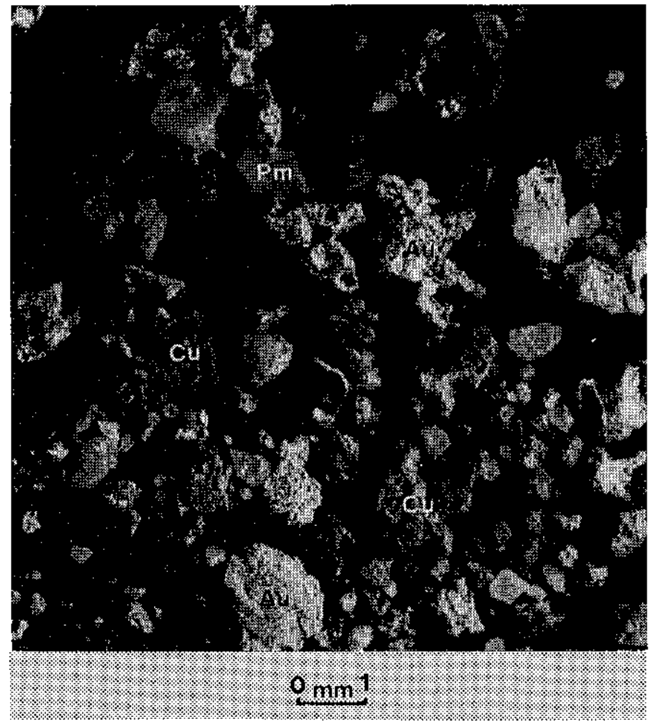

FIGURE 10. Binocular photomicrograph of pay streak gold, delicate variety (Au; approximately 23 particles), native copper (Cu) and pyromorphite (Pm).

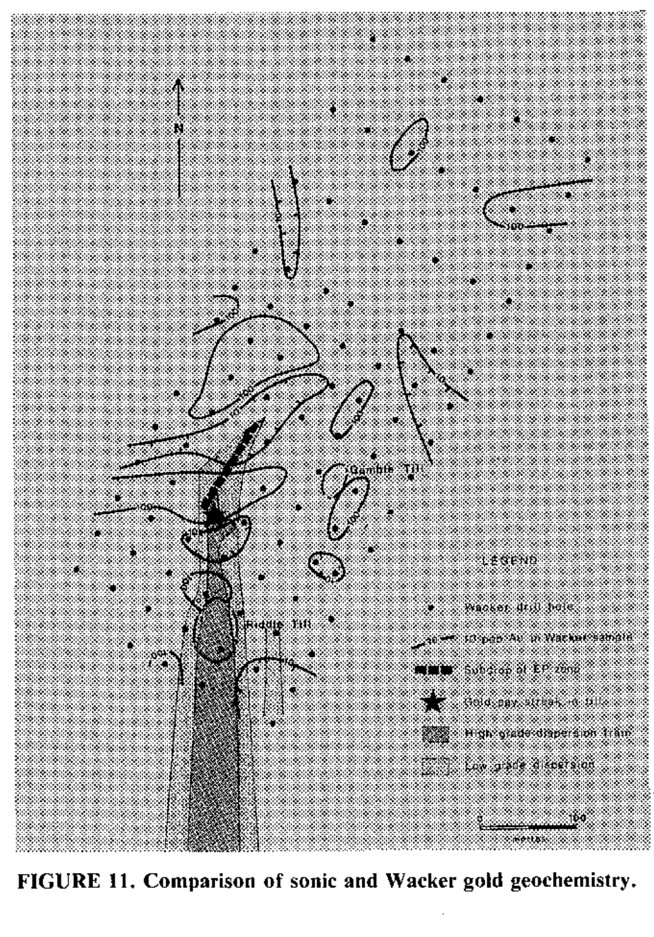

FIGURE 11. Comparison of sonic and Wacker gold geochemistry.

Conclusions

Exploration Lessons

The Waddy Lake story provides some basic lessons for the explorationist. Probably the most valuable lesson is that in exploring for a free gold deposit in glaciated terrain, it is better to search directly for the gold particles than for reconstituted gold in soils or vegetation. Ventures recognized this in 1960 and stated that "Patridge now uses soil panning as a regular prospecting technique, and it should be more widely employed in other areas of the Shield". Yet, twenty-four years later and in a period of much higher gold exploration activity, the technique is seldom used. Exploration programs in areas of little clay cover such as northwestern Ontario would benefit greatly from soil panning surveys.

The second major lesson is that large till samples must be used to ensure the identification of free gold dispersion trains and to avoid the generation of artificial anomalies from background gold particles. In the 1981 Wacker survey over the Riddle occurrence, samples weighing only 50 to 100 grams were obtained and a smaller 10-gram split of -80 mesh material was analyzed. The 1983 sonic drilling shows that the concentration of gold particles in the Wacker survey area was 2 - 3 per kg for background tills and 20 - 50 per kg in the EP dispersion train (excluding the high-grade pay streak). Thus in background areas one 10-gram Wacker split in 40 would be expected to contain a gold particle while in the EP train one split in three would contain a gold particle. Assuming an average particle size of 100 microns, one particle in a 10-gram split would generate an anomaly of 100 - 200 ppb (Fig. 3). As shown in Figure 11, only one of the seven Wacker samples collected from the EP dispersion train is anomalous while a similar proportion of samples from background areas are artificially anomalous. Thus, due to the nugget effect, the Wacker survey failed to identify the highest-grade free gold dispersion train known in Canada. The probability of detection would be further diminished in normal dispersion trains which are only one-tenth the grade of the EP train.

Another problem in analyzing -80 mesh material is the inability to differentiate physical gold from hydromorphically reconstituted gold. Many of the Wacker samples were collected from oxidized till and would potentially contain gold of both types. Samples with 10 to 100 ppb Au probably contain mostly hydromorphic gold although one or two physical particles finer than 100 microns could also be present. Most samples with less than 10 ppb Au are from clay-capped (unoxidized) tills and contain neither hydromorphic nor physical gold.

Clifton (1976) showed that twenty gold particles of similar size should be present in the analytical split to obtain an analysis that accurately reflects the gold content of the parent sample. The heavy mineral concentrates from the large sonic drill samples met this requirement and thus were suitable for establishing the true grade of the EP dispersion train. Moreover, while the Wacker samples were of little or no exploration value, the sonic samples provided the following clues to the EP source before its actual discovery:

1. Location - from delicacy and abundance of gold grains.
2. Strike - 015 degrees.
3. Mineralogy - native gold, gold-silver, and copper; galena, sooty chalcocite-galena, pyromorphite.
4. Deposit type - quartz veins in a soft chloritic shear zone having a supergene overprint.

The EP zone was a difficult diamond drill target, in part because it is so different from known deposits in the area, and without the comprehensive information from the sonic holes diamond drilling probably would have been discontinued before the deposit was discovered.

The final lesson is that one must keep an open mind when interpreting metal anomalies in tills. For example, the Riddle and Kosta till exposures are on the same dispersion train but differences in the size and grade of the exposures led Partridge to correctly project a small, high-grade, proximal source for the Riddle occurrence and to incorrectly project a large, low-grade, proximal source for the Kosta occurrence. All who worked on the Riddle program considered the outcrop striae to be reliable indicators of the direction of glacial transport but they were found to record only the direction of erosion. Good examples of this phenomenon cannot be found in the literature, illustrating that research into continental glaciation is still in its infancy. The 15-degree angle between glacial erosion and glacial transport clearly is not a product of bedrock topography as the dispersion train passes undeflected through bedrock valleys and over bedrock highs. We infer that the well-known shearing processes that cause upward imbrication of debris in the ice may also permit the vector of movement within the glacier to differ from that at the sole of the glacier.

In summary, the EP case history is an example of new technology (the sonic drilling/gold grain discrimination method) resolving an exploration riddle on an overburden gold occurrence that was identified a quarter of a century ago using an earlier version of the same technology (soil panning and gold grain counting). Both the new and old technology can be used very effectively to explore for other gold deposits in glaciated terrain. Such exploration programs will benefit from the lessons learned at Waddy Lake.

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