Diamond drilling as an aid in ore definition at the Dome Mine

D.S. ROGERS
Chief Geologist, Dome Mines Limited
South Porcupine, Ontario

ABSTRACT
Throughout the history of mining at the Dome, gold has been found in a number of different rock types and in association with a number of different structural settings. Diamond drilling plays an important role in the evaluation of the stratigraphic and structural features which control ore deposition. The main function of diamond drilling is to locate favourable areas of mineralization.

To date, over 20,000 diamond drill holes have been drilled from combined surface and underground programs. Needless to say, a great many significant intersections, carrying a wide range of gold values, have resulted from the total of over 756 miles of drill cores which these programs have produced.

However, the term “significant” takes on new meaning in light of the experience of diamond drilling in a number of ore-type situations at the Dome Mine. Drilling through individual ore veins, such as the Fuchsite Vein or the Quartz-Tourmaline Vein, often intersect the vein structure; however, assays from the veins frequently fail to yield any ore grades. Similarly, drill cores through stringer-type occurrences such as dacite or conglomerate, when assayed, fail to indicate the true size or grade of the orebody ultimately mined.

Introduction
Over the years, those who explore for gold and those who have the slightly less fickle task of actually mining gold have shared a common dilemma. That dilemma lies in the failure to relate the results of diamond drill information to a positive ore situation, or ultimately to reconcile “diamond drill indicated ore” to actual ore reserve tonnages.

Drawing on the knowledge of more than 72 years of mining history at the Dome operation in the famous Porcupine Camp, this paper will review a number of drift and stope situations in which the grades of the ore material extracted will be compared with the anticipated grade of that same drift or zone as calculated solely on the basis of diamond drill assays.

This paper is divided into three parts. The first deals with the geology of the mine and the mineralogy of the ore. The geology section emphasizes the stratigraphic and structural features which control the gold distribution; the mineralogy section describes the features which are significant in terms of ore association and which can be identified from the logging of the diamond drill cores.

The second part of the paper deals with the procedures and the practices of the entire diamond drilling operation at the mine. It presents a statistical review of the performance as well as our own account of the advantages and the limitations of diamond drilling as it relates to the over-all mining scheme at the Dome.

Finally, the third segment deals with a series of actual case histories, from both past and present stoping operations in a variety of different ore settings, where comparisons are made between actual stope muck grade and the calculated grade of the same zone based entirely on diamond drilling.

General Geology
The Dome Mine is on the south limb of the Porcupine Syncline in an area where volcanic rocks are overlain by metamorphosed slate and conglomerate and where the north-easterly plunge of this whole folded assemblage creates the structure locally referred to as the “Greenstone Nose” (Fig. 1).

South of the sedimentary rock there is a zone of magnesium-rich, metamorphosed and carbonatized rocks which trend east-northeast and are presumed to occupy a fault zone associated with a branch of the main Porcupine-Destor Fault (Fig. 2). To the east, this Porphyry and Highly Altered Zone passes between the two major porphyry bodies of the mine, namely the Paymaster and the Preston porphyries, and grades into a chloritic and talcose zone before joining the main Porcupine-Destor Fault. To the east, within the same carbonatized zone, there are lenses of porphyry-type rocks, similar lithologically to the main porphyry bodies. The eastern extremity of this zone similarly grades to a chloritic and talcose altered zone before being truncated by the Burrows-Benedict Fault. To the west, this Porphyry and Highly Altered Zone are the South Greenstones (Fig. 1). They consist of a series of south-dipping, massive flows, more mafic than the flows of the Greenstone Nose. Their anomalous southerly dip suggests...

Dean S. Rogers

Mr. Rogers is currently the chief geologist at the Dome Mine, a position he has held for the past 10 years. Previous to returning to the Dome in 1972, he spent a total of three years in exploration in the Blind River, Lynn Lake and Red Lake areas before his first underground geology position at H.G. Young Mines. The next ten years were spent in mining geology related positions at Broulan Reef, Dome, Eagle Gold and Preissac Molybdenite mines.

He is a graduate of Queen’s University and is a member of the Advisory Board of the Haileybury School of Mines and a member of The Canadian Institute of Mining and Metallurgy.

Keywords: Geology, Ore deposits Diamond drilling, Ore definition, Dome Mine, Gold deposits, Stratigraphy, Structure, Vein structure.

Paper presented: at the CIM Annual General Meeting, Calgary, May 1981; manuscript reviewed and revised version accepted for publication on February 25, 1982.
FIGURE 1. Generalized geology plan.

FIGURE 2. Diagrammatic section of geology and ore zones.
that a major structural break exists along the Porcupine-Destor Fault which dips steeply north and which is identified by a well-marked talc-chlorite zone. This zone passes about 1,200 m south of the mine workings (Fig. 2).

Classification of the Ore Deposits

TYPE I — Long narrow veins in schist, parallel to the general trend of the formations.
(a) Ankerite veins (in the Greenstone Nose).
(b) Quartz-tourmaline veins (chiefly in the Highly Altered rock).
(c) Quartz-fuchsite veins (in Carbonate Rock).

TYPE II — Lenticular or irregular "tension" veins in both massive and schistose rocks. They cut Type I veins.
(a) Orebodies of veins arranged en echelon in massive lavas in the Greenstone Nose.
(b) Stockworks, chiefly in the sedimentary trough and generally in conglomerate.
(c) Stockworks in porphyries and associated highly altered wall rock.

TYPE III — Mineralized rock, in which the gold is associated with pyrite with or without pyrrhotite and in which there is little or no vein material.

TYPE IV — Silicified greenstones.

Mineralogy of the Ores

Gold occurs primarily as coarse native metal in quartz or ankerite-type veins, but it occasionally is found in the adjacent wall rock. In the milling operation, about sixty per cent of the gold is recovered by gravity concentration and amalgamation; the remainder, including the fine fraction directly associated with the sulphides, is recovered by cyanidation. Sulphides are present in all ores and average about 2 to 3 per cent. Pyrite, and/or pyrrhotite, are the dominant sulphides; however, chalcopyrite, sphalerite and galena are found locally in most ore types and are quite good indicators of gold content. Several tellurides, namely altaite, petzite and tellurobismuthite, have been recognized in the mine; however, they constitute a very minor percentage of the total gold (>1%). Silver is recovered as a by-product of the operation in the ratio of about one ounce silver to six ounces gold.

Wall-rock alteration is widespread, particularly in the stringer-type ores, and includes silicification, carbonatization and sericitization. These favourable alterations are usually accompanied by disseminated sulphide mineralization in which the sulphide content is often higher in the wall rocks than in the veins themselves. Gold is visible in most ore types and is found along the contacts of the veins, in fracture fillings in the veins, along shear planes, and in bands of secondarily aligned minerals such as tourmaline, fuchsite and chlorite.

The mineralogy of each ore type is distinct, however, on the assessment of ore potential by diamond drilling there are two basic ore types: a single vein or vein structure and multiple veins or stockworks.

Ore Reserve Criteria

At the Dome Mine, the term "ore reserve" is applied only to a calculated tonnage which is blocked out in a zone, or more particularly on a vein, outlined by development drifting on successive levels and through which vertical continuity is confirmed by a raise driven between these levels. In addition to the strict criteria established for the structural continuity of the "ore", a grade requirement of approximately 4.00 dwt (0.20 oz per ton) is also set as the cut-off limit of such "ore". The ore reserve grade is defined as the arithmetic average of the grade of special face samples (chip channels taken every round) and of the grade of the muck samples taken over the same corresponding distance. All chip, channel and muck assays are cut to 10.00 dwt (0.50 oz per ton) before averaging.

Diamond drill holes may, in fact, further confirm the presence of an ore structure between adjacent levels; however, the drill core assays are not used in any direct calculations for "ore reserve" compilation.

Diamond Drilling History

Diamond drilling dates back to 1911, when the first surface program was initiated in an effort to trace the possible downward extension of the dome-shaped orebody which had been exposed on surface and from which open-pit production had already begun. In all, 29 holes were drilled in a program which amounted to a total of some 20,000 feet and which was successful in obtaining a number of fairly lengthy "ore" intersections. In summary, the following table from a 1913 company report gives an indication as to the magnitude of some of the results:

<table>
<thead>
<tr>
<th>Hole No.</th>
<th>Depth of Intersection (feet)</th>
<th>Length of Mineralized Core (feet)</th>
<th>Assay Values (dwt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>273</td>
<td>57</td>
<td>7.18</td>
</tr>
<tr>
<td>13</td>
<td>358</td>
<td>168</td>
<td>4.15</td>
</tr>
<tr>
<td>20</td>
<td>340</td>
<td>476</td>
<td>3.69</td>
</tr>
<tr>
<td>23</td>
<td>29</td>
<td>273</td>
<td>4.55</td>
</tr>
</tbody>
</table>

This report also states: "Too much weight, however, should not be attached to the assay values of bore-hole intersections, which are commonly unreliable as samples for valuation, though invaluable as a guide to development." It should be pointed out, however, that the drill intersections noted in the table, like others of the day, were reported in uncut values of gold. The sampling of the drill core was done in great detail and, in many instances, in small sample units of 3 to 6 inches in length in an effort to define the distribution of the gold. This practice, however, exaggerates the amount of gold present in the rock and is the basis for a universal practice which in the industry is called a cutting procedure.

The first underground hole, No. 30, was drilled in April 1913 and with it there began a practice which has continued to the present; that of numbering the diamond drill holes consecutively, regardless of their surface or underground location.

Early diamond drilling on the property was provided by outside contractors, Boyles Bros. being one of the first such companies. Gradually as diamond drilling equipment was purchased, the drilling was performed by Dome personnel, and up until 1944 the number of drills in operation ranged from 1 to 6
machines. In March 1944, the entire diamond drilling contract was awarded to N. Morissette Diamond Drilling of Haileybury, Ontario and for the past 37 years the drilling requirements of the mine have been capably and professionally performed under this continuous contract, which, by its length, may be unique in Canadian mining.

Although the primary function of diamond drilling was exploratory in nature and served as a direct aid to underground development, in the 1940s another practical use was found for the diamond drill. Blast holes were ring drilled with the diamond drill using a non-coring bit as part of an operation to recover the crown and sill pillars of remnant stope ore and served as the forerunner of long-hole mining at the Dome.

In the 1960s, with the conversion from sand to hydraulic mill tailings as the principle backfilling agent in the cut-and-fill stopes, the diamond drill also served to provide both “AX” (core size) (1-1/4-in. diameter) drain holes and “BX” (1-5/8-in. diameter) hydraulic fill holes for the transport and transfer of the slurry components between individual levels. These larger holes were a departure from the standard “EX” (7/8-in. diameter) holes which form the majority of the underground exploration drilling. Surface holes and long underground exploration holes of the order of 500 to 2,000 feet are drilled with “AX” core and with the now popular “AQ” wireline equipment and techniques. For the examples given in this report, however, where comparisons are made between “muck sample grades” and “diamond drill indicated grades”, they are made on the basis of “EX” core drilling.

The following chart shows a breakdown of the diamond drill footage to the end of 1980, together with comparative figures for the amount of drilling done prior to 1940.

**Drilling Footage**

<table>
<thead>
<tr>
<th>Year to Date</th>
<th>Hole Number</th>
<th>Exploration and Development Holes</th>
<th>Blast Holes</th>
<th>Drain Holes</th>
<th>Hydraulic Filled Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939</td>
<td>2,000</td>
<td>623,090</td>
<td>15,571</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(118 miles)</td>
<td>(3 miles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>20,000</td>
<td>3,669,497</td>
<td>278,377</td>
<td>22,377</td>
<td>12,645</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(700 miles)</td>
<td>(4 miles)</td>
<td>(2 miles)</td>
<td></td>
</tr>
</tbody>
</table>

**Procedures and Practices**

Throughout the years at the Dome Mine, diamond drilling has been characterized on the one hand by procedural conformity and on the other by an imaginative persistence which, in many instances, has turned a questionable showing into a producing stope. Acknowledging the importance of consistency in the geological interpretation of the drill cores was essentially the responsibility of three men in the logging of the drill core over the past 40 years. Although others in the geological department have been capable of logging core, and on many occasions have done so, the majority of the 18,000 holes drilled since 1940 have been logged in turn by either W. Cliff, H. McKinnon or by M. Millions.

The procedural factor which contributes the most to the preparation of this study however, relates to the practice of sampling all the core over the entire length of the drill hole, thus providing an assay record of the complete drill hole, while at the same time eliminating the problem of core storage. There are some exceptions, notably exploration holes on the margins of the property, which are stored for possible future re-examination. For the most part, however, the entire core is
sampled in sample units which are determined by the core logger, and which never exceed 5 feet in a mineralized area or through the contiguous margins of such an area. A mineralized area is defined as an area containing any quartz, ankerite or sulphide mineralization.

In addition to the complete assay record of the drill hole, an individual plan and section is prepared for each inclined drill hole or ring of holes and each hole collar is surveyed. Acid clinometer tests are taken at intervals of 200 feet in all drill holes to determine deviation in a vertical plane; holes in excess of 500 feet are tested for deviation in a horizontal plane as well. Initially, a Carlson compass was used to determine strike deviation within the hole (this was replaced more recently by a Pajari compass) and, from the true section which is prepared, the geology and significant assay values are projected on to the level plans through a vertical distance of 100 feet above and below each mine level. The level interval is 150 feet in most cases.

The routine and systematic practice of stope surveying provides the final ingredient in the drilling analysis. Because cut-and-fill stopes are surveyed each mining lift, it is then possible from the composite survey outline of the stope to plot the actual stope location on the individual drill-hole section and to determine accurately the length of the drill hole which passed directly through the stope area (Fig. 3). Knowing the complete assay record of the drill hole makes it possible to compare the lengths and grades of all such drill holes removed by stoping with the grade of the total muck drawn from the stope over its entire life span.

This comparative method has also been applied to single vein structures which are initially drilled through a horizontal plane and may subsequently become developed by means of drifting or sill drifting. In such cases, the development muck samples for each round as well as the chip channel samples across each successive face can be averaged for each sample method and can be compared with the original diamond drill values across the zone that has been mined. An actual mine example of such a case is shown in Figure 4.

Philosophy

The earliest assessment of the character of the orebody can be found in a 1917 company report which states: “the ore occurrence in the Dome Mine is of the type of large irregular masses, entirely without walls and extremely un-uniform in distribution of values”.

How prophetic that statement was! Ore types II(a) and II(b) mined in that era are comparable with the current stringer masses, entirely without walls and extremely un-uniform in distribution of values. In terms of ore values, a much more pronounced discrepancy is seen in diamond drilling results through the tourmaline and fuchsite veins, Type I(b) and I(c) respectively. These will be apparent when individual vein and stope situations are analyzed. Diamond drilling remains of secondary importance in exploration for these ore types. What is of prime importance, however, is recognizing the favourable contact zones along which these characteristic veins are located and using the diamond drill to direct the development toward these structural parameters. In both instances, these ore types are found in areas of the mine where a single drift (often on the vein in question) serves as the sole access, and where suitable positions from which to diamond drill are non-existent. Consequently, as in the case of the ankerites, not many single vein structures are diamond drilled between levels once vertical continuity is established by one or more raises. In this situation, a meagre amount of diamond drill information is available on which to base a comparison with the eventual stope grade. Here, comparisons are made with diamond drilling on or near the level, where the drill core intersections are assessed relative to drift or sill drift development on the vein (Fig. 4).

Where diamond drilling is most required and where saturation-type drilling has proved most effective is in relation to the Type II stockwork or stringer ores. Whether outlining a blast-hole stope with rings of holes at 30-foot centres (at times 15-foot spacing is adopted) or in routine panel stope investigation, diamond drilling is a necessary, but often inconclusive, method of delineating an ore zone. Owing to the variable strike and dip of the veins which constitute Type II ores, the pattern formed by the diamond drill hole intersections in a given area is often as irregular as the veins which they are intended to evaluate. Success in outlining a stringer orebody is measured in terms of both time and imagination. Time is involved to the extent that one diamond drill program from one location, or one direction, is rarely adequate to delineate a stringer zone. In some instances, there will have been a series of programs drilled from several separate locations, months or even years apart. The imagination of the geologist in laying out these programs is essential to their success. After having completed several programs, the percentage of ore-grade to low-grade intersections may not have changed substantially, but in absolute values the number of ore-grade intersections may have increased sufficiently to warrant further drilling, raising and/or subdrifting as a next logical step. As erratic as the diamond drill results from any one program may have been, the additional ore information from subsequent programs may have raised the confidence level to the degree that further development is indicated.

Critique

Discrepancies between diamond drill results and other types of sampling data raise questions as to the nature of the diamond drilling operation itself. What percentage of the core is lost or ground? Would sludge samples be useful? What would the result be if the core size were larger? In addressing these particular subjects at the Dome Mine, it should be noted that for the past several years records have been maintained on the reported lost and ground core in diamond drilling. Not only is the total performance of the monthly drilling recorded, but the performance of each individual runner is also tabulated and posted as a reminder of his personal achievement and of our own concern for the problem. Core recoveries of 97 to 98% have been achieved consistently in the monthly performance ratings; for individual holes, the recoveries range from 80% to 100%.

Recovery of core from routine drift diamond drilling is usually high, frequently 100%, whereas the variable, sometimes fractured areas around potential or actual stoping zones cause a reduction in the percentage of core recovered. The amount of lost or ground core in a vein structure, when ex-
TABLE 1. Comparison of diamond-drill-indicated grades with actual stope muck grades—multiple vein structures

<table>
<thead>
<tr>
<th>Stope</th>
<th>Life (in years)</th>
<th>Ore Type</th>
<th>No. of D.D. Holes</th>
<th>Length of D.D.H. Through Zone</th>
<th>Per Cent D.D.H. Indicated Ore</th>
<th>Grade in Dwt</th>
<th>Final Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1013 No. 3</td>
<td>1960</td>
<td>II (b)</td>
<td>12</td>
<td>419.0</td>
<td>155.5</td>
<td>37%----------</td>
<td>4.88 (uncut)</td>
</tr>
<tr>
<td>1272 No. 2</td>
<td>1957</td>
<td>II (b)</td>
<td>9</td>
<td>250.0</td>
<td>174.5</td>
<td>60%----------</td>
<td>5.43 (cut)</td>
</tr>
<tr>
<td>1372 Nos. 1.3 (No. 4 Panel)</td>
<td>1975</td>
<td>II (b)</td>
<td>6</td>
<td>394.0</td>
<td>162.0</td>
<td>42%----------</td>
<td>2.28 (cut)</td>
</tr>
<tr>
<td>1388 No. 15 Panel (1978)</td>
<td>10</td>
<td>II (b)</td>
<td>3</td>
<td>162.0</td>
<td>129.0</td>
<td>80%----------</td>
<td>7.33 (cut)</td>
</tr>
<tr>
<td>1548 No. 3</td>
<td>1967</td>
<td>II (a)</td>
<td>5</td>
<td>144.0</td>
<td>51.5</td>
<td>36%----------</td>
<td>1.85 (cut)</td>
</tr>
<tr>
<td>1903 No. 2</td>
<td>1952</td>
<td>II (a)</td>
<td>12</td>
<td>420.0</td>
<td>199.0</td>
<td>47%----------</td>
<td>2.53 (cut)</td>
</tr>
<tr>
<td>2415 No. A Panel (1977)</td>
<td>4</td>
<td>II (b &amp; c)</td>
<td>8</td>
<td>423.0</td>
<td>129.5</td>
<td>31%----------</td>
<td>2.47 (cut)</td>
</tr>
<tr>
<td>2415 No. 8 Panel (1975)</td>
<td>6</td>
<td>II (a &amp; b)</td>
<td>7</td>
<td>325.0</td>
<td>134.0</td>
<td>41%----------</td>
<td>2.05 (cut)</td>
</tr>
<tr>
<td>2527 No. 3 No. 9 Panel (1975)</td>
<td>2</td>
<td>II (c)</td>
<td>4</td>
<td>261.0</td>
<td>181.0</td>
<td>70%----------</td>
<td>2.55 (cut)</td>
</tr>
</tbody>
</table>

TABLE 2. Comparison of diamond-drill-indicated grades with lateral development—single vein structures

<table>
<thead>
<tr>
<th>Location (zone width)</th>
<th>Length of Zone</th>
<th>Ore Type</th>
<th>Holes Through Zone</th>
<th>Per Cent D.D.H. Indicated Ore</th>
<th>D.D.H. Grade in Dwt</th>
<th>Development Sample</th>
<th>Indicated Reserve Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1281 No. 16 Dr. (10 ft)</td>
<td>150'</td>
<td>I (c)</td>
<td>10</td>
<td>20%</td>
<td>2.60 (uncut)</td>
<td>27.43 (uncut)</td>
<td>3.00</td>
</tr>
<tr>
<td>1308 No. 6 Sill Dr. (6 ft)</td>
<td>200'</td>
<td>I (c)</td>
<td>5</td>
<td>20%</td>
<td>2.20 (cut)</td>
<td>4.27 (cut)</td>
<td>3.70</td>
</tr>
<tr>
<td>1308 No. 6 Stope (9 ft)</td>
<td>200'</td>
<td>I (c)</td>
<td>4</td>
<td>50%</td>
<td>1.80</td>
<td>3.19</td>
<td>4.54</td>
</tr>
<tr>
<td>2006 No. 8 Dr. (10 ft)</td>
<td>250'</td>
<td>I (a)</td>
<td>5</td>
<td>40%</td>
<td>0.90</td>
<td>2.75</td>
<td>3.00</td>
</tr>
<tr>
<td>2010 No. 10 Dr. (10 ft)</td>
<td>420'</td>
<td>I (a)</td>
<td>9</td>
<td>33%</td>
<td>0.80</td>
<td>2.66</td>
<td>2.84</td>
</tr>
<tr>
<td>2351 Sill Dr. (5 ft)</td>
<td>1,000'</td>
<td>I (a)</td>
<td>11</td>
<td>27%</td>
<td>1.75</td>
<td>4.93</td>
<td>3.20</td>
</tr>
<tr>
<td>2615 No. 6 Dr. (10 ft)</td>
<td>550'</td>
<td>I (a)</td>
<td>6</td>
<td>33%</td>
<td>1.38</td>
<td>4.32</td>
<td>4.32</td>
</tr>
</tbody>
</table>

While sludge samples have been taken in certain drilling situations where poor recoveries were anticipated, the results have not been sufficiently reliable to consider this procedure as a routine practice. The qualitative nature of the resulting assay, together with an unreliable location for that result, render sludge sampling of dubious value. Furthermore, the sheer number of samples from as many as twelve underground machines operating at one time, and the logistics of identifying, transporting, drying and finally assaying the samples, make sludge sampling impractical even before the important consideration of cost.

While acknowledging that larger-diameter holes would provide a larger core fraction for assay purposes, the actual increase in the sample size and the theoretical increase in the core recovery would not, in my estimation, result in any significant revelation in terms of ore assessment. At the Dome Mine, however, this comparison is entirely speculative, because ore definition is done exclusively with EX-size core. As a further comment relevant to the subject of core size, it has been my experience to observe many raises, particularly those driven through stringer-zone orebodies, which have failed to indicate the presence of continuous ore material by conventional sampling between levels and yet the zones have been successfully mined. If sampling from a raise drive on line and grade, 5 feet by 7 feet in dimension, fails to evaluate an ore occurrence, it would appear that adding one half or even one inch to the diameter of a drill core will not add appreciably to our understanding of the subtleties of gold mineralization.

Summary and Conclusions

The importance of diamond drilling as an effective exploration tool in the search for, and eventual development of, any commercial mineral deposit is well recognized. Although grassroots prospecting, geochemical sampling and a host of geophysical surveying techniques have laid claim to a number of significant mineral discoveries, the role of diamond drilling is paramount to success or failure in the "making of a mine."

Once a discovery is made, some appreciation of the size of the deposit must be understood before the economic viability of further development can be ascertained. To that end, diamond drilling is asked to play its conventional role. However, at the Dome Mine, in the exploration and development of gold-bearing deposits, diamond drilling results are often misleading when consideration is given only to the economic value of the drill-core assays themselves.

The comparisons between diamond-drill-indicated grades and actual stope grades are drawn from stopes in a number of individual ore classifications as well as from a combination of different ore settings. The stopes, in addition, are located in widely scattered areas of the mine where they represent a wide variety of cut-and-fill stoping operations over the past thirty years.

Diamond drilling information through multiple vein struc-
tures, such as the Dacite and the Conglomerate ores, which shows from 40 to 60% of the total drill-hole footage intersecting the stoping area, actually fails to return any gold values in excess of 1.00 pennyweight per ton (0.05 ounce per ton), whereas the grade of the stope mucks produced from these areas is often two or three times higher than the actual calculated grade of the entire diamond drill hole section which passes through the confines of the stope.

On examining the drilling data for single veins, the total number of diamond drill holes which actually intersect the structure is, in most cases, 100%. However, the percentage of those holes which intersect gold values in excess of 1.00 pennyweight is in the range of 20 to 50% of the total. Of even greater importance in the over-all diamond drilling analyses are the significance of those gold values in a range down to a low of 1.00 dwt per ton, particularly when approximate cut-off grades of assumed ore within the stopes range from 3 dwt per ton in wide stringer zones to 5 dwt per ton in the narrow-vein Type I ores.

The graphs illustrating total tons milled and total diamond drilling, respectively (Fig. 5), also indicate our average performance in these categories for the last 30 years. Based on this information, Figure 6 shows two graphs, the first indicating tons milled per foot of diamond drilling and the second indicating diamond drill costs per ton milled, where the costs are also shown as a percentage of the total over-all mining costs. The analysis shows that the diamond drilling costs never exceed 5% of the over-all mining costs. For the last thirty years, the ratio of tons milled per foot of diamond drilling has been 9:1 and this relationship is being regarded as a future barometer of diamond drilling activity in the planned No. 8 Shaft expansion program.

While the results of this comprehensive study on diamond drilling have a particular significance within the context of the operation at the Dome Mine, it is hoped that this paper will serve to qualify the expectations of those who endeavour to assess a gold deposit by diamond drilling rather than to quantify the results of other drilling programs to a Dome standard.

Acknowledgments

The author wishes to acknowledge with grateful appreciation the contributions and constructive criticisms of H.V. Pyke, manager of Dome Mines Limited, and T.C. Holmes, former chief geologist of Dome, in the preparation of this paper. I would also like to thank A. König, M. Millions and E. Kallio of the Geological Department for their contributions. In addition, I am indebted to W. Reid, chief accountant, for supplying the statistical data and to H. Childs for the final typing of this report.

REFERENCES


DOMINO ANNUAL REPORTS, Miscellaneous data and statistics were also obtained from previous annual reports of Dome Mines Limited dating back to 1913.