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SPA MINES PROJECT

DIAMOND DRILLING RESULTS
& SUMMARY

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DIAMOND DRILLING AND EXTENDED GEOCHEMICAL SURVEY

INTRODUCTION

The final phase of field work for the 1969 field season was concentrated in the vicinity of the trenches and granodiorite-tuff contact in the Dillard Zone. This involved minor extensions of I.P. line-surveys, four diamond drill holes totalling 1,507 feet, and re-assaying of previously collected soil samples for copper over limited areas.

DIAMOND DRILLING

Diamond drilling sites were selected on the basis of coincident zinc/silver soil anomalies and I.P. conductors. Holes 69-1 to 3 were all drilled from west to east at a starting angle of -45^{o} and 075^{o} azimuth, providing a cross-section from the granodiorite-tuff contact some 800 feet into the tuffs and cutting associated basic dykes. DDH 69-4 was a vertical hole drilled 402 feet over the site of a marked I.P. anomaly within the granodiorite boundary. In addition to assay samples of core, a number of samples were taken for petrographic study. Brief notes on individual samples are given in an appendix to this report, and generally verified nomenclature applied in the field.

DDH 69-1

DDH 69-1 collared at 164+00N, and 179+25E, was drilled for 353 feet and except for thin lenses of granitic to granodioritic material in the first 60 feet was drilled entirely in variable pyroclastics, ranging from fine-grained crystal and lithic tuffs to coarse agglomerate. Disseminated pyrite is a consistent feature of the core with heavy concentrations in narrow friable zones of metasomatic alteration and occasional zones of pyrite veining. The first 200 feet of core is generally more pyritiferous than the lower sections. No significant mineralization other than pyrite was noted.

DDH 69-2

DDH 69-2, collared 350 feet to the east of DDH 69-1 was drilled for 354 feet and intersected a more varied assemblage, including two near vertical basic dykes, the first of which extended for a core length of 55 feet from 100 to 155 feet, and extrapolated to trench outcrops is seen to dip steeply to the east increasing in width from approximately 30 feet at surface to about 40 feet at the diamond drill intersection. A second dyke of apparently similar proportions was intersected between 215 and 255 feet and almost certainly has a sub-outcrop to the east of the trenched areas. After cutting a third minor dyke a few feet in width at 320 feet the hole terminates in similar material. Intervening rocks are tuffaceous ranging from fine-grained lava-tuffs to coarse agglomerates. In addition to the type of pyrite mineralization seen in DDH 69-1, there is a notable concentration of pyrite for about 30 feet preceding the first dyke intersection. The tuffs in this section are heavily pyritized and partly brecciated, and in zones of relatively poor recovery sludge returns consisted largely of pyrite sand. Below the first dyke tuffs show only minor concentrations of pyrite as in DDH 69-1. Although pyrite is the main sulphide constituent of the rocks minor sphalerite, chalcopyrite and specularite were also noted.

DDH 69-3

This hole was collared 400 feet north of DDH 69-2 and drilled for 390 feet to the east for an inclined depth of 398 feet. Except for the last 70 feet, which cut a fine-grained basic lava or dyke, the core is made up entirely of variable crystal and lithic tuffs with a band of coarse agglomerate preceding the terminal dyke-like formation. Pyrite concentrations and veins are restricted to widely separated narrow zones from 5 to 10 feet in width.

DDH 69-4

This hole was collared 1,600 feet southwest of the trenched area and drilled vertically for 402 feet to intersect a moderately strong I.P. conductor located within the granodiorite boundary. For its entire length the hole was drilled in granitic to granodioritic material in varying stages of alteration, with minor siliceous bands and containing one notable xenolith of rhyolite porphyry. In general, the first 180 feet consisted of slightly chloritized leucocratic granodiorite with narrow zones of secondary silicification and 5 to 10 foot widths of intensive sericitization and kaolinization. The lower half of the core consisted of rather fresher biotite granodiorite intercalated with narrow zones of extremely altered material in which pyrite concentrations occur. In these zones the granitic material is reduced to a clay-like consistency armoured with pyrite and minor specularite. In the last 100 feet the granodiorite shows a marked biotite foliation at about 45° to the core axis. Minor blebs of chalcopyrite associated with a narrow four inch aplite vein occur at 328 feet and together with pyrite veining at 377 feet. In both cases the chalcopyrite appears to be a very late introduction.

SAMPLING PROCEDURES AND ASSAY RESULTS

Core from the four bore holes was sampled in 5 to 10 foot widths in zones of notable sulphide mineralization depending upon the type and extent. Control samples were taken over similar widths in zones of disseminated sulphide. All samples were assayed for gold and silver, a number for copper and zinc with a few sample checks for molybdenum, nickel and mercury.

The results are shown in the accompanying table and they are generally rather disappointing. Gold is present in trace amounts only, the silver from trace to generally less than 0.5 oz. per ton, lead up to .43% and zinc up to 1.0% in one 5-foot width, although the average for zinc is below 0.2% for all samples assayed. Molybdenum, mercury and nickel where tested for were only present in trace amounts.

The zone of most interest occurs in the 30 feet prior to the first basic dyke in DDH 69-2. A sludge sample from 65 to 85 feet consisted mainly of pyrite sand and contained 0.47% copper and 0.6 ozs. per ton of silver. Core from the section 86 to 98 feet contained 1.3 ozs. per ton of silver although the copper value was below 0.1%. An average of this sludge sample with core samples taken over the same width, i.e., 65 to 85 feet reduced the overall copper assay to 0.28%. Although these values are sub-economic, they occur over a reasonable width when considered together with the silver assays, and would appear to form a concentration of sulphides at the footwall or east wall of the dolerite dyke. Other assay results are of nominal interest only and rarely are the high zinc values associated with significant copper or silver values.

The hole drilled in the granite was again generally disappointing from an assay point of view, the highest copper value being 0.21% over only 2.5 feet. Interest in both cases centres around the amount of pyrite, both in the granodiorite and in the contact zone, together with the appearance of late chalcopyrite in the deeper sections of the granite hole.

SOIL SAMPLING - COPPER

Although preliminary orientation surveys carried out by Barringer Research Ltd. indicated a generally low to negative response for copper over the areas in question, the presence of copper values in core from DDH 69-2 and the presence of chalcopyrite in core from DDH 69-4, prompted a request for copper assays on alternate samples in the general area of the trenches on the Dillard Zone. Similarly, check assays for copper were made on a small area in the vicinity of a coincident weak I.P. anomaly and zinc soil anomaly centered on Line 180E, 80N in the southern part of the Dillard group of claims and again as a precautionary measure over the high magnetic anomalies indicated in the west central area of the Dillard claims underlain by basic volcanics.

In the trenched area values are generally low with a mean from 15 to 20 ppm and an indicated threshold value from the limited number of samples available of 30 to 40 ppm. These figures are tentative in the extreme and the reduction graph showed a long tail from 30 to 100 ppm copper. A ridge of anomalous values running roughly north-south with zones from 30 to 100 ppm copper roughly corresponds with the pyrite zone through the trenched area and approximately coincides with the anomalous areas indicated by previous zinc soil assays. In the centre of this zone a minor anomaly extends southeast from the trenches and is about 1,500 feet long by 400 feet wide showing values between 60 to 100 ppm. East and west of the ridge of relatively higher values, background falls off to the east below 20 ppm and to the west between 20 and 30 ppm.

In the area of the magnetic "highs" a narrow strip of assay values indicated a generally higher ratio of copper to zinc as might be expected over the basic volcanics. There is little or no correspondence between the position and trend of the magnetometer anomalies and the higher copper values. Again, general background was low, the highest reading being 66 ppm.

These results generally substantiate the zinc anomalies and it seems likely that any further extension of copper assays to the west of the trenched areas will closely mirror the previous zinc assay results.

CONCLUSIONS

It must be generally considered that the results of the diamond drilling are disappointing and the primary target of a wide zone of moderate silver values in the general area of the trenches can now be dismissed. Pyrite concentrations noted in the bore holes are sufficient to give the anomalous I.P. effects noted. Similarly, assay results from core samples for zinc and other metals are sufficiently high to explain the chemical soil anomalies; the wide spread of these values probably being due to the presence of excess pyrite resulting in a high dispersion factor.

In spite of these results, there are a number of points of interest which, provided additional work can be applied without additional cash payments, should be followed up.

1. From the diamond drill data it would appear that the heaviest zone of pyritization and coincident highest silver and copper values are definitely related to the west or footwall of a fairly large basic dyke. This conclusion is based on the factual presence of a zone of heavy pyritization in the position indicated and the absence of heavy pyritization on the hanging wall of the same dyke and on either the hanging or footwall of succeeding dykes to the east, cut by the same diamond drill hole. Although no direct relationship between the granodiorite and dykes can be seen from the bore holes, it would appear from petrological studies that the dyke material has undergone post-intrusive metamorphism including epidotization and alteration of calcic plagioclase to a more albitic type. Such changes together with replacement of original hornblende by fibrous green amphibole are usually associated with either regional or thermal metamorphism rather than simple late magmatic effects. It should be noted, however, that basic dykes of this size are generally resistant to both deformation and metamorphism, and core zones may remain relatively unaltered. It is suggested that the dykes which are obviously later than the tuffs they cut, are in fact, earlier than the granodioritic material and that the most westerly footwall of such dykes acted as a trap for the deposition of excess sulphides, in this case pyrite, emanating from the granodiorite intrusion. Such a theory would explain the observed phenomena and is reinforced by the presence of anomalous amounts of pyrite

in the cored granite of DDH 69-4. Reference to the geological map shows that DDH 69-2 is the only hole that cuts a potential dyke trap zone, i.e., between the dyke and the granodiorite contact. It is considered, therefore, that there is a potential zone of mineralization along the western side of the most westerly dykes paralleling the contact. On the 1"-400' geological map two dykes are shown <u>en echelon</u> which taken together extend for about 800 feet, and may continue to the southeast.

It is impossible to predict a change in the nature of the sulphides with depth even should this zone persist along strike, but it is possible that the ratio of chalcopyrite to pyrite may increase sufficiently below the present section to form an economic deposit. A 20-foot width of $15.00 gross value in this environment would appear to be a mineable proposition if sufficient tonnage is available.

2.) A second possibility for consideration is that the pyrite noted in the tuffs near the contact and within the granodiorite itself may be the result of a pyritic halo around a chalcopyrite rich zone of mineralization within the granodiorite itself. Indications from copper assays of geochemical samples taken to date indicate a very slight increase in background values to the west of the trenched area, but by itself the information is very weak and inconclusive.

3.) Other points of interest rest with a strong I.P. conductor north of the trenched area which has not yet been investigated by drilling and the area of coincident I.P. and soil anomalies centered on Line 180E, 80N.

RECOMMENDATIONS

Provided that further cash payments are suspended in favour of a limited work commitment, a program to test the above possibilities could be implemented. This could consist of extension of I.P. surveys over areas of interest, particularly the known areas of pyritized zones and contact areas, combined with a rapid E.M. survey for maximum effect. Further limited diamond drilling should be implemented to test the mineralized zone intersected in DDH 69-2 in depth, and lateral extensions if there is a substantial increase in mineral values on the first intersection. Similarly, limited diamond drilling should be carried out to test the I.P. anomaly to the north of the trenched area and also possibly in the Line 180E, 80N zone to the south. Alternate lines and stations from the existing soil samples should also be tested for copper on the off-chance that a Brenda-type situation may exist in the area underlain by granodiorite.

Such a program with up to 2,000 feet of drilling could probably be executed for around $30,000-$40,000.

Respectfully submitted,

Dr. J. G. Simpson

A P P E N D I X

BRIEF PETROLOGICAL NOTES ON SAMPLES FROM DIAMOND DRILL HOLES

DDH 69-1, 56 feet - Biotite, hornblende granodiorite.

Minerals

Plagioclase (oligoclase/andesine)	50-60%
Quartz	15-20%
Biotite-Hornblende	10%
Iron Ore	accessory

Description

In section the rock is coarse-grained with a xenomorphic texture and is fairly fresh except for slight alteration of hornblende which is probably a late magmatic effect. There is little or no K-feldspar.

DDH 69-1, 141 feet - Crystal tuff.

Description

In section the rock is seen to be very feldspathic with an irregular texture and consists largely of plagioclase, now almost entirely sericitized with irregular pools of recrystallized quartz. Clinozoisite is a fairly common accessory in the groundmass. A vein of iron oxide, probably specularite, cuts across the groundmass and is associated with some recrystallization of quartz and new micas. There is a good deal of amorphous material in the matrix, probably representing an original fine ash content.

DDH 69-1, 170 feet - Bleached leucocratic granodiorite.

Essential Minerals

Quartz	30%
Altered Plagioclase	60%

Description

The rock exhibits a coarse igneous texture with large pools and veins of recrystallized quartz in a largely sericitic groundmass after plagioclase. Remnant plagioclase twinning can sometimes be seen. Clots of secondary mica occur in the matrix together with a little bleached biotite and minor chlorite.

DDH 69-2, 185 feet - Extremely altered lithic tuff.

Description

This rock is extremely soft and the resulting section is fragmentary. Minerals seen comprise plagioclase and quartz phenocrysts in a rather ashy matrix; a little biotite and altered mafics.

DDH 69-2, 274 feet - Contaminated basic dyke.

Description

In section the rock appears to have a very altered metamorphic texture with a dirty matrix comprising quartz, feldspar (largely sericitized) and minor mafics. The pyroxene is largely changed to fibrous amphibole which in turn is largely chloritized. The pyroxene occurs as remnants only. Late narrow veins consisting of calcite or other carbonate, with hematite margins cut across the groundmass and pyrite occurs as scattered crystals.

DDH 69-3, 167 feet - Welded tuff.

Description

This is a fragmentary rock, possibly an auto-breccia with sub-rounded quartz and feldspar phenocrysts set in an amorphous rather glassy matrix. Examination under plain light indicates that the rock is made up of a number of individual tuff and lava fragments. The term "lava-tuff" is often used to describe such rocks.

DDH 69-4, 162 feet - Very altered, sericitized and kaolinized granodiorite with much pyrite.

Description

The groundmass is rather messy consisting mainly of sericite with new mica and lenses of ribbon quartz. Aggregates of pink materials have a high relief probably and are related to the epidote group as some anomalous blues are seen under crossed nicols. Mafic minerals are largely destroyed and are probably represented by chlorite patches. Pyrite is present as scattered cubes and octahedra, and would appear to be definitely late.

DDH 69-4, 171 feet - Altered granodiorite.

Description

This is a coarse-grained rock with a xenomorphic texture. It has undergone a good deal of matasomatic alteration. Plagioclases consisting largely of sericite, and mafic minerals are represented by chloritic clots. Quartz is little changed and there is less altered feldspar, probably orthoclase. A little accessory iron oxide is present together with pyrite.

DDH 69-4, 353 feet - Altered granodiorite.

Description

This is similar to the above-described rock, but is slightly less altered, with coarse-grained xenomorphic texture. There is a startling contrast between completely sericitized and altered palgioclase with a little remnant twinning visible and fairly fresh orthoclase. Mafic minerals are long gone and are represented by iron rich clusters mica and chlorite. Pyrite is present as well formed cubes and is more common than in the above specimen, and definitely appears to be a late introduction. Both in thin-section and hand-specimen there is an overall foliation of leucocratic minerals apparent, probably indicative of an original flow foliation related to the intrusion of the granodiorite.

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ASSAY RESULTS

QUALITY

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Assay No.	DDH #	From-To Feet	Width Feet	Au Oz.	Ag Oz.	Cu %	Pb %	Zn %	Bi %		
10276	69-1	31.5-40.0	8.5	Tr	Tr	0.02		0.15	Tr		
10277	69-1	50.0-60.0	10.0	Tr	Tr	0.02		0.13	Tr		
10280	69-1	70.0-80.0	10.0	Tr	Tr	Tr		0.05	Tr		
10278	69-1	100.0-110.0	10.0	Tr	Tr	0.02		0.15	Tr		
10279	69-1	110.0-120.0	10.0	Tr	Tr	Tr		0.40	Tr		
10281	69-1	150.0-160.0	10.0	Tr	Tr	Tr		0.05	Tr		
10282	69-1	160.0-170.0	10.0	Tr	Tr	0.02		0.08	Tr		
10283	69-1	190.0-200.0	10.0	Tr	Tr	0.04		0.18	Tr		
										Sn%	
10851	69-2	22.0-30.0	8.0	Tr	0.10		0.31	0.10		0.01	
10852	69-2	30.0-40.0	10.0	Tr	0.1			0.10			
10853	69-2	40.0-50.0	10.0	Tr	Tr	0.02					
10854	69-2	50.0-60.0	10.0	Tr	0.10			0.08			
10855	69-2	60.0-70.0	10.0	Tr	Tr	0.02				Mo%	
10856	69-2	65.0-85.0	20.0	Tr	0.60	0.47	0.18	(Sludge)		0.004	
10857	69-2	70.0-86.0	16.0	Tr	Tr	0.07				0.004	
10858	69-2	86.0-98.0	12.0	Tr	1.3	0.05	0.18	0.08		0.004	Hg%
10859	69-2	119.0-130.0	11.0	Tr	Tr						Tr
10860	69-2	140.0-150.0	10.0	Tr	Tr			0.20			
10861	69-2	160.0-170.0	10.0	Tr	0.01						
10862	69-2	170.0-180.0	10.0	Tr	Tr	0.03	0.27	0.10			
10863	69-2	190.0-200.0	10.0	Tr	Tr						
10864	69-2	220.0-230.0	10.0	Tr	Tr						
10865	69-2	240.0-250.0	10.0	Tr	Tr	0.03		0.13			
10866	69-2	280.0-290.0	10.0	Tr	Tr						
10867	69-2	300.0-310.0	10.0	Tr	Tr						
10868	69-2	320.0-330.0	10.0	Tr	Tr	0.03					
10869	69-2	340.0-350.0	10.0	Tr	0.01						
10874	69-3	20.0-30.0	10.0	Tr	Tr						
10875	69.3	50.0-60.0	10.0	Tr	Tr						
10251	69-3	90.0-100.0	10.0	Tr	Tr						
10252	69-3	120.0-130.0	10.0	Tr	Tr	0.03	0.27	0.15			
10253	69-3	166.0-170.0	14.0	0.10	0.90	0.06	0.25	0.38			
~~10254~~	~~69-3~~	~~170.0-175.0~~	~~5.0~~	~~Tr~~	~~0.10~~		0.18	0.13			
10255	69-3	210.0-220.0	10.0	Tr	Tr			0.13			
10256	69-3	230.0-240.0	10.0	Tr	0.2						
10257	69-3	250.0-260.0	10.0	Tr	0.5						
10258	69-3	280.0-290.0	10.0	Tr	0.2				Ni		
10259	69-3	310.0-320.0	10.0	Tr	0.1				Tr		
10260	69-3	340.0-350.0	10.0	Tr	Tr		0.11	0.43	Tr		
10261	69-3	370.0-380.0	10.0	Tr	0.1						
10262	69-3	380.0-390.0	10.0	Tr	0.4						
									Hg		
10263	69-4	40.0-50.0	10.0	Tr	0.4				Tr		
10264	69-4	105.0-110.0	5.0	Tr	0.1						
10265	69-4	160.0-165.0	5.0	Tr	Tr	0.03		1.06			
10266	69-4	165.0-175.6	10.6	Tr	Tr						
10267	69-4	224.0-231.0	7.0	Tr	Tr						
10268	69-4	260.0-265.0	5.0	0.06	Tr			0.86			
10269	69-4	301.0-206.0	5.0	Tr	Tr						
10270	69-4	376.0-378.5	2.5	Tr	0.4	0.12					