"MORE ORE IN '84!" - FROM SLOGAN TO SUCCESS, BY S.L.PHILLIPS, CHIEF GEOLOGIST, SILVANA DIVISION OF DICKENSON MINES LTD.

INTRODUCTION
(This hand-out is, for the most part, un-illustrated. The maps and rocks, etcetera, on display will, it is hoped, serve as illustrations).

A brief description of the Silvana geological setting is followed by particular reference to the role of graphitic shearing therein. The sequence of exploration events culminating in the 1984 program is sketched. There are some comments on notable features of the results, then a brief follow-up is given based on mining experience to date. A separate section contains notes on paragenesis and mineral occurrences at Silvana.

BRIEF GEOLOGICAL DESCRIPTION
The geological setting of the Silvana Division mine of Dickenson Mines Limited -- also known as the Silmonac mine -- is within the Slocan Series Triassic age rocks that outcrop about two miles north of the Nelson batholith intrusive in the area. The Slocan Series is a pile of mostly argillaceous sediments comprising argillites through argillaceous quartzites, accompanied by limy beds and argillaceous limestones. Marker beds are rare or poorly developed and the structural disposition of the sedimentary pile was not correctly determined until the late 1940's, by geologists of the Kelowna Exploration Company. They mapped and proved the existence of the large, overturned and eastwardly-recumbent folds that form the principal structural features of the area. This Company was later incorporated into the Silmonac Syndicate, and it is the Silmonac properties that Dickenson now holds.

Still on a historical note, it was unfortunate that the tour-de-force of structural interpretation -- which lead to excellent and considerable theorising as to the location of orebodies -- did not produce the desired results, viz. exploration tools capable of finding new mines. One reason may be that considerable redistribution of the main products of the mineralising events occurred after the folding -- this interpretation a relatively recent one. Also, mineral deposition appears spatially unrelated to the overall structure although small, localised correlations do occur.

The Silvana mine orebodies occur in a "lode fault" (lode structure). This structure is called the Main Lode, a south to southeasterly-dipping fault interpreted over a 7 miles length between Silverton Creek on its west end and Sandon on its east. The structure is sinuous and shows great variation in both dip and expression. Throw and sense are obscure and apparently change along its length. An interpretation from the segment worked by the Silvana operation suggests it is a shallowly-dipping (20° to 30°), thrust-type fault with a horizontal component of several hundred feet, probably approximately in a dip-slip sense. Other segments, principally east of the Silvana workings, have much steeper dips and other parameters that suggest normal faulting. In fact, when discovered, the lode segment that hosts the Silvana mine was, because of its aspect, considered unlikely to be the western extension of the Richmond-Eureka/Slocan Star/Silversmith/Hope mines segments of the Main Lode. From many considerations, including fifteen years' production and exploration, it is considered justifiable to call the productive structure at this property part of the Main Lode. If this interpretation is correct there is a large piece of the Main Lode to explore to the west, possibly up to two sq. miles, on the Dickenson property, between the 4,000 and 5,000 feet elevations -- ten times the area thus far explored and mined from.

Production started in 1970 and was continuous apart from short interruptions due to smelter shutdowns -- stockpiling of concentrates hasn't been possible -- until Decsmber 15, 1983. Milling resumed in September, 1984. Total production to December 31, 1984 was 322,516 tons grading 14.2 oz./ton silver, 4.8% lead and 4.7% zinc. Production from September to December, 1984 amounted to 8,137 tons at a respectable 21.4 oz./ton silver, 10.7% lead and 6.2% zinc.

Rocks within the lodes are mostly breccias having two basic styles -- flow and vein -- of greatly varying degrees of coarseness. Much if not all of the almost mylonitic-style flow-breccia arises from the later deformation and shearing of vein-breccias and previously less to non-brecciated rocks, an event that was responsible for the great quantity of carbonaceous "graphitic" material developed in the lodes and other structures. The "graphitisation" event appears responsible for the redistribution of the Ag/Pb/Zn mineralisation. Silicification of lode rocks is a pre-graphitisation event, this alteration often also appearing in adjacent rocks, principally the hangingwall, and occurring with a more or less similar distribution to the mineralisation. Lode structure thickness varies from a few inches to a few tens of feet and the fault itself may show braiding or multiple-stranding.

The main lead/zinc sulphide mineralisation occurred in at least two stages. Sphalerite with plentiful siderite and little or no lead and very variable silver values characterise the earlier phase. The later sulphide mineralisation was accompanied by more silver and is represented by an important lead introduction, characterised by argentiferous galena. In many places later events have obscured the overall paragenesis somewhat. The attached section on mineralogy contains more on the paragenesis and details of mineral occurrences at Silvana.

The ore mineralisation occurs as veins, lenses, pods, shreds, breccia infillings etc., most ore occurrence boundaries showing shearing and/or slickensiding. En echelon lenses and pods with such tectonic boundaries, also the presence of a folded, gneissic, foliated texture in much of the galena mineralisation are principal reasons for postulating considerable redistribution of previously-existing, largely vein-type mineralisation. The shearing of, principally, argentiferous galena also appears to have led to redeposition of some silver as ruby silver on slickensides.

Intrusive rocks are entirely pre-lode-faulting but post-folding, consisting mostly of biotite-rich diorites and biotite/felspar porphyries with minor lamprophyres. Many of the porphyries exhibit extreme contact metamorphism to partial or complete assimilation via biotitisation and silicification. Such haloes may be virtually non-existent to tens of feet in extent. The Nelson batholith, of late Cretaceous age, and apparently the last-emplaced intrusive, may be represented by the larger bodies of biotite/quartz diorite that are present, apparently widening downward, on the lowest (4000) mine level.

The latest-occurring tectonic disruptions are normal, clay-gouge-filled faults that slice through or drag the lodes and any contained ore. These structures are widely distributed, do not have a distinct pattern and rarely have any great size either in throw or persistence.

ROLE OF GRAPHITIC SHEARING

The "graphitic" shearing tectonism referred to above is far more widely developed than the lode-faulting. Unfortunately the shearing not only gave rise to somewhat lode-like zones but frequently intersected, paralleled, coincided with, dragged or cut off lode-faults or segments thereof. Whole Slocan Camp exploration programs have been diverted onto barren shear zones owing to the similarity and frequent intimacy of the two types of structure. The Silmonac Syndicate program was a case in point, and only a desperate, last-ditch exploration coup in 1967 prevented total failure of a program that had become sidetracked onto a major, sheared structure now known to be some 350 feet below the one they were nominally exploring -- and in which we are now mining.

The shearing cuts mineralised lodes, thus spuds, lenses and boudins of ore minerals can occur sporadically. When an exploration heading visits such an occurrence it is very tempting to assume it is a lode exposure. However it may be several hundred feet to the nearest true lode.

Shear zones branch, pinch and swell, wrap around intrusive bodies in some cases, cut them in others -- and can cause major ground control problems. It seems that large areas of lode structures can be effectively obliterated by shear zones, further adding to interpretation difficulties, and posing large problems in formulating effective exploration programs. For example, from 1977 until recently, the shearing overprint and lode disruption thwarted exploration for new ore shoots to the west and both up- and down-dip of the current most-westerly Silvana workings. Surface exploration instituted in 1983 and re-examination of geological data has resulted in a testable, revised interpretation that it is hoped will "fill the gap" between current workings and the Carnation mine 2000 feet to the west and 700 feet higher. The Carnation was an unsuccessful venture based on a Kelowna Exploration interpretation that may have been close to success had a little more flexibility in approach been used at the time.

The graphitic shearing feature is apparently more pronounced in this shallowly-dipping (Silvana) portion of the Main Lode than in steeper-dipping areas. Limited examination of the workings and reference to the geological mapping in the Standard, Hecla, Monarch and Mammoth mines to the west and Silversmith, Slocan Star etc. to the east show less graphite associated with the lode structures, though shear zones do occur in other settings in those mines. The presence of shearing to a greater or lesser extent has been almost universal in the areas of lode structure explored and mined at Silvana prior to the one outlined in 1984. The relative absence of shearing in the last-mentioned area, at least in the ore veins, is unusual in the Silvana mine and sheds light on pre-shearing relationships, particularly the paragenesis of the mineralisation, and some of the features operating during the mineralising process.

NEW OREBODY -- (a) EXPLORATION CHRONOLOGY

When the decision was made in November, 1983 to shut down production and do some underground exploration to attempt to outline new reserves at Silvana, it was indicated the budget would allow for 500 feet of lateral development and 5,000 feet of diamond-drilling. The relative merits of the various proposals were quickly resolved, the one chosen demanding extension of the 4270 Drift 500 feet to the east and drilling updip to intersect the lode structure between the 4,300 and 4,450 feet elevations on the north side of the drift. The proposal was one dating back to 1981, that would have been completed in 1982 had economic conditions and mine profitability been favourable. Even in 1983, 350 feet of drifting progress had been made towards this target area before the production suspension and exploration program were announced.

Previous work in the vicinity comprised five fairly long holes from the 4000 Level drift, some 250 feet lower in elevation, two drilled in 1980, the others in early 1983. All intersected some mineralisation, mostly sphalerite with low silver values, although one (DDH 4082, drilled December, 1980) intersected a one-foot length of almost solid galena and was the principal piece of evidence that suggested ground to the east and up-dip should be a prime prospecting area.

Thus it was very gratifying that the first hole drilled (by Rainbow Diamond Drilling Limited) -- (DDH K-633) -- nearly 200 feet northwest of DDH 4082, intersected a heavily mineralised section of lode structure. Prior to the drilling, however, the 4270 Drift had been "eyeballed" in with the fervent hope that its position relative to the lode would allow the drilling program to (a) reach it and (b) be effective in coverage. In early February a minor geological panic set in when the drift intersected a sheared, mineralised structure! The fact that it had a north-south strike and west dip, quite at variance with that expected for the Main Lode, and could not be correlated with any structures in the earlier drilling, led to the decision to discount it as a true lode, and continue the drift as planned.

Drilling commenced March 01, 1984 and intersected apparent ore-grade mineralisation in 16 of the initial 18 holes drilled, and in 21 of the total 27 drilled.

It did not pass un-noticed that the Silmonac Syndicate came within a couple of hundred feet of discovering this zone in 1963. They had indeed been following the "correct" structure via their drilling program from the 4000 Level. They were diverted from it when their westerly drift ahead intersected the shear zone mentioned earlier. Instead it took them another four years to hit the "correct" lode again, 2,000 feet further to the west and 600 feet above the 4000 Level.

-- (b) NOTABLE FEATURES

As noted above, graphitic shearing was virtually non-existent in most of the intersections, except at the eastern end of the block, although it was present in several places in the footwall of the overall lode package. This last phrase describes the most noteworthy feature of the Main Lode in the newly-drilled area, that of thickness, up to a 50-feet interpreted true width, much of it consisting of vein-type breccias and variable but patchily very heavy lead-zinc mineralisation. Mineralisation position, lengths and grades varied greatly even in closely adjacent holes and it appeared that correlation of mineralised sections would be unwise. There was a possibility that most of the zone was in fact a breccia with pockets and scattered irregular mineral concentrations, and it was decided that an initial ore reserves calculation should be prepared on that basis. Thus a considerably larger than normal tonnage per square foot of plan area and a moderate and diluted grade characterised reserves prepared for the May 31, 1984 statement. Even with the conservative parameters it was apparent the zone would be economic and profitable to mine, and initial development was planned and begun in May. Also a batch of diamond-drill core sample rejects was prepared and shipped for metallurgical testing, as the mineralogy had a different aspect than "normal" Silvana ore and new parameters for our concentrates would need to be identified for marketing to the smelter.

-- (c) EXPERIENCE FROM MINING

The first section to be cut, via a raise, was a flat-lying vein disappointing in grade and only moderately interesting in width. The second appeared to be a disaster, heavily sheared, graphitic and incompetent -- and poorly mineralised. The hastily revised geological interpretation said "try ten feet higher", and the raise then intersected a 4.0 feet thick vein carrying 50% sulphides with competent wall rocks, a vein which proved capable of being followed some 150 feet up the average 30° dip and 75 feet along strike, with a true width of 0.5 feet to 7.5 feet.

The existence of this well-developed composite vein emplaced along or very close to the hangingwall contact of the lode structure encouraged the hope that the orebody contained fairly continuous shoots of mineralisation, at least in part as veins. This would allow a higher grade to be mined and at a lower rate of dilution, than given by the ore reserves estimate. A drive flat from the hangingwall vein towards the footwall of the lode structure gave further such encouragement, again a thick (2.0 feet to 6.0 feet), heavily-mineralised composite vein was intersected. This vein has been followed, so far, 200 feet along its sinuous strike and from 30 to 75 feet up its very variable (30° to 90°) dip.

A third vein, probably along the footwall, has been intersected and followed up-dip for 75 feet but has not had any strike exploration as yet. The hangingwall vein also contains a second shoot west of the first, again with good widths up to 4.0 feet of ore, approximately 150 feet along strike by 50 feet up the dip.

Mining in the ore has also shown that the drilling under-sampled the lead mineralisation, apparently because of its unusually "gobby" nature. By contrast, the more uniformly-distributed zinc component appears to have been satisfactorily estimated from the drilling. Silver was under-represented in the drilling but less drastically than the lead. The zino component, historically, has been the most reliably-estimated one as its assays occupy a much narrower frequency distribution than the lead and silver. Nevertheless the widest range of silver assays accompany the zinc mineralisation, resulting in very poor silver-to-zinc correlation. Silver content in the lead mineralisation can be more reliably "guessed at" and is higher, on average, by a factor of two relative to that in the zinc. The overall average in the new zone is one oz. Ag to one percent (lead + zinc), whereas the historical average of production from the property shows one-and-one-half oz. Ag to one percent (lead + zinc). (It is a curious fact that silver to (lead + zinc) ratios tend to be higher in sheared ore than in undeformed material!).

At this point about half the ore intersections can be considered to have been tested, and with excellent results. 1985 should see testing of the balance of the intersections, mostly via in-stope development.

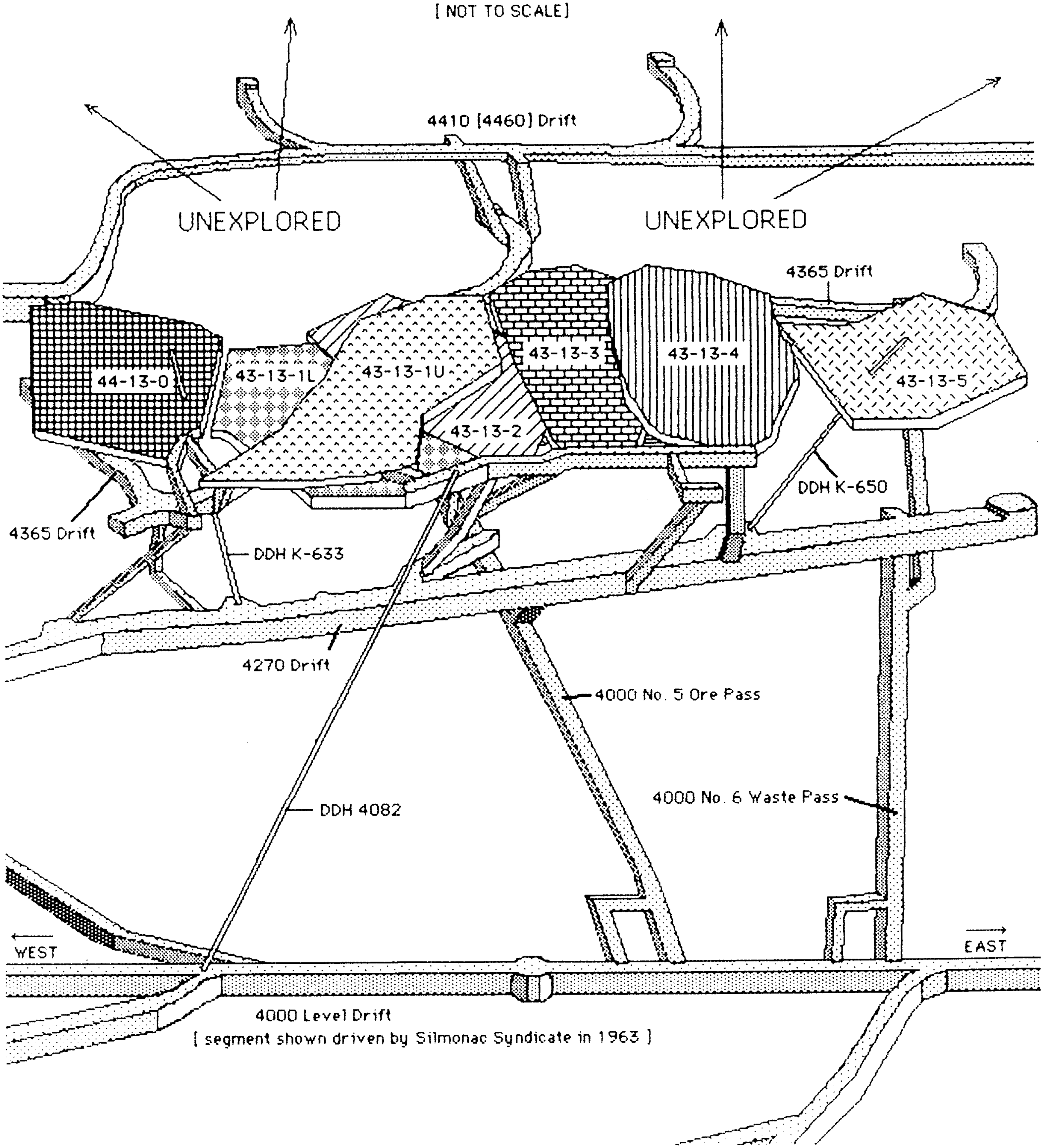
The mining method is currently a traditional(?) "sideswipe" style of stoping (an empirical blend of longwall and room-and-pillar methods). This follows development subdrifting and raising in the ore to determine its geography. Consideration is being given to establishing a blast-hole stope in the thickest area of the new zone. Up until now the low angles of dip have precluded anything but a relatively low productivity, in-stope slushing, extraction method. Nonetheless, a new ore pass system was incorporated into the 1984 development of the new block, with two wing raises feeding slushed muck directly from stopes into the pass, thus reducing scooptram haulage costs considerably.

Attached are two, three-dimensional computer (MacDraw) drawings by Dickenson/Silvana Exploration geologist D.K.Makepeace that show principal features of the area containing the 1984-outlined zone, also some of the work planned for 1985. Thanks are due to Dave for these and for the bulk of the map preparation. Thanks also go to R.A. (Bob) Attridge, for his detailed mineralogical work -- see the following section.

DICKENSON MINES LTD.
SILVANA DIVISION

1984-85 44-13-0 and 43-13-1 to 5 Stope Areas

[NOT TO SCALE]



DICKENSON MINES LTD.
SILVANA DIVISION

1984-85 43-13 STOPE AREA DEVELOPMENT

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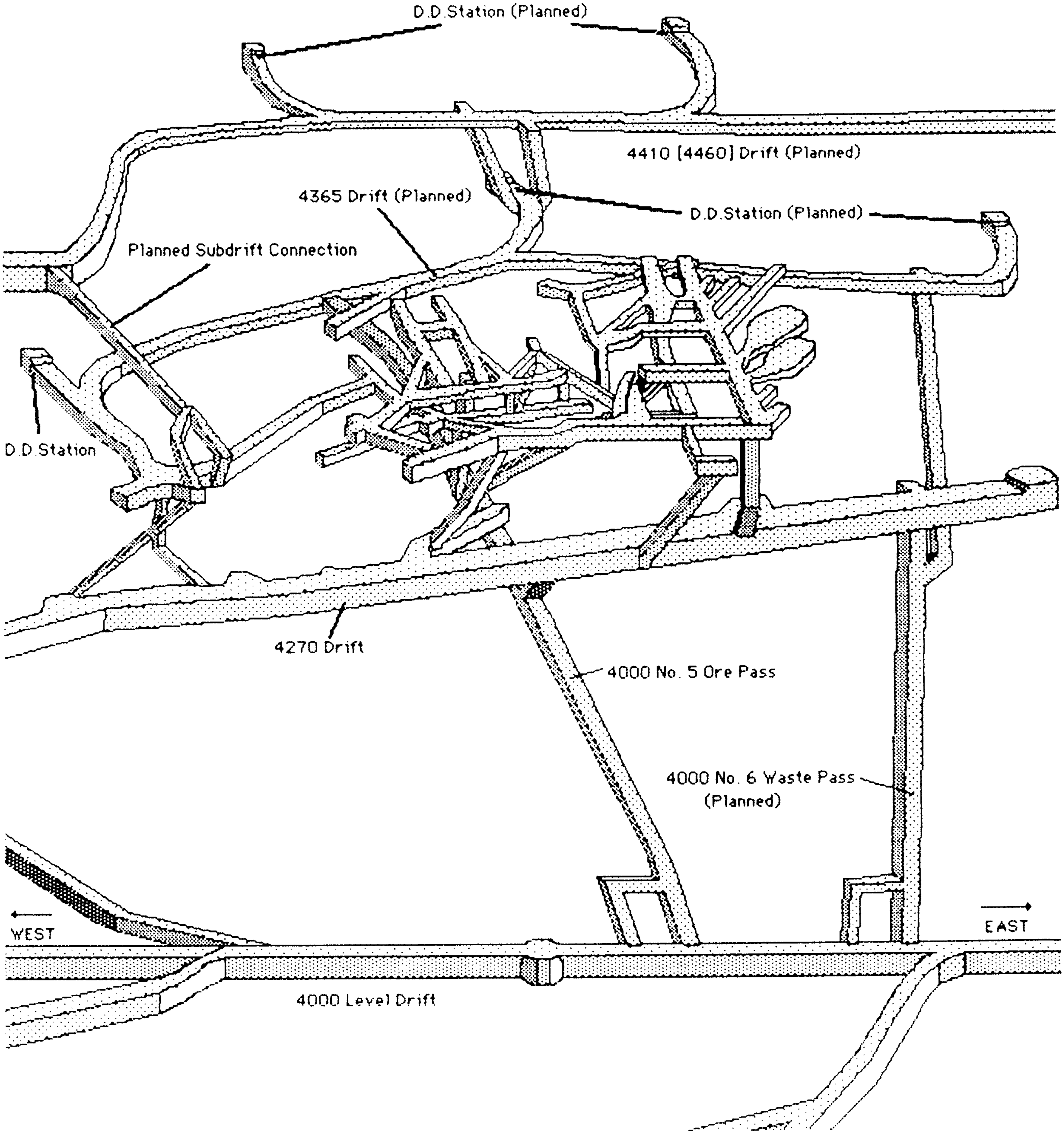

MINERALOGY OF THE SILVANA DIVISION OF DICKENSON MINES LTD., BY R. ATTRIDGE, ASSISTANT ENGINEER.

PARAGENESIS: The sequence is thought to be quartz, pyrite, calcite, siderite, two sphalerite phases, galena, tetrahedrite, with argentite, pyrargyrite, silver. See also the tentative diagram attached.

There is a considerable overlap of times of formation, especially with quartz which continues to form throughout most of the sequence. Ranges of pyrite and calcite are similar. The ranges of siderite and galena are limited. Tetrahedrite is closely contemporaneous with galena. Argentite is similar and may be later. Pyrargyrite is mostly hypogene although probably also formed by enrichment processes. Silver is probably supergene in origin.

In barren quartz veins, all minerals are contemporaneous.

Chalcopyrite, a very minor constituent of the ore zone, has an extended range, but starts to form definitely later than other iron-bearing sulphides (pyrite and pyrrhotite), and contemporaneous with galena and the later sphalerite.

MINERALS: Acanthite, argentopyrite, arsenopyrite, calcite, chalcopyrite, chlorites, clay mineral, feldspars, galena, laumontite, pyrargyrite, pyrite, pyrostilpnite, pyrrhotite, quartz, siderite, silver, sphalerite, stephanite, tetrahedrite, tourmaline.

ACANTHITE: As very tiny black, bladed crystals (30-50x -under 0.1mm length); occurs as an alteration product associated with minor native silver in massive quartz. From 4560 stope.

ARGENTOPYRITE: As black, pseudohexagonal crystal groups and prismatic crystals showing six-pointed "star" cross-section (0.5mm diameter); found only in 4560 stope in a fracture zone along with minor pyrrhotite and multiple rhombs of white calcite. Identified by X-ray at U.B.C.'s Geology Department.

ARSENOPYRITE: Small (20x) bronze crystals with pyrite cubes in a massive white quartz vein containing white calcite in argillaceous sediments. From a single drill core sample.

CALCITE: Usually white-to-colourless, single-to-multiple, rhombic crystals; sometimes as light, pinkish-white concretionary masses; fluoresces bright orange; sometimes prismatic; usually with quartz in "graphitic" shear zones; also as veinlets throughout mine.

CHALCOPYRITE: Usually as tiny (5-10mm) masses in massive sphalerite; uncommon, except in 43-13-2 and -3 stopes. Also as acicular, very tiny (30x) crystals -- like very fine, brassy hairs -- in sulphosalt-rich tension fractures, associated with pyrargyrite, stephanite, calcite, some dark chlorites, quartz and pyrrhotite. Analysed at U.B.C. by S.E.M. contains Cu, Fe and S only -- actual identification not known. Usually connected to pyrrhotite crystals (see S.E.M. photo No.1).

CHLORITES: Usually as rounded, mammillary groups on quartz crystals; from white, to pale to dark green, to greenish-black to brownish-grey; under 1mm in diameter; may be associated with proustite, acanthite, calcite pyrrhotite (see S.E.M. photo No.2).

CLAY MINERAL: Light brick-orange radial crystal groups on quartz, associated with laumontite; from shear zone fractures in 44-11-1 stope.

FELDSPARS: Celsian orthoclase (Ba-Ca); colourless, prismatic crystals from fractures in altered porphyry in ore zone of 45-11-9 stope; with filiform (up to 1mm) pyrite.

Orthoclase; colourless, prismatic wedge crystals with calcite and minor pyrite from vein in porphyry on 4000 level.

GALENA: Fine-to-medium-to-coarse-grained massive lenses, also as fine-to-medium-grained, gneissic textures.

LAUMONTITE: Clear, prismatic crystals, 2-3mm long; loses moisture and turns white shortly after removal from mine; from wide "graphitic" shear zone in 44-11-1, associated with quartz and minor clay mineral.

PYRARGYRITE: Bright red, prismatic crystals (up to 1mm); tarnishes dull black with long exposure to sunlight; usually seen as bright red smears on fracture surfaces in broken ore. Usually associated with sphalerite, quartz, some galena, calcite, pyrrhotite, chalcopyrite, stephanite; in tension fractures in ore zones, walls coated with rusty, reddish iron compound. Proustite may be present, all samples analysed contained only antimony (Sb) although arsenic -- garlic smell -- has been noted in many stopes while chip sampling and during operation of rock drills.

PYRITE: Usually as striated, cubic crystals, with octahedral faces, sometimes octahedra; occasionally as prismatic "filiform" crystals with feldspar in altered porphyry fractures. Associated with quartz and calcite.

PYROSTILPNITE: As thin, bladed orange-red crystals -- very tiny (30x) -- in fractures, along with chlorite minerals and/or pyrargyrite, stephanite, quartz, in silica-rich zones.

PYRRHOTITE: As hexagonal wafer roses associated with quartz, sometimes with pyrargyrite, stephanite, chalcopyrite, calcite, argentopyrite. May be partly eroded when associated with acicular chalcopyrite; may show secondary growth. Largest about 15-20mm diameter wafers; one piece from 45-11-6 stope shows thick, prismatic crystal groups -- not wafers. Sometimes may be covered by resinous brown amorphous compound.

QUARTZ: As small, white veins and veinlets, containing pockets of tiny, clear, prismatic crystals, sometimes with tiny pyrite cubes; from tension fractures in ore zones, may contain sulfosalts, pyrrhotite, chalcopyrite, calcite, chlorites, clay mineral, laumontite; from 4550 stope occurs as tiny bipyramids with little or no prismatic faces.

SIDERITE: Light, creamy masses darkening with long exposure to air and moisture. Usually associated with sphalerite and galena.

NATIVE SILVER: As tiny masses of bronzey-silver material in massive quartz, from 4560 stope; with associated acanthite.

SPHALERITE: Fine-to-medium-grained, massive lenses, reddish-brown to dark brown, surrounded by light, creamy-yellow siderite. Very tiny (50x) crystals in fractures from 4400 No.8 stope, as red tetrahedra with dark-brownish-grey chlorite.

STEPHANITE: As tiny (30x), shiny black prismatic crystals associated with sphalerite, quartz, pyrrhotite, pyrargyrite, calcite.

TETRAHEDRITE: As shiny black striated/twinned tetrahedral crystals from fracture in quartz zone in 44-11-1 stope.

TOURMALINE: Only from 4000 level, from thick white quartz veins, one single crystal, 2cm long, 0.1mm wide -- translucent brown, covered by thin layer of mammillary brownish green chlorite on calcite.

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