STEFFEN ROBERTSON AND KIRSTEN (B.C.) INC. Consulting Engineers
Suite 800, 580 Hornby Street, Vancouver, B.C. Canada V6C 3B6
Phone: (604) 681-4196 Fax: (604) 687-5532

March 18, 1991
Project Number 60619

Curragh Resources Ltd.
Box 1000
Faro, Yukon
Y0B 1K0

Attention: Leo Hwozdyk

Dear Leo:

RE: MARCH 5 SITE VISIT

A site visit at the Faro operation was conducted by James Mathis of SRK during the period March 5 - March 7, 1991. The purpose of this visit was to:

- train personnel to geotechnically log core for the Dy project;
- evaluate general geotechnical data pertaining to the Dy project, and;
- conduct a walk-through of the Faro underground operation.

Each of these will be dealt with under separate headings within this letter.

Geotechnical logging - Dy project

John Zbeetnoff and assistant were trained in using the mining rock mass rating (MRMR) geotechnical classification system. Both appeared to have a relatively sound grasp of the system and obtained appropriate ratings for test sections of logged core.

In addition, some core was geotechnically logged by J. Mathis (SRK). The phyllite/schist in the area may very well be sound (unfractured) in place. However, upon coring and subsequent handling, the material tends to break along extremely weak foliation planes. This presents a problem for the MRMR system as the fracture frequency composes a large percentage of the rock mass score. This was remedied by counting all fractures as joints. The rock mass score can then be adjusted upward, or downward, depending on the mining system to be used.

In general, the phyllites and schists have an RMR of between 20-35 which is classed as poor to very poor rock. There appears to be a certain reinforcement potential as most of the jointing follows foliation.

The massive sulphide appears to have an RMR of between 45 and 60 (fair to good) although this was difficult to ascertain as all the ore intercepts were split.

General geotechnical comments - Dy project

The Dy orebody is located approximately 2500-3000 feet below surface. As such it may be classed as a deep deposit. At this depth, stresses are high and will be critical to the mining method, especially in areas of weak rock. Vertical in-situ stress, neglecting induced tectonic stresses, will be on the order of 2800 to 3500 psi. These stresses are up to three times greater than those experienced at the Faro operation. They are also of the same order of magnitude as the compressive strength of the phyllites/schists overlying the orebody (2000-5000 psi estimated).

The orebody, from a geotechnical viewpoint, appears to be similar to the Faro underground orebody. It may, however, be slightly more broken. The orebody is inclined at 15 to 20 degrees to the horizontal with thicknesses ranging from 7 to 23 metres. Regionally, the structure is intensely foliated. This folding, together with the thickness variations, implies that fault/fold doubling is likely to exist in the orebody. Sub-vertical faulting is also present in the orebody. The frequency and offsets of these faults will be critical to the selection of mining methods. If the faults are closely spaced with large offsets, a mining method which is very flexible should be chosen to minimize dilution and support problems. If the fault spacing is large and offsets minimal, a more rigid production system can be envisioned. The mining method must also be amenable to the range of ore thicknesses mentioned.

Water may also be a problem in the area. Artesian flow was encountered in one drillhole at a depth of approximately 250 meters. Iron staining in dolomitic zones, indicating surface oxygenated waters, was encountered at even greater depths.

Recommendations for work which should be considered are as follows:

- Portal and decline:

The proposed portal area was examined during the site visit. As was expected from core, the rock is very fissile but reinforceable (Plates 1-3). The RMR of the material is in the 20-30 range. The material is, however, extremely sensitive to vibration (de-lamination of the foliation planes). Only controlled blasting, with a minimum of explosives, should be used. Mechanical excavation, such as with a road-header machine, should be explored. Mechanical excavation would not disturb the rock mass, minimizing support. It may also be cheaper and give more rapid advance rates than standard drill-blast-muck excavation techniques. In either case, shotcrete or fibercrete must be used as support and to protect the rock from possible slaking.

Drillholes along the proposed decline alignment should be re-logged, or the data reinterpreted using the MRMR system. Support should be estimated for both a mechanical and blasting excavation scenario.

In addition, the soil composing the left side of the portal cut may become unstable during spring thaw. It appears as if the overall soil cut is too steep. However, this is an assessment made on a slope covered with snow and should be taken as such.

- Orebody:

Angle holes, preferably oriented, should be drilled to determine the location, spacing, thickness and offset of subvertical geologic structures. At present, all holes are near vertical and, as such, blind to the major offsetting geologic structures. This could have a tremendous impact on the choice of mining methods.

In addition, in-situ stress measurements should be contemplated for the orebody. It is not known what the regional tectonic stresses are in the area. However, at the depth at which mining is contemplated, any regional horizontal stresses which exist will affect mining activities. If these stresses are large, they could well be a controlling factor on the mining system chosen.

- Mining method selection:

A careful survey should be made to determine which mining methods are appropriate for the Dy orebody. Given the weak hanging wall rocks, the large overburden stress, and the uncertain effects of fault offset, room and pillar mining may not be the most appropriate solution. Panel cut-and-fill or other fill techniques may offer higher recovery and better working conditions.

- Water:

The total inflow, aquifer capacities, and environmental effects (discharge and aquifer draining) must be addressed.

Faro underground walk-about

A walk-about of the Faro underground workings was conducted on the morning of March 7, 1991. Due to time constraints, not all areas were examined. However, most new areas and areas of potential problems were.

It appears as if three support systems are in use at the mine. These are: split sets, split sets with straps, and split sets with mesh and straps. At times, none of the three is appropriate. This is illustrated in the

North extension where the drifts cross the dike defining the orebody limits, as well as in the South G ramp area. Frame 4 shows how the rock has peeled away from the split sets, leaving them not only unbent but still firmly anchored in the back. This is indicative of a rock substance failure. Shotcrete followed by bolting should be attempted in such areas.

The one slusher stope which has been mined, although not technically a slusher stope, is not adequately supported. Mechanical rockbolts (Frame 5) are used almost exclusively in the back of the stope. Between 60-80% of these bolts are no longer tensioned (bearing plate not in contact with rock) and are therefore providing no support. The mining span is such that the back must be supported with a support system which does not need maintenance. This means that either split sets or grouted bolts must be used. Mechanical anchor bolts are dangerous if they cannot be maintained (re-tensioned) on a regular basis. They should never be used where they cannot be accessed.

An examination of the South B stoping area uncovered very minor pillar spalling, indicating that the pillars are beginning to take some load. Bearing plate bending (Plate 6), between some of the pillars in the area, may indicate that the back is beginning to sag slightly. The conditions of both pillars and spans between pillars should be monitored on a continuing basis.

Rock bolts and strapping were recommended for an area of the South G 300 drift where a potential rock substance failure existed in the drift ribs.

In general, the back looked good when composed for quartzite or sulphides, and not so good when composed of schist. Ground support is characterized by areas of over and under support (high and low bolt intensity) with no flexibility for alternative support systems such as shotcrete.

Yours truly,

STEFFEN, ROBERTSON AND KIRSTEN (B.C.) INC.

Dr. J.I. Mathis

JIM/059cs
Attach

Plate 1

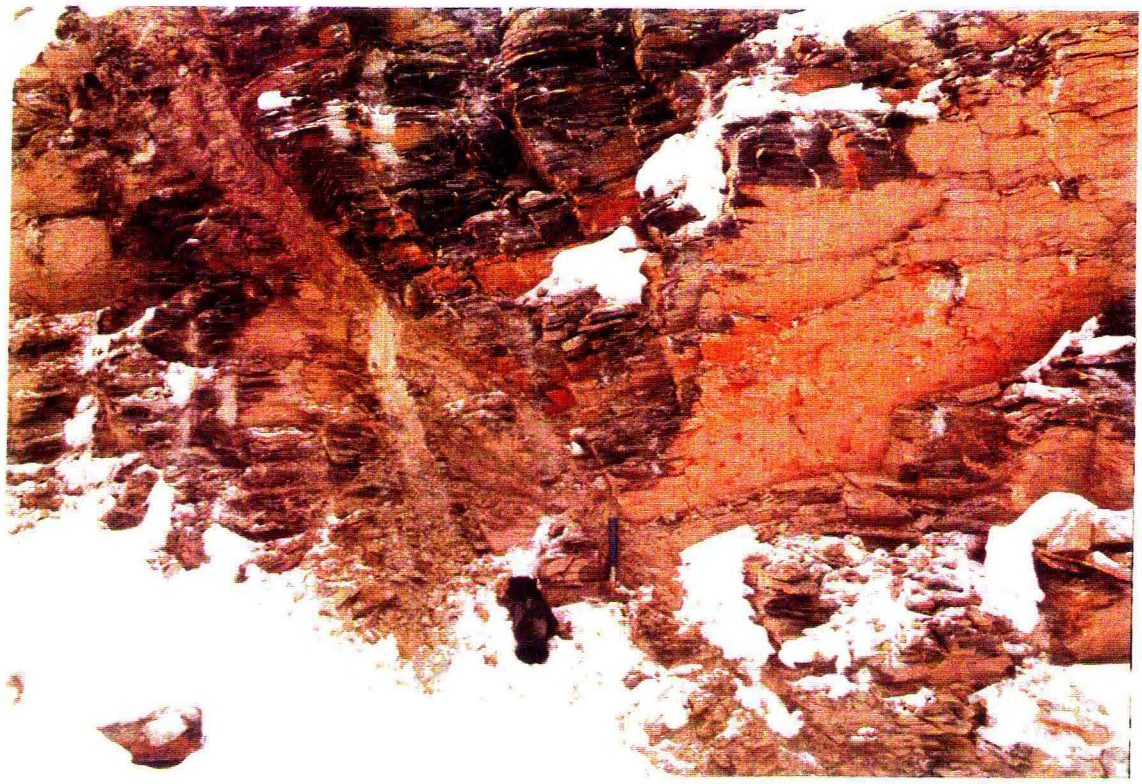


Plate 2

	Date
Plate 1: Portal cut, right hand side facing portal	Proj No.
	Approved
Plate 2: Portal cut, portal face	
STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers	

Plate 3

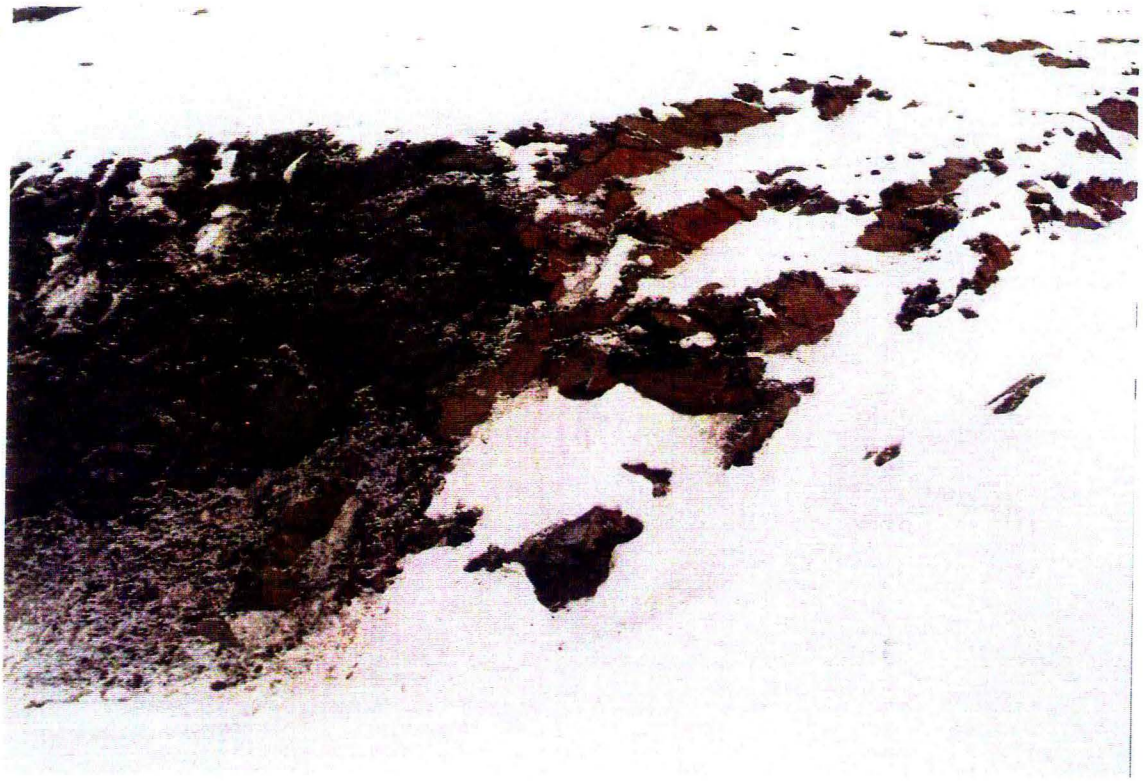
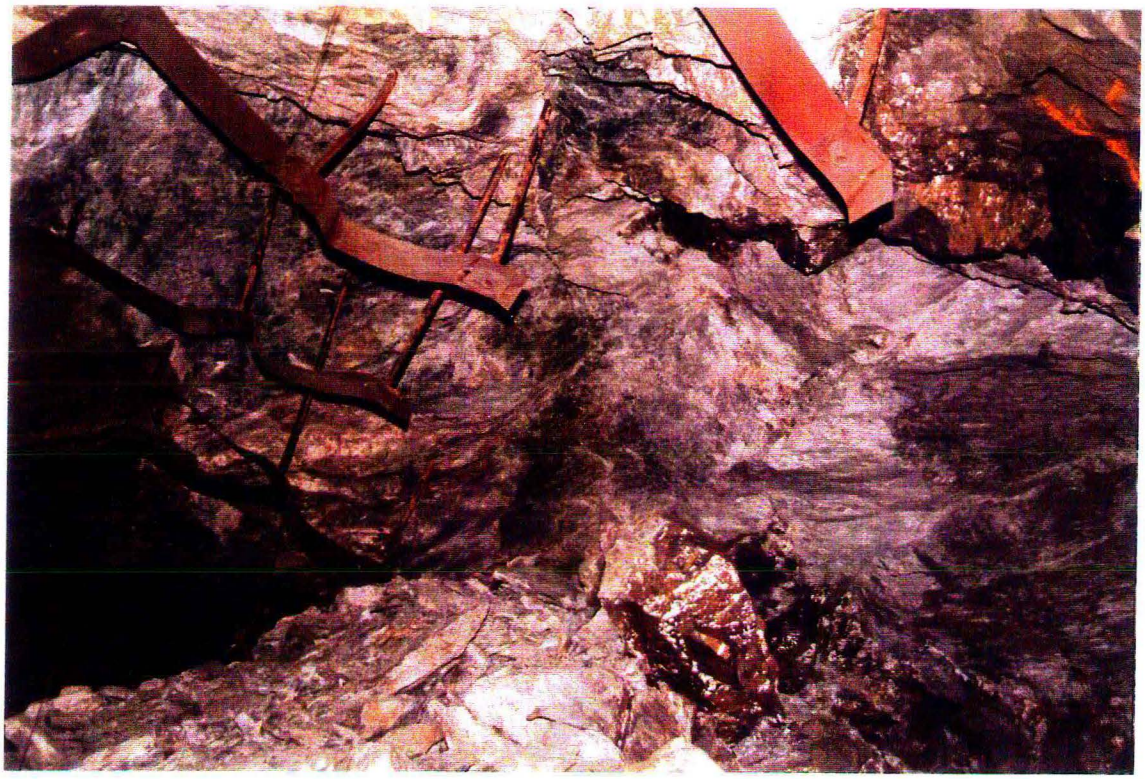


Plate 4



	Date
Plate 3: Portal cut, left hand side facing portal	Proj No.
	Approved
Plate 4: Failure in NB725 near dike crossing. Note unbent and still anchored split sets, fragmented failure mass.	
STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers	

Plate 5

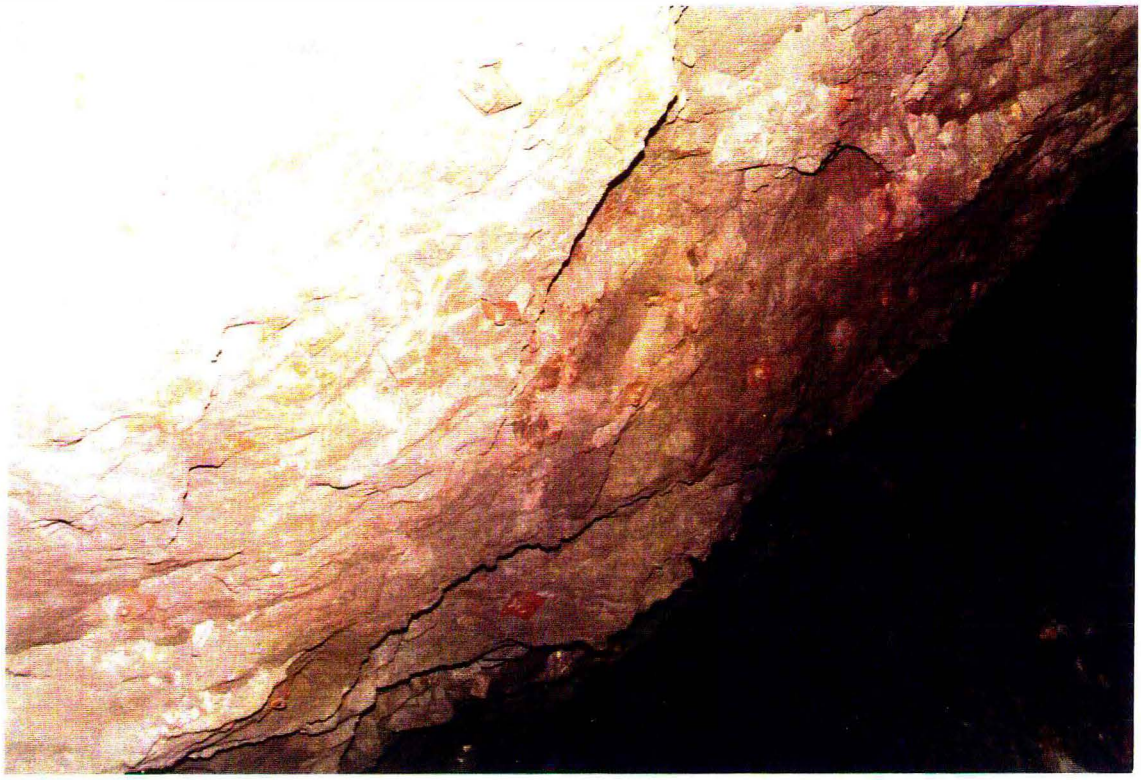
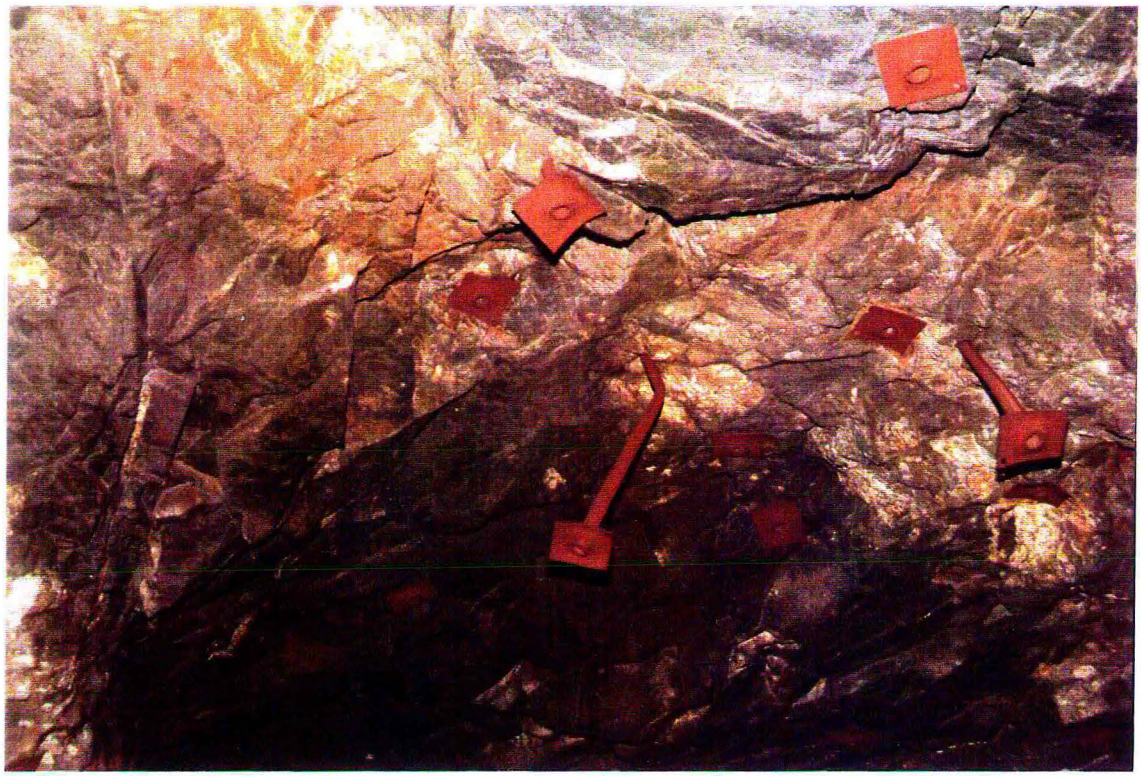


Plate 6



	Date
Plate 5: Mechanical anchor rockbolts in SA-500STP	Proj No.
	Approved
Plate 6: Possible bearing plate bending in South B room area	
STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers	