



**Golder Associates**  
CONSULTING GEOTECHNICAL ENGINEERS

E/75/901  
November 18, 1975

Kerr Addison Mines Ltd.,  
P.O. Box 460,  
Faro, Y.T. Y0B 1K0

Attention: Mr. J.K. Carrington,  
Project Superintendent

Re: Rock Strength Testing for  
Mineability Evaluation

Dear Sir:

The following is a report on the testing program that we conducted on samples of ore and waste rock to determine the feasibility of using a tunnelling machine for development work.

1. Introduction

The purpose of this preliminary program was to evaluate, by carrying out a limited series of uniaxial compressive strength tests, whether or not the waste and/or the ore were amenable to excavation with a tunnelling machine.

The uniaxial compressive strength is the basic parameter governing mineability. If this strength is less than about 15,000 p.s.i., tunnelling machines can probably be used; if the strength is above 15,000 p.s.i. this method of excavation is possible but costs rise rapidly. To determine what these costs would be, further tests would have to be carried out to determine such factors as the tensile strength, cutting force, specific energy consumed during cutting, cutter tool wear (related to hardness and grain size) and the mineralogy. Ultimately a field trial would be required to determine what type and design of machine would be best suited to the conditions.

2. Strength Testing Results

A total of 15 tests were carried out, 2 tests on ore and 13 tests on waste.

The procedure was as follows: a length of BQ core was cut with a diamond wheel to a length of twice the diameter. It was not possible to surface grind the ends to close parallelism tolerance because the samples tended to break along the foliation. The samples were then loaded along the longitudinal axis of the sample, i.e. perpendicular to the foliation, in a hydraulic compression machine until failure took place. The load was applied at controlled rate of 35 p.s.i./sec. and stress and axial strain were recorded on an X-Y recorder which produced a stress/strain curve.

This graph can be used, if required in the future, to determine the elastic modulus of the rock.

The two ore samples gave strengths of 36,000 p.s.i. (quartz sulphide, marginal ore, sample 17) and 21,400 p.s.i. (massive sulphide, high grade ore, sample 17). Since these values were significantly greater than 15,000 p.s.i., no further tests were conducted on the ore.

The thirteen waste samples had an average strength of 7,900 p.s.i. The strengths of only one sample exceeded 15,000 p.s.i., sample 12, graphitic phyllite, 15,900 p.s.i., and the lowest strength was 4,400 p.s.i., sample 6A, sericite phyllite. All the samples fractured across the foliation rather than along it (see figure 1).

The results of this series of tests indicate that the use of a tunnelling machine in the waste rock is feasible.

### 3. Support Studies

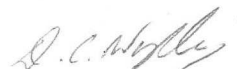
During the course of our first telephone conversation on September 9 we discussed the possibility of doing some testing to determine the possible span widths and support requirements. However, the core samples that you sent us indicate that these two factors will be primarily dependant upon the orientation, spacing and frictional properties of geological feature such as joints, faults and foliation. The intact rock itself is probably sufficiently strong to resist failure.

Therefore we recommend that detailed geological mapping and some tests to determine the friction angle of critical surfaces be used to assist in detailed mine design.

Please contact us if you have any questions concerning this report.

Yours very truly,

GOLDER, BRAUNER & ASSOCIATES LIMITED



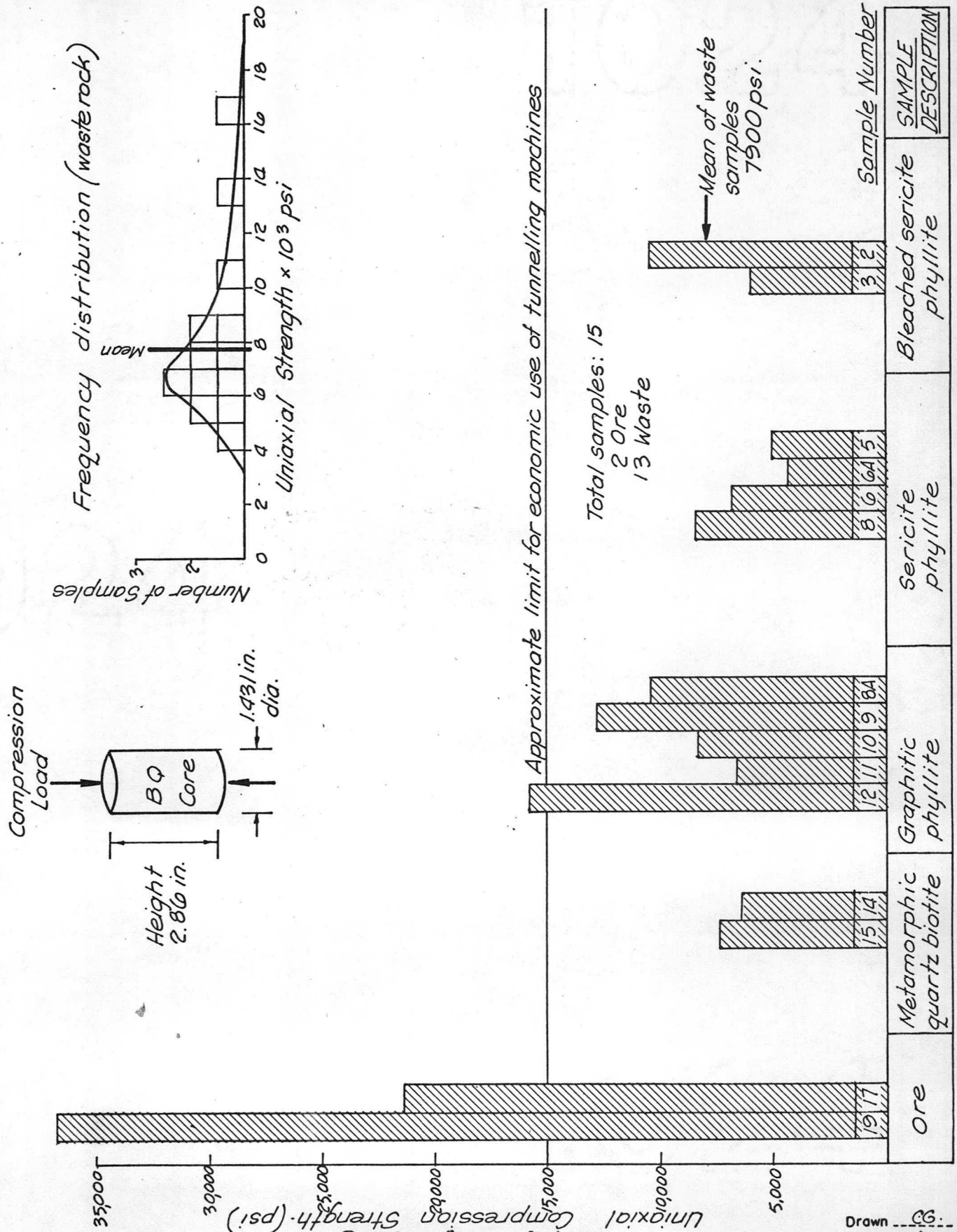
D.C. Wyllie, P. Eng.

DCW/hr  
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# RESULTS OF UNIAXIAL STRENGTH TESTS

FIGURE 1

Project No. -K-7524B



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Drawn: CG  
 App'd: [Signature]  
 Date: Nov/75