REPORT TO
WESTERN MARBLE COMPANY, LTD.
ON
THE KINSLEY MARBLE DEPOSIT
WHITE PINE COUNTY, NEVADA

E. J. LONGYEAR COMPANY
MINNEAPOLIS, MINNESOTA

(64)
Item 1
John H. Schilling

E.J.LONGYEAR COMPANY

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June 23, 1966

Western Marble Company, Ltd.
Room 834
470 Granville Street
Vancouver 2, British Columbia, Canada

Attention: Mr. John A. McKelvie

Gentlemen:

Report on
The Kinsley Marble Deposit
White Pine County, Nevada

We are pleased to transmit the attached report presenting findings made during our examination of the Kinsley marble deposit from June 6 to 9, 1966, and submitting conclusions and recommendations for your consideration and action.

Should you have any questions, please call on us for any additional comments that we may be able to offer.

We appreciate this opportunity to assist you and offer our services on matters relevant to the mineral industry.

Sincerely yours,

E. J. LONGYEAR COMPANY

Lee C. Armstrong

Lee C. Armstrong
Chief Geologist & Mining Engineer

LCA:V
ENC.

Distribution:
44 copies - Western Marble Company
6 " - Mr. William B. Murray
2 " - E. J. Longyear Company

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RESUME'

Assignment

Western Marble Company, Ltd. (Western) engaged the E. J. Longyear Company (Longyear) to examine and report on the Kinsley district marble deposit, White Pine County, Nevada. This report is submitted in fulfillment of the assignment.

Conclusions

1) Reserves of marble are large and many times the amount required to sustain for many decades the marble production envisaged by Western's market analyst, Mr. John de Wolf.

2) Principal reserves are comprised of three classes of dolomite marble: (a) white, (b) gray and (c) white with gray mottling and/or banding.

3) Lesser reserves exist with a variety of colorations, including various shades, tints and hues of pink, yellow, buff, brown and gray with a number of patterns in the form of veining, banding, mottling and other shapeless but attractive markings.

4) All classes and varieties are of good quality and amenable to polishing. In addition to pleasing colorations and patterns, the deposit possesses the attributes of denseness, fine crystallinity, low water absorptivity and relatively low solubility qualifying it for both indoor and outdoor applications.

5) Hardness somewhat in excess of that of other marbles would make the Kinsley stone more durable in installations subject to foot traffic, or in any other structural units requiring a higher resistance to wear.

6) Roads provide access to few points on the deposit, and roads to other parts of the deposit can be constructed at reasonable cost.

7) Mining would be by the relatively low-cost, "open-air" method. Overburden and vegetational cover are absent or scanty.

8) Production of broken and crushed marble for terrazzo, rubble stone, exposed aggregate panelling and similar construction is entirely feasible at low cost.

9) In our opinion, prospects are good for recovery of about 50 per cent of quarry production in the form of rectangular, sawable blocks measuring 5' by 5' by 8', approximately. (The unfavorable features affecting block recovery are joints. These are essentially vertical, natural parting planes that occur for the most part, in two sets - one bearing about N30°E and the other about N60°W, or essentially at right angles to each other. Some more or less horizontal joints were also observed. Joints, of course, also have a favorable aspect; when properly spaced and utilized in quarrying, they could facilitate freeing and removal of blocks.)

Recommendations

1) While opinion favors the probability for extraction of 50 per cent of the quarry production as sawable blocks, it

is recommended that this probability be investigated more positively before committing the outlays required for equipment, plant, construction and going on stream with production and sales.

2) We recommend, for your consideration, an experimental, or pilot quarry at a site judged to be in stone of best quality, coherence and soundness. Three such sites, known to Mr. McKelvie, are offered; they are:

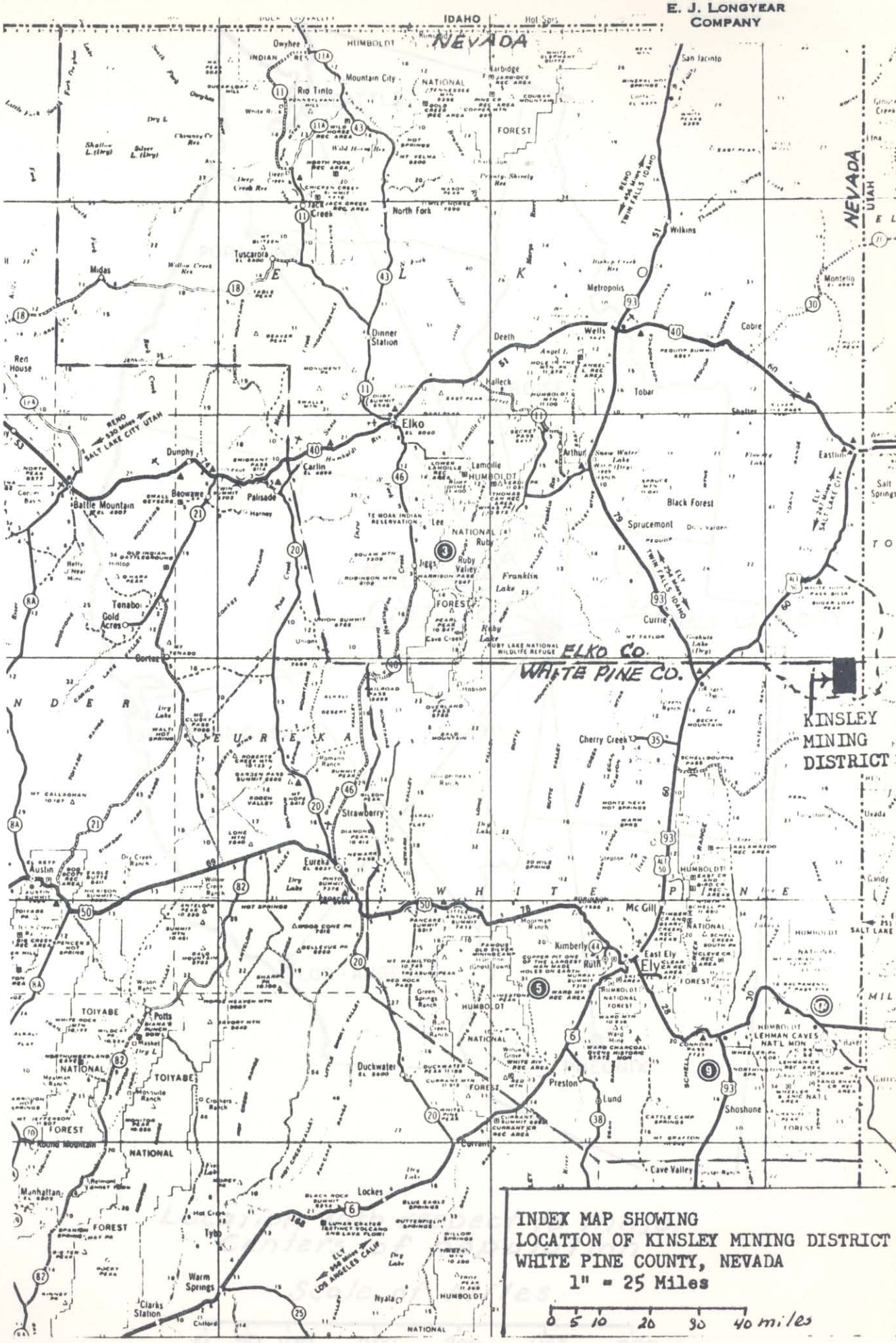
a) The gully between sites b) and c).

b) The little saddle some 400 feet north east of the Morning Star mine adit.

c) The big saddle.

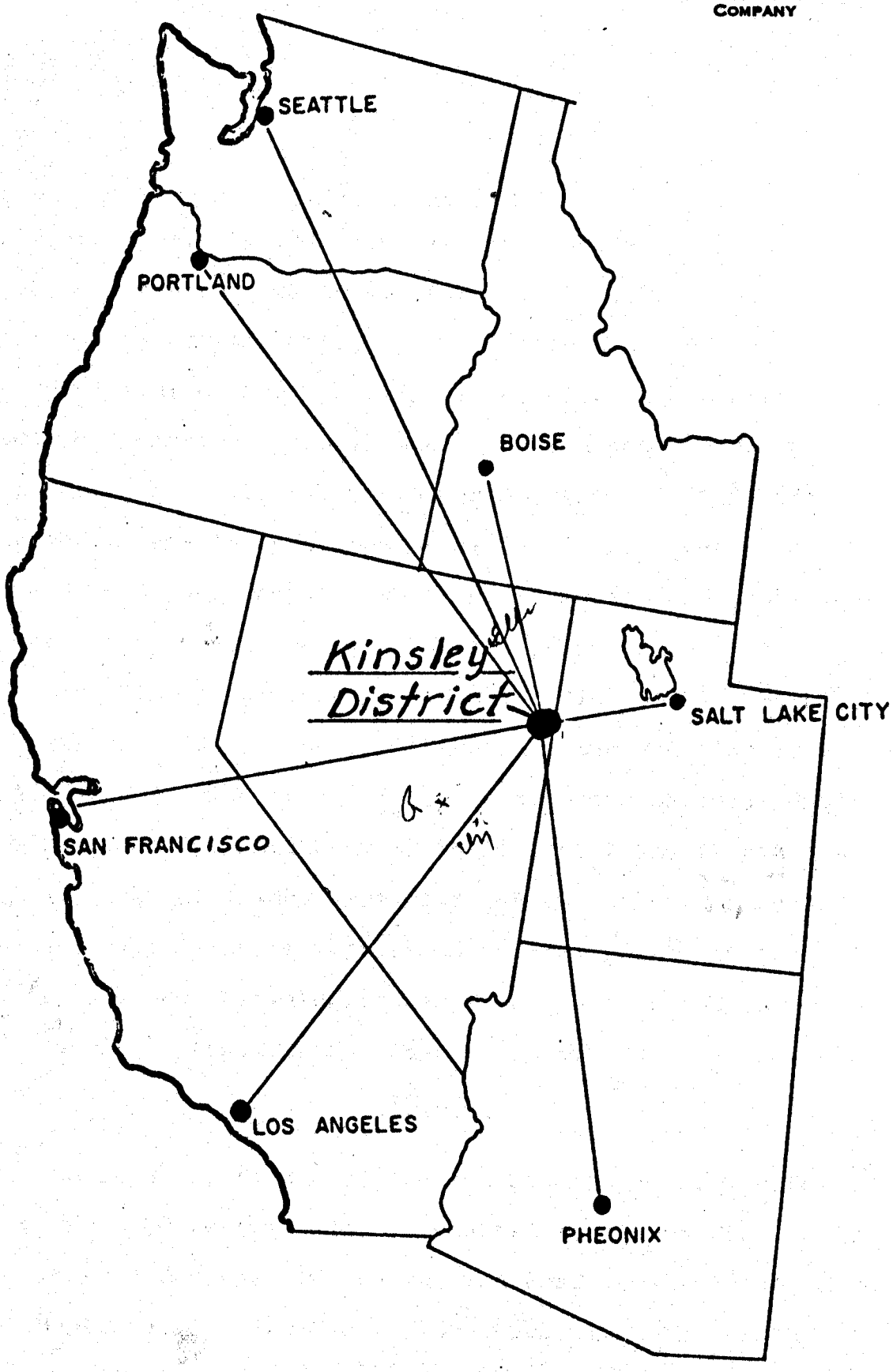
First choice is a), the gully site, where it is felt conditions of quality, coherence, soundness and ease of access are best fulfilled. Exact positioning should be done after study of the gully area to select best site and orientation with respect to quality and jointing.

3) Longyear further recommends that Western consider a core drilling program to add to knowledge acquired from the pilot quarry. A suggested program, described in greater detail in the ensuing text, is estimated to total 850 feet of core drilling and to entail expenditures of about one month and $6,500 to execute.



INDEX MAP SHOWING
LOCATION OF KINSLEY MINING DISTRICT
WHITE PINE COUNTY, NEVADA
1" = 25 Miles

Figure 1



Location with respect to major Centers of population

Scale of Miles

0 50 100 200 300 400 500

Figure 2

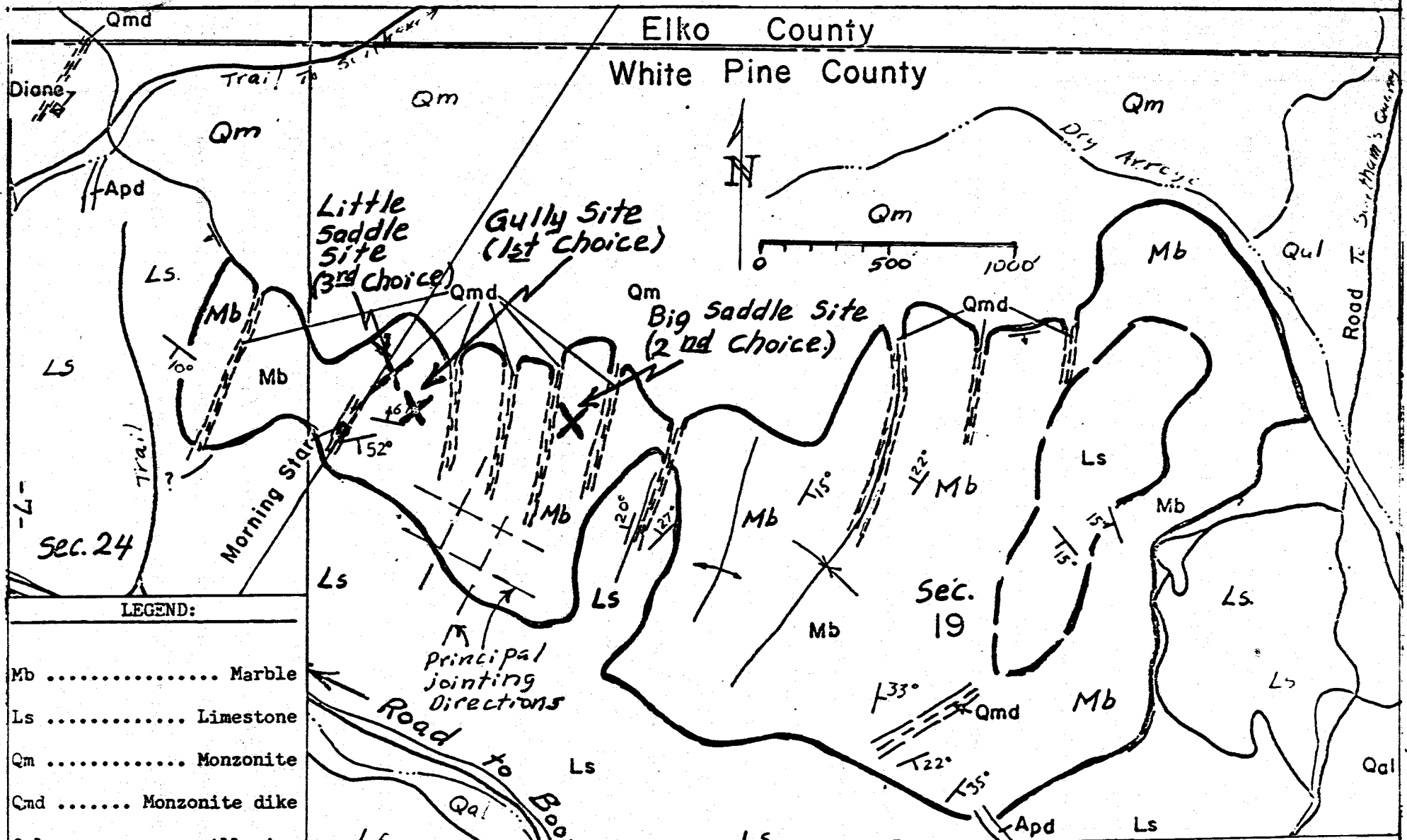
INTRODUCTION

The Kinsley marble deposit was examined from June 6 to 9, 1966 with the assistance of Mr. John A. McKelvie of Western Marble Company, Ltd. We were joined on June 8th by Attorney William B. Murray of Portland, Oregon. Itineraries on foot were carried out over much of the deposit, and core samples from the drilling, performed by others during 1963 in search of base and precious metals, were reviewed. All major and most minor natural outcrops of marble were observed, and pertinent observations and notes were recorded.

The Kinsley district is in White Pine County, Nevada, some 70 miles northeast of Ely (Figures 1 and 2). Access is afforded by U.S. Highway Alternate 50 to Boone Springs, which lies about 20 miles northwest of the district and is connected with it by a single-lane, dirt road. From the dirt road, a few motor trails provide ingress to several points in the district, and road building to reach any part of the marble deposit would be feasible at moderate cost.

GEOLOGY

As shown in Figure 3, the deposit ranges from a few hundred to 2,500 feet in width, measured in an N-S direction, and is about 4,000 feet in length, measured in an E-W direction. Depths exceed 200 feet. It occurs along the south border of an intrusive igneous body of monzonite. The Southam quarry, now abandoned, is in a smaller area of marble bordering



LEGEND:

Mb ..... Marble

Ls ..... Limestone

Qm ..... Monzonite

Qmd ..... Monzonite dike

Qal ..... Alluvium

15° ... Strike & dip of bedding

...principal joints Direction of

Suggested test

Figure 3. - Map of

KINSLEY DISTRICT MARBLE AREAS
SEC.24,R67E,T26N & Sec.19, T68E, T26N
White Pine County, Nevada

Scale: 1"=500' (approx.)

Adapted from map by R.A. Paige & L.M. Haglund

the opposite side of the monzonite body about one mile to the north. Locally, dikes of monzonite extend southward from the main body of monzonite into the marble deposit. The dikes are nearly vertical, tabular features ranging up to about 25 feet in width and several hundred feet (or more) in length and extending to an unknown, but doubtless considerable depth.

The monzonite body and related offshoot dikes were intruded in hot, liquid condition into limestone strata. Intrusive effects (heat and pressure, plus emanations of hot solutions and gases) fractured the limestone and converted large tonnages into dolomite marble. Chemically, these actions brought about replacement of limestone (calcium carbonate - $CaCO_3$) by dolomite (calcium-magnesium carbonate - $CaCO_3 \cdot MgCO_3$.) Physically, they resulted in the production of a dense, finely crystalline dolomite marble somewhat heavier and harder than the original limestone strata. In the marblizing process, large volumes of stone were bleached white, probably by expulsion of excess carbon in the limestone in the form of gases (probably largely CO_2 and CO .)

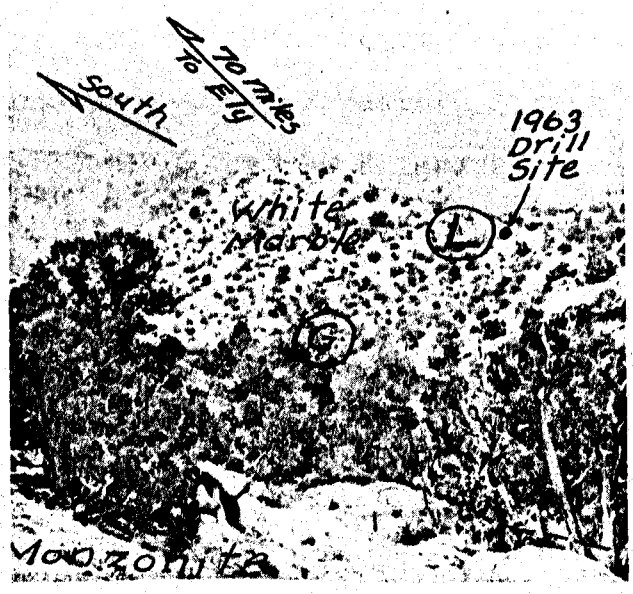
Other intrusive effects are now seen as thin zones of low-grade copper mineralization disposed in places along and at no great distance from the walls of the monzonite dikes. During the many milleniums following marblization, cooling and contraction, as well as pressure changes arising from earth movements and the uncovering of the area through removal of perhaps many thousands of feet of rock, have further fractured

the marble. Fortunately, many of the fractures have been healed, i.e., they have been filled by crystalline calcite and dolomite material which has recemented the marble into firm, coherent masses of various sizes.

Joints or natural fracture planes do exist today, however. These planes generally have little or no bonding material, and the marble parts readily along them. Characteristically, the joints are steeply inclined to vertical, and are marked by a thin coating, or dusting, of rusty iron oxides. The most prominent set of joints consists of a more or less vertical series of roughly parallel parting planes striking about N30°E. A second prominent set strikes about N60°W, or about normal to the first set. A nearly horizontal set may be seen, locally, and there are other jointings and fracturings which become more intense and numerous near the monzonite dikes. In surface exposures, many of the joints and fractures are marked by tiny, linear depressions, or V-shaped valleys, up to a few inches or more in depth, where weather has dissolved and carried away some of the marble. Commonly, the joints and fractures below these miniature valleys are filled with crystalline calcite and dolomite, and as pointed out above, the marble has been restored to solid blocks of appreciable dimensions.

In some outcrops, weather has weakened the bond between the individual dolomite crystals, and marble affected in this manner may be readily broken into a sugary-textured sand. This kind of weathering effect rarely persists to depths of more than several inches, and below a few feet, it is virtually absent.

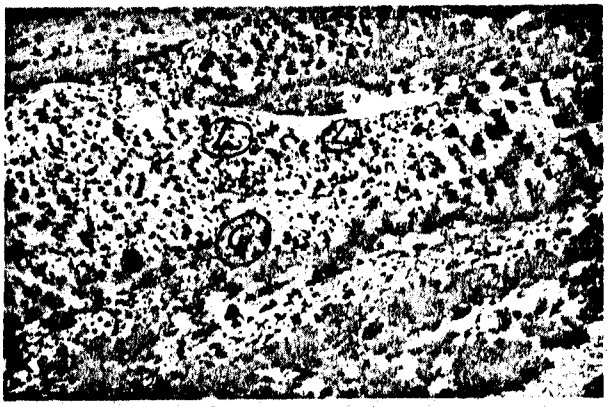
John A. Schilling



Little Saddle (L) and gully (G) sites. View looking S.W.

Southam quarry showing NE joints. Rusty surfaces facing camera are NW joints.

Marble in Big Saddle. Many of the linear, "V"-shaped depressions are along fractures that are healed by calcite or dolomite a few inches below the surface.



View looking SW of Little Saddle (L) and gully (G) sites. White area in upper center is the drilling site of 1963.

RESERVES AND QUALITY

Reserves are large and more than adequate to provide, for many decades to come, the yearly output of some 35,000 tons envisaged by Western Marble Company's market analyst, Mr. John de Wolf. Principal reserves are in three colors - white, gray and mottled white and gray. A large share of output would be of these kinds of marble.

Other colors and combinations thereof, as well as a variety of markings and patterns, were observed. These variations from the more plentiful white, gray and mottled white and gray marbles occur in places throughout the deposit. Such variations noted include:

1) White with gray, yellow, brown, rose or gold veinings and other irregular but appealing markings and patterns.

2) Rose-pink with various patterns in other colors.

3) Buff, tan and brown with various patterns in other colors.

4) Gray, ranging from dark to light gray, with various patterns in other colors.

Some of these varieties would be encountered in restricted areas during routine quarry operations in the three principal colors and would be considered as co-products to be fabricated for special applications, or for customers specifying such uniqueness. However, further scouting and exploration could, in all probability, develop enough reserves of one or more of these varieties to sustain an outlet, or outlets, calling for considerable volumes of these types.

All classes and varieties have excellent physical properties. They are finely crystalline and dense with very low water, or moisture, absorptivity. As previously pointed out, they are made up of dolomite marble and are somewhat harder than the more common calcite-bearing marbles. The high density and low absorptivity, coupled with the lesser solubility of dolomite as compared to calcite, would better qualify the Kinsley marble for external use. And its greater resistance to abrasion would be a major advantage in construction requiring the beauty of marble, along with a minimization of defacement by foot traffic.

There is no question concerning the abundance of white, gray and mottled white and gray marble for providing crushed and broken rock for such uses as terrazzo, landscaping, roofing, exposed aggregate panelling and similar applications, which market outlets have been estimated by Mr. de Wolf to aggregate about 29,000 tons yearly for a Kinsley operation. The Southam quarry, in a similar deposit about one mile to the north, has demonstrated ability to produce crushed material for these uses.

Productivity of blocks suitable for sawing into shapes for the dimension stone trade, however, has not been demonstrated. In my opinion, about 50 per cent of quarry production could be in the form of sawable blocks measuring about 5 by 5 by 8 feet. The adverse features reducing probability for recovery of a high percentage of blocks are the joints discussed previously and treated further under the following heading.

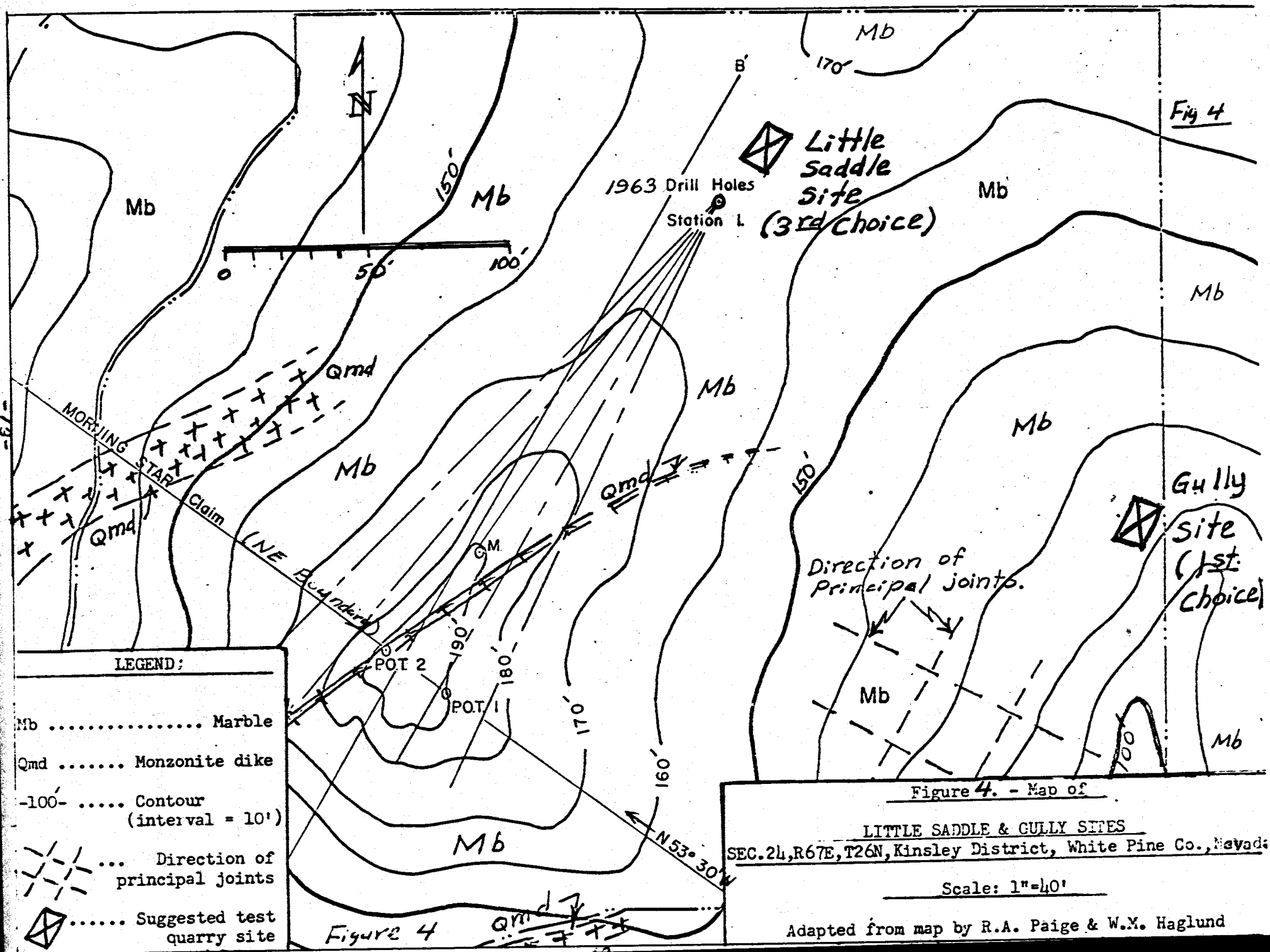


Figure 4. - Map of

LITTLE SADDLE & GULLY SITES

SEC.24,R67E,T26N,Kinsley District, White Pine Co., Nevada

Scale: 1"=40'

Adapted from map by R.A. Paige & W.M. Haglund

RECOMMENDED ACTION

While opinion favors the probability for recovery of 50 per cent of quarry production as sawable blocks, it is recommended that Western open an experimental, or pilot quarry to test this probability before committing the larger outlays needed for equipment, plant and other capital items.

Three sites in white marble are suggested for the pilot quarry; they are:

1) The gully site (Figures 3 and 4).

2) The little saddle site (Figures 3 and 4).

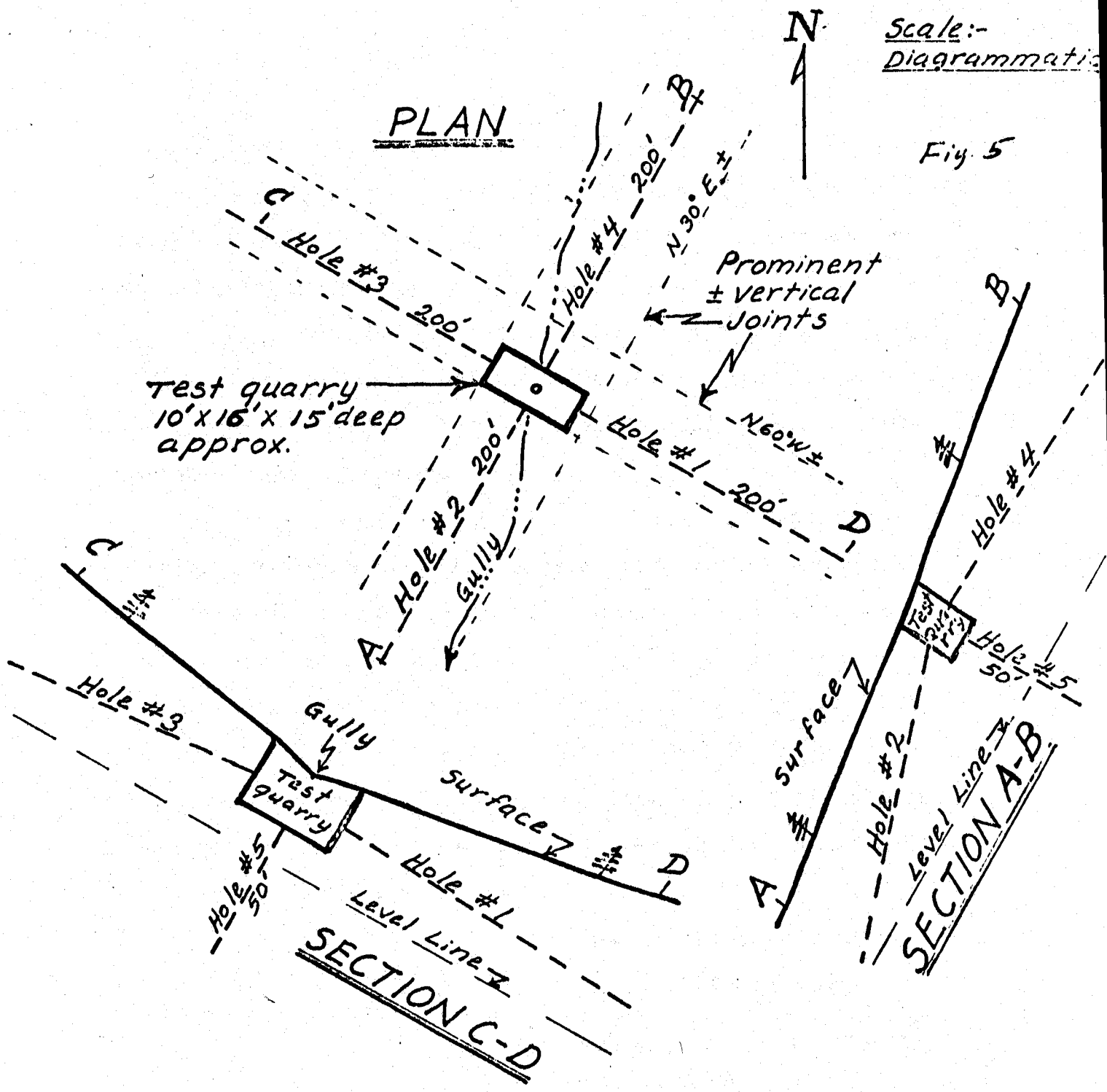
3) The big saddle site (Figure 3).

First choice is the gully site where it is felt conditions of access and soundness are best met, as far as could be determined during the examination.

Further suggestions on the pilot quarry are submitted in Figure 5 which shows an excavation 10 by 16 by 15 feet deep, with its side and end walls oriented parallel to the northeast and northwest jointing systems, respectively. It is designed for a capacity of 12* blocks with nominal dimensions of 5 by 5 by 8 feet, and if attempted and carried out, should provide an assessment of what may be expected in block production from a full-scale quarry operation.

Supplementary to the pilot quarry, Longyear recommends that Western consider a core drilling program to provide additional knowledge on the character of the marble and the jointing. Figure 5 offers a program wherein 200-foot core holes are to be

*Allowing for spoilage of 6 blocks in order to gain access for undercutting, a net of 6 blocks may be realized in such a test quarry.



Sketched Plan & Sections Showing Proposed Test Quarry And Core Drilling Layout

L.C.A. 6/15/66

Fig 5

drilled outward and downward from each of the four test quarry walls and a 50-foot hole is to be drilled vertically downward. This pattern could develop enough pre-production reserves to supply anticipated output for some 25 years.

Quarrying would be done without blasting by drilling a series of close-spaced holes, broaching the webbing of rock between holes and hoisting the freed blocks carefully with suitable power equipment.

It is suggested that core drilling be done by an air-powered, underground-model, bar-mounted machine. Wireline tools are recommended to speed progress and as added insurance against loss of core samples. Estimates of time and money to complete the 850-foot program, employing one rig operated two 8-hour shifts daily, are one month and $6,500, respectively. Requests for bids to reputable drilling contractors should specify that maximum core recovery and careful handling of core are of paramount importance.

Respectfully submitted,

E. J. LONGYEAR COMPANY

Lee C. Armstrong

Lee C. Armstrong
Chief Geologist & Mining Engineer

Minneapolis, Minnesota
June 27, 1966