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(188)
Item 22

Reno, Nevada - November 5, 1968

P. A. Meyer - Salt Lake City

Re: Proposed Exploration
Ludwig-Douglas Hill Area
Lyon County, Nevada

Mr. J. V. Tingley has prepared the attached report in support of a drilling program in the Ludwig-Douglas Hill Area, Lyon County, Nevada. The potential of this ground is premised on widespread surface evidence of copper mineralization, previous mining of high-grade ore bodies, and possible "porphyry-type" mineralization at depth.

In my opinion, this is one of the more favorable areas adjacent to the great Yerington copper deposits which requires additional exploration. I fully concur with the minimum recommendations submitted herein.

R. J. Anctil

R. J. Anctil

Distribution:
Los Angeles - (1)
LAMDF - (1)
Salt Lake City - (2)
Reno - (2)

PROPOSED EXPLORATION PROGRAM
LUDWIG - DOUGLAS HILL AREA
LYON COUNTY, NEVADA

by
J. V. Tingley

Distribution:
Los Angeles - (1)
LAMDF - (1)
Salt Lake City - (2)
Reno - (2)

Reno, Nevada

October 28, 1968

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SUMMARY

The Ludwig-Douglas Hill property is in Lyon County, Nevada about three miles southwest of Yerington. Copper mining has been conducted in this area since the early 1860's, when bluestone (copper sulfate) was mined to use in treating Comstock silver ores. During the period of high copper prices prior to the end of World War I, nearly 60,000 tons of copper metal were produced from this district.

At the Ludwig, production was from a narrow lode which was mined to 900 feet below surface. The Douglas Hill production came from high-grade, near-surface lenses in a fractured tactite body. All ores were oxide consisting primarily of tenorite and malaconite. Some silicates and carbonates also were present.

The geologic setting is simple; the entire Ludwig-Douglas Hill area is an altered roof pendant of Triassic metamorphics resting between two large intrusive masses. An inferred third intrusive may underlie Douglas Hill and be responsible for the copper mineralization. As a result of intrusive activity, faulting and fracturing developed in the intruded rock mass. This rock breakage

allowed access for mineralized solutions and prepared ground for the formation of copper deposits.

Geologic mapping of Douglas Hill has outlined two specific exploration targets. The fractured mineralized tactite body around the Douglas Hill Mine shows possibility for development of a moderate-tonnage oxide copper ore body in and around the old mine workings. A program of trenching and surface drilling is recommended for this area.

The inferred intrusive underlying Douglas Hill could contain disseminated "porphyry copper" type mineralization. Any ore body outlined would be deep and require exploitation by block-caving methods, but the hoped-for tonnage could be large. A program of ground magnetics and I.P., followed by deep drilling is recommended to test this possibility.

CONCLUSIONS AND RECOMMENDATIONS

The Ludwig-Douglas Hill Property represents a large surface area with widespread evidence of copper mineralization. Mining carried out during the World War I copper boom exploited high-grade bodies of oxidized ore

present in two areas of the property. No exploration has been conducted on the property since these early operations shut down.

A definite possibility exists that drilling and sampling would outline a moderate tonnage of oxide copper ore on Douglas Hill.

There are also indications that disseminated sulfide mineralization may exist at depth beneath the surface showings.

To test for the oxide possibility, a program of drilling and sampling should be commenced on this property. Five drill sites have been proposed, a 500' hole should be drilled at each location. The maximum extent of mineralized ground is such that if favorable results are not obtained from this drilling, an ore body of sufficient size to be of interest could not exist.

At the same time this first program is being conducted, geophysical work should be started to assist in selecting two drill sites to test the deep porphyry potential.

INTRODUCTION

The Ludwig-Douglas Hill Area was first examined in November 1967. A preliminary report was submitted in December of that year. That proposal described reasons for investigating a small magnetic anomaly on Idaho Mining Company land west of Ludwig, and also mentioned the oxide copper potential of the Douglas Hill area. Idaho's ground was acquired and tested. One hole was drilled into the magnetic anomaly, disclosing unaltered granodiorite containing 10% to 15% magnetite. The anomaly was thereby accounted for, and no further work is contemplated on that portion of the property.

Lease negotiations were then started on the Ludwig-Douglas Hill properties. Negotiations were not completed until late August, 1968. Mapping and evaluation work was started in September, 1968. This report describes conclusions derived from work now completed, and outlines an exploration proposal for future work.

LOCATION AND OWNERSHIP

The Ludwig Property is located in Sections 26, 27, 34 and 35, T. 12 ~~S.~~ N., R. 24 E., Lyon County, Nevada (Figure 1). Most of the ground is patented and owned jointly by Ideal

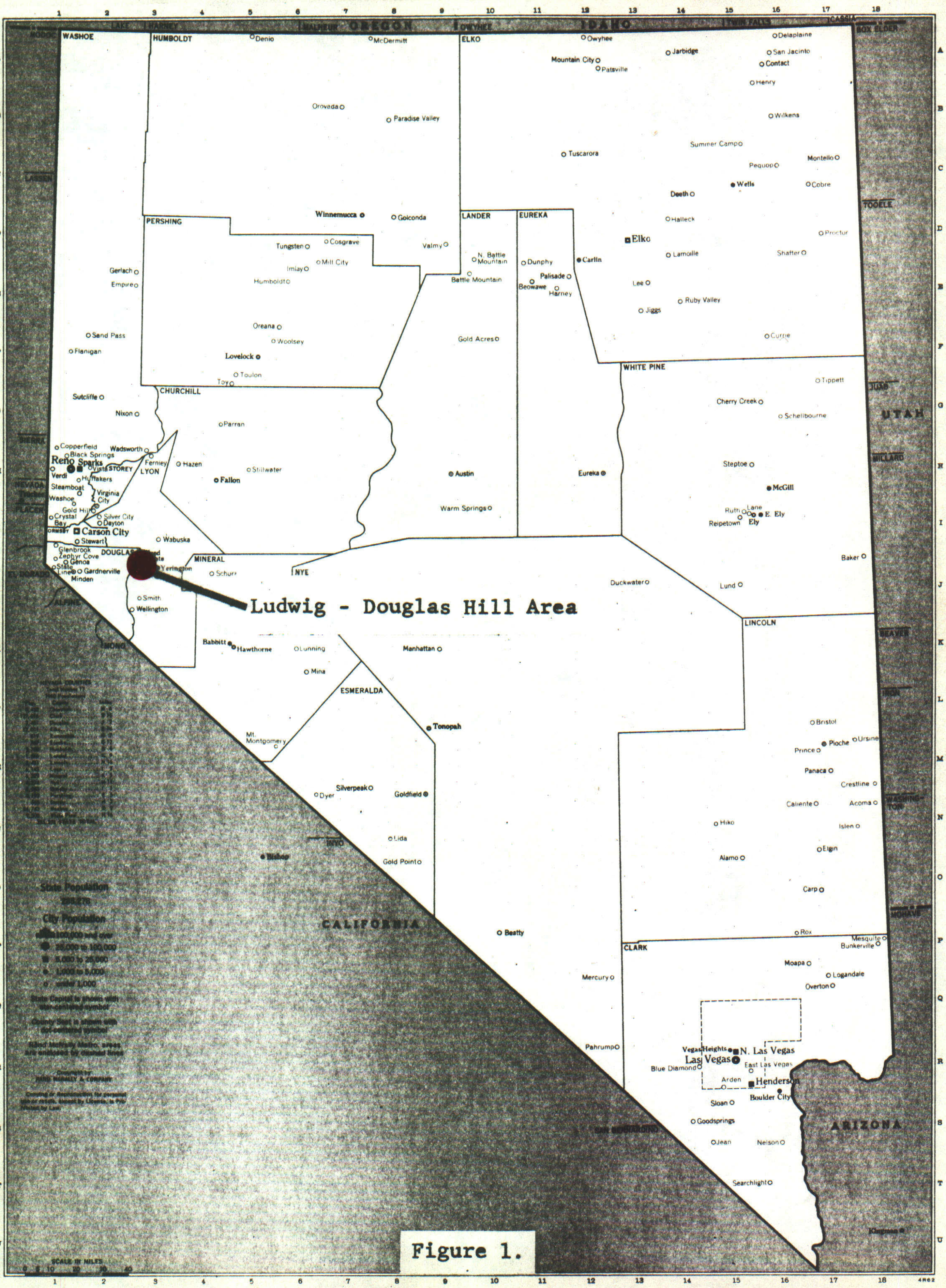

Ludwig - Douglas Hill Area
OREGON
IDAHO
UTAH
ARIZONA
CALIFORNIA
WASHOE
HUMBOLDT
ELKO
PERSHING
LANDER
EUREKA
CHURCHILL
WHITE PINE
LYON
STOREY
DOUGLAS
MINERAL
NYE
LINCOLN
ESMERALDA
CLARK
Reno
Sparks
Carson City
Winnemucca
Elko
Lovelock
Fallon
Austin
Eureka
Ely
Yerington
Hawthorne
Tonopah
Goldfield
Pioche
Las Vegas
Henderson

Figure 1.

Cement Company and Kaiser Gypsum Company. Other claim owners in the area include the Anaconda Company, John Regan of Yerington, Frank Lewis (Legend Corporation), and Lyon County. Idaho Mining Company, Grand Junction, Colorado owns a large block of unpatented claims southwest of the patented area.

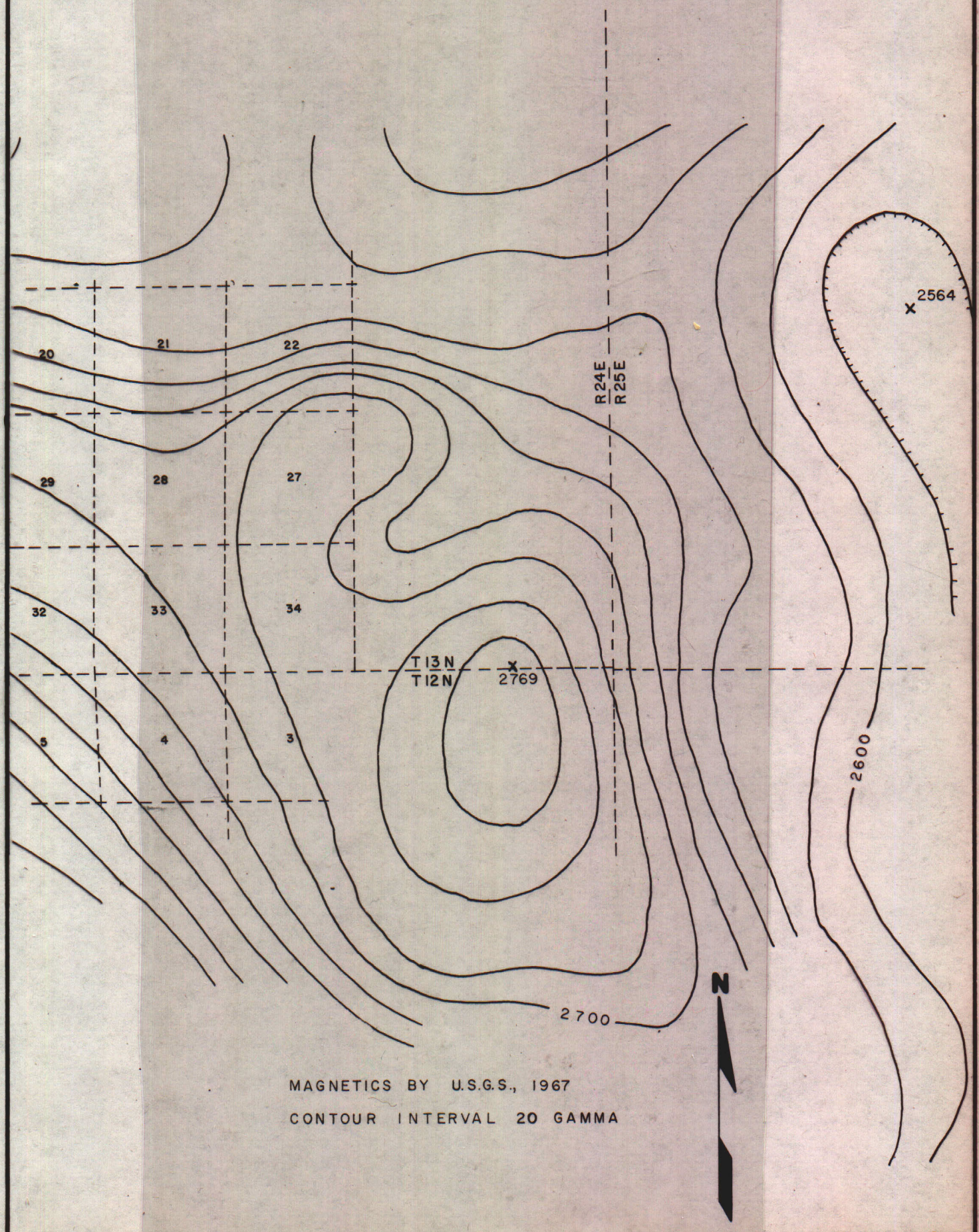
Union Pacific has mining leases on the Ideal Cement-Kaiser Property, the Regan ground, and the Idaho Mining Company claims. In addition to this, six lode claims were staked by the Natural Resources Division to acquire a small fraction of open ground. (See Plate IV).

GENERAL GEOLOGY

Rocks cropping out in the Ludwig-Douglas Hill area are mainly metamorphosed and metasomatised Triassic sediments (Figure 2). They have the configuration of a thin lobe of altered, mineralized rocks separating a large granodiorite mass on the north from a more recent quartz monzonite intrusive on the south.

The western slope of Douglas Hill between the Ludwig and Douglas Hill Mines is composed of dark grey to brown banded hornfels. These rocks strike N. 35-45° E. and dip moderately to the southeast. A major N. 45° E. fault

AEROMAGNETIC OVERLAY



MAGNETICS BY U.S.G.S., 1967

CONTOUR INTERVAL 20 GAMMA

FIGURE 2A

GENERALIZED GEOLOGIC MAP

YERINGTON AREA

LYON COUNTY, NEVADA

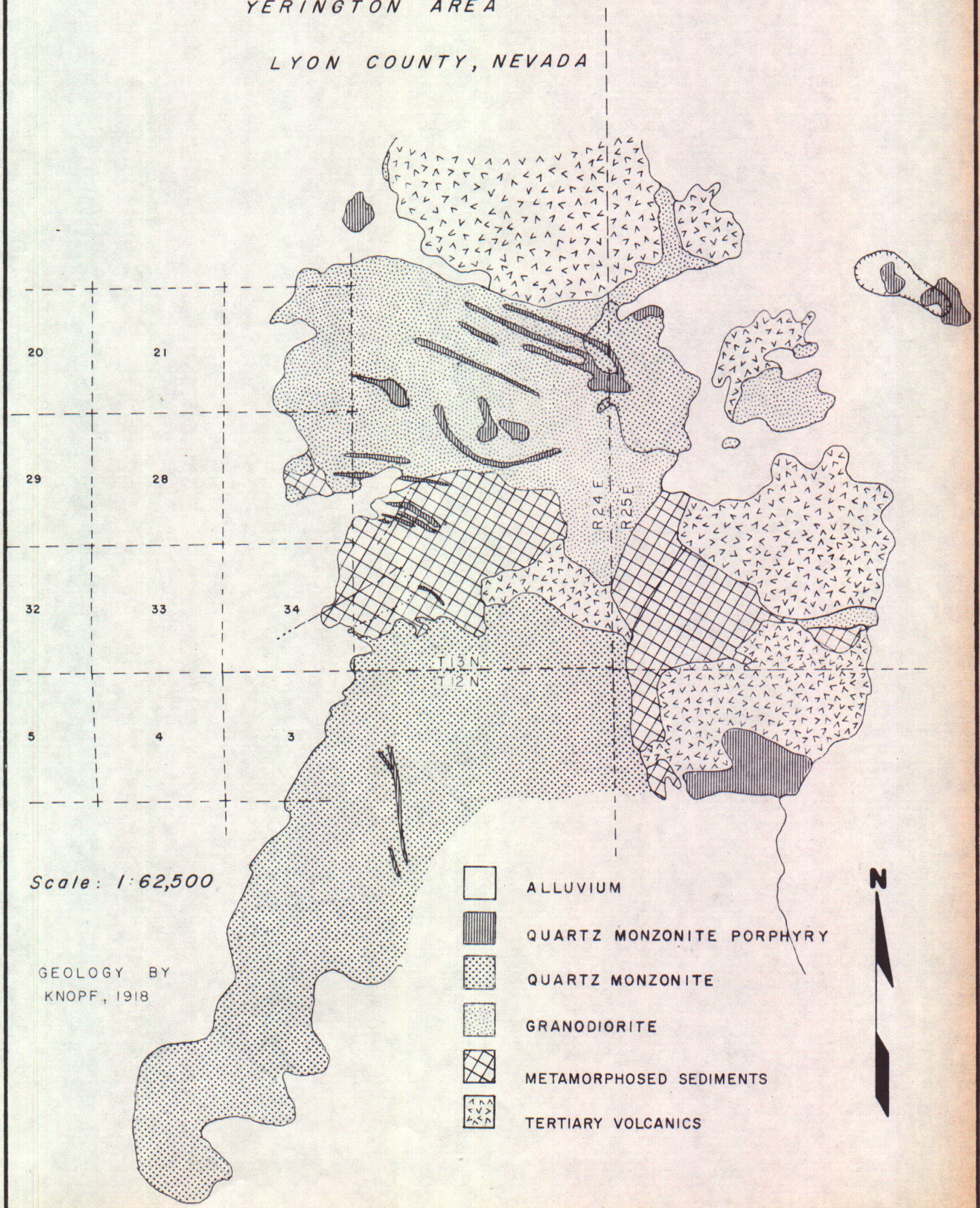


FIGURE 2

separates hornfels from the garnet mass that forms the main portion of Douglas Hill. Small patches of marbleized limestone crop out, but they grade laterally into garnet. South of the Douglas Hill Mine, garnet rock appears to be down-dropped along an east-west fault zone. Marbleized limestone occurs to the south in fault contact with garnet.

The southwestern portion of Douglas Hill, between its peak and the Casting Copper area, is composed of grey, recrystallized limestone. This grades into marbleized limestone and then garnet to the north and east. Marbleization also occurs along a northwest-trending quartz monzonite dike which crops out southeast of the Casting Copper portal.

East of the Douglas Hill garnet zone, more hornfels occurs, extending southeast to its eventual contact with a large quartz monzonite intrusive. This hornfels mass is banded similar to the western hornfels outcrop, but strikes northwest and dips to the northeast.

Quartz monzonite dikes occur in two places within the mapped area, one has been mentioned as occurring near the Casting Copper portal. Another is found in the faulted area between hornfels and garnet north of the Douglas Hill Mine.

North of the mapped area, a series of northwest-trending quartz monzonite dikes cut both hornfels and granodiorite. Massive dark-green epidote with white quartz, and calcite usually form in the intruded rocks along the walls of these dikes. Locally, they show kaolinization and moderate silicification.

STRUCTURE

Four major structural trends are apparent in the Ludwig area.

A northeast trend is expressed by the parallel N. 45° E. faults which traverse Douglas Hill. This trend coincides with the inferred contact line of granodiorite and quartz monzonite intrusives.

A northwest trend, possibly caused by doming along a northwest axis is evidenced by a series of quartz monzonite porphyry dikes which occur north of the Ludwig Mine. These dikes usually have concentrations of copper minerals near their contact zones, indicating they may be related to the source of copper mineralization.

Flat dipping east-west faults can be seen in the walls of glory holes on Douglas Hill. Within the main workings, two sets of these structures can be seen, one dipping 20° to the north, the other 20° to the south.

It seems almost as if there were a hinge line here with structures dipping away from it in both directions.

The fourth major structure noted is a north-south vertical fault system, a fairly wide and sometimes indistinct zone can be traced from the Amalgamated Copper Mine north to the Douglas Hill Mine. Wherever seen, these faults show copper mineralization. Away from Douglas Hill, the main Ludwig Lode follows a north-trending zone which may be related to this same fault system.

MINERALIZATION

Past production on the Ludwig property originated from two distinctly different ore bodies, the Ludwig Lode and the Douglas Hill Mines.

Ludwig Lode: The Ludwig Lode was a vein-like replacement body occurring along a steeply-dipping limestone-garnet contact. It was mined along a strike length in excess of 1,000 feet and was followed down dip for 900 feet. The ore was composed predominately of copper oxide minerals. At depth, the lode changed to what was described as a pyritic quartz-porphyry plug. Little else is known concerning the Ludwig, as no detailed maps or reports are available. One reference, an interoffice memo obtained

from Kaiser Gypsum, states: "The 700-foot level in the Ludwig Claim only shows approximately 10,000,000 pounds of copper in the sulfide ore body." This is part of what is described as a "large body of sulfide ores at lower levels." How large this body is, and its probable grade is unknown.

However, the Thompson Smelter, the treatment plant to which Ludwig ores were shipped, handled only oxide ores of shipping grade. Therefore, any sulfides encountered in the mining operation no doubt remain in the ground.

Douglas Hill Mines: Included in this group are the main Douglas Hill Mine, the Casting Copper Mine, and the Amalgamated Copper Mine. All of these workings penetrate various portions of Douglas Hill. Mineralization occurs as disseminations of tenorite, melaconite, and occasionally chalcocite and chalcopyrite in shattered zones within a garnet host rock. Mineralized areas seem to be strictly fracture controlled, as the best ore bodies occurred in the most intensely faulted portions of the garnet mass. Some leaching and re-precipitation have taken place, as within the major fault zones fractures are usually coated with films of chrysocolla and malachite. The main ore control seems to have been a north 45°-55° east-trending

fault system. The largest ore body, that of the Douglas Hill Mine, occurred at that point where the northeast fault system has been cut by both north-south and east-west faults. In general, copper seems to have been confined beneath flat-lying east-west faults along the favorable northeast structural trend. Vertical north-south faults cut the other two systems and may have provided the access routes for mineralizing solutions.

At the Casting Copper Mine, the major northeast fault system is intersected by a northwest-striking quartz monzonite dike. High-grade ore was mined near this intersection. The Amalgamated Copper deposit occurred in garnet along a north-northeast fault zone.

INFERRED STRUCTURAL HISTORY AND ITS RELATION TO MINERALIZATION

The following events are thought to have been important in formation of ore at the Ludwig property:

1) Intrusion of granodiorite into Triassic sedimentary rocks, causing them to be partially metamorphosed and silicified.

2) Intrusion of quartz monzonite into both granodiorite and metamorphosed sediments, resulting in further metamorphism and metasomatism. The result was an elongate northeast-trending lobe of garnet and hornfels occupying

a saddle between the two intrusive masses.

3) Doming or arching along a northwest-trending axis, possibly due to intrusion of a third igneous body. Quartz monzonite porphyry dikes filling northwest-trending structural breaks could be part of this mass, indicating the unexposed main intrusive may also be quartz monzonite porphyry.

4) Resulting from the doming, the following fault systems developed.

a) A northeast trend parallel to the contact line of granodiorite-quartz monzonite.

b) A northwest trend parallel to the axis of uplift.

c) North-south and east-west systems resulting from movement along the other sets of faults.

5) Copper-bearing solutions related to the third-stage quartz monzonite porphyry-formed mineral deposits both along dike boundaries and in structurally prepared areas within the garnet-limestone mass.

EXPLORATION POTENTIAL

This property contains two exploration targets. One is a moderate-tonnage potential for oxide copper in and around the Douglas Hill Mine. Since the cut-off grade of the 1917-1918 operation was near 3% copper, there could be a rather large tonnage of 1% copper ore remaining in the walls of the old workings. Favorable structures also extend both north and south from the Douglas Hill Mine. The possible southern extension is thought to be in a down-dropped block which is unexplored by mine workings. If mineralization does exist there, even the high-grade portions could be present. The ground to be tested measures approximately 2000' X 1000' and could have a thickness of 200'. Therefore, the maximum target possible would be a 40,000,000 tons ore body hopefully averaging 1% or better in copper.

The second target developed within the mapped area is a possibility for a large body of disseminated copper mineralization in the inferred quartz monzonite intrusive beneath Douglas Hill. Evidence pointing toward the existence of such an intrusive is as follows:

1) Presence of sulfide copper and a "pyritic quartz porphyry" on the 700'-900' levels of the old Ludwig Mine.

2) The 2000' X 1000' faulted, mineralized domal structure of Douglas Hill, possibly the surface expression of a deeper ore body.

3) A large bleached and silicified area in the hornfels block between the Ludwig Mine and Douglas Hill could be one result of such an intrusive.

4) Three oval-shaped areas of leached capping occur in hornfels just east of the Douglas Hill Mine. The capping is formed from pyrite disseminated in a moderately kaolinized hornfels. Again, this could be related to deeper copper mineralization.

5) High altitude aeromagnetic coverage of this area shows a southwest-trending embayment extending over the Ludwig-Douglas Hill area. This coincides with the location of the suspected porphyry intrusive, and could indicate destruction or alteration of magnetite in the older rocks.

A third possible target area would be the sulfide body reported on the lower levels of the Ludwig. If this

could be expected to maintain the shape and dimensions of the upper portions of the Ludwig, the size would not be great, and an expensive underground operation would be required. This should be investigated only if one of the other targets shows success.

PROPOSED PROGRAM

Douglas Hill Oxide Program

1) Trenching: Four to six trenches on the rubble-covered garnet outcrops north and south of the Douglas Hill Mine would allow bulk sampling of the favorable outcrops. The main dump would also be trenched and sampled.

2) Drilling: Five 500' drill holes have been tentatively located to sample the area. (See Plate V). Air rotary drilling, using a hammer, should be very successful on this property.

If this first program is encouraging, it would then be necessary to reopen and sample the underground workings. Additional drilling would be done from both surface and underground drill stations.

Deep Porphyry Program

1) Ground magnetic survey - twenty line miles of survey will be necessary to cover the property and extend north and south into the two intrusive areas. (See Plate V).

2) Geochemical sampling - grid sampling will be done in the hornfels outcrops near bleached and pyritized areas.

3) Geologic mapping - mapping will be extended to the east.

4) I.P. Survey - approximately 5 line miles will be needed to ascertain if there is a sulfide buildup beneath the bleached, pyritized hornfels and Douglas Hill. The unit used must be able to gather information from at least 1000' below surface. (See Plate V).

5) Using information gained from the above steps, two drill sites will be chosen. The holes will be deep, 1500' each. Of this, it is felt the first 500' could be done with air-rotary drilling, and the remainder using a diamond drill.

J. V. Tingley

J. V. Tingley

UNION PACIFIC RAILROAD COMPANY
NATURAL RESOURCES DIVISION
MINING DEPARTMENT

EXPENDITURE FORECAST

Project Name Yerington (Ludwig-Douglas Hill)

Prepared by J. V. Tingley

Project No. 38

Date October 28, 1968

Location Lyon County, Nevada

Description of Work to be Performed Ground magnetic survey (15 line miles). I. P. Survey (5 line miles), surface trenching, continuation of geologic mapping, geochemical sampling, 3,500 feet of rotary drilling - cuttings to be assayed in 5' intervals for copper, 2,000 feet of diamond drilling - core to be split and assayed in 10' intervals for copper, final report and maps.

Date Work to Start November 15, 1968

Estimated Time to Complete Four months

Estimate of Manpower Requirements:

1. Field Time
   - A. Permanent Staff 1½ man-months
   - B. Temporary Staff 3 man-months
2. Office Time
   - A. Permanent Staff ½ man-month
   - B. Temporary Staff ---

3. Total Estimated Manpower Time 5 man-months

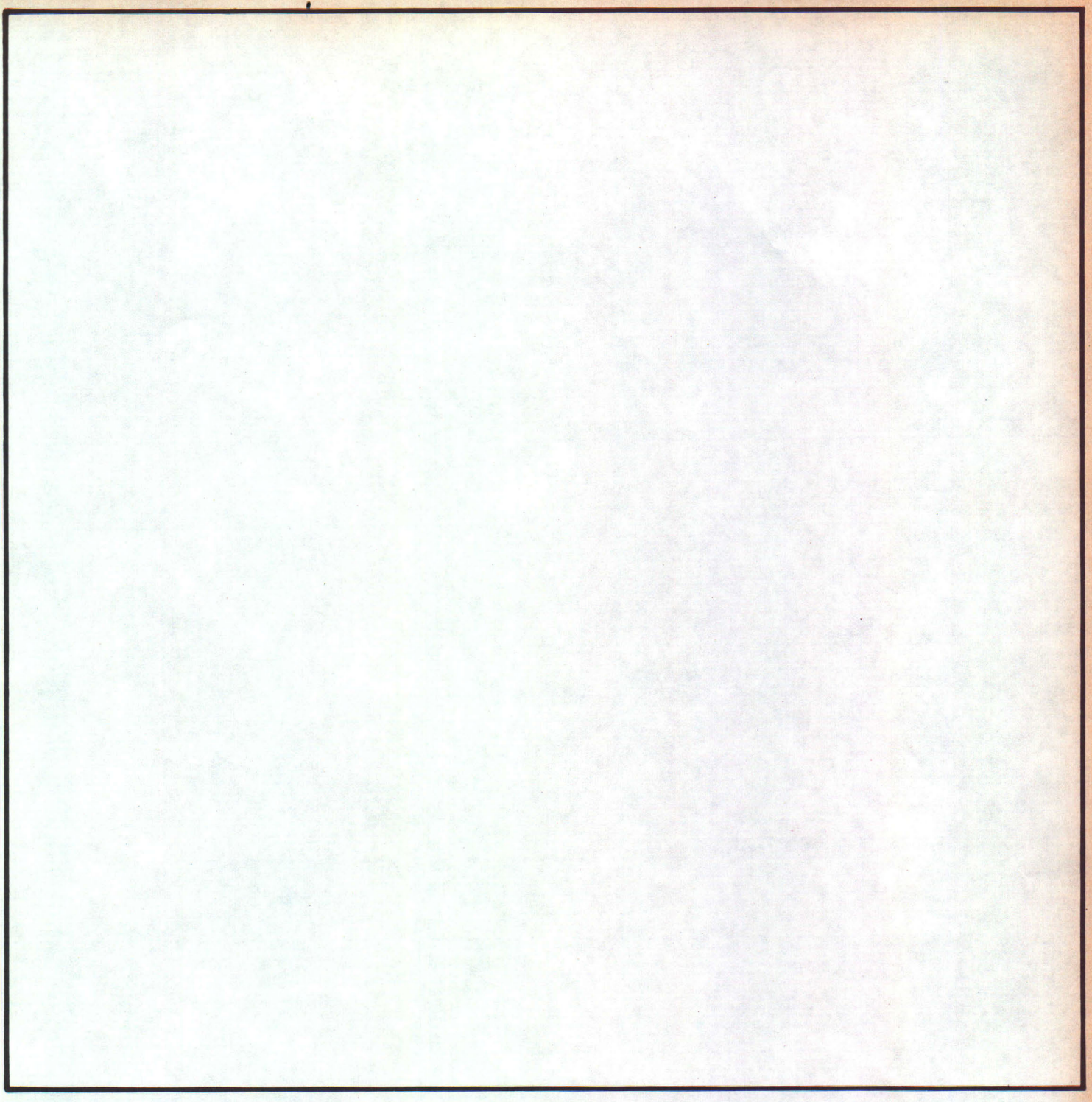
UNION PACIFIC RAILROAD COMPANY
NATURAL RESOURCES DIVISION
MINING DEPARTMENT
EXPENDITURE FORECAST

PROJECT NAME Yerington (Ludwig-Douglas Hill)

PROJECT NUMBER 38

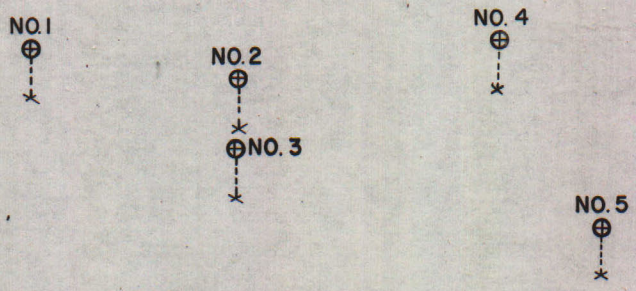
DATE October 28, 1968

	July 1	Aug. 2	Sept. 3	Oct. 4	Nov. 5	Dec. 6	MONTHS Jan. 7	Feb. 8	Mar. 9	April 10	11	12	TOTALS
INVESTMENT													
Option													
Rental													
Purchase													
Other Finder's Fee				900		900							$ 1800.00
Total													
CAPITAL ASSETS													
Vehicles													
Equipment													
Other													
Total													
SALARIES & WAGES													
Geologists					500	500	250	250	250				$ 1750.00
Geophysicists													
Surveyers													
Technicians					300	600	600	300					$ 1800.00
Casual													
Other													
Total													
TRAVEL & FIELD EXP.													
Transportation													
Living					210	350	280	140					$ 980.00
Other													
Total													
OFFICE & SUPPLIES													
Maps & Reports													
Other													
Total													
NON-TECH. CONTRACTORS													
Drilling					6700	11250	15000	5000					$37950.00
Bulldozing					1100								$ 1100.00
Other													
Total													
ASSAYING					700	525	263	88					$ 1576.00
Total													
AUTO- OPER. & MAINT.					60	80	80	60					$ 280.00
Total													
EQUIP.-OPER. & MAINT.													
Total													
CONSULTANTS & CONTRS.													
Geological													
Geophysical					3500								$ 3500.00
Geochemical													
Other													
Total													
TOTAL				900	13070	14205	16473	5838	250				$50736.00



OBLIQUE PHOTO
LUDWIG MINE
(LOOKING EAST)
LYON COUNTY, NEVADA

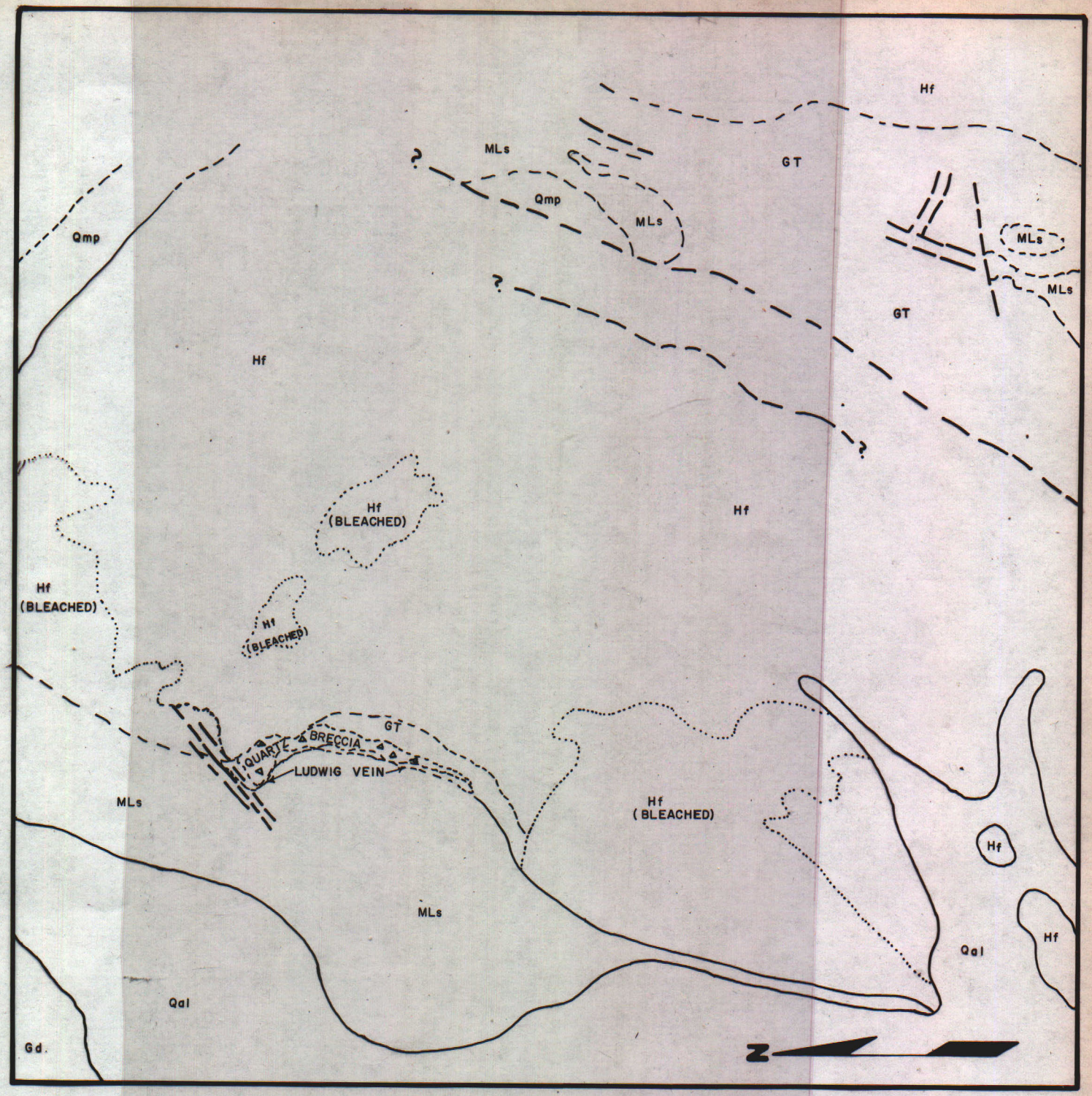
PLATE I



DOUGLAS HILL
(LOOKING EAST)
LYON COUNTY, NEVADA

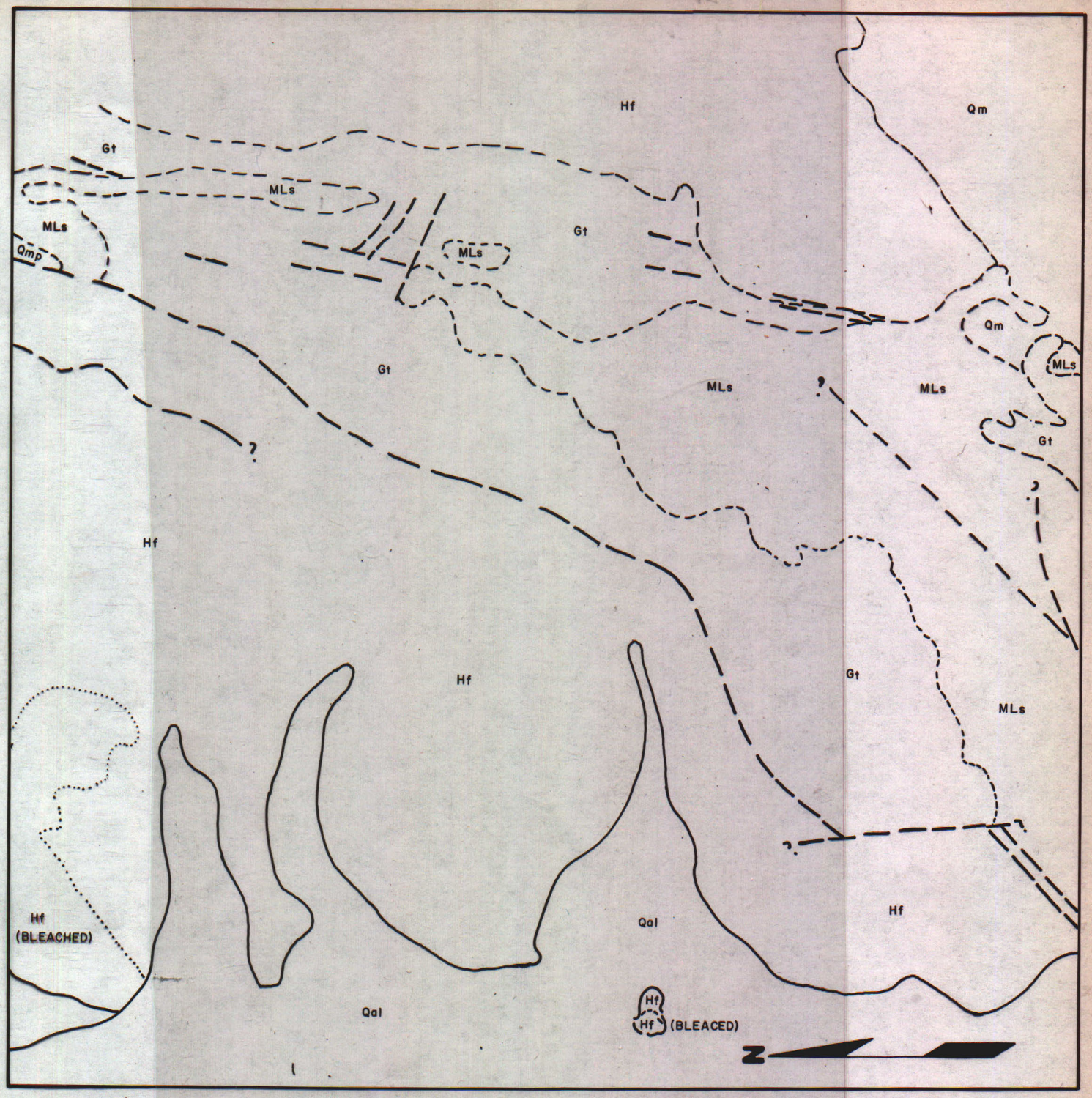
OVERLAY SHOWING PROPOSED
DRILL HOLES

PLATE II-A



LUDWIG MINE
(LOOKING EAST)
LYON COUNTY, NEVADA
OVERLAY SHOWING GEOLOGY
(SEE FOLD-OUT FOLLOWING PLATE III FOR LEGEND)

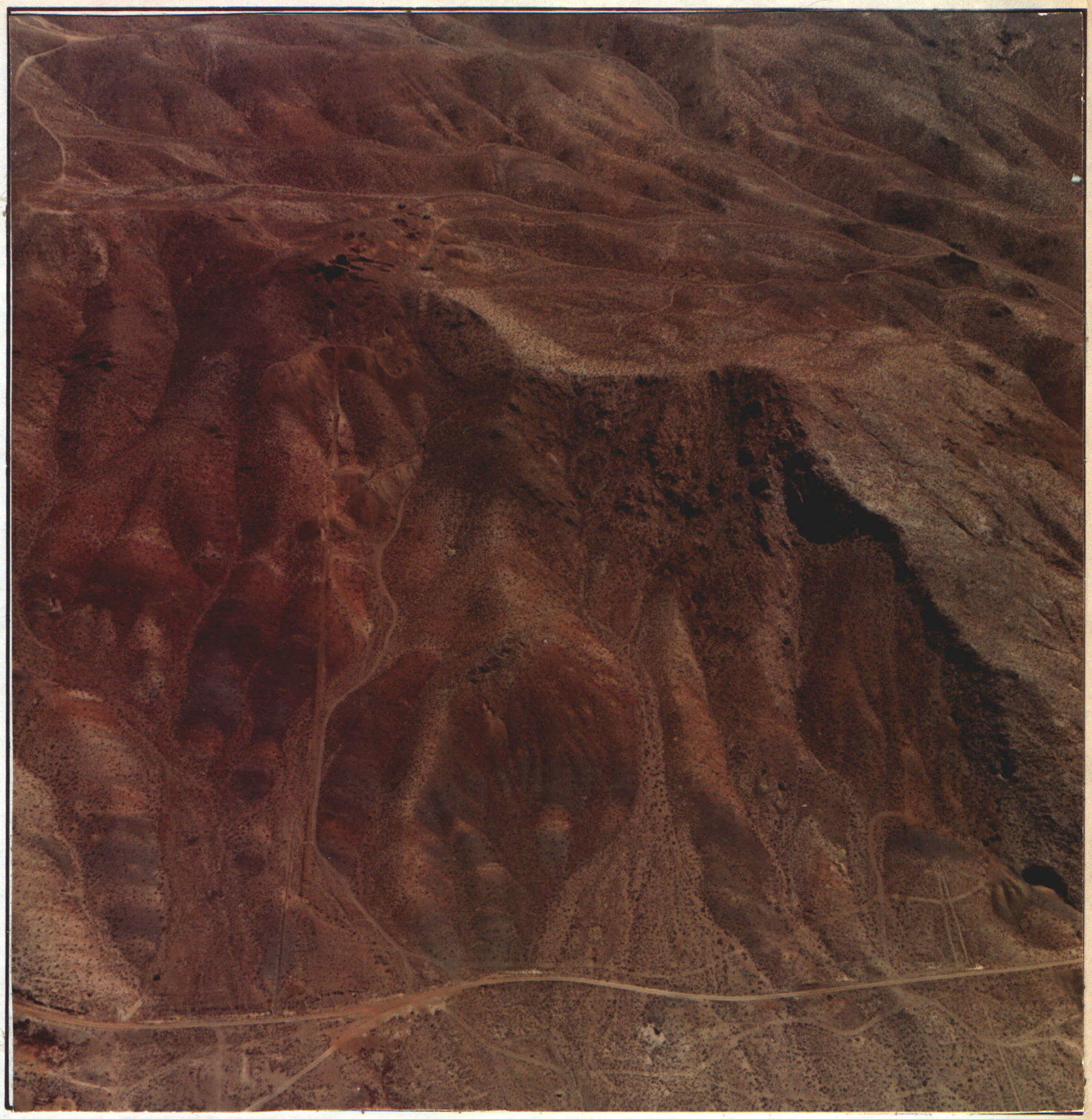
PLATE I-A



DOUGLAS HILL
(LOOKING EAST)
LYON COUNTY, NEVADA

OVERLAY SHOWING GEOLOGY
(SEE FOLD-OUT FOLLOWING PLATE III FOR LEGEND)

PLATE II- C

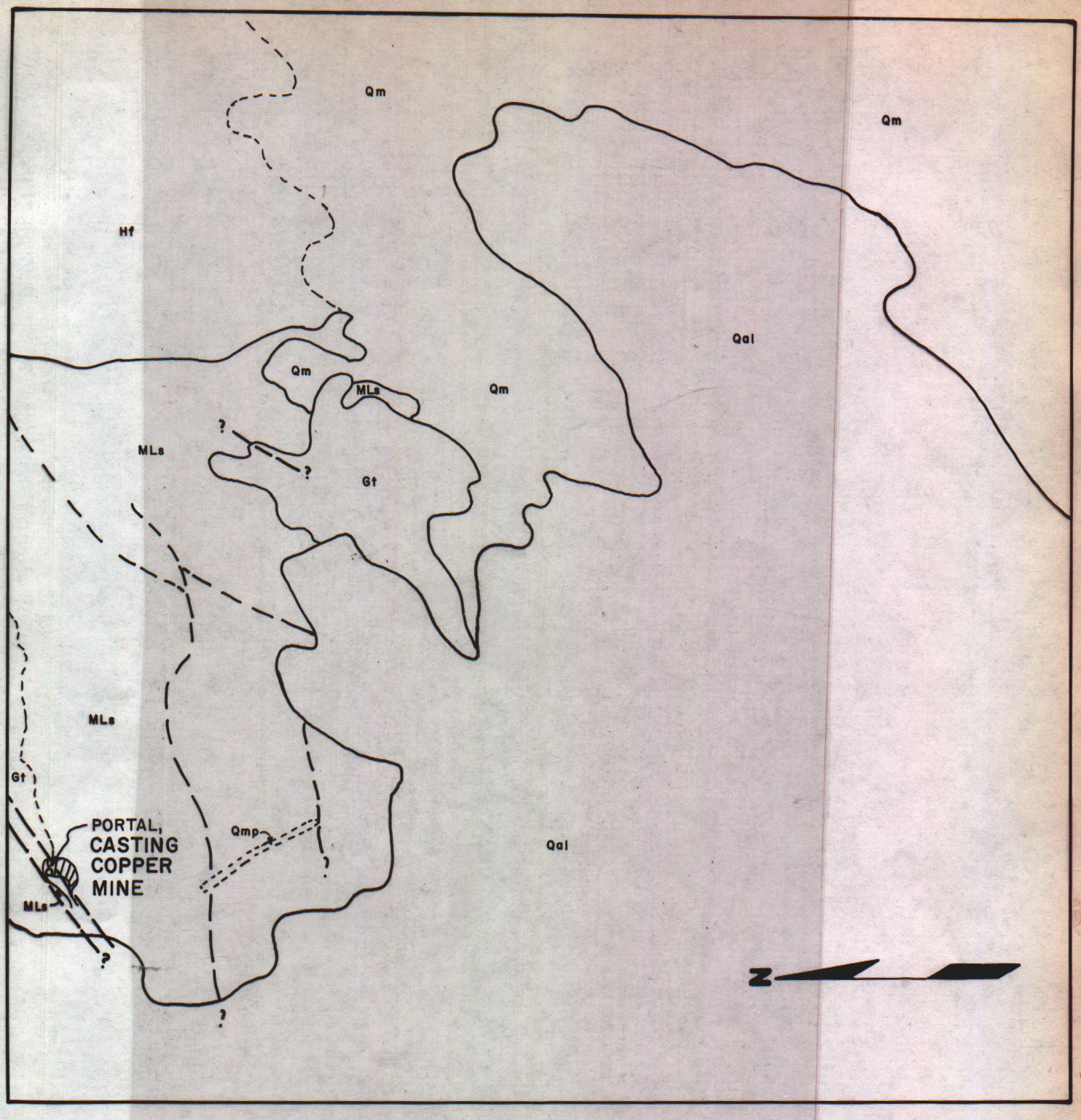


OBLIQUE PHOTO
DOUGLAS HILL
(LOOKING EAST)
LYON COUNTY, NEVADA

PLATE II

OBLIQUE PHOTO
CASTING COPPER
(LOOKING EAST)
LYON COUNTY, NEVADA

PLATE III



CASTING COPPER
(LOOKING EAST)
LYON COUNTY, NEVADA
OVERLAY SHOWING GEOLOGY
(SEE FOLD-OUT FOLLOWING PLATE III FOR LEGEND)

PLATE III-A

EXPLANATION

(FOR PLATES I – III)

Qal	ALLUVIUM
	QUARTZ BRECCIA
	LUDWIG VEIN
Qmp	QUARTZ MONZONITE PORPHYRY DIKE
Qm	QUARTZ MONZONITE
Gd	GRANODIORITE
MLs	MARBLEIZED LIMESTONE
Hf	HORNFELS
Gt	GARNET TACTITE

APPROXIMATE SCALE

FOREGROUND, 1 IN. = 150 FT.

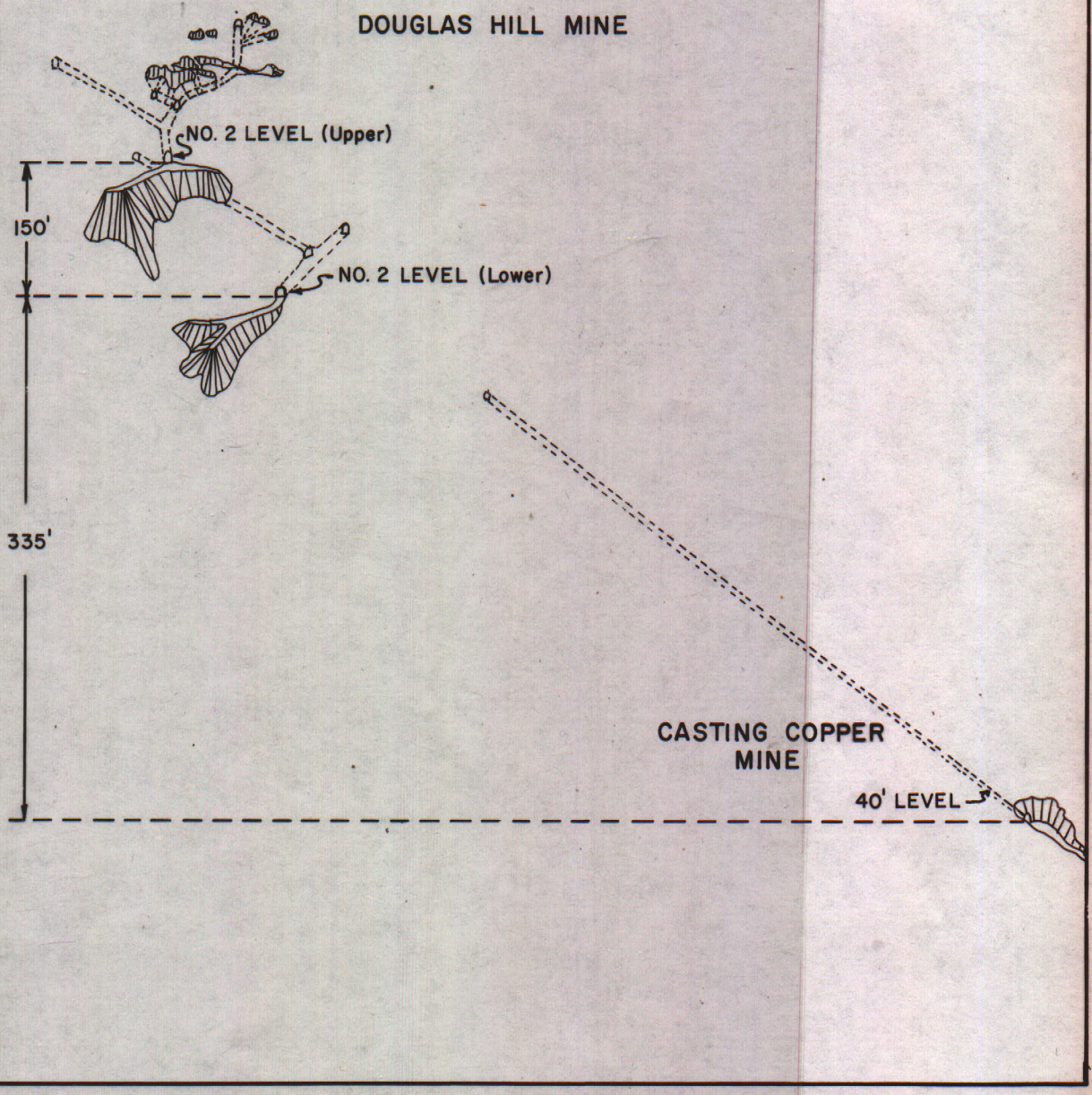
BACKGROUND, 1 IN. = 500 FT.

All Large map files:

Plate 5
Plate 6
Claim map

} all marked 188

Item 22



DOUGLAS HILL
(LOOKING EAST)
LYON COUNTY, NEVADA

OVERLAY SHOWING GENERALIZED
UNDERGROUND WORKINGS

PLATE II- B