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The following file is part of the West Oatman Project mining collection

MOSS MINE PROJECT

MOHAVE COUNTY, ARIZONA

MINEABLE RESERVE ESTIMATE

for

CYPRUS METALS COMPANY

by

HUMBOLDT MINING SERVICES AND ASSOCIATES

JANUARY 29, 1991

A drill hole inferred Mining Reserve Estimate of 1,010,790 tons with a grade of .065 ounces of gold per ton was calculated by HMS for the East Area of the Moss Mine. The estimate was made using a cross-sectional technique based upon area-of-influence polygons for standard rotary and reverse circulation drill holes. An open pit was designed on the vein to an elevation depth of 1800 feet above sea level. All information used in the calculations and design were supplied by Billiton Minerals, Inc., USA.

	Tons	Gold Grade	Contained Ounces
Polygon Estimate	851,190	.078	66,393
Mining Extraction Loss(5%)	42,560	.078	3,320
Mining Dilution(25%)	202,160	.015	3,032
Mineable Reserve	1,010,790	.065	66,105
Recoverable Ounces(70%)	46,274		
Total Pit Tons	9,012,400		
Waste Tons	8,001,610		
Stripping Ratio	7.9:1		

According to Billiton approximately 14,000 ounces of gold have historically been mined from the Moss Mine but some of this production may have come from areas other than the area which is the basis for this reserve. These ounces were not subtracted from the reserve estimate because the amount of material, the grade of the production and the location of the historical mining are not known.

An estimate of the mineable ore material in the West Area was not attempted due to sparse information and highly variable values from hole to hole.

Caution should be exercised in using the reserve estimate and available information for critical or significant decisions for the following reasons:

* The estimate is based on sparse rotary and reverse circulation drill hole assay data. Underground sampling appears to confirm intercept widths but is generally of a significantly higher grade. Little is known about the quality of the underground sampling or the rotary drilling.

* The water table is reported to be only 140 to 200 feet deep. If the drill holes were wet the grade and thickness

MOSS MINE PROJECT
MOHAVE COUNTY, ARIZONA

INTRODUCTION

The Moss mine is a stockwork/vein-hosted gold deposit in Mohave County, AZ, in the San Francisco mining district, five miles northwest of the Oatman-Goldroad gold district, in Section 19, T20N, R20W. Drilling along a portion of the vein in 1982 indicated consistent ore-grade mineralization with the probability for continuing at depth. The property lay dormant until 1990, when complex property negotiations were concluded and BMUSA obtained an option on the patented claims over the original mine. BMUSA's first round of drilling confirmed the deeper continuity of the ore-grade mineralization and a second round of drilling to explore further along strike is planned for the fourth quarter of 1990.

Present drilling indicates geologic reserves of 1.5 million tons @ 0.065 ounces gold/ton. A potential for 350,000 ounces of open pit heap leachable gold exists. BMUSA has options to purchase eleven patented lode claims and has staked an additional 67 lode claims.

DEVELOPMENTAL HISTORY

Visible gold was discovered in 1863 by John Moss immediately north of the present shaft. The property was worked until the mid-1930's but production records were not kept. Approximately 1,600 feet of drifting and stoping along the vein was accomplished on three levels 65 feet, 220 feet and 300 feet below the shaft collar. Reports by observers estimate that total past production was valued at $500,000 using historic prices.

In the early 1980's, B.F. Minerals obtained a lease on the property and drilled 25 near-surface Air-Trac holes and 4 deep reverse circulation holes. A new shaft was sunk near the older shaft and a small but unrecorded amount of ore was produced before the company ceased production due to financial and legal difficulties.

In 1990 BMUSA obtained an option to purchase the key patented claims and staked 67 claims in the surrounding area. In August 1990 twelve reverse circulation holes were drilled to test the down-dip extension of the ore outlined by the previous Air-Trac drilling. The drilling successfully indicated that the mineralization is consistent to depths mineable by open-pit methods. Mineralized rock blossoms out from the vein at depth within a wide stockwork zone in the hanging wall and footwall of the vein.

Encouraged by these results, BMUSA began a program of geologic mapping along the extension of the vein and a second round of drilling to test further along strike is planned.

GEOLOGY

Productive gold-silver veins in the vicinity of the Moss mine lie within a host rock of quartz monzonite locally referred to as the Moss porphyry, an intrusive body two miles wide and four miles long with its long axis oriented in a northwest - southeast direction. The porphyry mass intrudes trachyte, andesite and latite flow rocks of Tertiary age. The Moss porphyry is inferred to be an intrusive equivalent of the extrusive flow rock Gold Road Latite. The Moss porphyry is cut by NNE-trending latite dikes and is strongly dissected by a series of joints and faults showing 10 to 100 foot displacements trending generally N - S to N 15 degrees E. On the western side of the Moss property these cross-structures to the main structure are strongly silicified in an area of extensive silica-flooded stockwork.

The main structure strikes generally N 80 degrees W and dips 65 to 70 degrees to the south. It consists of a mineralized quartz-calcite-adularia vein surrounded by silica-flooded and mineralized stockwork veining from 20 to 100 feet wide. This structure can be traced intermittently for several miles. It extends east and west of BMUSA's Moss property and is widest at the western end of that claim group. The vein on the Moss property represents contemporaneous fissure-filling during periods of recurrent movement along N 80 degrees W fault structures. Post mineralization movement along the faults displaces the ore veins 10 to 100 feet or more in several places. The vein is also cut and displaced by a number of N 15 by 20 degrees W faults documented by previous workers in underground workings. The Canyon fault is responsible for a 200 foot-wide hiatus in the surface expression of the vein directly west of the existing shaft.

In the hanging wall of the main structure are several narrow quartz veins dipping antithetically toward the Moss vein. These have been the object of intensive prospecting and limited mining has taken place along one five foot vein 700 feet south of the main vein.

The vein structures represent fracture fillings which are not consistent along the entire length of the structures. Stringers along the surface may lead to a solid vein of quartz and calcite within 30 feet along dip. Similar variations in width are common along strike. Consequently the entire strike length of the main structure that lies within BMUSA's claims - approximately two miles - is prospective ground.

Gold occurs free in its native form and is rarely visible. The gold:silver ratio is variable but averages about 1:5. Secondary gold has been observed as coarse pieces and fine wires, and is generally silver-free.

RESERVES

The wide grid spacing of the drilling conducted and the unknown quality-control of the early phase Air-Trac portion of that drilling preclude any precise reserve calculations. However, assuming good sample quality and continuity of mineralization between holes, the drilling to date indicates a geologic reserve of approximately 1.65 million tons @ 0.065 ounces gold/ton within an area 500 feet along strike, to a depth of 400 feet below the outcrop of the vein, assuming a 100 foot average width of the vein and mineralized stockwork.

METALLURGY

Preliminary mineralogical studies and metallurgical tests are underway.

POTENTIAL

There is potential for a 350,000 ounce mineable gold deposit within the area of the patented claims. A geologic reserve of approximately 100,000 oz. has already been realized. There is additional exploration potential to the east, where the main structure is virtually unexplored along a strike length of over one mile.

Present plans include a second round of drilling to explore an additional 3,000 feet of strike length eastward from the area of the best mineralization with a series of nine reverse-circulation holes 300 feet to 500 feet apart. An additional two holes are planned to test the further down-dip extension of the known mineralization.

LAND STATUS

The central core of the Moss mine project consisting of six patented claims carrying the best currently known mineralization was brought to BMUSA as a submittal by Greg Gintoff, an independent geologist. Gintoff had succeeded in putting together a deal with the controlling key claims. The difficulties associated with acquiring this key ground were a major obstacle to exploration of the property in the latter half of the eighties, and prevented at least one major company from exploring the ground.

Greg Gintoff has since leased seven additional adjoining claims and assigned them to BMUSA. Negotiations are in progress for control of one key claim (California Moss #1) which lies directly east of the best mineralization. This landowner is cooperating with BMUSA and a deal is anticipated in the near future. Sixty-seven lode claims have been staked by BMUSA in 1990 to cover the area south and east of the key group of patented claims.

The remaining land to the north and west of the BMUSA land position is covered by patented claims or by valid unpatented lode claims. The major active competitor holding a large block of claims directly west of BMUSA's position is Compass Minerals, who is in a joint venture with Reynolds Metals, with Reynolds as the apparent operator.

THE DEAL

1) BMUSA holds a 100% interest in the claims which it has staked, with overriding obligations to Gintoff of 2.5% gross royalty from any production from those claims which lie within the BMUSA/Gintoff area of interest (see "Gintoff Agreement", below).

2) Gintoff Agreement: For assignment of the original package of six patented claims to BMUSA, Gintoff received $20,000 on the effective date (7-1-90) and will receive $35,000 one year later. Gintoff will receive a 3.5% Gross Value royalty on production from these claims and from the adjoining Mosely claims, and a 2.5% Gross Value royalty on production from any additional properties within the area of interest. After BMUSA's exercise of the purchase option Gintoff will receive $60,000 advance royalty per year prior to production. After production BMUSA can recoup from Gintoff's royalty up to 1/2 the $1 million purchase price plus any advance royalties paid to Gintoff.

3) Williams et. al.: Under a two-year option granted to Gintoff and assigned to BMUSA the owners of the original six claims acquired under the Gintoff Agreement received $10,000 upon signing. They will receive $20,000 180 days later and $40,000 on the first anniversary of the option. The purchase price is $1 million.

4) Martinez: Five patented claims adjoining the original six claims are owned by Ramon and Edna Martinez and were optioned by them to Gintoff on October 17, 1990. This option has been assigned to BMUSA. Martinez received $1,000 upon signature and will receive $500/month for six months beginning 180 days after exercise of the agreement, $1,000/month for the second year of the agreement, $2,000/month during the third year and $2,500/month for the fourth and fifth year. The option price of the property is $250,000.

RECLAMATION/ENVIRONMENTAL SITUATION

1) There are no reclamation obligations outstanding. All drilling by BMUSA has been accomplished with a tracked RC rig on privately owned ground with minimal surface disturbance.

2) The area is approximately ten miles from the nearest town, Bullhead City, AZ, in a typical arid desert environment. There is believed to be abundant water on the property below the water table which lies 140 to 200 feet below the surface.

AVAILABLE INFORMATION

The following data is available for inspection:

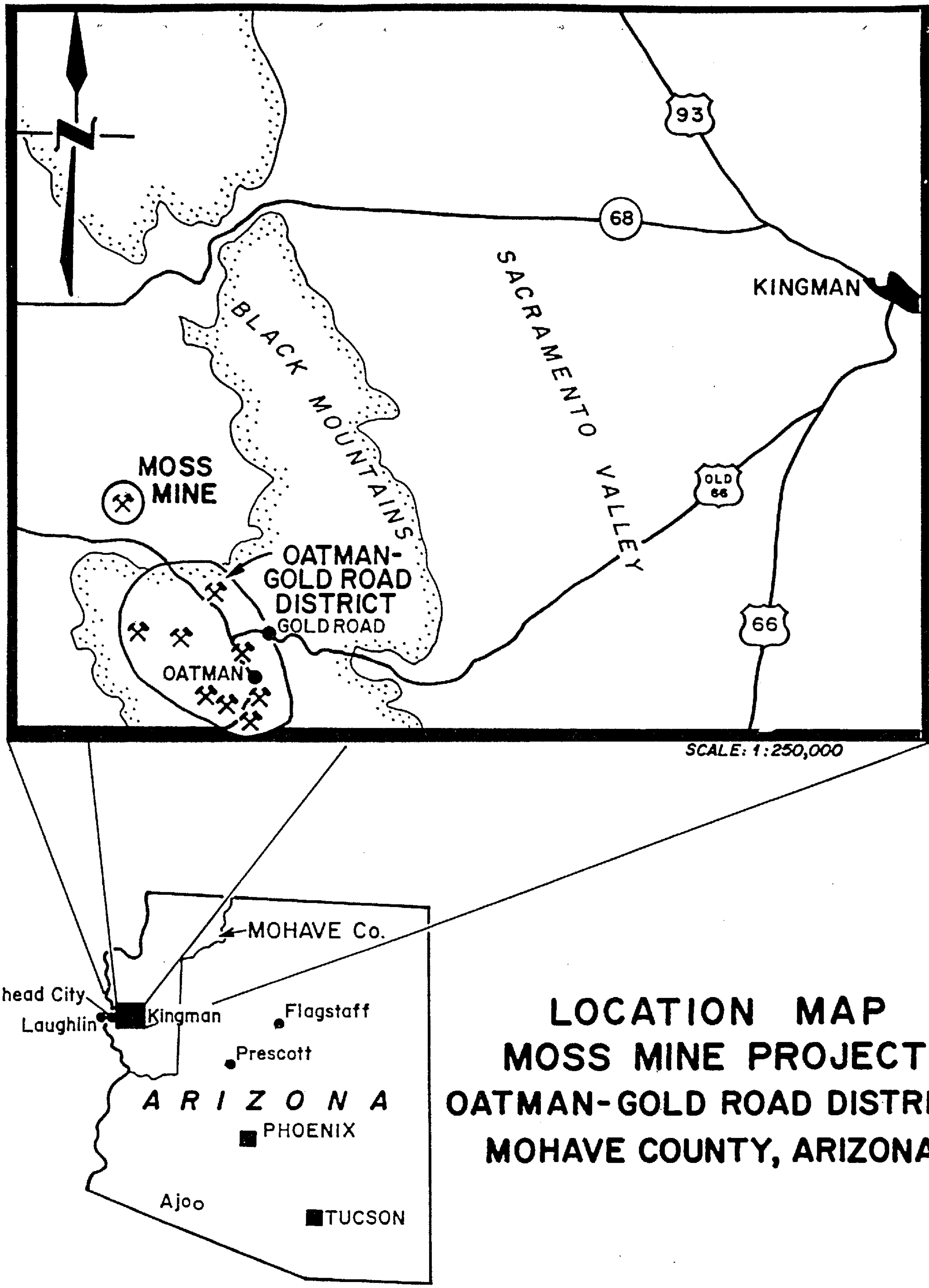
1) B.F. Minerals' surface and underground level plan maps generated by their 1981-82 activities.

2) B.F. Minerals' Air-Trac and RC drill logs, presented as sections, with posted composite assays for holes M-1 thru M-29.

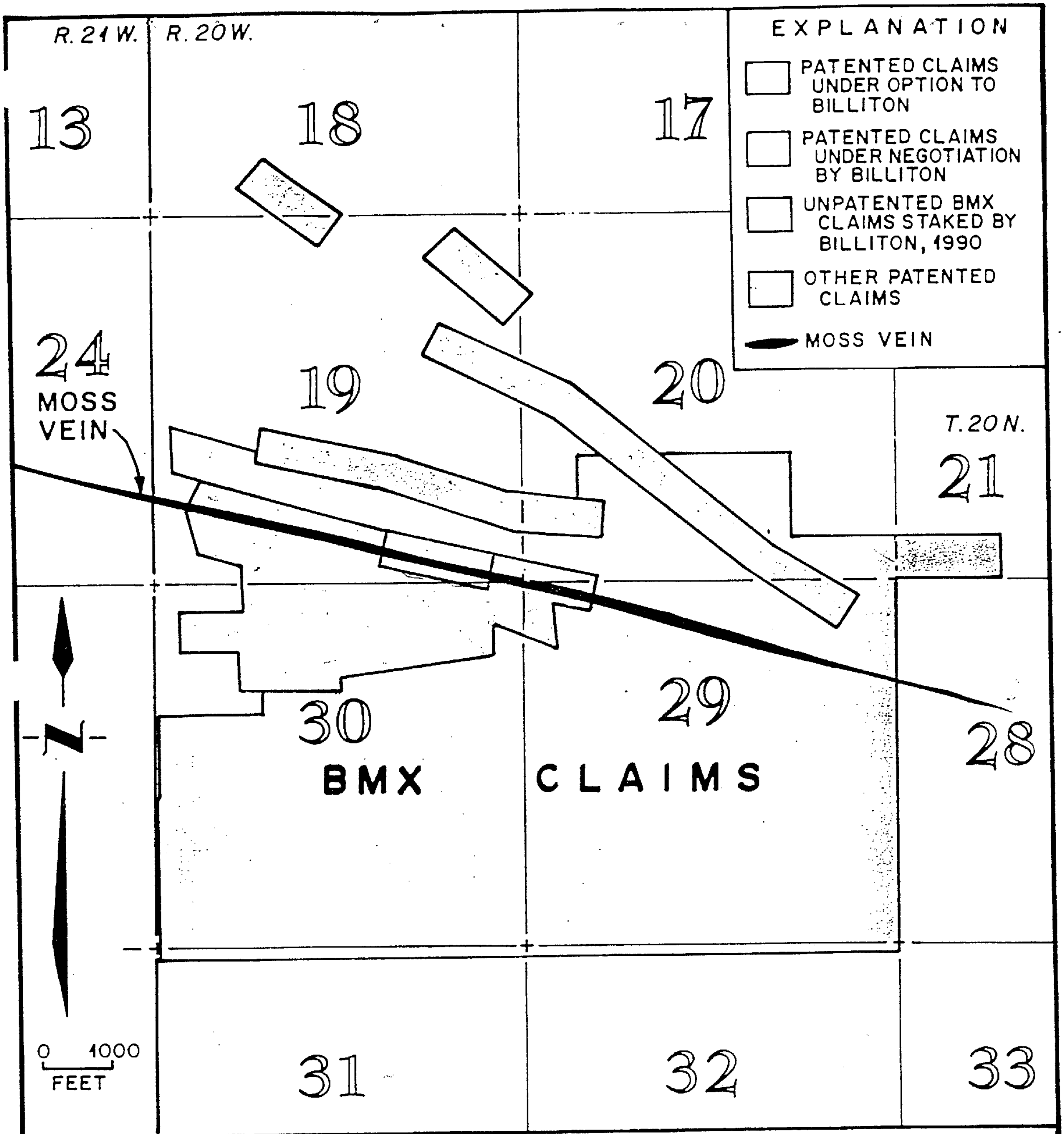
3) BMUSA's 1990 drilling results:

   a) Drill hole location map (holes posted on B.F. Minerals' surface map)
   b) Drill logs
   c) Drilling assay results
   d) Cross sections through significant ore holes with posted composite assay results.

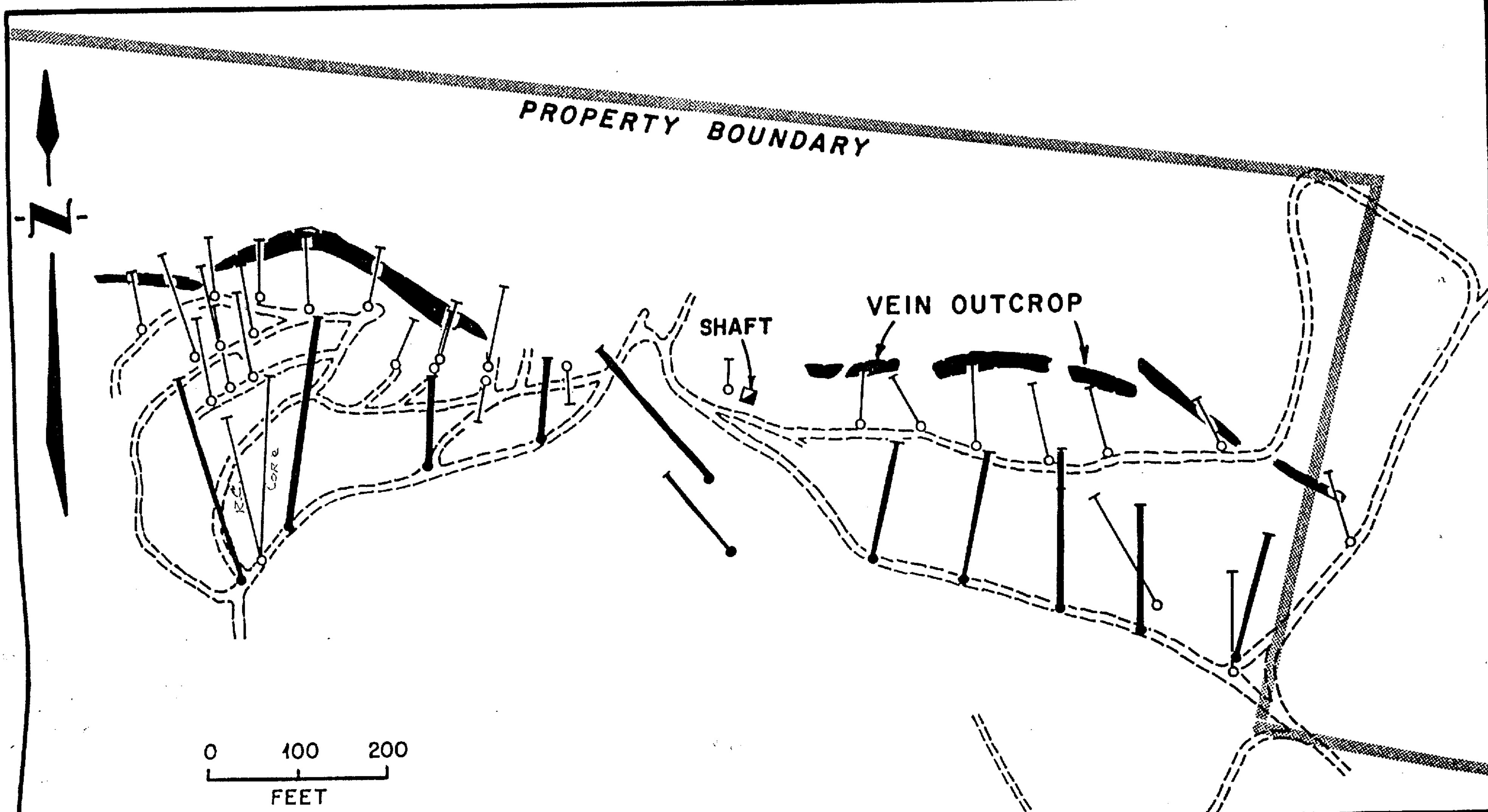
4) BMUSA's field maps of ongoing geological mapping.



LOCATION MAP
MOSS MINE PROJECT
OATMAN-GOLD ROAD DISTRICT
MOHAVE COUNTY, ARIZONA



PROPERTY POSITION MAP
MOSS MINE PROPERTY
MOHAVE COUNTY, ARIZONA



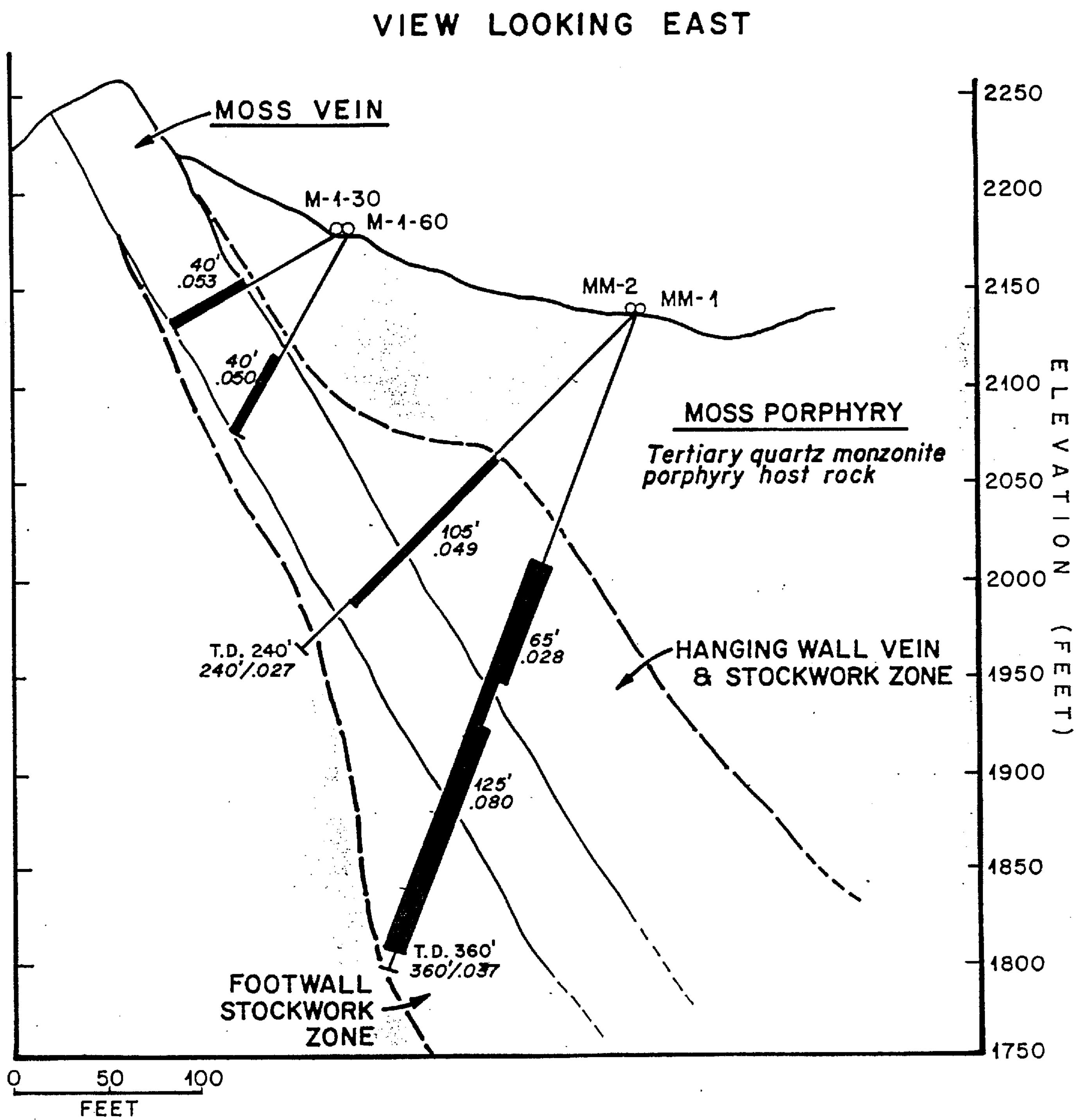
Reverse circulation drill hole, Billiton 1990

Air-Trac drill hole, BF Minerals 1982

R.C.

Outcrop exposure of vein system

MOSS MINE DRILLING
MOSS MINE PROJECT
MOHAVE COUNTY, ARIZONA



SCHEMATIC CROSS SECTION
MOSS MINE PROJECT
~~OATMAN-GOLD ROAD~~ DISTRICT
MOHAVE COUNTY, ARIZONA

San Francisco Dist.

April 26, 1990

TO: Jim Curl

FROM: Ed Hanley

RE: Moss Mine - Estimation of Probable and Possible Reserves

Using the data supplied by Greg Gintoff, which includes the results of 30 drill holes and assay maps of the underground workings, the gold potential of the Moss mine has been estimated.

Probable reserves were calculated from the near-surface air-track drill results, with a pit depth of 200 - 250 feet. They include mineralization in both the "West Pit" and the "East Pit" areas. The "East Pit" area is the area that includes the underground workings, but the Probable Reserves do not go deep enough to include the underground workings because of the sparse data at depth. Probable reserves are 538,000 tons at .05 opt Au, with a stripping ratio of 1.38:1.

Possible reserves were calculated for a pit 400 - 450 feet deep and took into account the underground level assay results and the results of three deep drill holes. Possible Reserves were calculated for the "East Pit" area only; the "West Pit" area has indications of possible deep ore and represents significant upside potential for the area, but data (two drill holes) is too sparse to make any reasonable tonnage estimate in this area. Possible reserves in the East Area only are 1.2MMT at 0.08 opt Au, with a 4:1 stripping ratio. From given estimates of the dollar value of past production, approximately 14,000 oz. Au have been been removed already from this volume of rock, leaving a Possible Reserve of 80,100 oz Au. (This includes 20,100 oz. of near-surface Probable Reserves.)

The higher grade of the Possible Reserves (.08 opt) vs. the Probable Reserves (.05 opt) is strongly influenced by extrapolation of the 300 Level average grade of 0.18 opt over a distance along dip of the vein of over 200 feet. This is justified by the sparseness of the data and the fact that what little data there is indicates that the width and grade of the vein do increase with depth. However it may not in fact stand up to testing.

The ore in the East Pit is confined on the west by the Canyon fault, which separates the East and West areas with a 200 ft. wide unmineralized zone; and on the east by the decline in width and grade of the vein and its contained ore. There is deep exploration potential on the vein to the east of the patented claims, and further potential in the hanging wall area within the patented claims.

The deeper ore in the West Area represents an upside potential for the project; the West Area holds approx. 6,700 oz Au in probable reserves, and may may contain a total of up to 50M oz Au.

SUMMARY

Probable Reserves (near surface)............	26,900 oz Au
Additional Possible Reserves.................	60,000 " "
Additional Upside Potential, West Area.......	50,000 " "

Total Potential for Moss Mine	136,900 oz Au

Ed

MOSS MINE - POSSIBLE RESERVES

RUN DATE: 05/09/90

RUN TITLE: POSSIBLE RESERVES - EAST PIT ONLY
FILE NAME: MOSS2

TONS ORE (TOTAL MINEABLE)		1,200,000
AVG. GOLD MINING GRADE (OPT)		0.080
MINING CUT-OFF GRADE (OPT)		0.020
AVG. STRIP RATIO		4.0
RECOVERY %		75%
TOTAL EQUIV. GOLD PROD. (OZ.)		74250
AVG. ANNUAL EQUIV. GOLD PROD. (OZ./YR)		21093.75
MINE LIFE (YEARS)		3.5
GOLD PRICE $/OZ		$400
DISCOUNT RATE (REAL)		7.0%
PVPAT		$4,540,201
ROR (REAL)		49.0%
ROR (NOMINAL)		56.5%
%PVP = PVPAT/PV ULTIMATE INVESTMENT (CAP. ONLY)		97%
PV ULT INVESTMENT (TOTAL CAPITAL)		$4,700,000
PV CAP COST PER RECOVER.OZ. EQUIV AU(TITLE OZ.)		$63
PAYBACK PERIOD (YEARS FROM TIME 0)		1.64
AVG. ANNUAL OCI (Constant $)		$3,852,793
DOC/TON & /OZ	$11.23	$199.70
TOC/TON & /OZ	$12.97	$230.50

JV OPTIONS:

Company's interest in total project		100%
Partner's interest in total project		0%
Co.carries x% of Partner's capital		0%
Co. to recoup x% of carried capital		0%
Co.to recoup from x% of Partner rev.		0%
Interest rate on carried capital		0%
Take title to recoup ounces,YES/NO	NO	
Co. depreciates carried capital,YES/NO	NO	

3½% GROSS @ 400/AU = $1,039,500
− ½ PURCHASE P 500,000
539,500

* Moss Mine * Probable Reserves

SUMMARY PAGE::

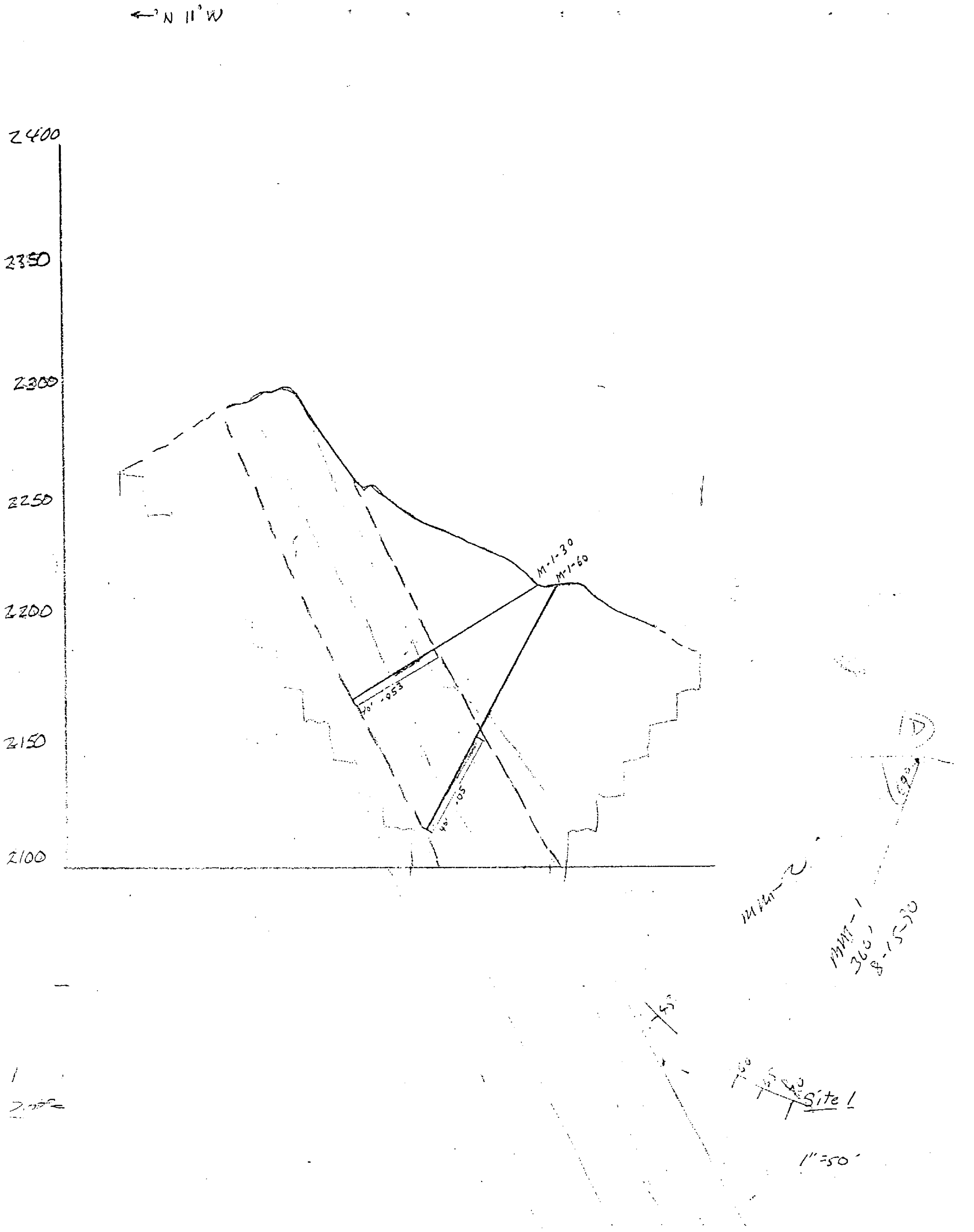
PROJECT NAME: MOSS MINE - MOHAVE COUNTY, AZ
RUN TITLE: PRELIMINARY RESERVES - EAST AND WEST PITS
FILE NAME: MOSS

RUN DATE: 04/19/90

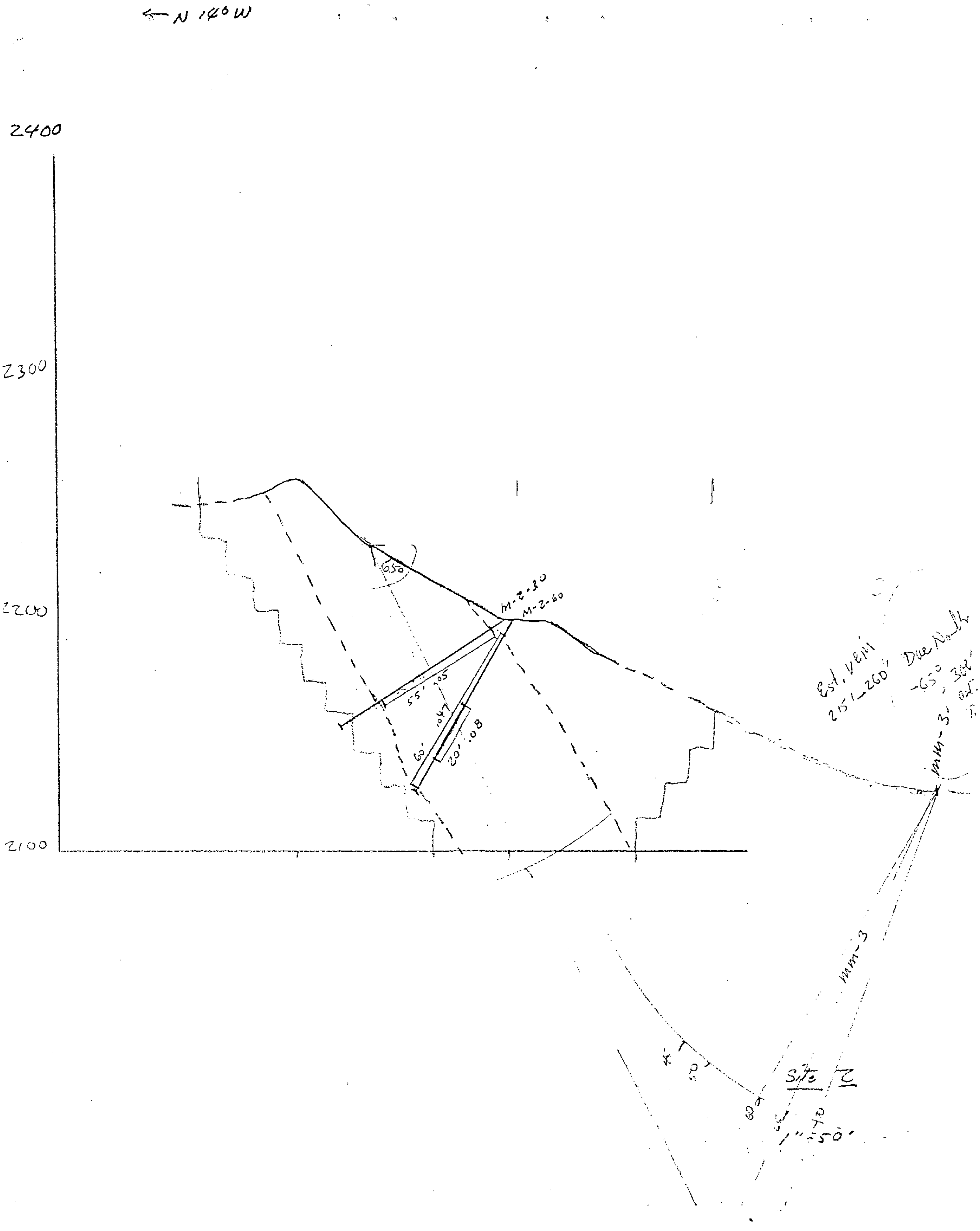
TONS ORE (TOTAL MINEABLE)		558,073 > Probable 200-250' deep
AVG. GOLD MINING GRADE (OPT)		0.050
MINING CUT-OFF GRADE (OPT)		0.020
AVG. STRIP RATIO		1.4
RECOVERY %		80%
TOTAL EQUIV. GOLD PROD. (OZ.)		22,446
AVG. ANNUAL EQUIV. GOLD PROD. (OZ./YR)		10429
MINE LIFE (YEARS)		2.2
GOLD PRICE $/OZ		$400
DISCOUNT RATE (REAL)		7.0%
PVPAT		$1,071,948
ROR (REAL)		34.5%
ROR (NOMINAL)		41.0%
%PVP = PVPAT/PV ULTIMATE INVESTMENT (CAP. ONLY)		49%
PV ULT INVESTMENT (TOTAL CAPITAL)		$2,200,000
PV CAP COST PER RECOVER.OZ. EQUIV AU(TITLE OZ.)		$96
PAYBACK PERIOD (YEARS FROM TIME 0)		1.67
AVG. ANNUAL OCI (Constant $)		$1,934,713
DOC/TON & /OZ	$3.78	$210.48
TOC/TON & /OZ	$3.99	$229.91

JV OPTIONS:

Company's interest in total project		100%
Partner's interest in total project		0%
Co.carries x% of Partner's capital		0%
Co. to recoup x% of carried capital		0%
Co.to recoup from x% of Partner rev.		0%
Interest rate on carried capital		0%
Take title to recoup ounces,YES/NO	NO	
Co. depreciates carried capital,YES/NO	NO	

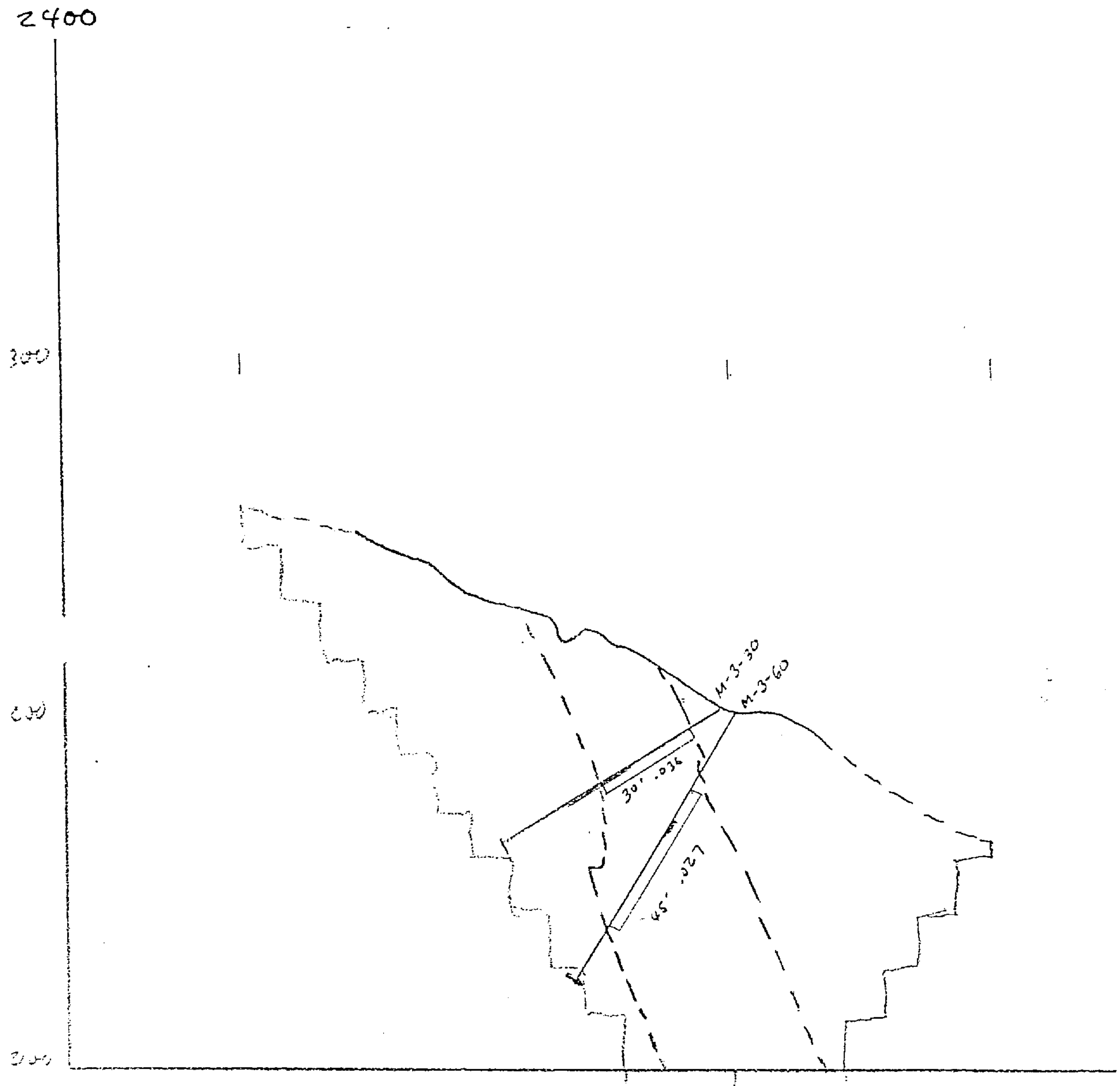


← N 11° W
2400
2350
2300
2250
2200
2150
2100
M-1-30
M-1-60
MM-2
MM-1
360°
8-15-90
Site 1
1" = 50'



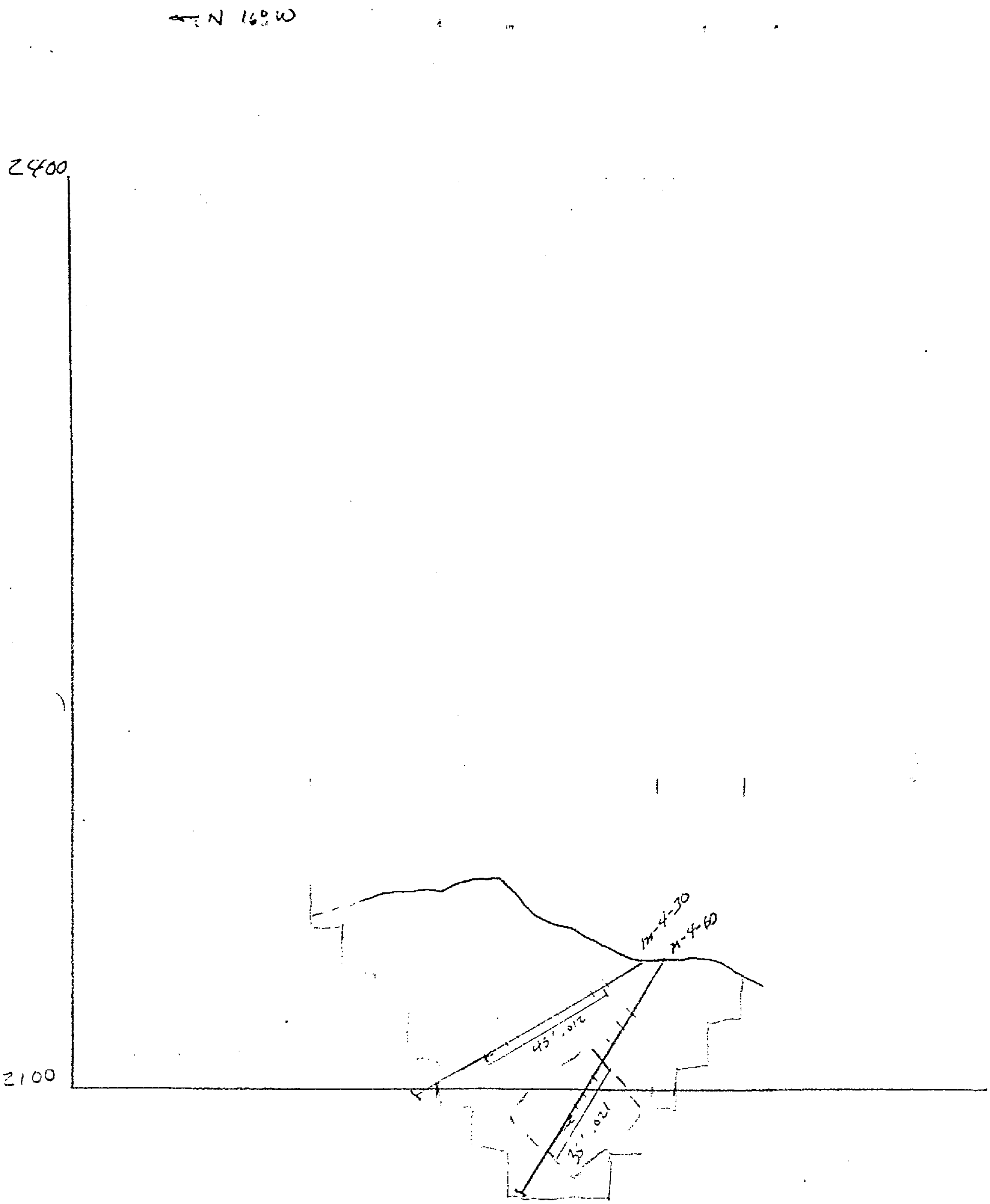
← N 14°W
2400
2300
2200
2100
65°
M-2-30
M-2-60
55' .05
60' .047
20' .08
mm-3
Site II
1" = 50'

← N 26° W



SITE 3

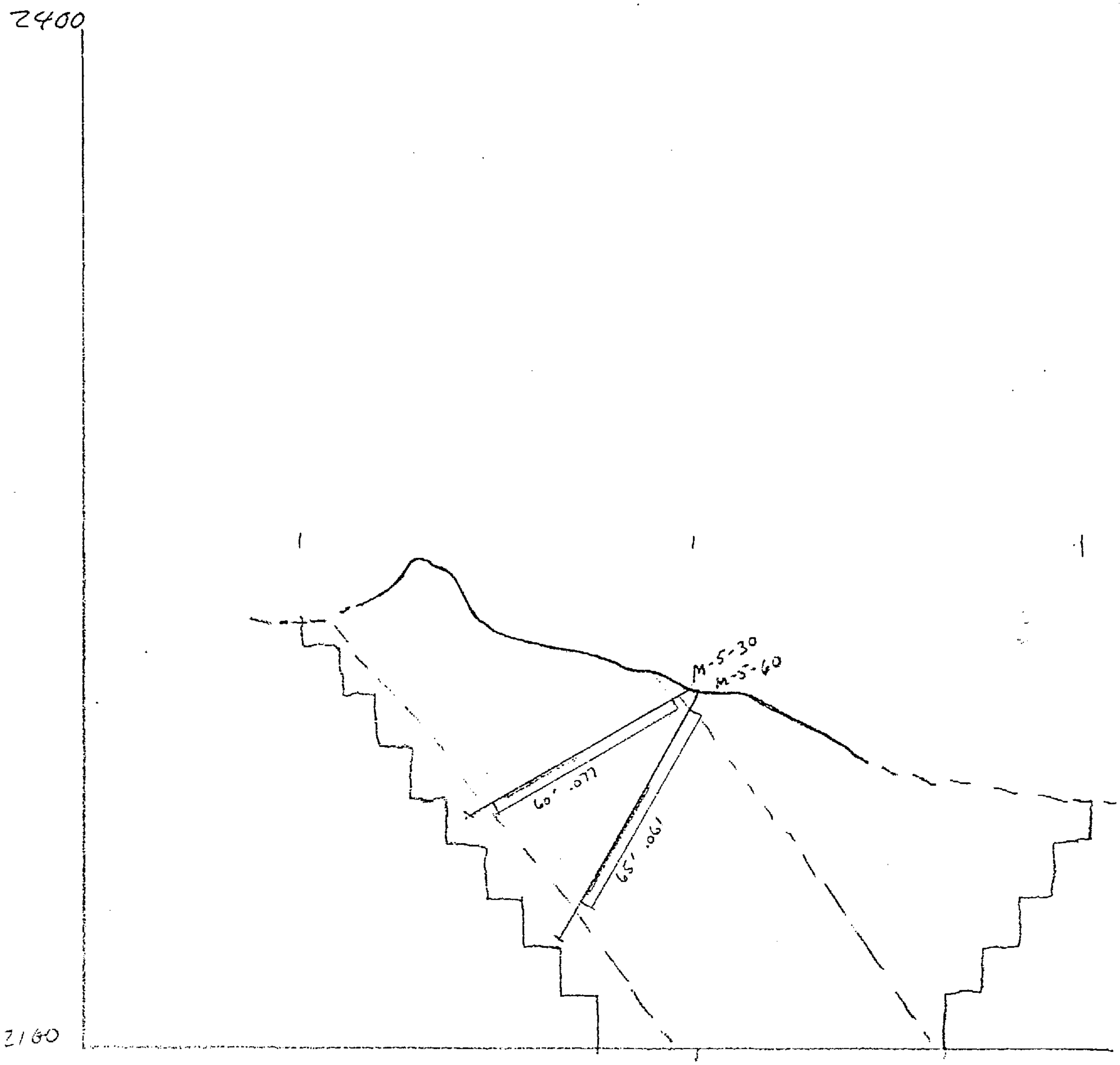
1" = 50'



Site 4

1" = 50'

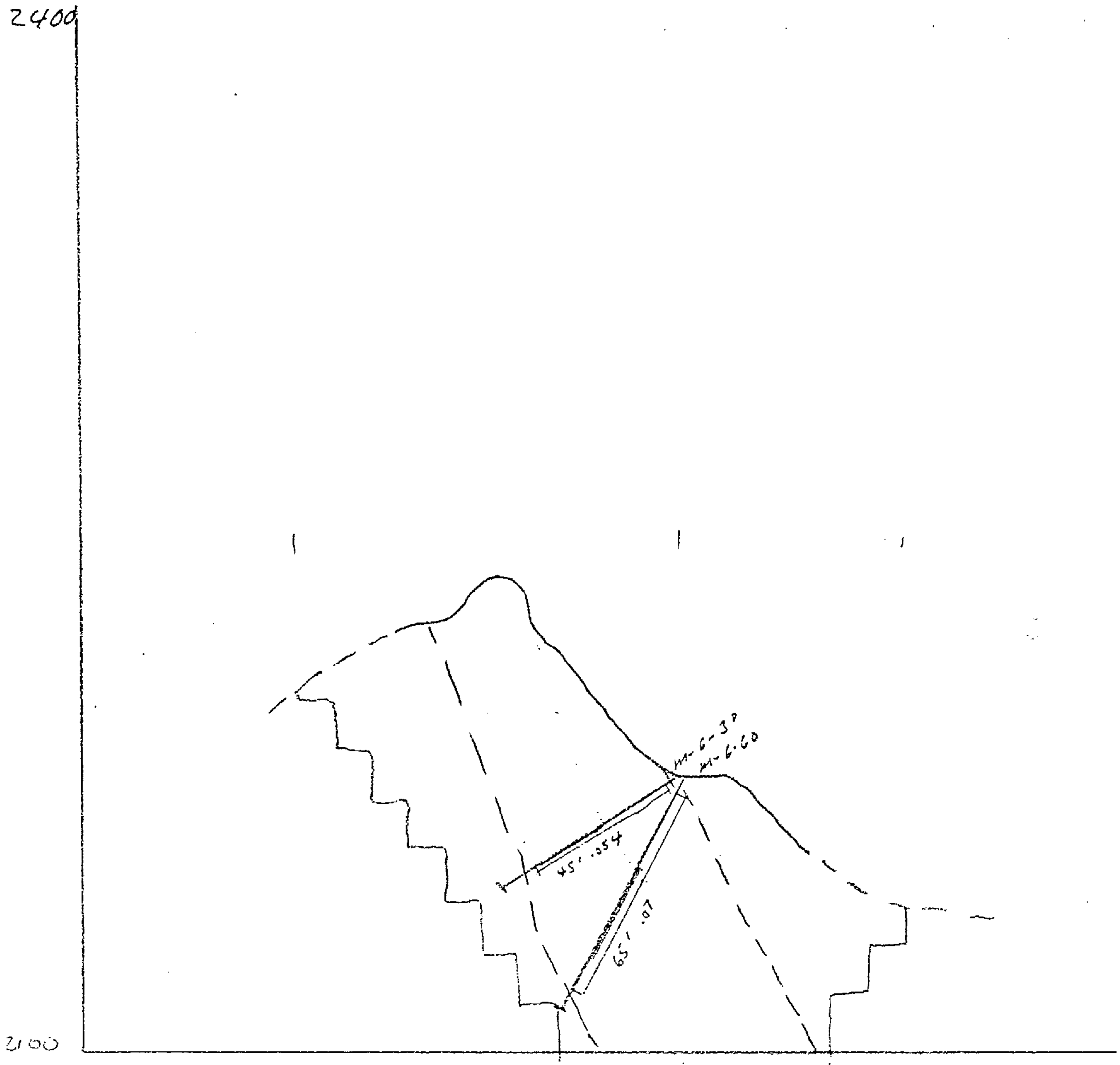
← N 28° W



Site 5

1" = 50'

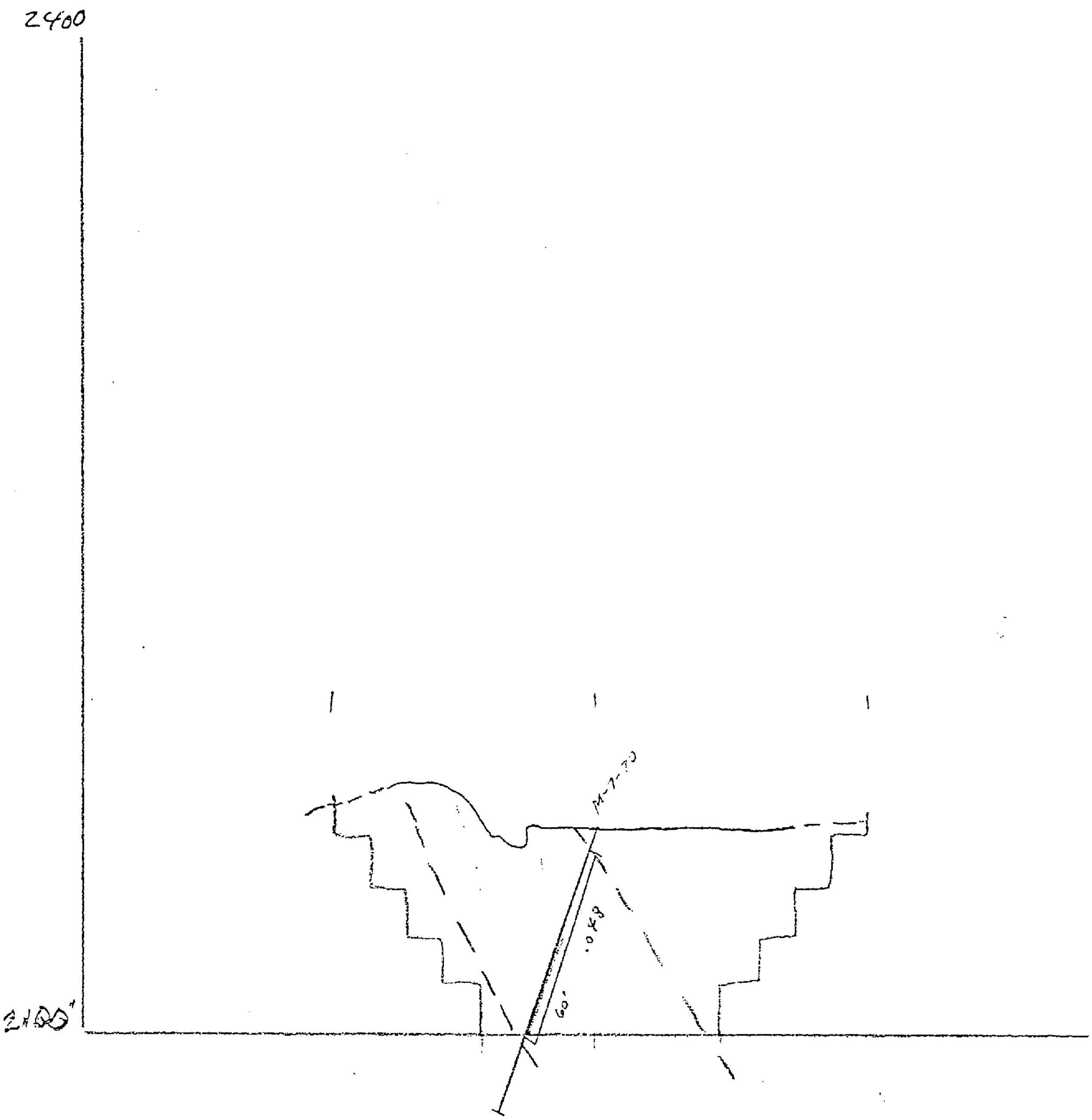
← N 4°E



Site 6

1" = 50'

← N 4½° E



SITE 7

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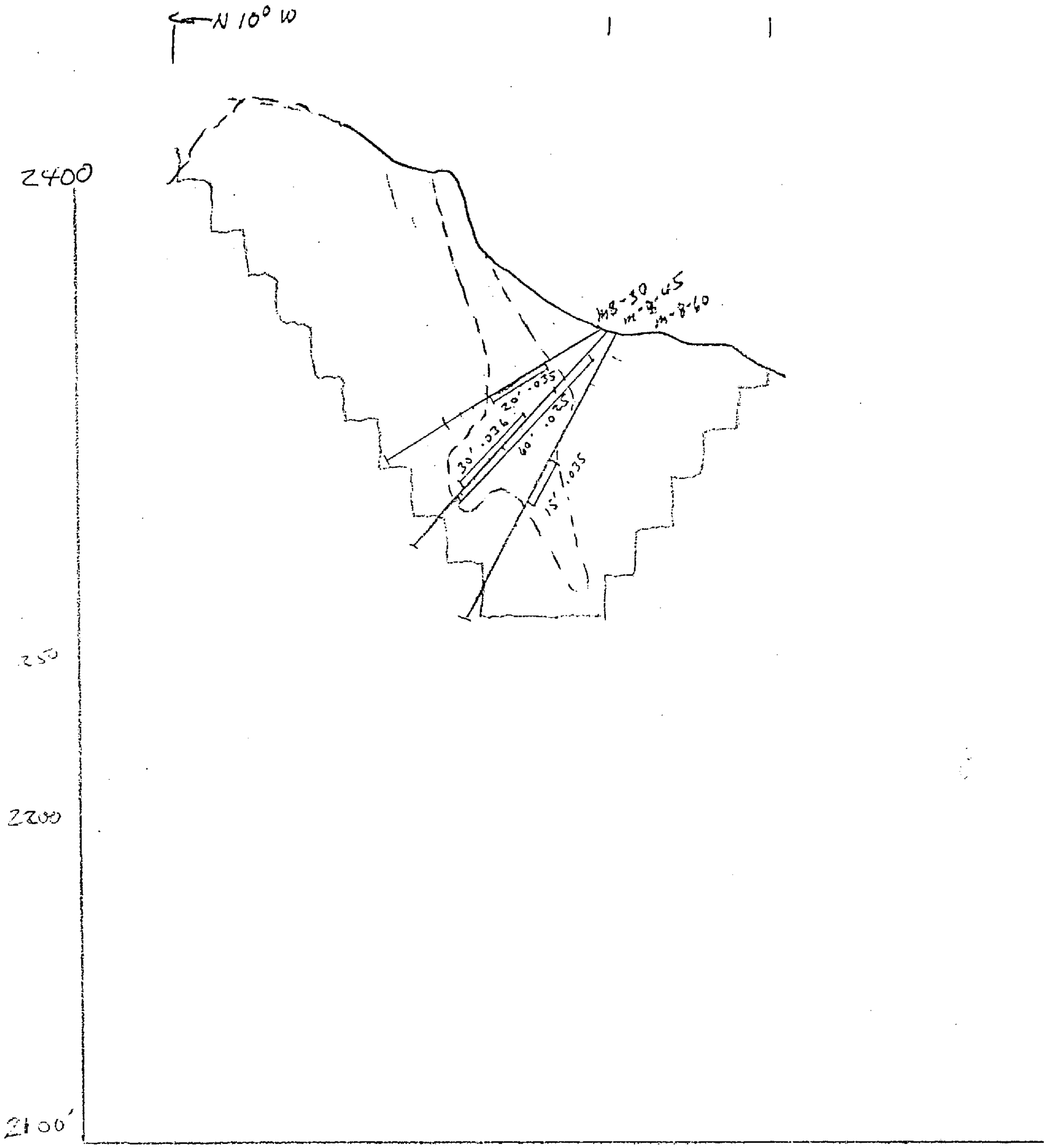

SITE 8

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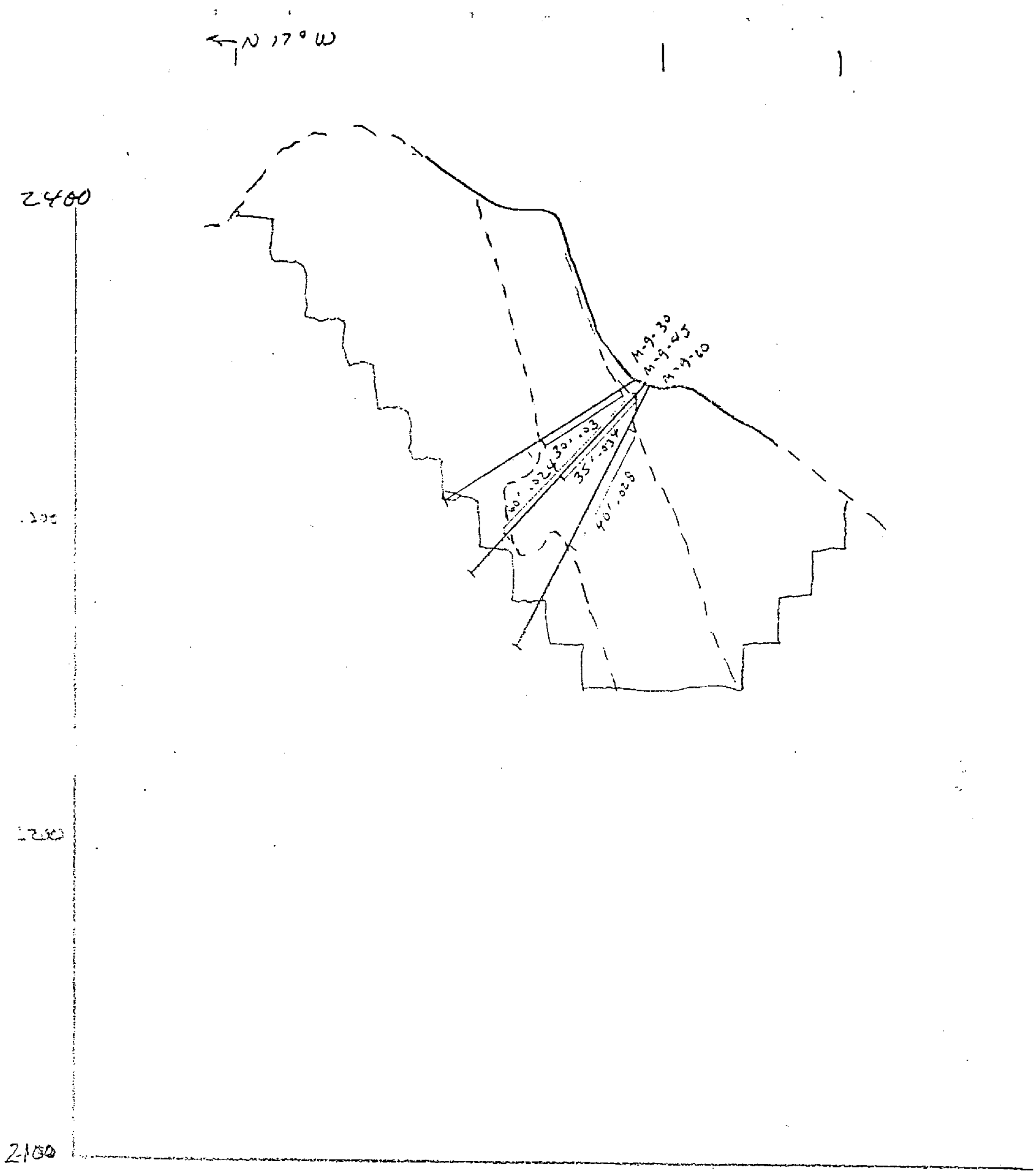
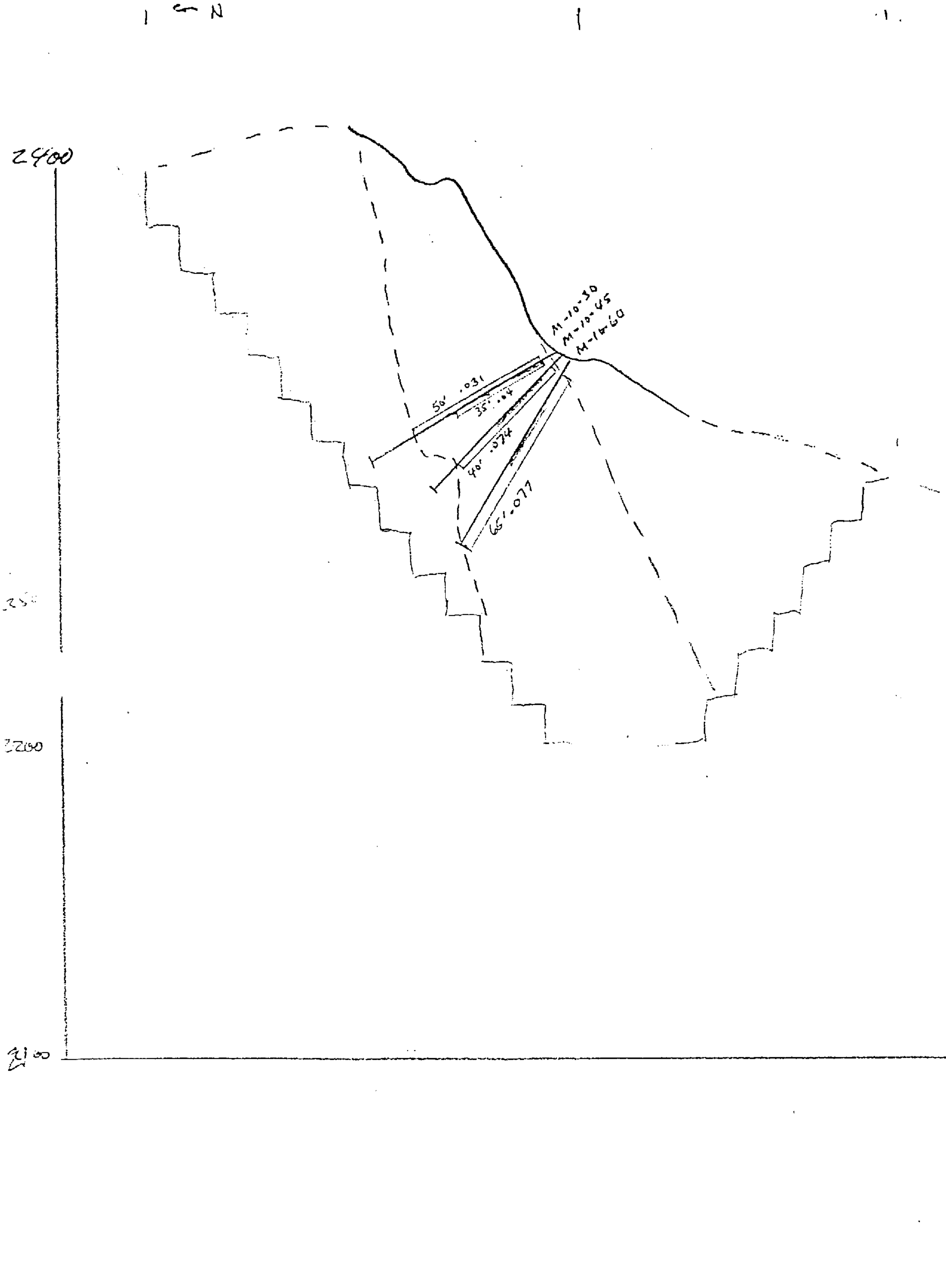

N 17° W
2400
2200
2100
M-9-30
M-9-45
M-9-60
30'.03
30'.024
60'.024
35'.034
40'.028

SITE 9

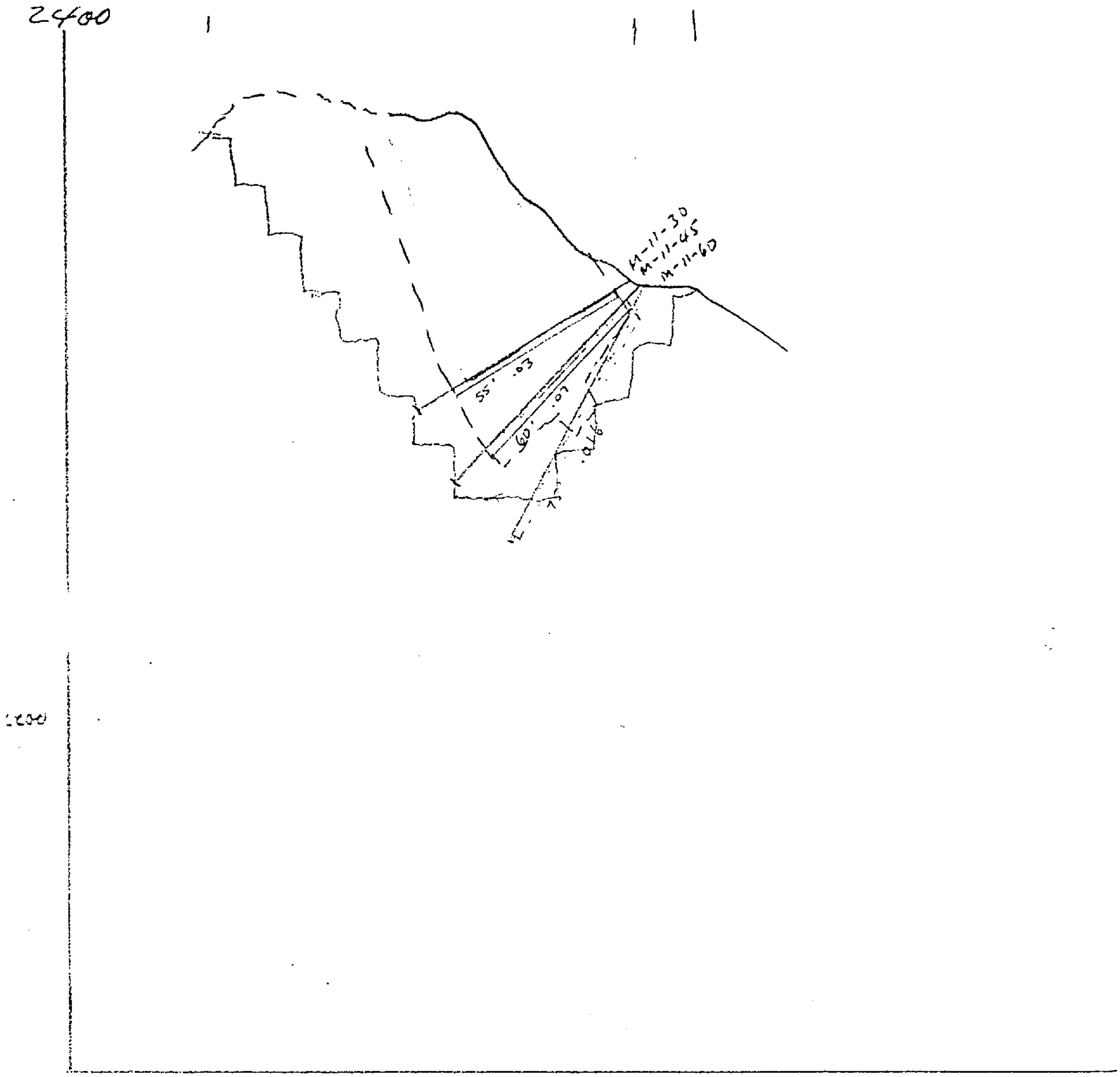
1"=50'



SITE 10

1" = 50'

← N 5° W



SITE 11

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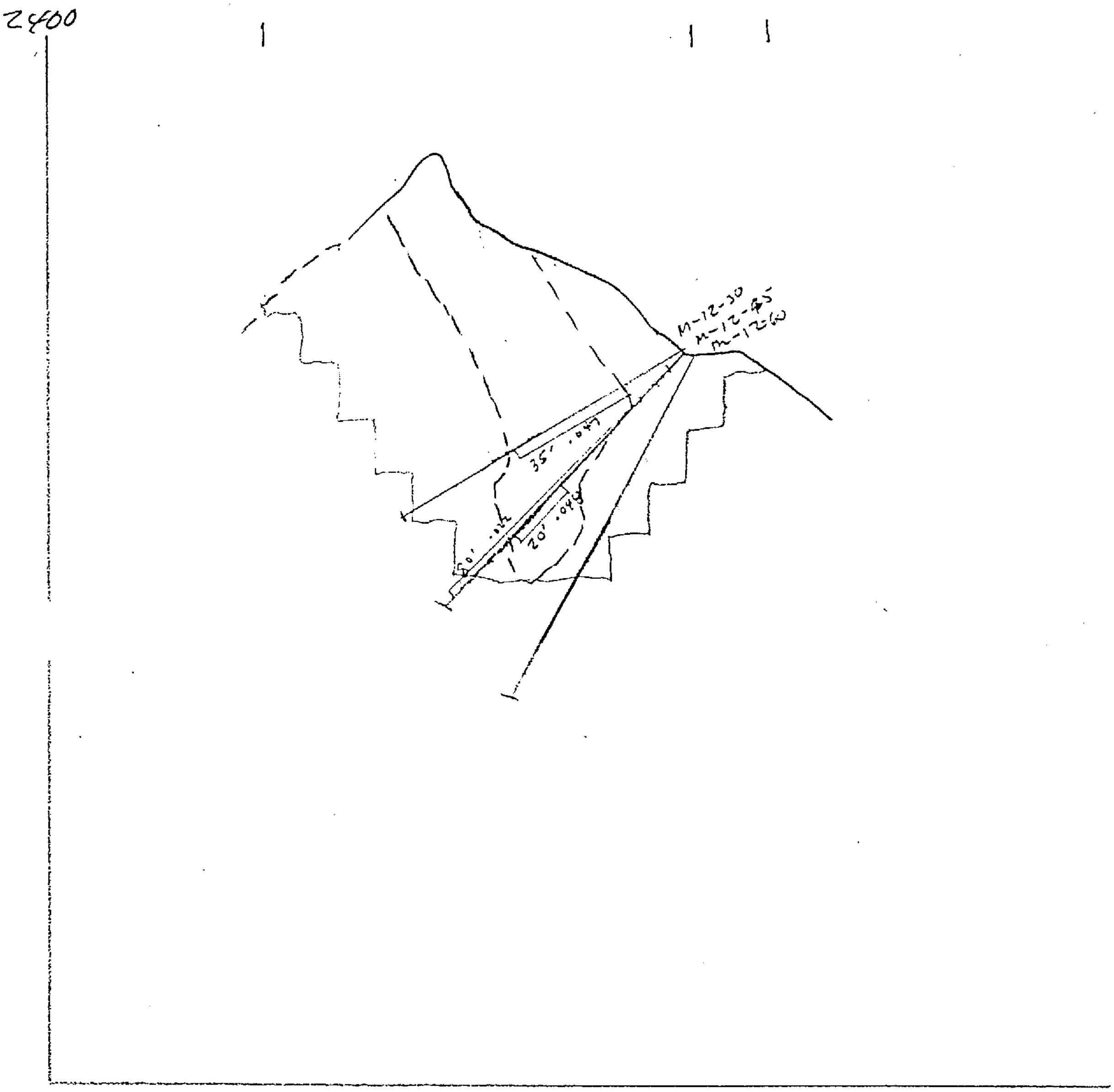
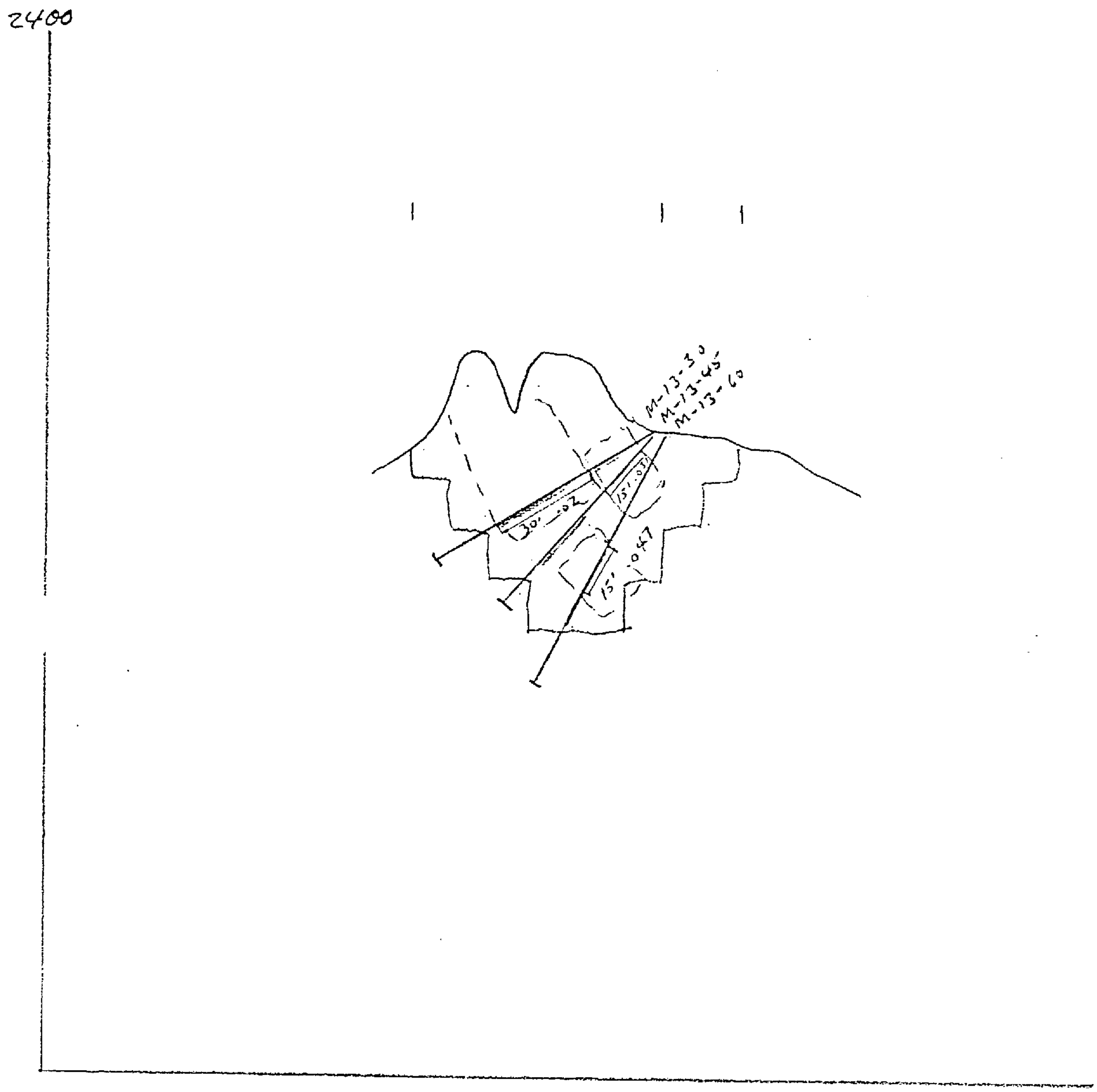
← N 20° W



SITE 12

1" = 50'

<— N 16° E



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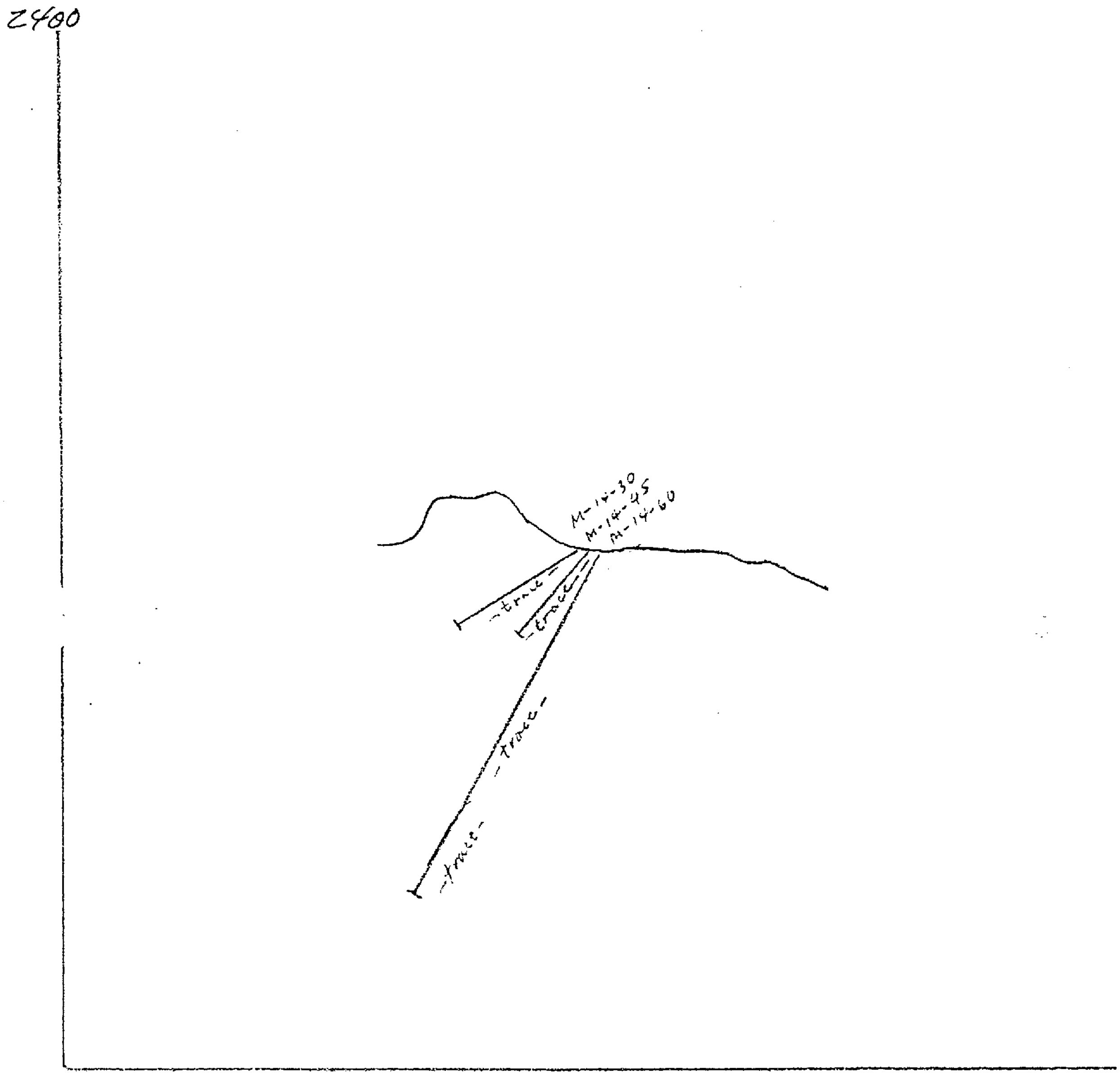
←N 25° E



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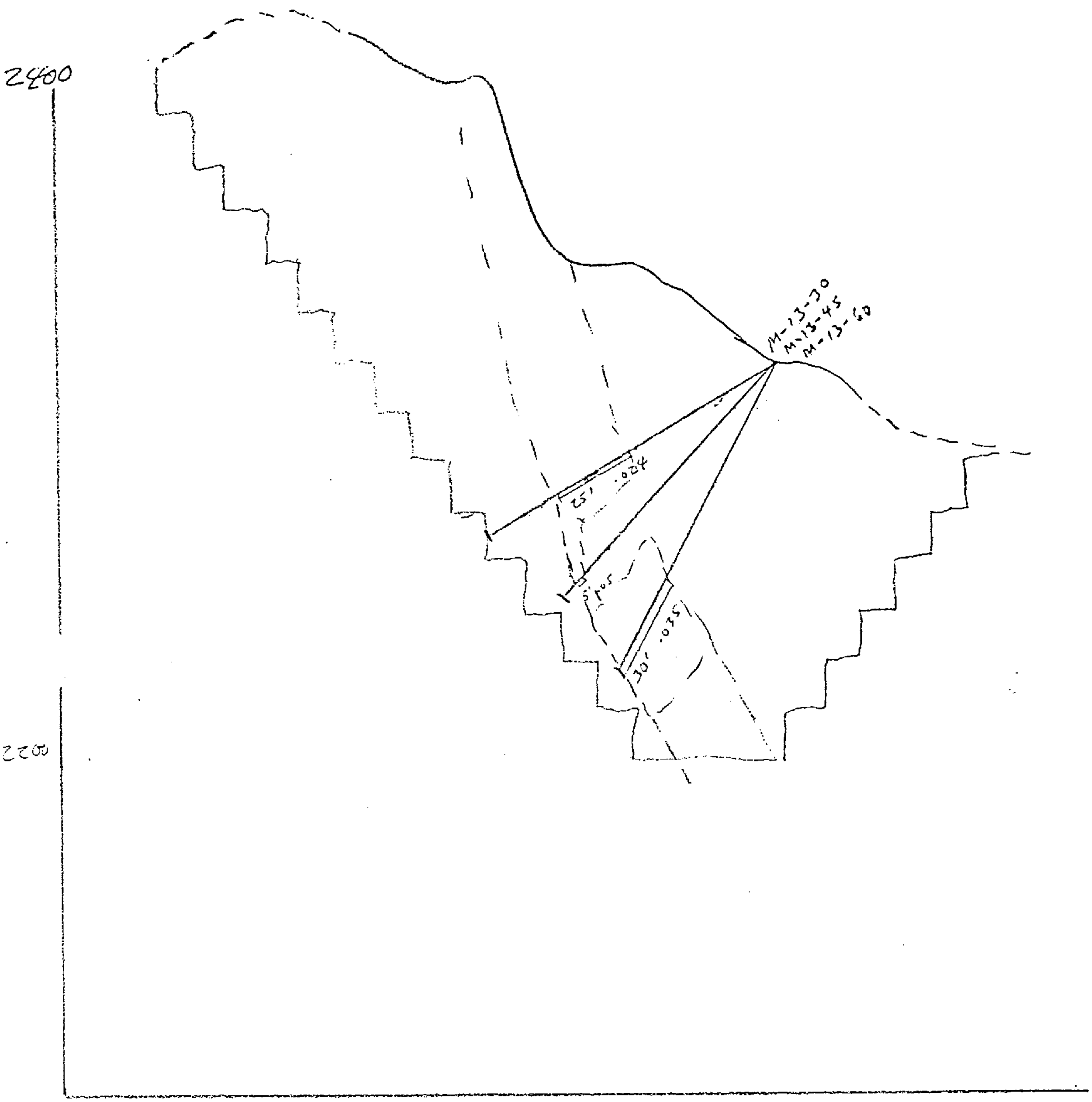

SITE 15

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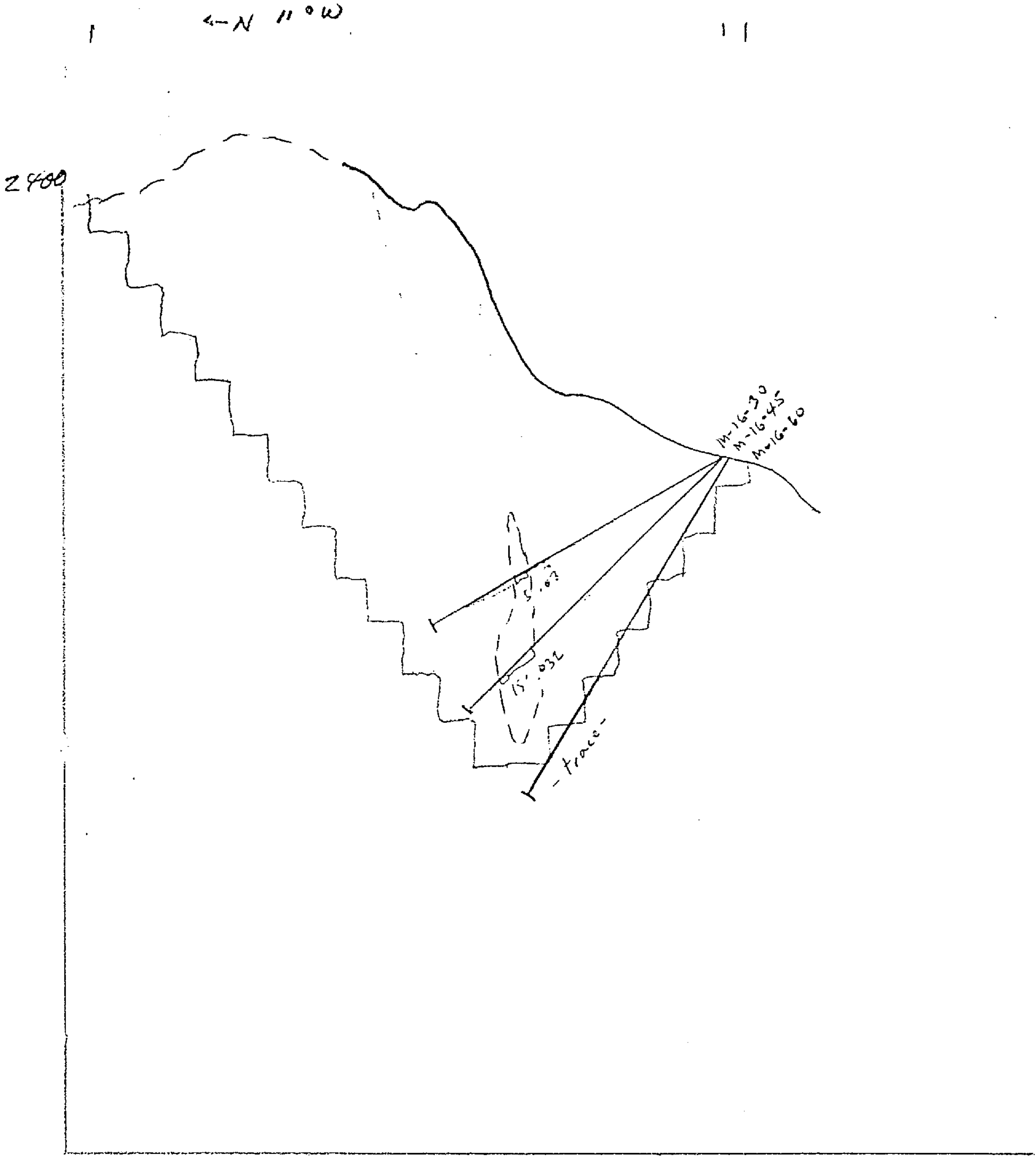
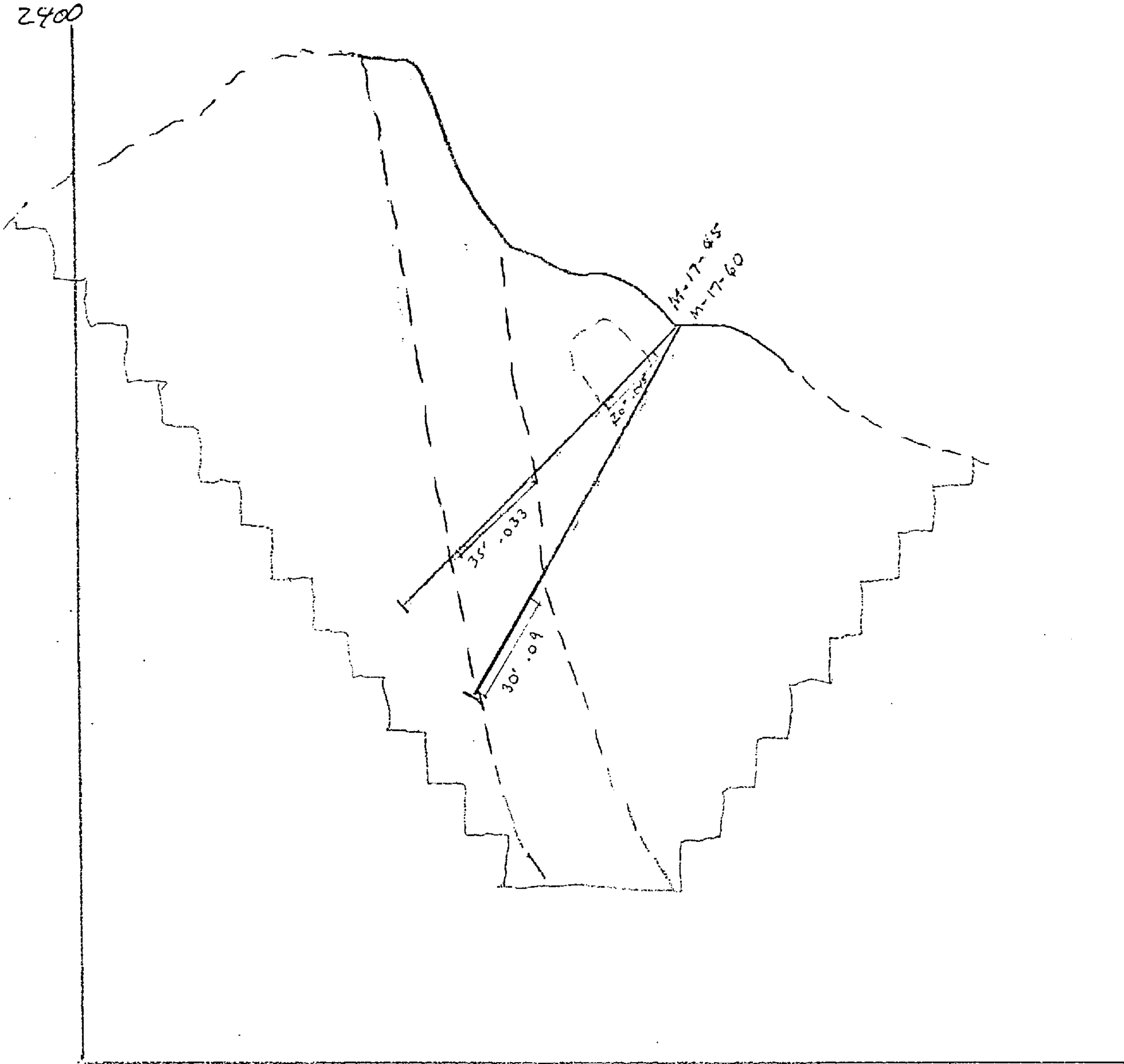


SITE 16

1" = 50'

← N 90 W



SITE 17

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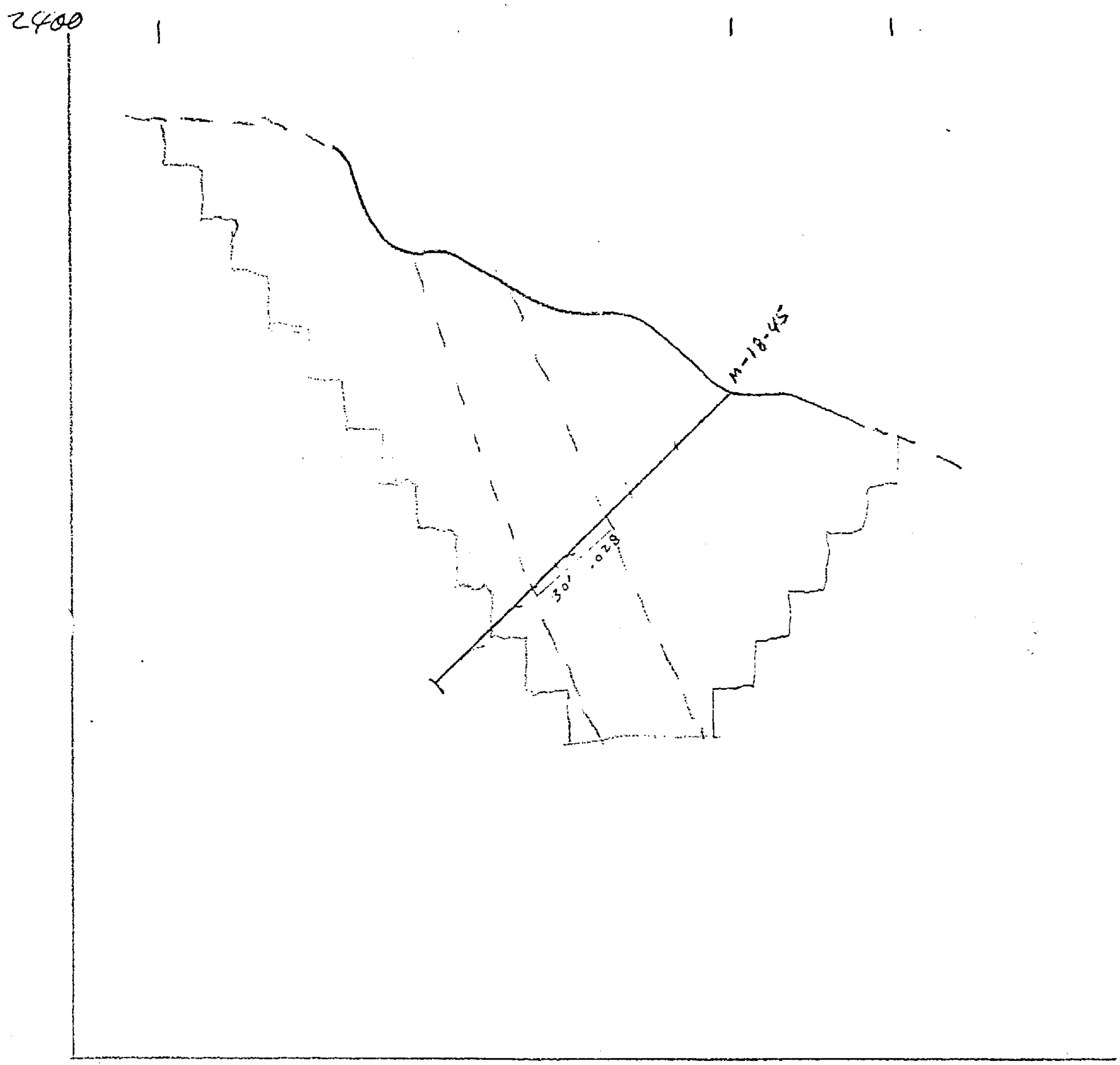
← N 90° W



SITE 18

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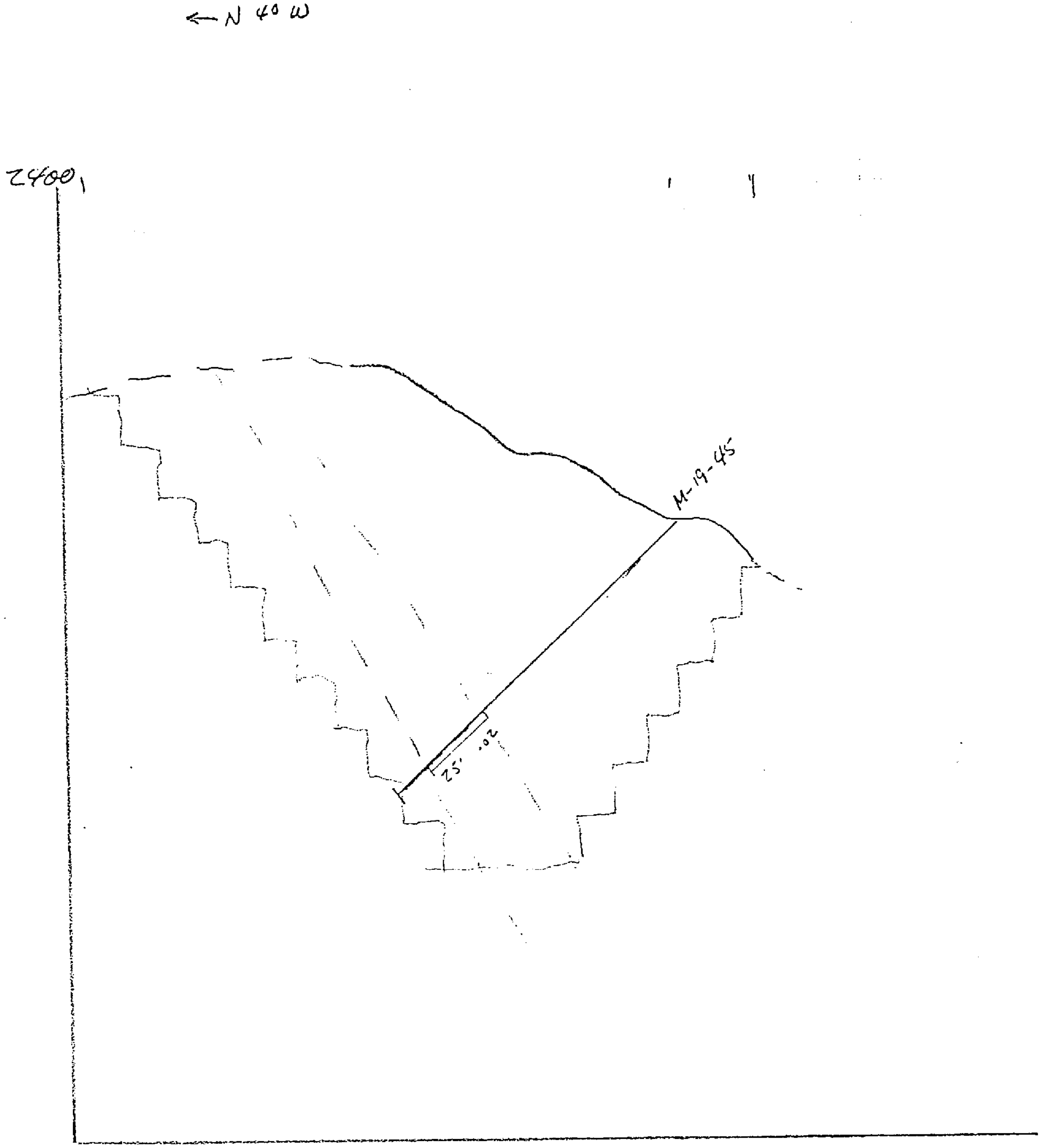

SITE 19

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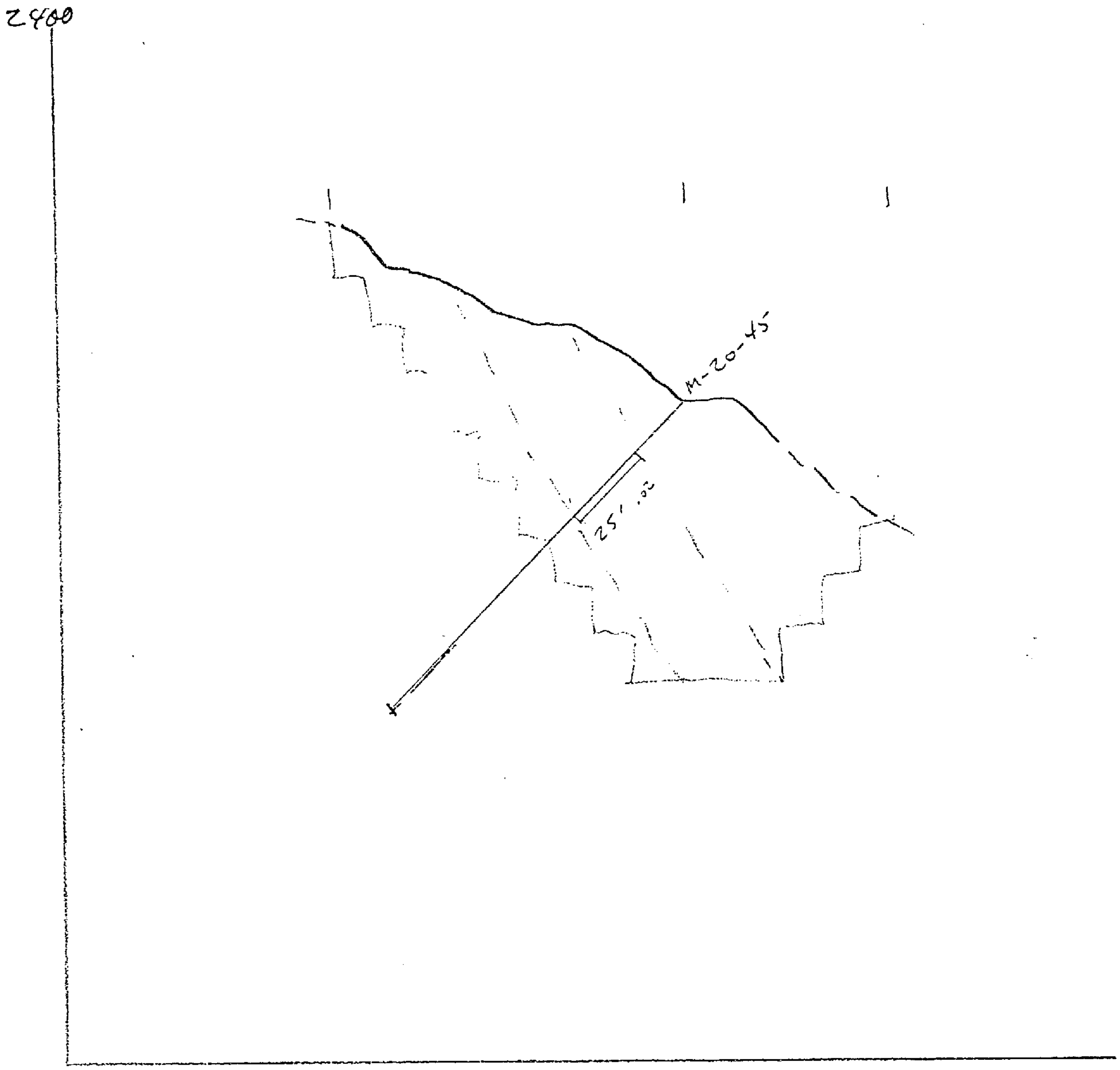
<-N 10° W



SITE 20

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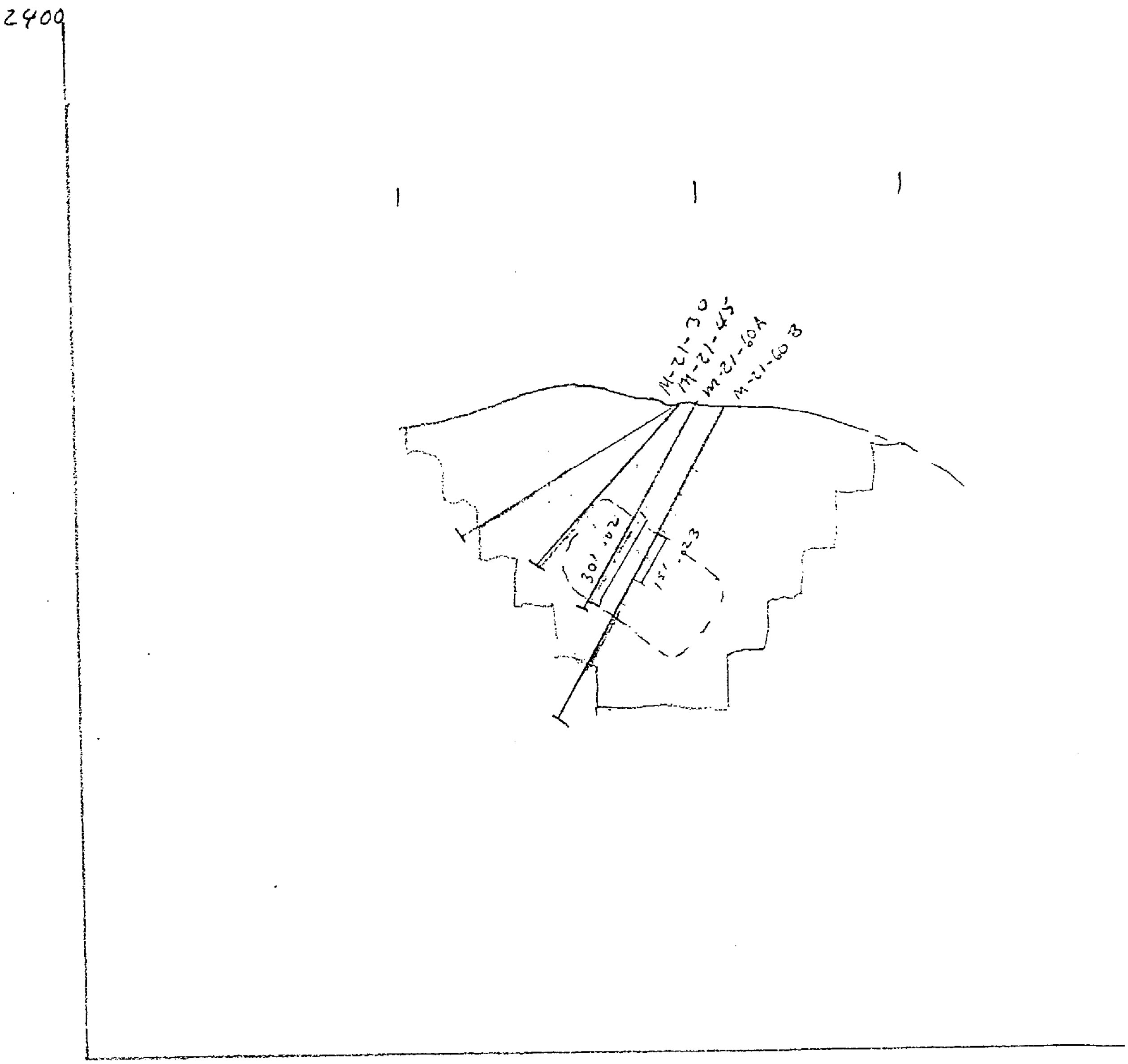
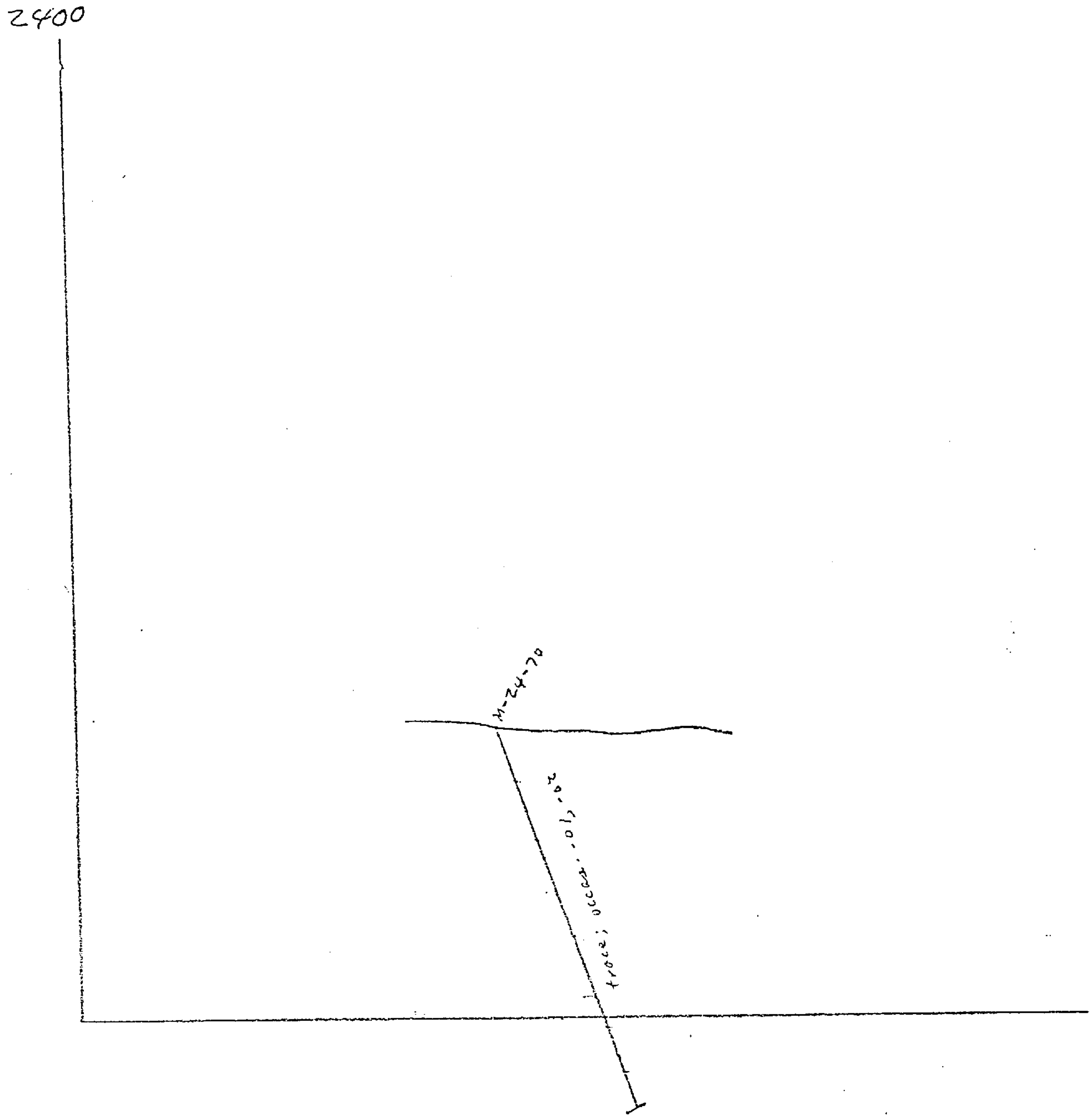
N 16° E



SITE 21

1" = 50'

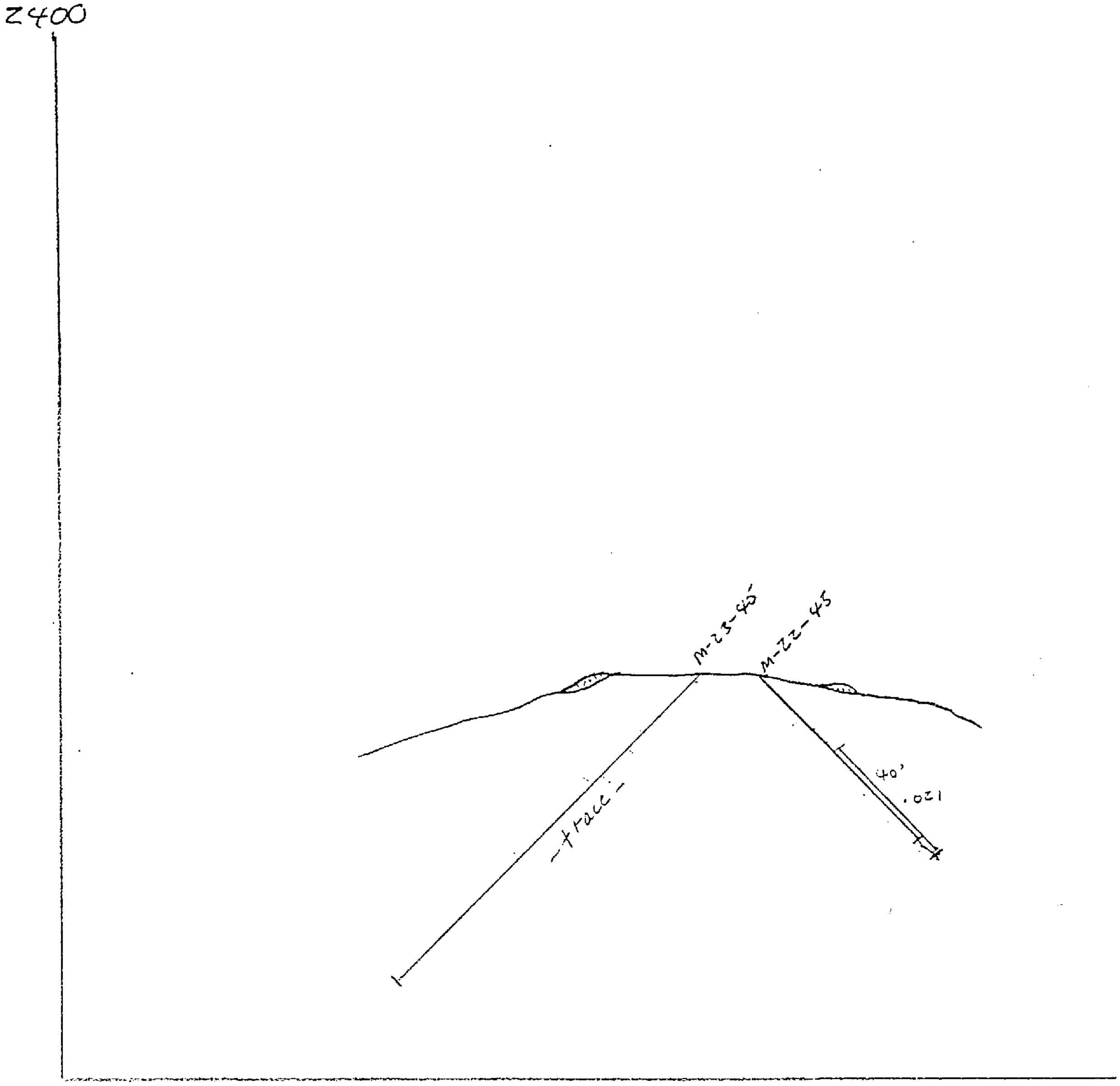
S 4° E →



SITE 24

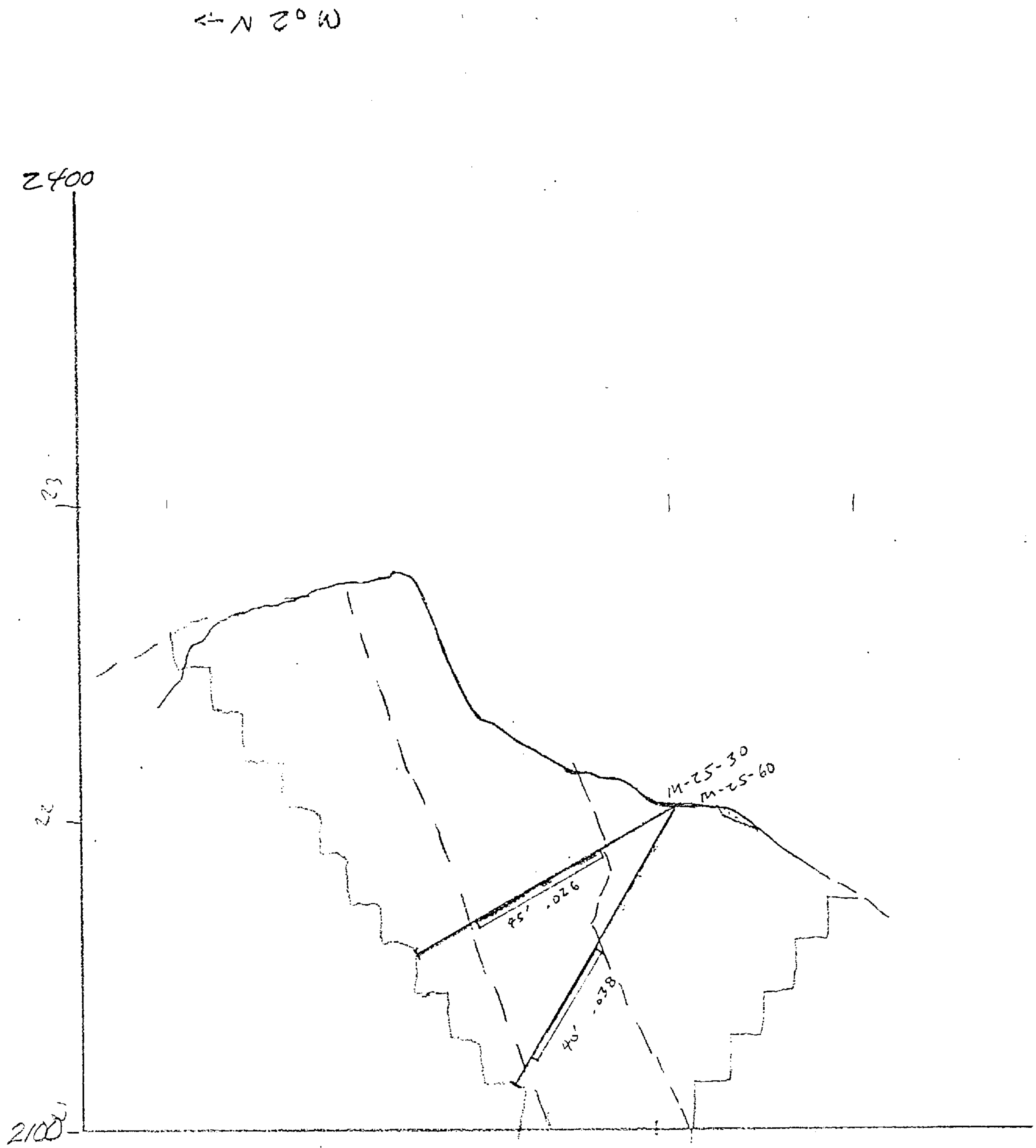
1" = 50'

← N 13° E



Site 22 & 23

1" = 50'



SITE 25

1" = 50'

PREPARED FOR:

BILLITON MINERALS U.S.A., INC.

CYANIDE LEACH TESTS AND MINERALOGICAL CHARACTERIZATION OF GOLD ORE SAMPLES FROM THE MOSS MINE PROJECT

By

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Project O M 33

December 17, 1990

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BACKGROUND AND OBJECTIVE OF WORK

On November 15, 1990, Billiton Minerals requested a proposal for bottle roll cyanide leach tests and a mineralogical characterization of two gold ore samples from the Moss Mine project.

The objective of the work was outlined by Mr. Michael Lucid and was summarized in a PMET quotation of November 15, 1990. It included the following work objectives:

Tested High Grade

- Perform bottle roll cyanidation tests on three selected size fractions of a high-grade gold ore composite.
- Determine the gold mineralogy, quantitatively, in order to evaluate and interpret the results of the cyanidation tests.
- Determine the pertinent mineralogical characteristics of the ore which would impact feasible metallurgical treatment options and the gold recovery.
- Determine the reason(s) for unrecovered gold in the cyanide leach residues.
- Determine the mode of occurrence of gold and the gold size distribution in a low(er)-grade composite in order to evaluate if there is a bimodal gold mineralogy between high- and low-grade ore feed causing differences in cyanide leach amenability.

SAMPLES RECEIVED AND METHODS OF STUDY

Three ore zone interval samples were received from Billiton on November 20, 1990, at the PMET laboratories. The samples were designated as shown in Table 1.

Table 1

Samples Received

PMET No.	Billiton Designation		Billiton Assay	Weight
444-1	MM-8-46	225-230'	0.229 oz/ton Au	6.55 lbs.
444-2	MM-8-48	235-240'	0.236 oz/ton Au	4.10 lbs.
444-3	MM-1-49	Coarse Rej.	0.622 oz/ton Au	2.0 lbs.

An equal-weight composite was prepared from samples 444-1 and 444-2 for the cyanide leach tests. Due to small sample size, sample 444-3 was used for mineralogical work only.

The laboratory work included sample preparation, bottle roll cyanidation tests, fire assays of head samples and leach residues, chemical analyses of filtrates and wash water, bulk X-ray diffraction analyses, heavy liquid separations with assays and mineralogical characterization of separation products, optical microscopy with modal analysis, particle size analysis by screening and microscopy and photomicrography.

This work was performed under Billiton purchase order number VAM 901 105.

DISCUSSION OF RESULTS

Chemical Characterization

Well-blended assay pulps were split out from the head samples and subjected to fire assays for gold. The assay results are summarized in Table 2.

Table 2

Gold Assays of Head Samples

Sample No.	Gold (oz/ton)
Composite 444-1-2	0.220
444-3	0.270

The pH of the ore samples was determined using Method ASA 12-2 (Methods of Soil Analysis). The results of this work are summarized in Table 3.

Table 3

pH Measurements

Sample	pH
444-1-2	7.90
444-3	8.23

Mineralogical Characterization

Prior to the ore blending, a megascopic characterization was prepared of the three samples.

Sample 444-1

White-yellow gray, coarse-grained ferruginous carbonate-rich quartz vein(?) material. The calcite is intimately associated with hydrated iron oxides, jarosite, hydrated

Cyanide consumers ?

manganese oxides and clay minerals. Most of the iron/manganese hydrated oxides appear to represent a former disseminated iron sulfide mineralization. The sample contains 5-8% of chloritic-siliceous rock fragments which contain large amounts of relatively fresh, well-crystallized and coarse-grained pyrite. The sample contains an estimated quartz content of 40-50% and a carbonate content of 25-35%.

Sample 444-2

White to light gray, carbonate-bearing quartz vein material which is distinctly less ferruginous than the first sample. The sample contains an estimated quartz content of 40-60% and a carbonate content of 10-20%. Both the quartz as well as the carbonates contain a weak, disseminated and strongly oxidized sulfide mineralization. In addition, there are also noticeable amounts of manganese oxides and hydroxides.

Sample 444-3

White-yellow gray, carbonate-bearing siliceous vein material. The overall mineralogical sample characteristics are very similar to sample 444-1. Ferruginous and weakly chloritic. Contains considerable amounts of well-crystallized quartz and calcite.

Subsequently, the blended composite and sample 444-3 were subjected to a bulk X-ray diffraction analysis. The XRD work confirmed the optical microscopy, i.e. that the dominating ore-forming minerals are quartz (with minor silica modifications such as opaline silica and chalcedony) and calcite. In addition, minor amounts of swelling clay minerals were identified. The XRD analyses are summarized in Table 4.

Table 4

Bulk XRD Analyses of Moss Mine Gold Ore Samples

Sample	Major	Minerals & Concentration Minor	Trace
444-1-2	Quartz Calcite	Muscovite Montmorillonite	Chlorite
444-3	Quartz	K-feldspar Calcite Montmorillonite	Muscovite

The bulk XRD analysis represents crystallized minerals present in concentrations above 2%. Extremely fine-grained, poorly crystalline and/or amorphous mineral phases such as alteration products and clay minerals may not be detectable or may be under-represented.

Concentration Ranges: Major = 20 - >50%
Minor = 5 - 20%
Trace = <5%

Representative split portions of each sample were subjected to optical microscopy with modal analysis in order to quantify pertinent mineralogical characteristics. The results of the modal analysis are summarized in Table 5.

Table 5

Microscopic Modal Analysis of Head Samples

Mineral	Sample 444-1-2	Sample 444-3
Silica/Feldspar Groundmass	49% vol.	63% vol.
Carbonates	41	20
Clay Minerals	7	15
Opaque Minerals	3	2

Gold Mineralogy

The gold mineralization in the Moss Mine samples is characterized by the presence of mostly silver-rich native gold which frequently may approach electrum composition. The silver content in this gold shows an average concentration of 27% according to semiquantitative SEM-EDX analyses. Intimately associated with the silver-rich gold is native gold with extremely low silver concentrations (<5%).

The gold is primarily associated with siliceous gangue and hydrous iron oxides. These iron oxide minerals represent alteration products of gold-bearing pyrite and/or are the result of hydrothermal iron mobilization and reprecipitation. Minor amounts of the gold are associated with small concentrations of pyrite, some of which occurs as the spheroidal variety. Approximately 20 - 30% of the total pyrite mineralization consists of spheroidal fine-grained iron sulfides. The spheroidal pyrite exhibits particles sizes of <1 to 50 micron in diameter.

In addition to the iron sulfides there are minor to trace amounts of sphalerite, chalcopyrite, bornite and galena. Most of these sulfide minerals occur as inclusions in the pyrite.

Some of the liberated gold particles observed in these samples exhibit surface coatings of (hydrous) iron oxides and/or silica clay slimes. Approximately 30% of the gold displays rapid surface tarnishing. In composite sample 444-1-2, 64% of the gold is associated with hydrous iron oxides. Most of the remaining gold (30%) is intergrown with silica gangue. Minor amounts of gold (<10%) occur as refractory gold associated with pyrite. Many pores and fractures in the gangue particles are filled with silica-carbonate-clay slimes.

As indicated by the microscopic analysis of the head samples, the gold mineralogy in the composite 444-1-2 differs distinctly from sample 444-3 with regard to particle size and mineralogical residence:

1. The gold in the PMET cyanide leach composite contains distinctly more fine-grained (-25 micron) gold than sample 444-3.

2. In the cyanide leach composite, the majority (64%) of the gold is locked with hydrous iron oxides; whereas in sample 444-3, gold association with silica gangue is dominating.

The gold particle sizes range from <1 micron to 300 micron with the majority of the gold occurring in the coarser (+400 mesh) sizes. The microscopic work indicates that the native gold present in sample 444-3 shows distinctly coarser particle sizes than the gold observed in composite 444-1-2. Table 6 summarizes a microscopic gold particle size analysis for both samples.

Table 6

Microscopic Gold Particle Size Analysis of Moss Mine Samples

Size of Gold Particles (Approximate Diameter)

Size(micron)	Samples 444-1-2	Samples 444-3
< 5	60%	21%
5 - 20	21%	15%
> 20 - 50	10%	24%
> 50-- 100	7%	22%
>100	2%	18%
	100%	100%

Both samples contain noticeable amounts of tramp iron shavings (from drilling?) and fragments of copper wire. Trace concentrations of organic/carbonaceous material were observed in sample 444-1-2.

Gravity Separation Tests

The gravity testwork was performed on 800-gram splits from samples 444-1-2 and 444-3 by way of heavy liquid separation at a S.G. of 2.95. Prior to separation, the samples were carefully stage-crushed to -48 mesh and deslimed at 400 mesh.

- The gravity separation tests confirmed the conclusions made from the optical microscope analysis, i.e. that the gold mineralogy of composite 444-1-2 and sample 444-3 exhibits significant differences in particle size and gold occurrence. Both of these factors will impact gold ore processing and precious metal recovery.

50% of value - 400 mesh slimes

- In composite 444-1-2, almost half of the gold reported to the -400 mesh slimes fraction. This fraction represents 30% of the sample weight. Less than one third (26.8% distribution) of the gold was recovered in an extremely small (0.12% of the weight) gravity concentrate assaying 38 oz/ton gold. The remainder (28.7% distribution) of the gold occurred in the gravity tailings (float fraction) due to encapsulation in (light) silica gangue. The gravity tailings account for the majority of the sample weight (69%).

- In sample 444-3, the majority of the contained gold (69.4% distribution) was recovered in a high-grade (71.8 oz/ton Au) gravity concentrate which represents 0.29% of the sample weight. Eighteen percent of the gold reported to the float fraction. This fraction accounts for 75% of the sample weight. Only 12% of the gold occurred in the -400 mesh slimes.

  The reasons for the high gold recovery by gravity methods in this particular sample are a) distinctly coarse gold particle sizes and b) good liberation of gold at the 48 mesh grind.

The results of the gravity separation tests are summarized in Table 7 and Figure 1.

Table 7

Gravity Separation Tests

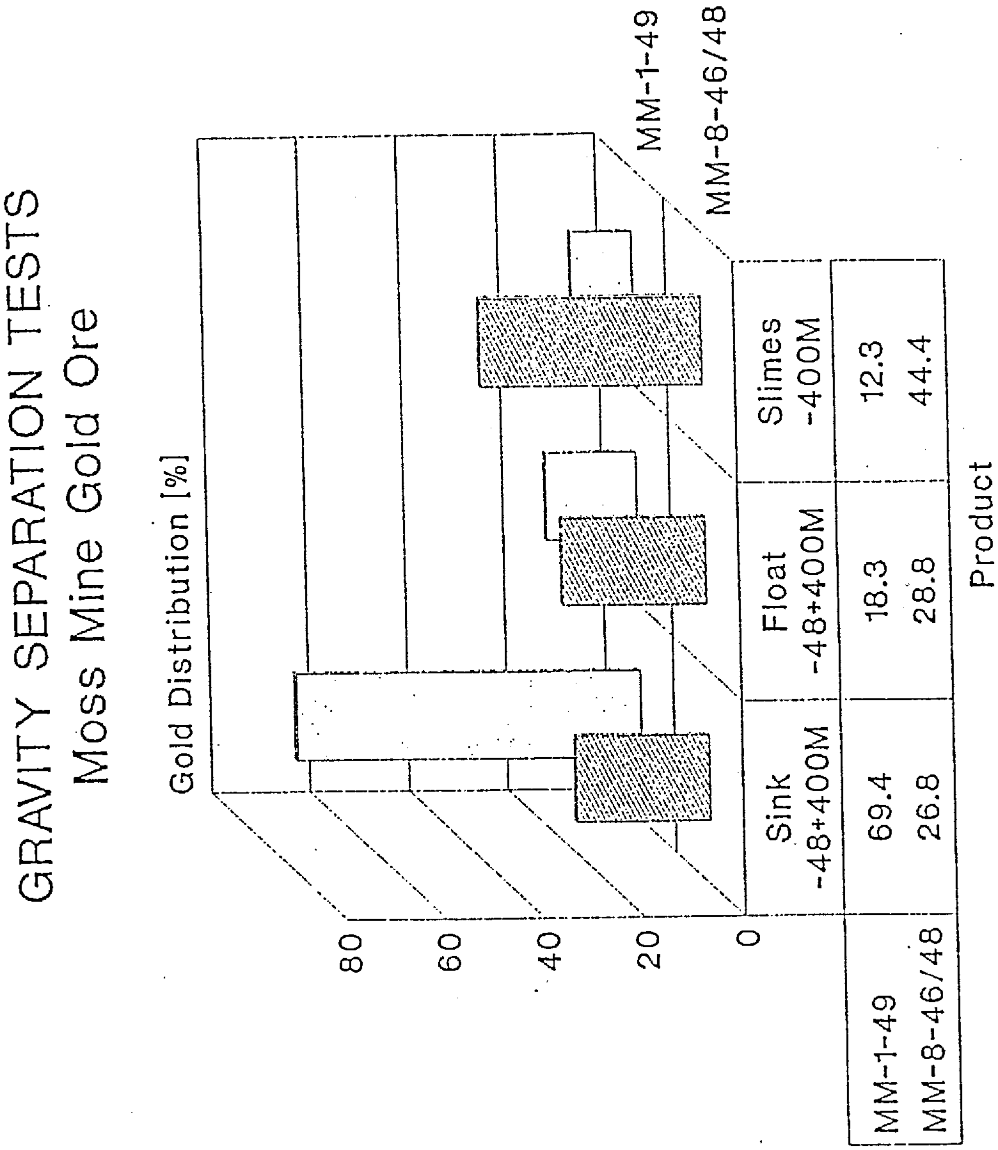
Sample 444-1-2

Product	Weight(%)	Assay Gold(oz/ton)	Distribution (%)
Assay Head		0.220	
Calc. Head	100.0	0.173	100.0
Grav. Conc.	0.12	38.70	26.82
Grav. Tails	69.16	0.072	28.79
-400 Slimes	30.72	0.250	44.39

Sample 444-3

Product	Weight(%)	Assay Gold(oz/ton)	Distribution (%)
Assay Head		0.270	
Calc. Head	100.0	0.299	100.0
Grav. Conc.	0.29	71.80	69.43
Grav. Tails	75.13	0.073	18.27
-400 Slimes	24.58	0.150	12.30

Figure 1



	Sink -48+400M	Float -48+400M	Slimes -400M
MM-1-49	69.4	18.3	12.3
MM-8-46/48	26.8	28.8	44.4

Cyanide Leach Tests 72 Hour Bottle Rolls

Well-blended split portions of three different size fractions were prepared from the head sample by stage crushing and grinding. The sample splits were then subjected to bottle roll cyanidation tests using the following conditions.

Samples:	Composite 444-1-2 1. As-received 2. -10 mesh 3. -200 mesh
Amount of Sample:	300 grams
% Solids:	23.08%
NaCN Concentration:	3 g/l NaCN
pH:	10.5 - 11
Temperature:	Ambient
Leach Time:	72 hours with solution samples taken at 6, 24, 48, and 72 hours.

- A total of 300 grams of sample was slurried in an aqueous solution containing 3 g/l NaCN at a pH of 10.5 to 11. Solution pH was adjusted using hydrated lime, i.e. $Ca(OH)_2$.

- Tests were initiated and conducted for a total time of 72 hours. Solution pH was measured and adjusted to target levels after 0.5, 2, 6 and 24 hours of total target levels using hydrated lime additions. Free lime concentrations were also measured via acid titration after 2, 6, 24, 48 and 72 hours.

- NaCN concentrations were also measured after 2, 6, 24, 48, and 72 hours. If required, NaCN additions were made following the 2-, 6-, 24- and 48-hour measurements to bring the solution NaCN concentration to the target of 3 g/l. NaCN concentrations were measured via titration with $AgNO_3$ solutions.

- After 72 hours, the samples were filtered and the leach residues were washed. The first wash was performed with 500 ml of DI water containing low levels of cyanide. This was followed by two additional washing steps with 500 ml DI water each. Total water used amounted to 1500 ml.

- Samples of leach solution were collected after 6, 24, 48 and 72 hours of leaching for gold analysis. In addition, gold fire assays were done on splits of the head sample and leach residue. The final wash water was also analyzed for gold.

Gold extractions were calculated in two fashions: one being based on the head sample assays and the solution assays and one being based on the leach residue assays and the solution assays. In the former case, a solution volume of 1000 ml was assumed, and solution aliquots removed for assay and titration were included in the calculations to account for all the gold. Extractions calculated from head sample assays in all cases differ from those calculated from residue assays. This reflects both sampling and analytical error.

Leach Results

The leach results indicate that gold liberation appears to be the most significant factor for high gold recovery. The gold extraction was lowest in the as-received material (59.7%) and increased with crushing to -10 mesh to 73.7%. Almost complete gold extraction was achieved in the sample material ground to -200 mesh. The lime consumptions are negligible whereas the cyanide consumptions were equally high in all tests (21.6 - 22.9 lbs. NaCN/ton).

A potential for preg robbing is indicated for this sample material. It is tentatively concluded that preg robbing could be caused by spheroidal pyrite, hydrous iron oxides and oxidizing tramp iron, as well as minor amounts of carbonaceous matter occurring in the ore. The cyanide consumption is affected by natural cyanicides present such as iron oxidation minerals, ferruginous clays and sulfides. In addition, artificial cyanicides such as tramp iron shavings from drilling and copper wire fragments were also present.

A summary of the leach test results is presented in Table 8. Details of the cyanidation tests and the complete mass balance information are presented in Table 9. The solution pH measurements are listed in Table 10. Figure 2 provides a graphic presentation of the NaCN leach tests based on solution and head sample assays.

Table 8

Cyanide Leach Extractions of Gold
and Reagent Consumptions

Sample	Gold Extractions(%) after 72 hours	NaCN Consumption (lbs/ton)	Lime Consumption (lbs CaO/ton)
444-1-2 As-is	59.7	22.9	< 1
444-1-2 -10 Mesh	73.7	22.7	< 1
444-1-2 -200 Mesh	100.0*	21.6	< 1

* Based on outputs

Table 9

NaCN LEACH TEST RESULTS

10-Dec-90

Sample: 444-1 As-Is

Inputs	Mass [g]	Volume [ml]	Analyses CaO	Analyses NaCN	Analyses Au	CaO [mg]	NaCN [g]	Au [mg]	Au Dist [%]
Ore	300.00	-	-	-	0.220 oz/t	0.0	0.00	2.263	100.0
Solution	-	1000	23.8 mg/l	3.0 gpl	-	23.8	3.00	-	0.0
Sln - 2 Hrs	-	20	23.8 mg/l	3.0 gpl	-	0.5	0.06	-	0.0
Sln - 6 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
Sln - 24 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
Sln - 48 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
NaCN - 2 Hrs	1.47	-	-	100 %	-	-	1.47	-	0.0
NaCN - 6 Hrs	0.80	-	-	100 %	-	-	0.80	-	0.0
NaCN - 24 Hrs	0.48	-	-	100 %	-	-	0.48	-	0.0
NaCN - 48 Hrs	0.31	-	-	100 %	-	-	0.31	-	0.0
Ca(OH)2 (T) - XX Hrs	0.00	-	75.7 %	-	-	0.0	-	-	0.0
Ca(OH)2 (T) - XX Hrs	0.00	-	75.7 %	-	-	0.0	-	-	0.0
Wash Water	-	1500	-	-	-	-	-	-	0.0
Total	303.06	2625				26.7	6.44	2.263	100.0

Sample: 444-1 As-Is

Outputs	Mass [g]	Volume [ml]	Analyses CaO	Analyses NaCN	Analyses Au	CaO [mg]	NaCN [g]	Au [mg]	Au Dist [%]
2 Hr Sample	-	20	140 mg/l	1.50 gpl	mg/l	2.8	0.03	0.000	0.0
6 Hr Sample	-	35	64 mg/l	2.18 gpl	0.990 mg/l	2.2	0.08	0.035	1.6
24 Hr Sample	-	35	32 mg/l	2.50 gpl	1.130 mg/l	1.1	0.09	0.040	1.9
48 Hr Sample	-	35	51 mg/l	2.68 gpl	1.180 mg/l	1.8	0.09	0.041	2.0
NaCN Filtrate	-	970	153 mg/l	2.72 gpl	1.000 mg/l	148.4	2.64	0.970	46.1
Wash Filtrate	-	1430	3 mg/l	0.06 gpl	0.120 mg/l	4.6	0.08	0.172	8.2
Dry Residue	301.71	-	-	-	0.082 oz/t	-	-	0.848	40.3
Total	301.71	2525				160.9	3.01	2.105	100.0

Au Accountability: 93.0 %

Final Au Extraction: 59.7 %

NaCN Consumption: 22.9 lbs/ton

Lime Consumption: <1.0 lbs CaO/ton

Table 9 (Continued)

-N LEACH TEST RESULTS

10-Dec-90

Sample: 444-1 -10M

Inputs	Mass [g]	Volume [ml]	Analyses CaO	NaCN	Au	CaO [mg]	NaCN [g]	Au [mg]	Au Dist [%]
Ore	300.00	-	-	-	0.220 oz/t	0.0	0.00	2.263	100.0
Solution	-	1000	23.8 mg/l	3.0 gpl	-	23.8	3.00	-	0.0
Sln - 2 Hrs	-	10	23.8 mg/l	3.0 gpl	-	0.2	0.03	-	0.0
Sln - 6 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
Sln - 24 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
Sln - 48 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
NaCN - 2 Hrs	1.50	-	-	100 %	-	-	1.50	-	0.0
NaCN - 6 Hrs	0.75	-	-	100 %	-	-	0.75	-	0.0
NaCN - 24 Hrs	0.48	-	-	100 %	-	-	0.48	-	0.0
NaCN - 48 Hrs	0.31	-	-	100 %	-	-	0.31	-	0.0
Ca(OH)2 (T) - XX Hrs	0.00	-	75.7 %	-	-	0.0	-	-	0.0
Ca(OH)2 (T) - XX Hrs	0.00	-	75.7 %	-	-	0.0	-	-	0.0
Wash Water	-	1500	-	-	-	-	-	-	0.0
Total	303.04	2615				26.5	6.39	2.263	100.0

-mple: 444-1 -10M

Outputs	Mass [g]	Volume [ml]	Analyses CaO	NaCN	Au	CaO [mg]	NaCN [g]	Au [mg]	Au Dist [%]
2 Hr Sample	-	10	280 mg/l	1.49 gpl	mg/l	2.8	0.01	0.000	0.0
6 Hr Sample	-	35	89 mg/l	2.23 gpl	1.250 mg/l	3.1	0.08	0.044	2.2
24 Hr Sample	-	35	32 mg/l	2.50 gpl	1.390 mg/l	1.1	0.09	0.049	2.4
48 Hr Sample	-	35	45 mg/l	2.68 gpl	1.420 mg/l	1.6	0.09	0.050	2.5
NaCN Filtrate	-	950	102 mg/l	2.70 gpl	1.220 mg/l	96.9	2.57	1.159	57.3
Wash Filtrate	-	1458	3 mg/l	0.09 gpl	0.130 mg/l	5.1	0.14	0.190	9.4
Dry Residue	298.50	-	-	-	0.052 oz/t	-	-	0.532	26.3
Total	298.50	2523				110.6	2.97	2.023	100.0

Au Accountability: 89.4 %

Final Au Extraction: 73.7 %

NaCN Consumption: 22.7 lbs/ton

Lime Consumption: <1.0 lbs CaO/ton

Table 9 (Continued)

LEACH TEST RESULTS

10-Dec-90

Sample: 444-1 -200M Inputs	Mass [g]	Volume [ml]	Analyses CaO	NaCN	Au	CaO [mg]	NaCN [g]	Au [mg]	Au Dist [%]
Ore	300.00	-	-	-	0.220 oz/t	0.0	0.00	2.263	100.0
Solution	-	1000	23.8 mg/l	3.0 gpl	-	23.8	3.00	-	0.0
Sln - 2 Hrs	-	10	23.8 mg/l	3.0 gpl	-	0.2	0.03	-	0.0
Sln - 6 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
Sln - 24 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
Sln - 48 Hrs	-	35	23.8 mg/l	3.0 gpl	-	0.8	0.11	-	0.0
NaCN - 2 Hrs	1.54	-	-	100 %	-	-	1.54	-	0.0
NaCN - 6 Hrs	0.77	-	-	100 %	-	-	0.77	-	0.0
NaCN - 24 Hrs	0.43	-	-	100 %	-	-	0.43	-	0.0
NaCN - 48 Hrs	0.28	-	-	100 %	-	-	0.28	-	0.0
Ca(OH)2 (T) - XX Hrs	0.00	-	75.7 %	-	-	0.0	-	-	0.0
Ca(OH)2 (T) - XX Hrs	0.00	-	75.7 %	-	-	0.0	-	-	0.0
Wash Water	-	1500	-	-	-	-	-	-	0.0
Total	303.02	2615				26.5	6.36	2.263	100.0

..le: 444-1 -200M Outputs	Mass [g]	Volume [ml]	Analyses CaO	NaCN	Au	CaO [mg]	NaCN [g]	Au [mg]	Au Dist [%]
2 Hr Sample	-	10	280 mg/l	1.45 gpl	mg/l	2.8	0.01	0.000	0.0
6 Hr Sample	-	35	51 mg/l	2.20 gpl	1.930 mg/l	1.8	0.08	0.068	3.5
24 Hr Sample	-	35	32 mg/l	2.55 gpl	1.900 mg/l	1.1	0.09	0.067	3.5
48 Hr Sample	-	35	38 mg/l	2.71 gpl	1.830 mg/l	1.3	0.09	0.064	3.4
NaCN Filtrate	-	960	76 mg/l	2.85 gpl	1.520 mg/l	73.4	2.74	1.459	76.4
Wash Filtrate	-	1410	2 mg/l	0.08 gpl	0.180 mg/l	3.1	0.11	0.254	13.3
Dry Residue	297.28	-	-	-	<0.005 oz/t	-	-	0.000	0.0
Total	297.28	2485				83.5	3.13	1.911	100.0

Au Accountability: 84.5 %

Final Au Extraction: 100.0 % (Based on Outputs)

NaCN Consumption: 21.6 lbs/ton

Lime Consumption: <1.0 lbs CaO/ton

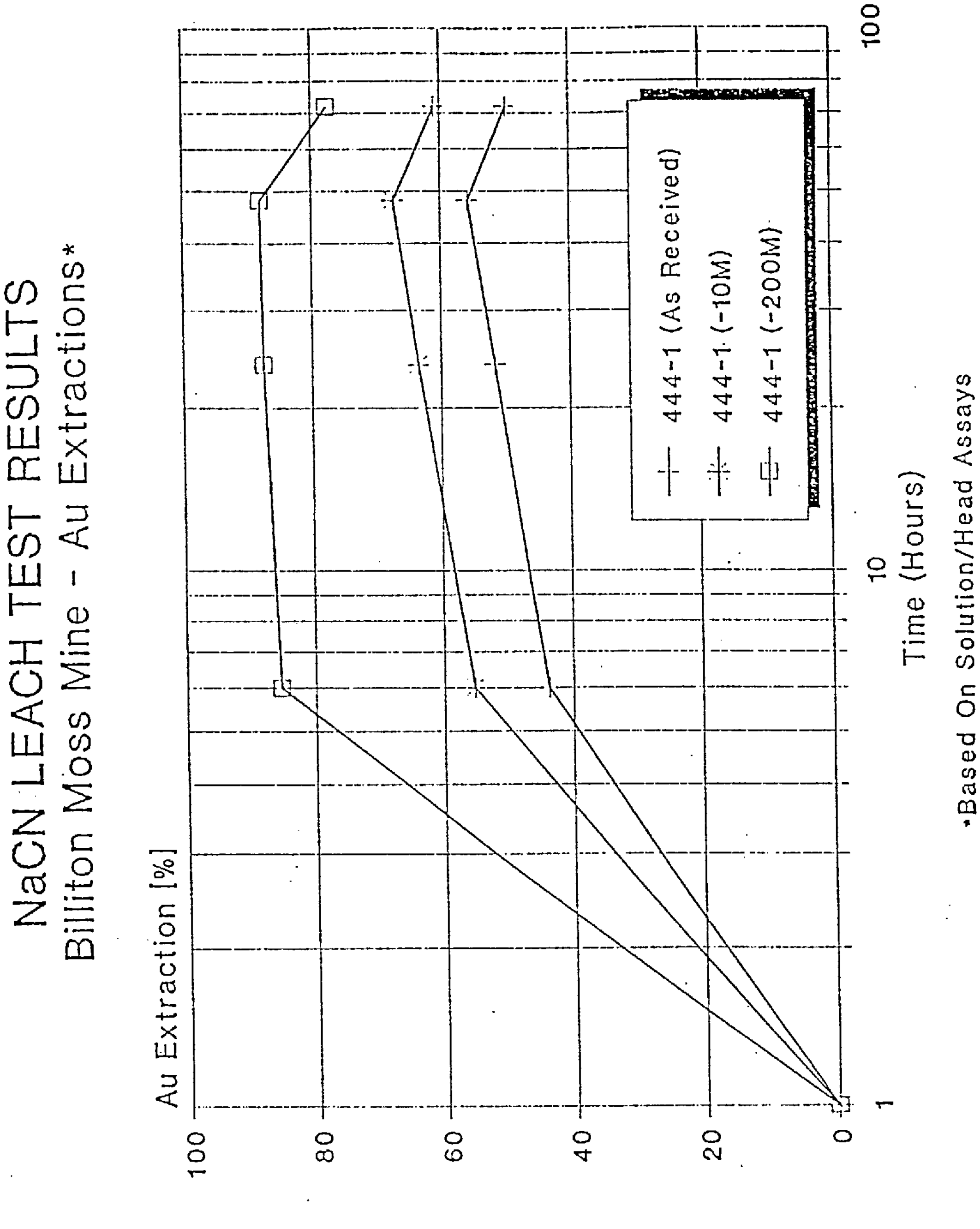
Table 10

Billiton - Moss Mine
NaCN Leach Tests - Solution pH

Sample	Elapsed Time [hrs]	Slurry pH Data: Initial	Slurry pH Data: Adjusted
444-1 (As-Is)	0.0	10.94	NA
	0.5	10.84	NA
	2.0	10.82	NA
	6.0	10.83	NA
	24.0	10.81	NA
	48.0	10.69	NA
	72.0	10.65	NA
	Avg.	10.82	-
444-1 (-10M)	0.0	10.94	NA
	0.5	10.82	NA
	2.0	10.75	NA
	6.0	10.81	NA
	24.0	10.88	NA
	48.0	10.85	NA
	72.0	10.86	NA
	Avg.	10.84	-
444-1 (-200M)	0.0	10.72	NA
	0.5	10.67	NA
	2.0	10.62	NA
	6.0	10.65	NA
	24.0	10.69	NA
	48.0	10.65	NA
	72.0	10.69	NA
	Avg.	10.67	-

NA = No Adjustment

Figure 2


NaCN LEACH TEST RESULTS
Billiton Moss Mine - Au Extractions*
Au Extraction [%]
100
80
60
40
20
0
1
10
100
Time (Hours)
444-1 (As Received)
444-1 (-10M)
444-1 (-200M)
*Based On Solution/Head Assays

Mineralogy of Unleached Gold

Following the cyanide leach tests, a split portion of the leach residue from sample 444-1-2 (-10 mesh) was used to determine the mode of occurrence of unleached gold in order to assist in the interpretation of gold extraction rates.

Due to the small sample size, it was decided to perform a wet screen analysis followed by fire assays of the screen size fractions. Concurrently, the screen fractions were examined by microscopic methods for the mineralogical residence of the gold.

The screening indicates that the major reason for the presence of unleached gold in the -10 mesh composite (as well as coarser-grained material) is locking of native gold in iron oxide/hydroxide and siliceous host minerals all of which are impervious to the lixiviant. From the unleached gold in the -10 mesh cyanide leach residue, 64% distribution of the gold occurs in the +48 mesh screen fraction. This fraction represents half of the sample weight. Most of the remaining gold (30%) occurs in the -400 mesh fraction, also primarily caused by locking and slimes coatings. The results of the screen analysis are summarized in Table 11.

Table 11

Screen Analysis and Gold Distribution
in -10 Mesh Cyanide Leach Residue
(Sample 444-1-2)

Product (Mesh)	Weight (%)	Gold Assay oz/ton	Gold Distribution (%)
Head Assay		0.052	
Head Calc.	100.0	0.062	100.0
+48	49.15	0.081	64.61
-48+100	11.14	0.022	3.90
-100+200	10.14	0.006	0.97
-200+400	8.58	0.004	0.49
-400	20.99	0.088	30.03

Based on the mineralogical work of head samples, gravity separation products and leach residues as well as the results of the bottle roll tests, the following Table 12 quantifies the mode of occurrence of gold in the Moss Mine samples.

Table 12

Mineralogical Mode of Occurrence of Gold in Moss Mine Gold Ore Samples

Type of Gold Occurrence	Frequency (%) 444-1-2	444-3
Native gold associated with hydrous iron oxides*..................	64	7
Native gold associated with quartz or other gangue minerals........	30	89
Native gold associated with partially oxidized pyrite.............	6	4
Total	100	100

* This includes gold associated with hydrous iron oxides which are pseudomorphous after pyrite as well as gold remobilized during alteration/oxidation and reprecipitated in (layered) iron hydroxides.

It is pointed out that the gold mineralogy established in Table 12 is based on the sample material investigated. Fluctuations and deviations of the mode of occurrence of gold may occur throughout the deposit.

Pertinent mineralogical features of the Moss Mine samples are shown in Figures 3 to 12 in the Appendix.

CONCLUSIONS

- The Moss Mine gold ore samples examined during this study contain a fine- to coarse-grained mineralization of silver-rich native gold some of which may be equivalent to electrum. Minor amounts of gold with low silver contents are also present. It is indicated that the ore may contain a bimodal occurrence (mineralogical residence) of gold as well as a bimodal gold particle size distribution:

  1. In the composited samples MM-8-46/48, the majority of the gold is associated with iron oxidation minerals and the gold is primarily of ultrafine particle size.

  2. In the MM-1-49 sample, most of the gold is associated with siliceous gangue and exhibits distinctly coarse particle sizes.

- The characteristics of the gold mineralogy described above have a distinct impact on ore processing and gold recovery. The fine gold intergrown/encapsulated by iron oxides will require a sufficiently fine grind to become amenable to direct cyanidation. The coarser gold mineralization found in sample MM-1-49, however, showed a good response to gravity concentration, i.e. almost 70% of this gold can be recovered into a small-volume, high-grade concentrate by physical preconcentration.

- The bottle roll cyanidation tests and subsequent mineralogical analyses of a leach residue confirmed the mineralogical characteristics identified in the head samples. The leach tests revealed a particle size-dependent refractoriness to direct leaching. Based upon the recent work, it is also concluded that in ore samples similar to the composite MM-8-46/48, 10-15% of the gold occurs encapsulated in pyrite and may require oxidation prior to cyanidation.

- It is concluded that losses encountered during cyanide leaching are primarily due to partial or complete locking (encapsulation) of gold in iron oxidation minerals, siliceous gangue and/or middlings particles of these minerals.

- The very coarse gold particle sizes observed in sample MM-1-49 could become troublesome in sampling, sample preparation and assaying by causing severe nugget effects. In addition, extremely coarse gold may not be entirely leached during short bottle roll tests. The resultant poor gold extraction could be erroneously interpreted as being caused by locking. Routine gravity separation tests are therefore of critical importance during further development work.

- Due to the presence of spheroidal pyrite, sorptive clay minerals, and traces of carbonaceous matter, the ore may exhibit minor preg-robbing effects. Considerably more follow-up work is required to confirm these conclusions.

- Increased cyanide consumption is caused by cyanicides such as soluble iron oxidation products, spheroidal pyrite, tramp iron and copper wire contamination and cyanide-consuming ferruginous gangue in the slimes fraction.

Figure 3: Photomicrograph showing the typical occurrence of fine native gold (see arrows) locked in hydrous iron oxides (gray).
Scale = ⎣________⎦ 100 micron

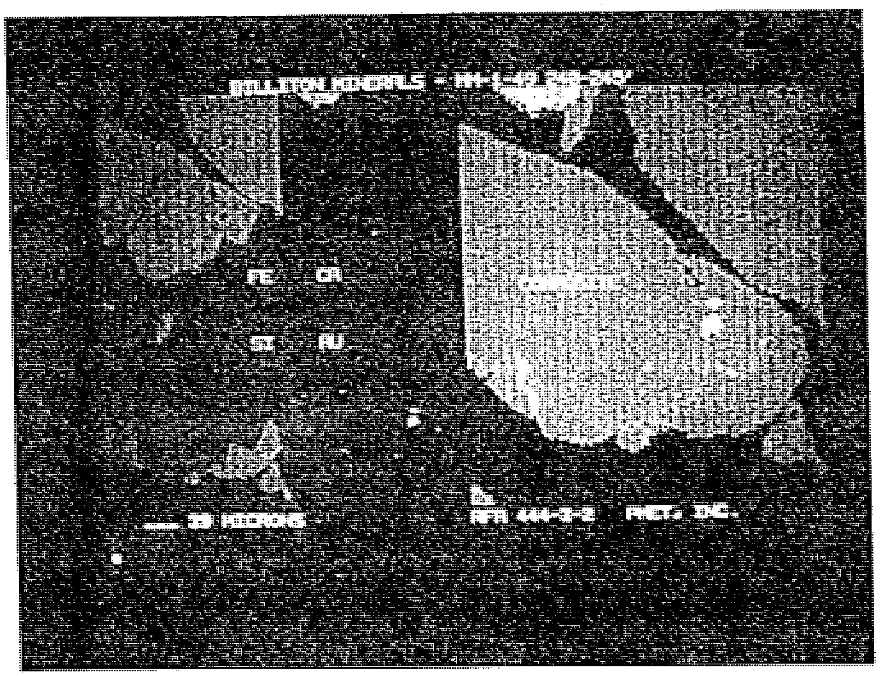


Figure 4 SEM digital X-ray map of the particle shown in Figure 3 outlining the gold encapsulation.

Figure 5 Photomicrograph showing encapsulated and partially liberated native gold (see arrows) in a hydrous iron oxide particle which is attached to a larger quartz grain (Q).
Scale = ⌴ 100 micron

Figure 6 Detail of Figure 5. Fine native gold (yellow) intimately associated with hydrous iron oxides.
Scale = ⌴ 50 micron

Figure 7 Photomicrograph showing the presence of silver-rich (A) and silver-poor (B) gold particles both of which are encapsulated by hydrous iron oxides.
Scale = ⎵ 50 micron

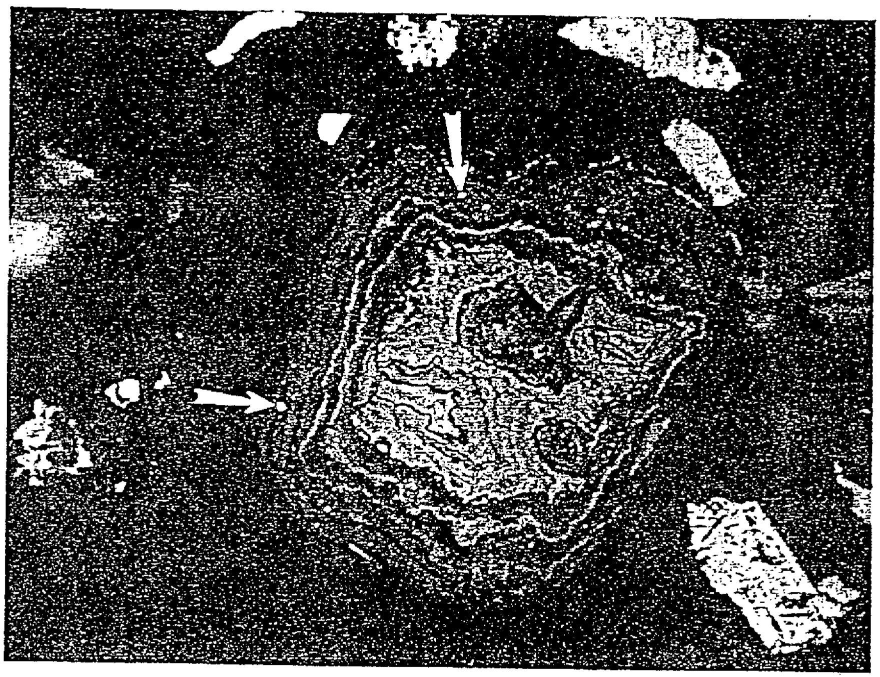


Figure 8 Photomicrograph showing rhythmic iron precipitation with ultrafine gold formation (see arrows). It is tentatively concluded that this gold has been remobilized from a primary mineralization during alteration and was thereafter co-precipitated with the iron.
Scale = ⎵ 50 micron

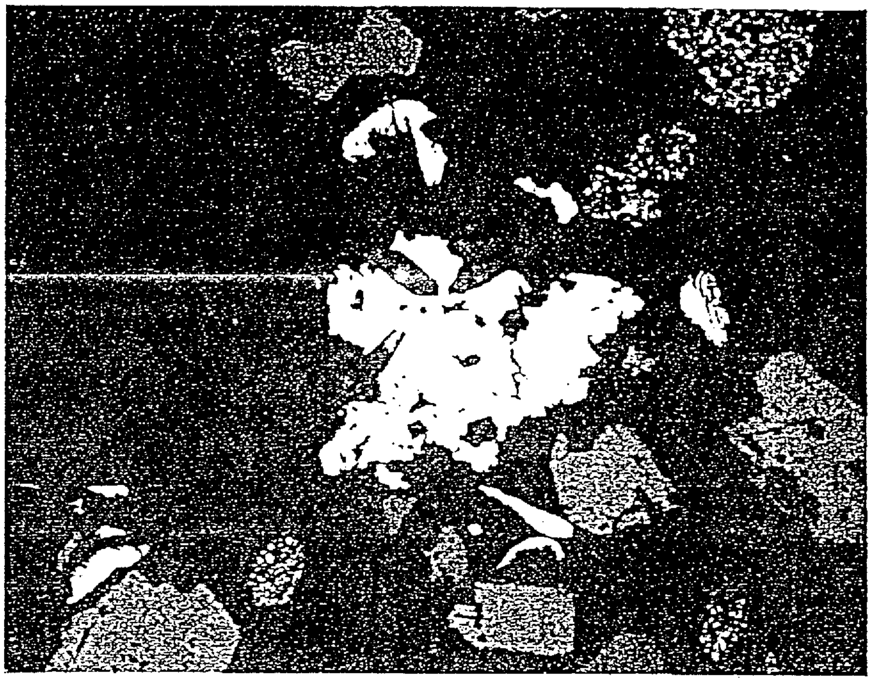


Figure 9 Photomicrograph showing a liberated particle of coarse native gold (G).
Scale = ⌊______⌋ 100 micron

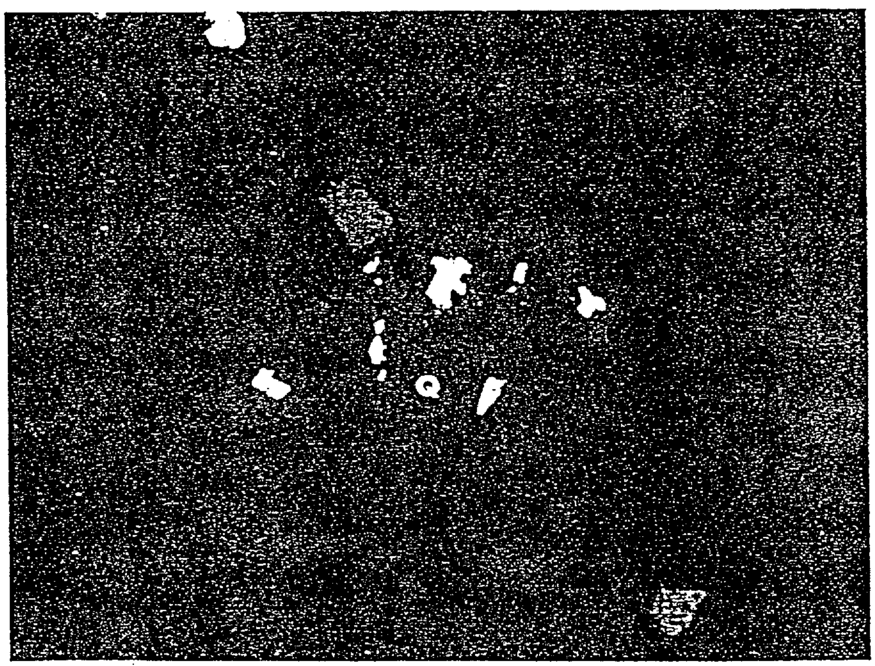


Figure 10 Photomicrograph showing a larger quartz grain (Q) with partially as well as completely locked native gold (yellow).
Scale = ⌊______⌋ 100 micron

Figure 11 Photomicrograph showing the occurrence of spheroidal pyrite (see arrows) which may exhibit preg-robbing potential.
Scale = ⎵⎵⎵⎵ 100 micron

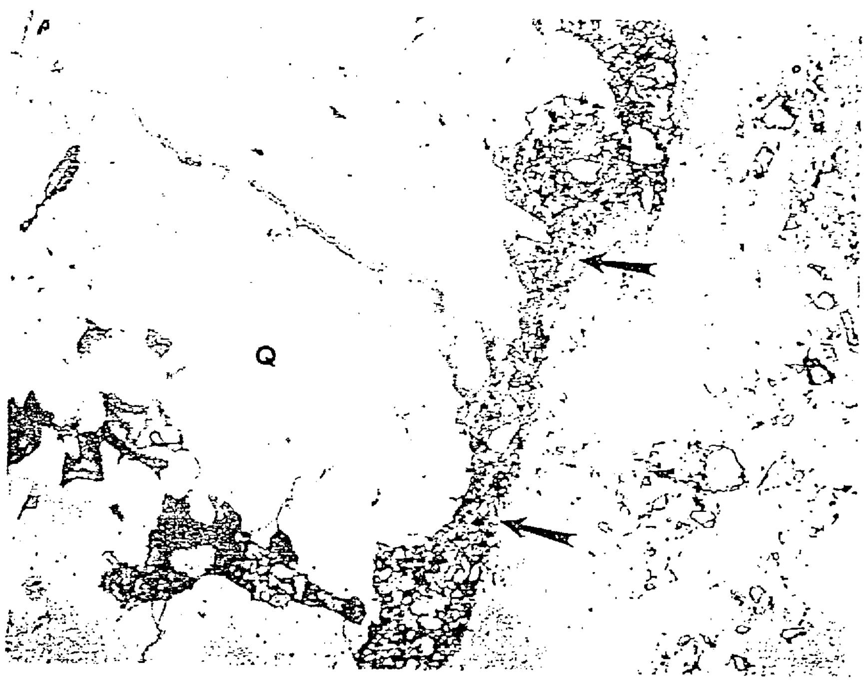


Figure 12 Photomicrograph showing a large quartz grain (Q) coated by clay and silica slimes (see arrows). These slimes coatings may retard or prevent lixiviant penetration.
Scale = ⎵⎵⎵⎵ 100 micron